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**European Journal of  
Contemporary Education**



ELECTRONIC JOURNAL

## The Problems of Contemporary Education

### Lecturer-Student Mentorship and Engagement in Student's Organisational Citizenship Behaviour among University Students: Mediating Role of Supportive Institutional Policies

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#### Abstract

This research explores the relationship between lecturer-student mentorship and organisational citizenship behaviour (OCB), examining the potential mediating impact of supportive institutional policies on this relationship. The study evaluates three distinct dimensions of lecturer-student mentorship, namely academic mentorship, career mentorship, and personal development mentorship. We adopted a cross-sectional design and purposively selected 331 undergraduate students [males = 53.2 %, females = 46.8 %; Age (mean) = 29 years] in Ghana to respond to our survey. The face-to-face survey consisted of demographic information and standardised scales: Student Mentorship Scale, Students' OCB Scale, and Supportive Institutional Policies Questionnaire. The findings indicate a positive influence of each form of lecturer-student mentorship (academic, career, and personal development) on students' OCB. Using mediation modelling through the JASP software, supportive institutional policies partially mediated the relationship between all the dimensions of lecturer-student mentorship and students' OCB. These results suggest that institutions should recognise the importance of creating policies that support and reinforce positive mentoring relationships to enhance students' OCB. The findings from the study serve as a pioneering effort to explore the dimensions of student mentorship within the

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specific context of Ghana. Higher educational institutions should consider developing policies that encourage mentorship programmes, allocate resources for mentoring activities, and establish a conducive environment for mentorship to flourish.

**Keywords:** Ghana, lecturer-student mentorship, mediation analysis, organisational citizenship behaviour, supportive institutional policies, university students.

## 1. Introduction

Professors or lecturers have three fundamental duties within academia, encompassing research, teaching, and service (Hawkins et al., 2014). While teaching and research roles are often clearly defined, the sphere of service within the academic community can manifest in many ways (Reymert, Thune, 2023). One critical component of service that significantly contributes to the growth and development of the academic community is the mentorship of students (Hamann, 2019). Lecturer-student mentorship (LSM) is an integral component of the service aspect of a lecturer's role (Gill et al., 2018). It embodies the nurturing and cultivation of intellectual and professional growth within the student body (Lin et al., 2021). Through this service, professors or lecturers in higher educational institutions extend their commitment beyond imparting knowledge and conducting research towards the guidance and support of individual students in their academic pursuits and personal aspirations (Hamann, 2019). By assuming the role of mentors, they provide a valuable support system that fosters a conducive environment for students to flourish intellectually, emotionally, and professionally (Reymert, Thune, 2023). Lecturers who deliver the mentorship role assume the responsibilities of advisors, motivators, and role models, imparting wisdom, experience, and practical insights to students navigating the complexities of their academic journey (Ghosh, Reio, 2013). This service is instrumental in facilitating students' academic progress and achievement and nurturing their personal growth, self-confidence, and critical thinking abilities (Bogler, Somech, 2023).

The LSM mentorship assumes various forms, each contributing uniquely to the comprehensive development of students (Reymert, Thune, 2023; Tonidandel et al., 2007). These are academic mentorship, career mentorship, and personal development mentorship. Academic mentorship (AM) helps students set educational goals, identify their strengths and weaknesses, and navigate challenges related to coursework, exams, and research (Sozio et al., 2017). Career mentorship (CM) aims to assist students in developing a clear understanding of their professional aspirations and career paths (Gill et al., 2018). Personal development mentorship (PDM) supports students in setting and achieving personal goals, promoting a healthy work-life balance, and cultivating habits that contribute to overall well-being and fulfilment (Lin et al., 2021).

Despite recognising the multifaceted impact of LSM on students' lives, extensive research on its direct correlation with students' organisational citizenship behaviour (SOCB) remains limited (Blondheim, Somech, 2019). The role of students as responsible citizens is intricately entwined within the concept of LSM. Organisational citizenship behaviour (OCB) refers to the discretionary individual behaviour that promotes the effective functioning of an organisation but is not formally recognised (Garcia, 2023). The concept of SOCB denotes the positive behaviours exhibited by students within an educational institution that contribute to the overall functioning and well-being of the academic community (Asad et al., 2019). These behaviours go beyond the formal requirements of coursework and academic performance and include actions that contribute to a positive and supportive learning environment (Somech, Ohayon, 2020).

Remarkably, while the literature has explored the dynamic interplay between LSM and student behaviour, it has primarily approached mentorship as a composite construct rather than discerning the nuanced impact of its distinct forms (Sozio et al., 2017; Wang et al., 2014). Amidst this research gap, it becomes imperative to examine the distinctive influences of the triad of LSM forms on SOCB. Moreover, supportive institutional policies (SIP), which are the bedrock for fostering a nurturing and inclusive environment, assume a critical position. A cursory review shows no recent study has assessed supportive institutional policies' mediating role in the relationship between LSM and SOCB. According to Cao et al. (2022), SIP, which refers to the guidelines, regulations, and practices implemented within an organisation or institution to foster a positive and inclusive environment that promotes the well-being, growth, and success of its members, are designed to provide a framework that supports individuals, groups, or communities in achieving their goals and objectives (Wang et al., 2014). When institutions actively promote a culture of appreciation for the lecturer's mentoring behaviour, students are motivated to participate more

actively in OCB (Asad et al., 2019). Based on this, the study considers SIP to be a mediating factor in the relationship between LSM and SOCB.

## **2. Literature review**

### **2.1. Theoretical Review**

The role of SIP as a mediator in the relationship between LSM and SOCB can be explained through the tenets of the Social Exchange Theory (SET; Blau, 1959). The SET emphasises social relationships as exchanges of valued resources, wherein individuals seek to maximise their rewards and minimise costs. The SET suggests that SIP act as a framework that structures social exchanges within an educational institution. These policies can formalise expectations, clarify roles, and provide a basis for evaluating performance. SIP may also address recognition, rewards, and professional development opportunities, influencing students' motivations to exhibit positive behaviours like OCB (Huart et al., 2023). According to the SET, individuals feel obliged to reciprocate the positive treatment they receive (Scerri et al., 2023). SIPs that foster a positive environment and acknowledge OCB create a sense of obligation for students to reciprocate by continuing to exhibit such OCB.

### **2.2. Lecturer-Student Mentorship**

Mentorship represents a developmental relationship where a mentor, possessing greater knowledge or experience, guides and supports a mentee, aiming to foster personal and professional growth (Hawkins et al., 2014). The LSM programmes can be grouped into three: academic, career, and professional development (Reymert, Thune, 2023; Tonidandel et al., 2007). Firstly, academic mentorship (AM) assumes a pivotal role in fostering students' sense of belonging and support within the academic sphere, positively influencing their inclination to contribute to the overall well-being of the educational community (Tonidandel et al., 2007). Furthermore, AM focuses on refining study skills, time management, effective learning strategies, and subject-specific knowledge, bolsters students' academic endeavours, and fosters a culture of continuous intellectual development (Bogler, Somech, 2023). Thus, AM is designed to support students in their educational endeavours, primarily focusing on enhancing their academic performance and learning experience (Ghosh, Reio, 2013).

Secondly, career mentorship (CM) aids students in delineating their professional aspirations and trajectories, equipping them with insights into diverse industries, job roles, and career pathways, thus enabling informed decision-making and cultivating a strong professional identity and commitment to their future careers (Hawkins et al., 2014). Thirdly, personal development mentorship (PDM) focuses on guiding and supporting student's growth, self-improvement, and self-awareness (Reymert, Thune, 2023). This type of mentorship typically involves helping students develop specific skills, enhance their strengths, and address areas for improvement. Also, it delves into the holistic well-being of students, surpassing the confines of academics and professions (Xu et al., 2014).

### **2.3. SOCB**

The OCB refers to discretionary individual behaviour that promotes the effective functioning of an organisation but is not formally recognised or rewarded (Blondheim, Somech, 2019). The concept of SOCB often refers to positive behaviours exhibited by students within an educational institution that contribute to the overall functioning and well-being of the academic community (Garcia, 2023). These behaviours go beyond the formal requirements of coursework and academic performance and include actions that contribute to a positive and supportive learning environment (Blondheim, Somech, 2019). Some examples of SOCB may consist of helping peers with academic tasks, volunteering for school events or activities, demonstrating responsible and ethical conduct, and contributing to school initiatives (Asad et al., 2019). By engaging in these forms of OCB, students contribute to the educational institution's overall positive atmosphere and cultivate essential skills and values for personal and professional development. Encouraging and recognising SOCB can foster a culture of active citizenship, responsibility, and community engagement, nurturing well-rounded individuals who are academically successful, socially responsible, and empathetic members of society (Blondheim, Somech, 2019).

### **2.4. Supportive Institutional Policies**

The SIP refers to the set of guidelines, regulations, and practices implemented within an organisation or institution to create an environment that fosters its members' well-being, growth, and success (Xu et al., 2014). These policies provide a framework that supports individuals, groups,

or communities in achieving their goals and objectives while promoting a culture of inclusivity, fairness, and support (Cao et al., 2022). Institutional policies are supportive when they support a healthy balance between work and personal life, outline the ethical standards and expected conduct within the institution, promote integrity, accountability, and a respectful work environment, and ensure equal opportunities and treatment for individuals from different backgrounds (Chen et al., 2017). By establishing SIP, organisations can create a conducive and nurturing environment that fosters growth, development, and overall well-being (Cao et al., 2022). These policies contribute to the success of individuals within the institution and promote a positive and inclusive culture that values diversity, encourages collaboration, and supports the achievement of collective and individual goals (Ekpoh, Ukot, 2019).

### **2.5. The relationship between LSM and SOCB**

The relationship between LSM and extra-role activities, such as OCB, remains a subject of growing interest and research (Lin et al., 2021). While studies have indicated a positive association between mentorship and various positive outcomes, the specific impact of LSM on SOCB has garnered less attention. However, SOCB has potential implications for academic and organisational settings (Gill et al., 2018). The LSM is believed to influence SOCB in several ways. First, mentorship often fosters increased engagement and commitment among students, encouraging them to participate actively in academic and extracurricular activities (Garcia, 2023). Second, effective mentorship can serve as a source of positive role modelling for students, encouraging them to exhibit behaviours that benefit the academic community beyond the formal requirements of their coursework (Lin et al., 2021). Third, supportive mentorship relationships can enhance students' motivation to contribute positively to their academic environment, fostering a sense of responsibility and ownership toward the collective welfare of the institution (Somech, Ohayon, 2020). When students feel supported in their academic pursuits, they may be more inclined to engage in helping behaviours towards peers, lecturers, and the institution, thus promoting OCB (Chen et al., 2017).

Moreover, students who gain guidance on navigating their careers and developing essential skills may demonstrate proactive behaviours and a willingness to contribute beyond their formal job roles, positively impacting OCB in their future workplace (Bogler, Somech, 2023). Personal development mentoring can enhance self-awareness. PDM also helps students understand their strengths, weaknesses, and areas for improvement (Chang, Uen, 2022). This awareness can encourage them to actively contribute to the organisation's goals beyond their defined roles. Mentoring that aims at personal development often focuses on enhancing essential skills such as communication, teamwork, and leadership (Garcia, 2023). Students with these skills are more likely to engage in cooperative behaviours and assist others within the organisation (Ghosh et al., 2012). Thus, we hypothesised that all the dimensions of LSM (AM, CM, and PDM) will positively predict SOCB.

### **2.6. Mediating role of supportive institutional policies**

The crucial role SIP plays in mediating the relationship between LSM and SOCB is worth exploring in this study. According to the SET, when students perceive that the institution values their contributions and well-being, it fosters trust and commitment within the student body (Scerri et al., 2020). As per the SET, trust is an essential component of any exchange relationship, and when students trust that the institution will support and recognise their efforts, they are more likely to engage in SOCB (Huart et al., 2023). The SET emphasises the interdependence between individuals in a relationship. Besides, SIPs prioritising students' well-being and development underscore the idea of mutual dependence, fostering an environment where students feel valued and integral to the institution's success, which contributes to students' engagement in SOCB (Scerri et al., 2020). Moreover, policies influence the expectations, norms, and motivations contributing to SOCB within the academic context.

Furthermore, institutional policies that recognise and reward instances of SOCB can amplify the impact of LSM on students' behaviour (Zhao et al., 2022). Positive policies may provide a supportive framework that encourages effective mentorship, creating an environment where students feel valued, supported, and motivated to engage in OCB. On the other hand, if institutional policies are not supportive or are inconsistent with the goals of mentorship, they may hinder the positive impact of mentorship on SOCB (Ghosh et al., 2012). Thus, SIPs prioritise creating a positive and inclusive learning environment to foster a sense of belonging among students. When students feel valued and supported within the institution, the mentorship provided



by lecturers becomes more impactful in encouraging OCB, as students are more likely to reciprocate the positive environment through their actions (Ekpoh, Ukot, 2019). We again hypothesised that SIP will mediate the connection between the dimensions of AM and SOCB.

### 3. Methodology

#### 3.1. Research approach, participants and procedure

A quantitative survey approach utilising a cross-sectional framework was chosen for this study primarily due to its suitability for gathering data from a diverse sample at a particular point in time (Addai et al., 2023). This research design was carefully selected based on its ability to infer the relationship between various variables within the given context, enabling the researchers to draw insights from a large and diverse dataset. The targeted population comprised undergraduate students enrolled at a Ghanaian university with a student body totalling fewer than 10,000 individuals. The selection of this population was particularly relevant given the competitive nature of universities in Ghana. Thus, a robust mentoring programme can provide students with essential insights and networking prospects within their respective fields. When prospective students observe a university's strong history of facilitating graduates' career success through effective mentorship, they are more inclined to be drawn to the institution.

**Table 1.** Respondents demographic characteristics (n = 331)

Variable	Frequency	Per cent (%)
Sex		
male	176	53.2
Female	155	46.8
Age		
≤ 20 years	72	21.8
21 – 30 years	165	49.8
≥ 31 years	94	28.4
Level of study		
Level 100	78	23.6
Level 200	77	23.3
Level 300	95	28.7
Level 400	81	24.4
Educational Session		
Business	121	36.6
Engineering	106	32.0
Information Technology	104	31.4

The researchers employed purposive sampling to target 400 participants, a method aligned with the predefined inclusion criteria of selecting readily available individuals who met our inclusion characteristics (Sarfo et al., 2022). Of the 400 questionnaires distributed, 331 were returned, resulting in a robust response rate of 82.8%. Among the participants, the majority, accounting for 53.2 %, were identified as males, with a mean age of 29 years old. The participants constituted a diverse group of undergraduate students ranging from level 100 to 400, enrolled in various academic programmes such as business, engineering, and information technology (refer to Table 1).

To improve the response rate, the researchers opted for face-to-face data collection. During these encounters, the researchers personally approached potential respondents, obtained their informed consent, and provided them with the questionnaires. Those who had the time readily completed the questionnaires on the spot. The questionnaires were left in their possession for those unable to respond immediately, and the researchers made subsequent visits the following day to retrieve the completed questionnaires. The data collection process spanned approximately two weeks.

### 3.3. Measures

The study's participants responded to a questionnaire comprising a biodata section (sex, age, level of study, and educational session) and three validated scales. All the scales were responded to on a five-point Likert scale ranging from "Strongly Agree" to "Strongly Disagree." The three scales were as follows:

**Student Mentorship Scale (LSMS)** (Sozio et al., 2017): It is a 10-item scale designed to assess the effectiveness of student mentorship programmes and the quality of the mentor-mentee relationship, with a Cronbach's alpha of 0.91. The scale evaluates the three dimensions of mentorship: academic, career, and personal development. An example item from the LSMS is "My lecturer provides valuable guidance and support in my academic pursuits."

**Students' OCB Scale (SOCBS)** (Desselle, Semsick, 2016): It is a 12-item measure that evaluates the extent to which students engage in behaviours contributing to the overall functioning and effectiveness of the academic environment, with a Cronbach's alpha of 0.89. A sample item from the SOCBS is "I willingly assist my classmates when they encounter academic challenges."

**Supportive Institutional Policies Questionnaires (SIPQ)** (Cao et al., 2022): It is a 9-item scale developed to evaluate the effectiveness and perception of various supportive policies within an institution. These policies encompass areas related to academic support, diversity, inclusivity, and mentorship activities. The scale has a Cronbach alpha of 0.79. A sample item from the SIPQ is "I feel that the institution provides adequate academic resources and support services for students."

### 3.4. Analysis

Following data acquisition through questionnaire administration, statistical analysis was conducted using the JASP software [Version 0.17.2.1] (JASP Team, 2023), employing Bootstrap resampling with 5,000 replications. To ensure model robustness, we used ML and DWLS (robust options) estimator and lavaan syntax, while full information maximum likelihood (FIML) was employed to address missing values in the dataset. The JASP (JASP Team, 2023) was also used to assess reliability, generate descriptive statistics, conduct correlation analyses, and execute confirmatory factor analysis (CFA).

The mediation model syntax for the analysis is as follows:

```
# dependent regression
SOCB ~ b11*Policies + c11*Academic + c12*Career + c13*Personal
# mediator regression
Policies ~ a11*Academic + a12*Career + a13*Personal
# effect decomposition
# y1 ~ x1
ind_x1_m1_y1 := a11*b11
ind_x1_y1 := ind_x1_m1_y1
tot_x1_y1 := ind_x1_y1 + c11

# y1 ~ x2
ind_x2_m1_y1 := a12*b11
ind_x2_y1 := ind_x2_m1_y1
tot_x2_y1 := ind_x2_y1 + c12
# y1 ~ x3
ind_x3_m1_y1 := a13*b11
ind_x3_y1 := ind_x3_m1_y1
tot_x3_y1 := ind_x3_y1 + c13
```

### 3.5. Factor analysis

The CFA was employed to assess the discriminative validity of LSM, SIP, and SOCB. The results of this analysis are detailed in Table 2.

**Table 2.** Confirmatory factor analysis of the variables

Model	$\chi^2$	Df	$\chi^2/df$	RMSEA	TLI	GFI	CFI	
(1)	Three-factor model	4177.86	434	9.62	0.16	0.37	0.90	0.42

(a)	LSM and SIP	858.17	152	5.64	0.12	0.60	0.94	0.64
(b)	LSM and SOCB	3378.44	209	16.16	0.21	0.31	0.86	0.37
(c)	SIP and SOCB	3140.87	189	16.61	0.21	0.32	0.86	0.39
(2)	Single factor model	4288.37	405	10.58	0.17	0.34	0.84	0.39

Notes: RMSEA, root-mean-square error of approximation; TLI, Tucker-Lewis statistics; GFI, goodness-of-fit index; CFI, comparative-fit index. Supportive institutional policies (SIP), academic mentorship (AM), career mentorship (CM), personal development mentorship (PDM) and students' organisational citizenship behaviour (OCB).

From Table 2, the proposed three-factor model consisting of LSM, SIP, and SOCB demonstrated a strong agreement with the dataset ( $\chi^2/df = 9.62$ , RMSEA = 0.16, TLI = 0.37, GFI = 0.90, CFI = 0.42,  $p < 0.01$ ). These findings validate the robust fit of the proposed model. Additionally, each item exhibited significant loadings on their respective constructs, confirming the convergence of validity within these constructs. We conducted a single-factor assessment to evaluate the potential impact of common method variance. The results revealed an inadequate fit for the single-factor model ( $\chi^2/df = 10.58$ , RMSEA = 0.17, TLI = 0.34, GFI = 0.84, CFI = 0.39). This emphasises the distinct nature of the constructs from one another, indicating their strong discriminant validity.

### 3.6. Analysis of descriptive statistics and correlations

From Table 3, the analysis revealed that AM exhibited a strong positive correlation with CM ( $r = 0.55$ ,  $p < 0.01$ ), PDM ( $r = 0.52$ ,  $p < 0.01$ ), SIP ( $r = 0.40$ ,  $p < 0.01$ ), and SOCB ( $r = 0.48$ ,  $p < 0.01$ ). CM also indicated a significant positive correlation with PDM ( $r = 0.50$ ,  $p < 0.01$ ), SIP ( $r = 0.42$ ,  $p < 0.01$ ), and SOCB ( $r = 0.48$ ,  $p < 0.01$ ). Moreover, PDM was observed to be significantly correlated with SIP ( $r = 0.36$ ,  $p < 0.01$ ) and SOCB ( $r = 0.53$ ,  $p < 0.01$ ). Lastly, SIP positively correlated with SOCB ( $r = 0.54$ ,  $p < 0.01$ ).

**Table 3.** Descriptive statistics and correlation matrix (N = 331)

	Measures	Mean	SD	Correlations				
				1	2	3	4	5
1	AM	11.65	2.91	1				
2	CM	9.60	2.59	.55**	1			
3	PDM	9.00	2.19	.52**	.50**	1		
4	SIP	29.01	6.00	.40**	.42**	.36**	1	
5	SOCB	38.81	8.58	.48**	.48**	.53**	.54**	1

Notes: \* $p < 0.05$ ; \*\* $p < 0.01$ ; Supportive institutional policies (SIP), academic mentorship (AM), career mentorship (CM), personal development mentorship (PDM) and students' organisational citizenship behaviour (OCB).

## 4. Results

The results indicate direct, indirect and total effects from the Hypotheses tests using the mediation analysis. The hypotheses were analysed using JASP and summarised using tables. To evaluate the impact of LSM components (AM, CM, and PDM) on SOCB (refer to Table 4), the analysis indicated that AM significantly predicted SOCB (direct effect  $b = 0.047$ ,  $p = 0.009$ ). Additionally, CA significantly predicted SOCB (direct effect  $b = 0.049$ ,  $p = 0.015$ ). Furthermore, PDM significantly predicted SOCB (direct effect  $b = 0.126$ ,  $p < 0.001$ ). These findings lend support to Hypothesis 1.

**Table 4.** Summary of the direct effect of the components of mentorship on SOCB (N = 331)

	Estimate	Std. Error	z-value	p	95 % Confidence Interval	
					Lower	Upper
AM → SOCB	0.047	0.018	2.594	0.009	0.003	0.091
CA → SOCB	0.049	0.020	2.437	0.015	0.005	0.097
PDM → SOCB	0.126	0.023	5.497	< .001	0.062	0.183

Notes: Supportive institutional policies (SIP), academic mentorship (AM), personal development mentorship (PDM), career mentorship (CA) and students' organisational citizenship behaviour (OCB)

Evaluating the indirect impact of AM on SOCB through SIP, the introduction of SIP into the model resulted is noteworthy in the effects of AM (indirect effect  $b = 0.022$ ,  $p = 0.004$ ), CA (indirect effect  $b = 0.032$ ,  $p < .001$ ), and PDM (indirect effect  $b = 0.022$ ,  $p = 0.023$ ) on SOCB. This role suggests a partial mediating effect of the components of LSM on SOCB. See Table 5 for details.

**Table 5.** Indirect effect of mentorship components and SIP on SOCB (N = 331)

	Estimate	Std. Error	z-value	p	95 % Confidence Interval	
					Lower	Upper
AM → SIP → SOCB	0.022	0.008	2.865	0.004	0.007	0.042
CA → SIP → SOCB	0.032	0.009	3.605	< .001	0.015	0.056
PDM → SIP → SOCB	0.022	0.009	2.273	0.023	0.002	0.047

Notes: Supportive institutional policies (SIP), academic mentorship (AM), personal development mentorship (PDM), career mentorship (CA) and students' organisational citizenship behaviour (OCB).

In other words, SIP indeed mediates the relationship between AM, CA, and PDM on SOCB, indicating a partial mediation role of SIP in the relationship between the components of LSM and SOCB. This finding aligns with the second hypothesis.

**Table 6.** Total effect of the component of LSM on SOCB (N = 331)

	Estimate	Std. Error	z-value	p	95 % Confidence Interval	
					Lower	Upper
AM → SOCB	0.069	0.019	3.599	< .001	0.019	0.112
CA → SOCB	0.082	0.021	3.859	< .001	0.035	0.137
PDM → SOCB	0.147	0.024	6.037	< .001	0.083	0.212

Notes: Academic mentorship (AM), personal development mentorship (PDM), career mentorship (CA) and students' organisational citizenship behaviour (OCB).

From the path coefficients, it was clear that SIP as a construct influenced SOCB, with a direct effect  $b = 0.335$ ,  $p < .001$ . Moreover, according to the coefficients of determination ( $R^2$ ), the SIP explained 23.8 % of SOCB (medium effect) (Cohen, 1992).

**Table 7.** Path coefficients of the components of mentorship and SIP on SOCB (N = 331)

	Estimate	Std. Error	z-value	p	95 % Confidence Interval	
					Lower	Upper
SIP → SOCB	0.335	0.046	7.235	< .001	0.214	0.452
AM → SOCB	0.047	0.018	2.594	0.009	0.003	0.091
CA → SOCB	0.049	0.020	2.437	0.015	0.005	0.097
PDM → SOCB	0.126	0.023	5.497	< .001	0.062	0.183
AM → SIP	0.066	0.021	3.120	0.002	0.017	0.116
CA → SIP	0.097	0.023	4.158	< .001	0.050	0.148
PDM → SIP	0.064	0.027	2.394	0.017	0.005	0.129

Notes: Supportive institutional policies (SIP), academic mentorship (AM), personal development mentorship (PDM), career mentorship (CA) and students' organisational citizenship behaviour (OCB).

The path estimates in Table 7 are depicted in Figure 1.

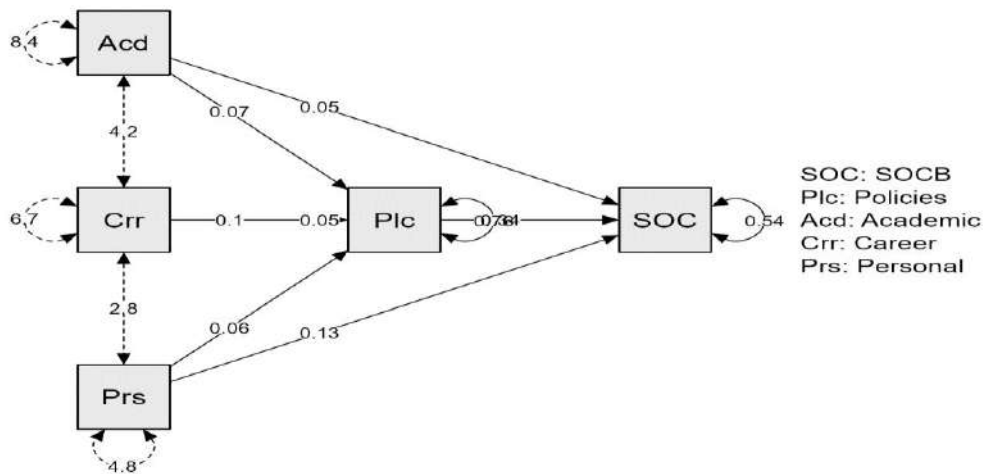


Fig. 1. Path plot of the mediating effect

## 5. Discussion

The findings indicated a significantly positive influence of the components of LSM on SOCB. This means that mentorship programmes provided by the lecturers to the students benefit the student's willingness to go beyond their prescribed roles and contribute positively to the institution. The findings agree with the studies that illustrated a positive impact between the components of LSM and SOCB (Chang, Uen, 2022; Ghosh et al., 2012). Student mentorship programmes facilitate OCB by providing students access to experienced mentors who serve as role models, guiding them in professional norms, ethical conduct, and responsible behaviour within the academic community. By instilling these values, mentorship programmes empower students to actively contribute to the academic community, fostering a sense of responsibility and engagement crucial to OCB development.

Within the academic realm, LSM assumes a specialised form, with educators taking the role of mentors, imparting knowledge and expertise to enhance students' academic performance, personal development, and career progression (Wang et al., 2014). LSM fosters robust connections between lecturers and students, nurturing an environment of open dialogue, constructive feedback, and intellectual exchange, thus cultivating a vibrant learning community grounded in mutual respect and engagement (Hamann, 2019; Tonidandel et al., 2007). The overarching objective of mentorship is to facilitate the holistic development of the mentee, aiding them in their journey of growth, learning, and goal attainment (Ekpoh, Ukot, 2019). Mentorship can transpire across various domains, including education, career development, personal growth, and social integration, emphasising its multifaceted impact on individuals' lives (Bogler, Somech, 2023).

Concerning the complement prediction, SIP had a significant partial mediating role in the relationship between the three components of LSM and SOCB. These findings also align with the study by Cao et al. (2022), which indicates that SIP mediates the relationship between mentorship and OCB. It became evident that SIP reinforces the values conveyed through mentorship, creating an environment that promotes and rewards positive behaviour. When institutional policies align with mentor guidance, students are more likely to internalise and exhibit SOCB as an integral part of their academic and social engagement. Clear and well-communicated institutional policies reinforce the significance of SOCB, enhancing students' commitment to engaging in such behaviour.

Furthermore, the crucial role SIP plays in mediating the relationship between LSM and SOCB is worth exploring in this study. According to the SET, when students perceive that the institution values their contributions and well-being, it fosters trust and commitment within the student body (Scerri et al., 2020). As per the SET, trust is an essential component of any exchange relationship, and when students trust that the institution will support and recognise their efforts, they are more likely to engage in SOCB (Huart et al., 2023). The SET emphasises the interdependence between individuals in a relationship. Besides, SIPs prioritising students' well-being and development underscore the idea of mutual dependence, fostering an environment where students feel valued and integral to the institution's success, which contributes to students' engagement in OCB (Scerri

et al., 2020). Moreover, policies influence the expectations, norms, and motivations contributing to SOCB within the academic context.

The present research presents significant insights that add to the existing literature on mentoring and SOCB. In line with the SET, the results suggest that LSM represents a form of social exchange wherein both parties expect certain benefits and incur costs. Students perceive mentorship as gaining knowledge, guidance, and support, while lecturers find fulfilment in fostering student development and contributing to the academic community. The SET emphasises the significance of perceived fairness and equity in social exchanges as crucial determinants of individuals' attitudes and behaviours. SIP functions to establish a perception of fairness and trust. This, in turn, nurtures a constructive and productive exchange, fostering a positive environment. The outcome is the cultivation of SOCB. Thus, SIP acts as a mediator by shaping the mentorship environment, defining roles and expectations, allocating resources, and fostering a positive institutional culture. These factors, in turn, contribute to the development of positive student OCB.

## **6. Practical Implications**

Significant practical implications can be drawn from the findings of this present study. First, the findings indicate that mentoring students in academic, career and personal development contribute to SOCB. The findings suggest that creating and fostering effective LSM programmes can significantly contribute to the development of positive SOCB. Therefore, educational institutions and lecturers can refine and improve existing mentorship programmes, incorporating elements that promote a supportive and conducive environment for the mentees.

Secondly, the study revealed the mediating role of SIP in the relationship between the three forms of student mentorship activities (academic, career and personal development) and SOCB. These findings underscore the importance of understanding the crucial role of institutional policies in facilitating the positive linkage between students' mentorship programmes and SOCB. This implies that institutional and educational policymakers can focus on developing and implementing supportive policies that encourage and reward mentorship efforts. Institutions can work on fostering an organisational culture and climate that values mentorship, promotes supportive policies, and encourages a sense of community and collaboration among students and faculty, ultimately contributing to a more conducive learning environment and overall student well-being.

Lastly, the findings underscore the importance of faculty training and development. Institutions can utilise these findings to design training and development programmes for faculty members, emphasising the importance of effective mentorship and the role of SIP in fostering SOCB. Such programmes can equip faculty members with the necessary resources, training, and support to effectively engage with students in all forms of mentorship activities, provide guidance, and foster positive behavioural outcomes, thereby contributing to developing a more engaged and proactive student community.

## **7. Limitations and Future Directions**

The current study is subject to certain limitations that warrant consideration. Firstly, the control measures were confined to sex and course of study, neglecting the inclusion of additional variables that may potentially impact mentoring, such as socioeconomic background and cultural differences. Prior studies have associated different socioeconomic characteristics with varying levels of access to resources and opportunities, influencing their involvement in SOCB activities (Bogler, Somech, 2023). Moreover, cultural differences can shape individuals' values, beliefs, and behaviours, impacting how students perceive and engage in organisational activities within their academic setting (Desselle, Semsick, 2016). Additionally, given that establishing and maintaining a mentoring relationship necessitates a significant time commitment, the duration of the mentor-mentee bond can be seen as an evaluation of the rapport between the mentor and mentee (Blondheim, Somech, 2019). Therefore, future investigations should incorporate controls for pertinent influencing factors related to the proposed associations.

Secondly, our reliance on self-reported survey measures may heighten the risk of eliciting socially desirable participant responses. To counteract potential bias arising from self-reporting, we implemented three specific strategies. Firstly, we promoted an environment where participants felt safe and comfortable sharing their experiences without fear of judgment or repercussions, ensuring confidentiality and anonymity. Secondly, we ensured a clear and unbiased survey design, using unbiased language and avoiding leading questions. Additionally, we engaged in pilot testing of

the survey instruments with a diverse sample, which helped identify any potential biases or misinterpretations before the main study. Lastly, we addressed social desirability bias by encouraging participants to provide honest and genuine responses, emphasising the importance of their truthful input in advancing research and promoting understanding. Using indirect or implicit measures, when appropriate, helped minimise the impact of social desirability bias on self-reported data.

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### **8. Conflict of interest**

The authors report no conflict of interest.

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## **Influence of the Content of the Ethnic Component in Pedagogical Education on the Development of Ethnopedagogical Competence in Future Teachers**

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### **Abstract**

This study is devoted to the topical issue of developing professionally important qualities of multicultural personalities for future teachers using the ethnic component in pedagogical education. The object under study is the process of developing professionally important qualities of the multicultural personality of a future teacher in a pedagogical vocational school. The purpose of this research is to determine how the ethnic component in the content of pedagogical training affects the formation of the considered personal qualities. Having examined the representation of the ethnic component in the curriculum for the qualification 4S01140605 "Foreign language teacher", the grounds for its inclusion in the content of teacher training, and the principles of its formation, the authors experimentally test its impact on the development of the considered qualities of the multicultural personality of a future teacher-patriotism, tolerance, and intercultural and regional competence. Proceeding from the experimental findings, the authors design a special course for the development of the examined qualities.

**Keywords:** pedagogical education, ethnic component, educational content, ethno-pedagogical competence, ethno-pedagogy.

### **1. Introduction**

Currently, the goal of global education is to introduce the young generation to national cultures and traditions, develop ethnic consciousness, and solve problems independently of national traditions and world experience.

The 20th century experience proves that insufficient attention is given to ethnocultural problems, which are fraught with irreversible consequences for mankind. The UNESCO policy document "Change and Development in Higher Education" (1995) states that "the rigid adoption of

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foreign concepts and values and the neglect of regional and national cultures and philosophies have had negative repercussions on education".

In modern conditions of societal development, the extensive influence of mass culture on young people leads to a decrease in their interest in the history, culture, and traditions of their native people and the destruction of intergenerational cultural continuity. Young people who do not know the traditions of their people may in the future be cut off from it, unaware of their roots. This, in turn, may lead to the loss of accumulated cultural and historical experience, which is the foundation for the formation of an ethnocultural personality.

Ethnopedagogical training by teachers is associated with the transmission of unique heritage objects and aimed at transforming the social environment; this training is one of the most important tasks in any country (Slobodová Nováková et al., 2021). Thus, the result of pedagogical education should be not only the ability to solve narrow professional tasks but also the ability to be a subject of the educational process versatile in mastering culture and its transmission. Pedagogical universities, institutes, and vocational schools should prepare future teachers for work aimed at the formation of national consciousness and the ability to develop the original culture of their people and region (Burdina, 2006: 83). The main directions of educational work should be conditioned by the influence of traditions of folk culture, the interpenetration of cultures, and the specificity of particular national and regional characteristics.

This will help to educate younger generations to live in a multicultural environment and develop their abilities and skills for cooperation and communication with people of different nationalities, races, and religions without losing their national features (Burdina, 2006; Götz, 2021; Lednev, 2014).

Therefore, to develop ethno-pedagogical competence (EPC) in a future teacher, it is necessary to include an ethnic component in the content of pedagogical education, which will promote "the adoption of ethnocultural values and ideas, which form the basis of their worldview and world-understanding" (Vasileva, 2020: 166).

The ethnic component in the content of pedagogical education is defined by scientists as "a humanitarian complex of knowledge, genetically conditioned by the development of ethnic identity. It is represented by a set of didactic units based on certain principles of its structuring. This component has an ethno-pedagogical orientation for the formation of personal and professional qualities of a future teacher" (Mukhtarova, 2008: 41). According to Sh.M. Mukhtarova, the essence of this concept, consists of its orientation on the development of a polycultural personality as a future teacher as a bearer of an active civil position and a positive national identity.

In Kazakhstan, the initial conditions for the incorporation of the ethnic component into the content of pedagogical training are established by regulatory documents of national significance. The Law of the Republic of Kazakhstan "On Education" reflects the key characteristics of the educational ideal: the formation, development, and professional establishment of the individual based on national and universal values; the development of the intellectual, creative, spiritual, and physical capabilities of the person; the cultivation of civil consciousness and patriotism; an active civil position; knowledge of the history of the country; its traditions and culture; etc. (Law of the Republic of Kazakhstan..., 2007).

Thus, the purpose of the present article is to determine the impact of the ethnic component in the content of pedagogical education on the formation of professionally significant qualities for future teachers.

## **2. Methods**

The object of the study is the system of pedagogical education in vocational schools, and the subject is the content of education. The content of education is a key component of the pedagogical system that is responsible for the implementation of the goal of education.

The application of the systematic approach enabled us to examine the interaction of the research subject with the purpose of ethno-pedagogical education as a prototype of the future result.

The study included 110 students. The experimental group consisted of 51 people from the Pavlodar Higher Pedagogical College named after B. Akhmetov (2018–2019 and 2021–2022 academic years, Pavlodar, Kazakhstan), and the control group included 59 pedagogical students

from the Toraighyrov University (2018–2019 and 2021–2022 academic years) and the Mogilev State A. Kuleshov University (2017–2018 and 2021–2022 academic years, Mogilev, Belarus).

All participants in the experiment were pedagogy students studying a foreign language (English) or several sociohumanitarian disciplines aimed at the formation and development of their social identity and the growth of professional competence. In the experimental group, along with sociohumanitarian disciplines, a special course (elective) aimed at the formation of professionally significant personal qualities was introduced.

The study was conducted in several stages:

1. In the first stage, documents and legal acts regulating the introduction of ethnocultural education in Kazakhstan and education in general were studied and analyzed. In addition, we examined the scientific, psychological, pedagogical, and specialized literature on the problem under study and analyzed the content of training programmes for specialists.

Having considered the representation of the ethnic component in the curriculum of the qualification 4S01140605 "Foreign language teacher", the grounds for its inclusion in the content of pedagogical education, and the principles of its formation, we experimentally determined the degree of influence on the formation of the studied qualities of the multicultural personality of a future teacher – patriotism, tolerance, and intercultural and regional competence.

2. In the second stage, to determine the level of development of the competence under study, a diagnostic map was developed. The diagnostic map was constructed based on the structure of the EPC revealed by future teachers in the context of the modernization of social consciousness and the competencies allocated to it and based on the revealed criteria and indicators of the development of the analyzed competence.

The diagnostic of EPC determined three levels of development among the students: low, average, and high. The criteria for the development of the EPC in a future teacher in the context of modernization of social consciousness are the cognitive, emotional and value, professional and functional, and personality criteria. The levels of formation are defined as low (critical), average (acceptable), or high (optimal). The selected criteria and indicators enabled us to identify the level of development of the EPC for future teachers.

3. The third stage consisted of an ascertaining experiment, which allowed us to test the efficiency of the developed model for the formation of the EPC in a future teacher in the context of modernization of social consciousness.

The results of the ascertaining experiment served as a basis for the development of a theoretical model for developing the EPC in the future in the context of the modernization of social consciousness in the educational process. In this regard, a formative experiment was conducted to develop the EPC for future teachers.

4. The fourth stage involved the formative experiment.

At the formative experiment stage, the goal was to develop a model for the formation of the EPC for future teachers in the context of the modernization of social consciousness and test its efficiency in practice. Achievement of this goal was associated with solving the following objectives:

- To use the potential of all types of pedagogical practices in the formation of components (competencies) of the EPC for a future teacher based on the implementation of personal-activity, ethnocultural, competency-based, subject-centered, and systemic approaches;

- To develop and test a special course titled "Culture, Traditions, and Customs in Kazakhstan and Other Countries" for the formation and development of this quality for future teachers;

In addition, at the formative experiment stage, in accordance with the developed methodology, the electronic textbook "National Etiquette Specifics in Intercultural Business Communication", designed to develop spoken English in pedagogical students, was introduced and tested in the educational process (Novoselova, Nieto-Moreno-de-Diezmas, 2018).

Additionally, during the educational process (2019-2020 academic year), Toraighyrov University and the Pavlodar Higher Pedagogical College (named after B. Akhmetov) employed the following materials:

- the electronic training manual "National Traditions, Customs, and Business Etiquette in Kazakhstan and English-Speaking Countries" (Novoselova, Mukataeva, 2019);

The training manual "Ethnic specifics of communication culture in Kazakhstan and Spain" was used (Novoselova, Nieto-Moreno-de-Diezmas, 2019).

The content of the teaching material was chosen in strict accordance with the requirements of the model program for the discipline "Foreign Language". The survey included topics and exercises

to develop spoken language within the framework of the international European standards A1 and A2. The selected material contributes to the development of ethno-pedagogical, intercultural, and regional competence and is presented with consideration of its use in preparing future teachers for ethno-pedagogical activities.

5. In the fifth (control) stage, we evaluated the development of professionally significant qualities in future teachers through a comparative analysis of the results of the experimental groups in comparison with those of the control groups and through quantitative and qualitative processing of the results, identifying the effectiveness of the developed model.

The data processing and evaluation of the effectiveness of the developed elective course were carried out using mathematical methods. The goal of the experiment was to identify differences in the distributions of specific characteristics (proficiency levels in components of EPC) when comparing two empirical distributions (EG and CG). For this purpose, the  $\chi^2$  Pearson criterion was employed.

The measurement scale consisted of  $C=3$  categories (3, "low level"; 4, "medium level"; and 5, "high level", with one independent condition imposed. Therefore, the degrees of freedom,  $v = C-1 = 2$ .

To analyze the results, two statistical hypotheses were formulated:

1) The hypothesis of no differences in the indicators of the level of proficiency in the components of EPC for future teachers (null hypothesis).

2) The hypothesis of the significance of differences in the indicators of the level of proficiency in the components of EPC for future teachers (alternative hypothesis).

From the table of  $\chi^2$  values for a significance level of  $\alpha = 0.05$  and degrees of freedom  $v = C - 1 = 2$ , the critical value of the  $\chi^2$  statistic is determined to be  $\chi^2_{crit} = 5.991$ .

Scientific and theoretical substantiation of the issue of developing the EPC for a future teacher through the introduction of an ethnic component in the educational and pedagogical process allowed us to test the effectiveness of the theoretical model of the investigated competence in the vocational school and university educational process.

The level of development of the EPC for a future teacher with the use of the ethnic component was determined by the diagnostic map. The level of development of future teachers' EPC and its constituent competencies (EPC components) were assessed by testing, questionnaires, and other research methods during the implementation of the special course and observation of students in the learning process, considering the developed criteria and indicators.

The program for diagnosing the EPC of future teachers in the context of modernization of social consciousness included the following:

- a diagnostic map of the formation of the EPC for a future teacher in the context of modernization of social consciousness developed by the authors of the study;

- Questionnaire "Personal growth of students" by D.V. Grigoriev, I.V. Kuleshova, and P.V. Stepanov to test the development of professionally significant qualities in future foreign language teachers: patriotism, tolerance, and ability to intercultural dialog;

- test-questionnaire to assess intercultural competence;

- test-questionnaire "Traits of a Tolerant Person" (a group of questions from the questionnaire on the sections "Student's attitude to the world" and "Student's attitude to a person as such" served as a basis for defining tolerance as a necessary professionally significant quality of a future teacher);

- the method "The concept of patriotism and the teacher's role in fostering it in students";

- specially designed questionnaires (original methodology) "My native land" and "Outstanding people of the Pavlodar region". These questionnaires assessed the level of knowledge of the region's sociocultural values and traditions, i.e., regional competence. Along with questions related to national and historical material, the survey contained questions of the following nature concerning the ethnographic and sociocultural experience of the inhabitants of Priirtyshje, Pavlodar region:

- Can you say that you love your city?

- Would you leave for another city without regret?

- Are you proud when people talk about your region as a center of science, culture, a major industrial center, or something else positive?

- Do you think you can participate in the development of your region as a teacher, school administrator, or other professional?

- Do you aspire to foster love for your hometown among your students?

- If you were offered to volunteer to lead a local history club and teach children about local

history, would you refuse or agree to do so?

- From what branch of knowledge would you prefer to choose local history material to speak at a conference, roundtable meeting, or class hour in high school?

- Would you like to compete in local contests such as "Miss City", "Mr. City", and "City Teacher", etc., and win first place?

### 3. Results

The processing of the results obtained with the diagnostic map provides an objective characteristic of the EPC for future teachers in the context of the modernization of social consciousness (Table 1).

**Table 1.** Diagnostic map of the initial level of development of the components of future teachers' EPC in the context of modernization of social consciousness

Component	Studied Competenices	Level	EG – 51 people		CG – 59 people		$\chi^2$
			Number	%	Number	%	
1	2	3	4	5	6	7	8
Cognitive Component – Public Consciousness	CC1	Low	4	7,8	6	10,2	1,456
		Mid	35	68,6	42	71,2	
		High	12	23,6	11	18,6	
	CC2	Low	8	15,7	7	11,9	0,876
		Mid	31	60,7	39	66,1	
		high	12	23,6	13	22	
	CC3	Low	7	13,7	8	13,6	0,572
		Mid	33	64,7	35	59,3	
		High	11	21,6	16	27,1	
Motivational-Value Component - Patriotism	MVC1	low	11	21,6	9	15,3	2,634
		mid	32	62,7	43	72,9	
		high	8	15,7	7	11,8	
	MVC2	low	42	82,4	47	79,7	1,092
		mid	9	17,6	12	20,3	
		high	-	-	-	-	
	MVC3	low	13	25,5	11	18,65	1,236
		mid	29	56,9	37	62,7	
		high	9	17,6	11	18,65	
Professional-Functional Component – Regional Competence	PFC1	low	13	25,5	12	20,3	0,322
		mid	28	54,9	37	62,7	
		high	10	19,6	10	17	
	PFC2	low	51	100	59	100	0,0
		mid	-	-	-	-	
		high	-	-	-	-	
	PFC3	low	41	80,4	44	74,6	0,584
		mid	10	19,6	15	25,4	
		high	-	-	-	-	
Activity-Behavioral Component, Intercultural Competence	ABC1	low	16	31,4	17	28,8	0,631
		mid	29	56,9	34	57,7	
		high	6	11,7	8	13,5	
	ABC2	low	18	35,3	24	40,7	1,382
		mid	28	54,9	32	54,2	
		high	5	9,8	3	5,1	
	ABC3	low	14	27,5	16	27,1	0,311
		mid	31	60,7	36	61,0	

Personal Component - Tolerance	PC1	high	6	11,8	7	11,9	0,245
		low	35	68,6	40	67,8	
		mid	16	31,4	19	32,2	
	PC2	high	-	-	-	-	2,145
		low	20	39,2	19	32,2	
		mid	27	52,9	37	62,7	
	PC3	high	4	7,9	3	5,1	2,017
		low	39	76,5	43	72,9	
		mid	12	23,5	16	27,1	
			high	-	-	-	-

Notes:

CC1 – A complex of knowledge about the cultural heritage of the Kazakh people, national culture, traditions, customs, and folklore

CC2 – A complex of specific comprehensive knowledge about the region of residence (history, geography, culture and education, ecology, etc.)

CC3 – Knowledge and understanding of the cultures of the people living in our multiethnic state, in countries near and far abroad, ethnopsychological features of other people, basic norms, and rules of universal ethics

MC1 – Readiness to serve the Homeland and defend it

MC2 – Sense of "small homeland," love for one's land, region (small town, village, hamlet)

MC3 – Respect for the national and cultural values of the region, conviction in the uniqueness of one's region

PFC1 – Ability to implement a complex of knowledge and skills about specific comprehensive knowledge about the region of residence (knowledge of history, geography, culture and education, ecology, etc.)

PFC2 – Skills aimed at forming the regional identity of students, fostering patriotism

PFC3 – Focus on preserving, recreating, and multiplying the cultural values of the region

AC1 – Mastery of forms and methods of intercultural interaction in the professional field

AC2 – Ability to transmit knowledge of world culture into the educational and educational process of the school

AC3 – Ability to instill in the student's personality the setting for a polypositional perception of the world in the process of educational and educational activities

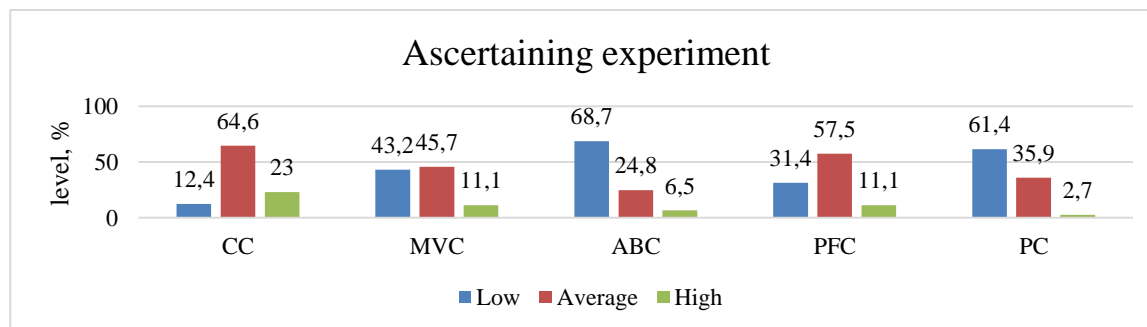
PC1 – Ability to perceive the world with tolerance based on scientific knowledge and universal human spiritual values

PC2 – Openness to "other" cultural meanings

PC3 – Formation of a dialectical worldview in the conditions of cultural pluralism of modernity

Before conducting the formative experiment, the calculated  $\chi^2$  value is less than  $\chi^2_{crit}$  for all the studied competencies; i.e., it does not fall into the critical region. This finding indicates that at the beginning of the special course, the control and experimental groups do not significantly differ in terms of the levels of proficiency in the components of the EPC.

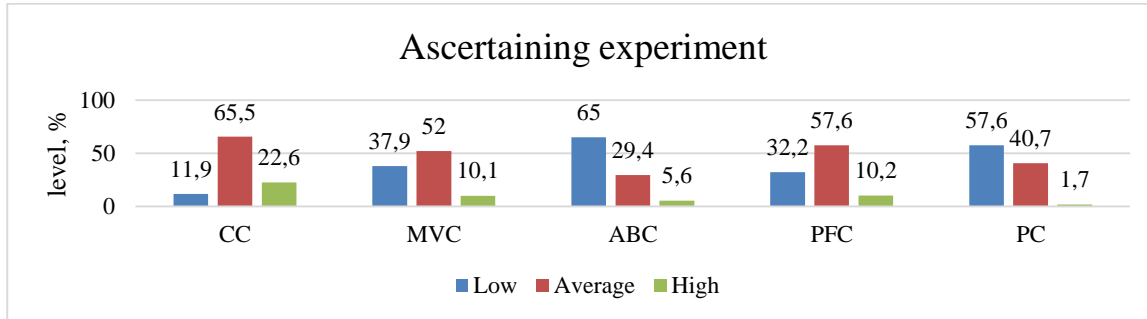
The analysis of the diagnostic map results describing the initial level of development of future teachers' EPCs is shown in [Figures 1 and 2](#).



**Fig. 1.** The initial level of development of future teachers' EPC in the context of modernization of social consciousness (experimental group)

Notes:

- CC – Cognitive Component
- MVC – Motivational Value Component
- ABC – Activity-Behavioral Component
- PFC – Professional-Functional Component
- PC – Personal Component



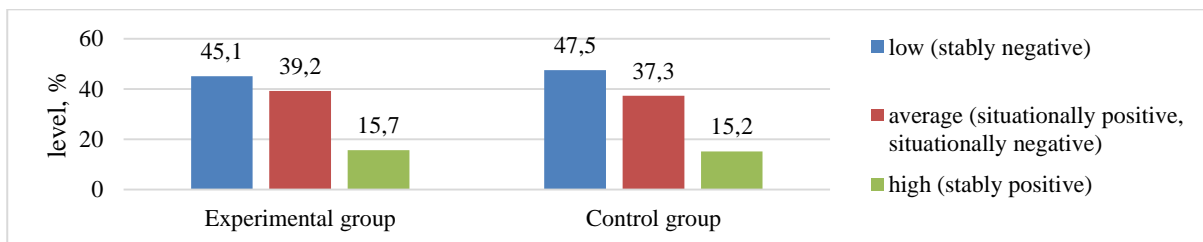
**Fig. 2.** The initial level of development of future teachers' EPC in the context of modernization of social consciousness (control group)

Notes:

- CC – Cognitive Component
- MVC – Motivational Value Component
- ABC – Activity-Behavioral Component
- PFC – Professional-Functional Component
- PC – Personal Component

The above figures indicate that future teachers predominantly demonstrate a low level of the activity-behavioral and personality components (68.7 and 61.4 %, respectively, in the EG and 65.0 and 57.6 %, respectively, in the CG) and an average level of the cognitive and professional-functional components (64.6 and 57.5 %, respectively, in the EG and 65.5 and 57.6 %, respectively, in the CG). The degree of development of the motivational value component falls between the low and average levels (43.2 and 45.7 %, respectively, in the EG and 37.9 and 52.0 %, respectively, in the CG).

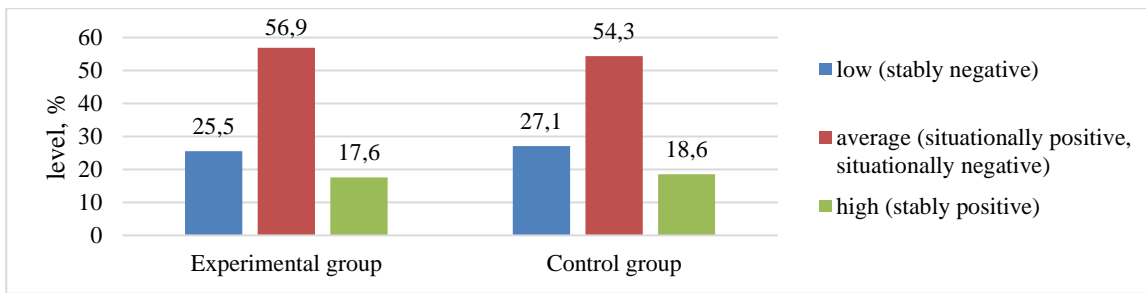
The assessment of the level of development of students' sense of patriotism, calculated based on the questionnaire sections "Student's attitude toward the Fatherland", "Student's attitude toward the land", and "Student's attitude toward the family", demonstrated the following results (Figure 3).



**Fig. 3.** The initial level of development of the sense of patriotism

The figure demonstrates that the predominant level of patriotism among future teachers is low: EG – 45.1 % and CG – 47.5 %; the average level of development of this quality is 39.2 % of students in the EG and 37.3 % in the CG. High patriotism is found in 15.7 % of the students in the EG and 15.2 % of those in the CG.

The results of the diagnostics of students' tolerance are given in Figure 4.

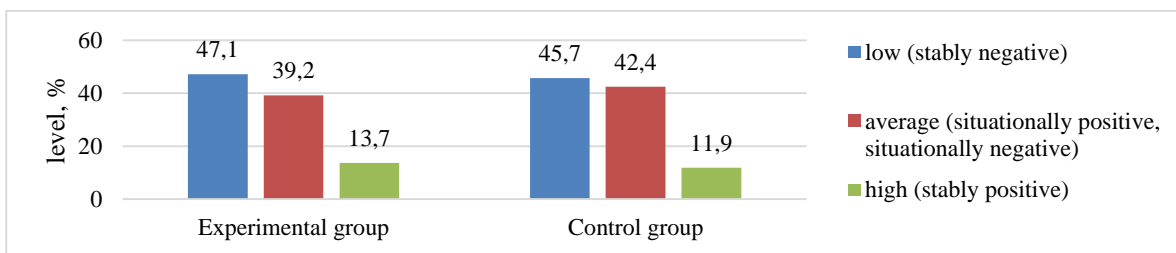


**Fig. 4.** Initial level of development of tolerance

Figure 4 indicates that a high level of tolerance, which is expressed in well-developed respect for other people and their traditions, values, and achievements, is found in 17.6% of the EG students and 18.6% of the CG students.

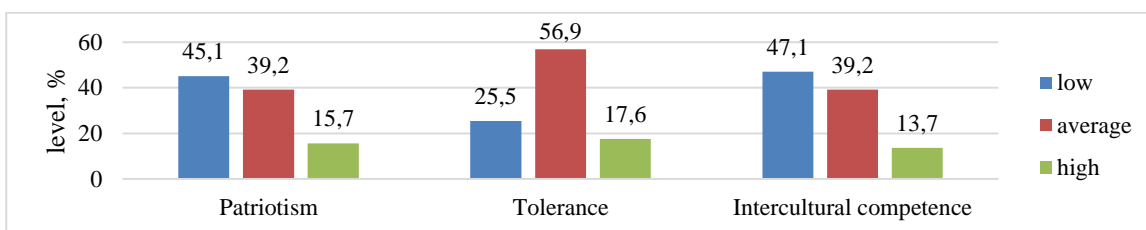
The survey revealed the predominance of an average level of development of this personal quality (56.9 % in the EG and 54.3 % in the CG). In these students, tolerance is a voluntary personal choice that is not imposed by anyone but acquired through upbringing, information, and personal experience as a moment of intercultural communication. A low level of tolerance was demonstrated by 25.5 % of the respondents in the EG and 27.1 % in the CG.

Intercultural competence (ability to engage in intercultural dialog) was assessed by survey sections titled "Student's attitude toward culture" and "Student's attitude toward a person as a different person". An analysis of the responses to these questions revealed the initial level of intercultural competence (Figure 5).



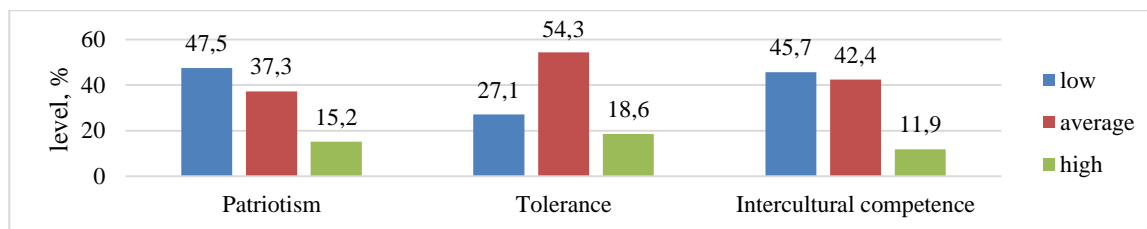
**Fig. 5.** Initial level of development of intercultural competence

Most participants in the experiments were found to have a low level of tolerance (47.1 % in the EG and 45.7 % in the CG), which was marked by poor knowledge of the culture of other people. An adequate understanding of the cultural values of other people was demonstrated by 13.7 % of participants in the EG and 11.9 % in the CG.



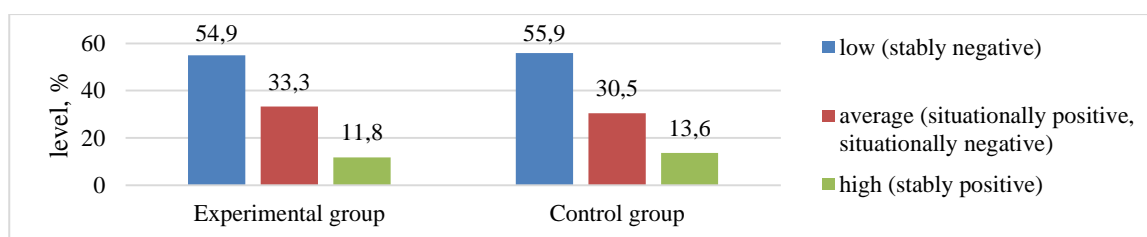
**Fig. 6.** The initial level of development of patriotism, tolerance, and intercultural competence (experimental group)





**Fig. 7.** The initial level of development of patriotism, tolerance, and intercultural competence (control group)

Thus, the levels of development of the studied professionally significant qualities (Figures 6 and 7) suggest that the most important professionally significant qualities for future teachers are formed partially and do not fully meet the requirements of society and professional education.



**Fig. 8.** The initial level of development of regional competence

Students' regional competence is represented mainly by two levels: average (33.3 % – EG and 30.5 % – CG) and low (54.9 – EG and 55.9 – CG) (Figure 8). The level of students' knowledge of the distinctive natural and climatic features and the national, cultural and historical identity of the region are virtually the same in the two student groups, which points to the need to work on students' acquisition of knowledge about the historical, ethnographic, national, and cultural originality of their native region and the region's inherent mentality concentrated primarily in the spiritual culture, as well as the reflection of this material in the content of their training.

Summarizing the results of the ascertaining experiment, we conclude that the students generally accept the values of ethno-pedagogical activity, yet they do not possess the special competencies needed to implement them in practice. Students point to the lack of theoretical and practical training for ethno-pedagogical work in the context of the modernization of social consciousness. Nevertheless, they demonstrate the desire for self-improvement in the field of ethno-pedagogical activities and ethno-pedagogical education in the aforementioned aspect.

In this regard, we conducted an educational experiment on the formation of the EPC for a future teacher.

In this framework, we developed and introduced into the educational and upbringing process of the university an elective course (specialized course) titled "Culture, Traditions, and Customs in Kazakhstan and Other Countries".

Through a complex of exercises aimed at actively mastering the English language and developing critical thinking skills, the students learned in detail about the traditions and customs of Kazakhstan and English-speaking countries.

Thus, the study scientifically substantiated and tested a model for developing the EPC for future teachers in the learning process through the use of the ethnic component from the perspective of realizing personal-activity, ethnocultural, competency-based, subject-centered, and systemic approaches.

In general, the results of the formative experiment confirm the efficiency of the developed model for the formation of EPCs for future teachers. The introduction of the special course and the accompanying training materials contributed to the acquisition of theoretical knowledge and practical skills and fostered professionally important qualities such as patriotism, intercultural competence, regional competence, and tolerance. These findings provide evidence that the proposed model favorably affects students' interest in the teaching profession and understanding

of its social significance. Diagnostic results on the level of development of the EPC for future teachers after the formative experiment are given in [Table 2](#).

**Table 2.** Results of diagnostics of the level of development of the EPC for future teachers after the formative experiment

Component	Studied Competences	Level	EG – 51 people		CG – 59 people		$\chi^2$
			Number	%	Number	%	
1	2	3	4	5	6	7	8
Cognitive Component – Public Consciousness	CC1	Low	2	3,9	4	6,8	11,014
		Mid	31	60,8	40	67,8	
		High	18	35,3	15	25,4	
	CC2	Low	-	-	2	3,4	8,932
		Mid	26	51,0	38	64,4	
		high	25	49,0	19	32,2	
	CC3	Low	3	5,9	5	8,5	6,428
		Mid	31	60,8	34	57,6	
		High	17	33,3	20	33,9	
Motivational-Value Component – Patriotism	MVC1	low	4	7,8	4	6,8	10,532
		mid	35	68,6	45	76,3	
		high	12	23,6	10	16,9	
	MVC2	low	3	5,9	12	20,3	18,386
		mid	32	62,7	43	72,9	
		high	16	31,4	4	6,8	
	MVC3	low	5	9,8	6	10,2	6,314
		mid	33	64,7	40	67,8	
		high	13	25,5	13	22,0	
Professional-Functional Component – Regional Competence	PFC1	low	2	3,9	7	11,9	12,241
		mid	35	68,6	40	67,8	
		high	14	27,5	12	20,3	
	PFC2	low	11	21,6	34	57,6	17,226

	PFC3	mid	37	72,5	23	39,0	15,387
		high	3	5,9	2	3,4	
		low	8	15,7	26	44,1	
		mid	38	74,5	31	52,5	
		high	5	9,8	2	3,4	
-Activity-Behavioral Intercultural Competence	ABC1	low	10	19,6	13	22,0	16,258
		mid	25	49,0	35	59,3	
		high	16	31,4	11	18,7	
	ABC2	low	5	9,8	13	22,0	21,321
		mid	28	54,9	40	67,8	
		high	18	35,3	6	10,2	
	ABC3	low	5	9,8	12	20,3	12,157
		mid	32	62,7	36	61,0	
		high	14	27,5	11	18,7	
Personal Component Tolerance	PC1	low	14	27,5	25	42,4	22,043
		mid	30	58,8	33	55,9	
		high	7	13,7	1	1,7	
	PC2	low	6	11,8	11	18,6	18,345
		mid	32	62,7	43	72,9	
		high	13	25,5	5	8,5	
	PC3	low	17	33,3	26	49,1	19,366
		mid	28	54,9	32	54,2	
		high	6	11,8	1	1,7	

Notes:

CC1 – A complex of knowledge about the cultural heritage of the Kazakh people, national culture, traditions, customs, and folklore

CC2 – A complex of specific comprehensive knowledge about the region of residence (history, geography, culture and education, ecology, etc.)

CC3 – Knowledge and understanding of the cultures of the people living in our multiethnic state, in countries near and far abroad, ethnopsychological features of other people, basic norms, and rules of universal ethics

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PFC2 – Skills aimed at forming the regional identity of students, fostering patriotism

PFC3 – Focus on preserving, recreating, and multiplying the cultural values of the region

AC1 – Mastery of forms and methods of intercultural interaction in the professional field

AC2 – Ability to transmit knowledge of world culture into the educational and educational process of the school

AC3 – Ability to instill in the student's personality the setting for a polypositional perception of the world in the process of educational and educational activities

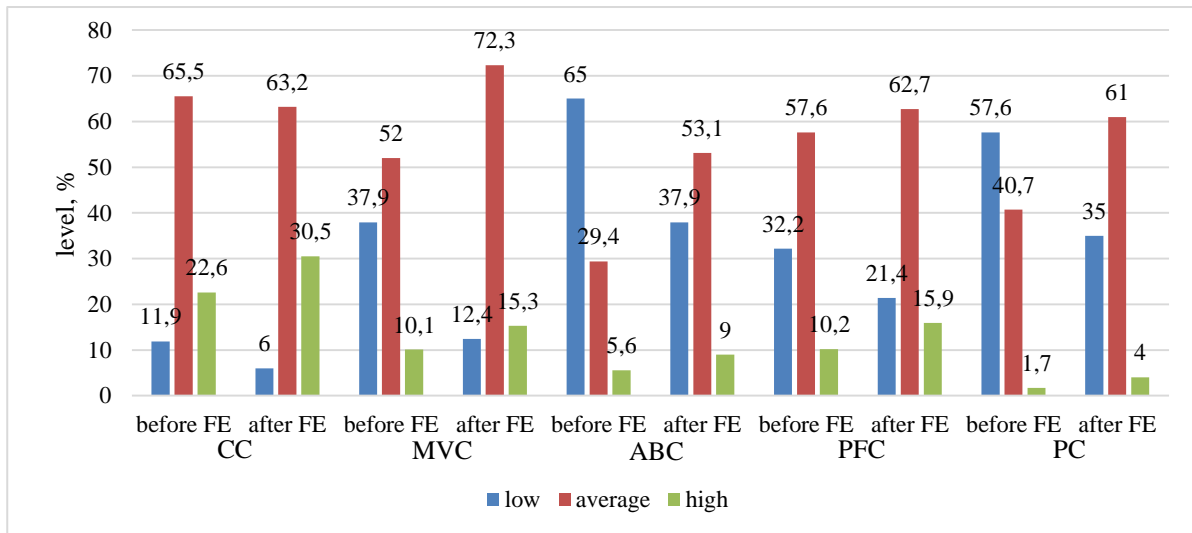
PC1 – Ability to perceive the world with tolerance based on scientific knowledge and universal human spiritual values

PC2 – Openness to "other" cultural meanings

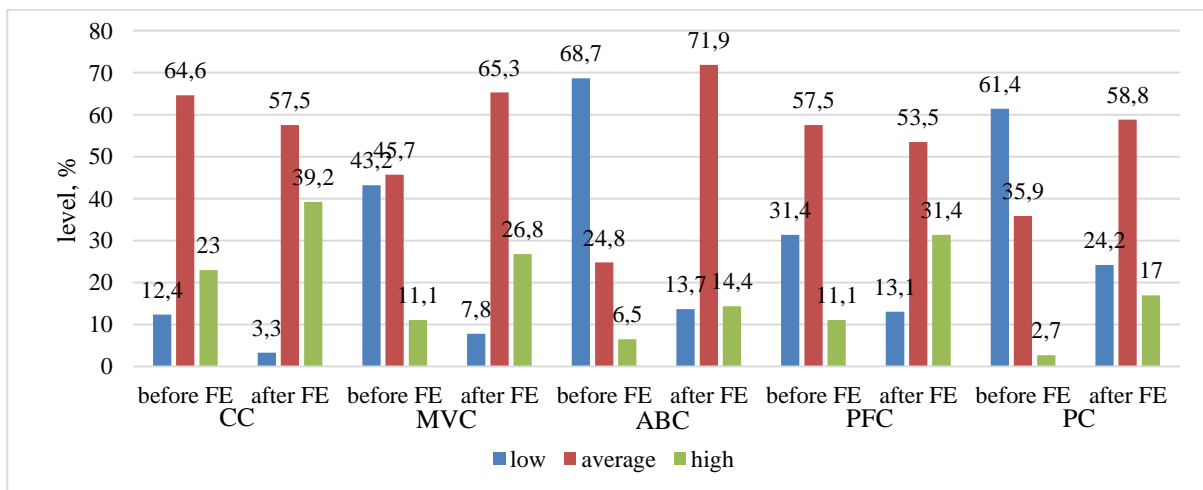
PC3 – Formation of a dialectical worldview in the conditions of cultural pluralism of modernity

The calculations of the  $\chi^2$  criterion for the experimental and control samples after conducting the formative stage of the pedagogical experiment showed that  $\chi^2 > \chi^2_{crit}$  for all values of the studied competencies. This provides a basis for rejecting the null hypothesis. Accepting the alternative hypothesis allows us to assert that these samples have statistically significant differences. In other words, the development and implementation of the elective course "Culture, Traditions and Customs in Kazakhstan and other Countries" in the educational and educational process of universities is an effective means of forming EPCs for future teachers.

A comparative analysis of the level of formation of the competencies that constitute the EPC of future teachers in the context of modernization of social consciousness before and after the formative experiment is illustrated in Figures 9 and 10.



**Fig. 9.** Comparative analysis of the levels of development of components constituting the EPC of the future teacher before and after the experiment (control group)



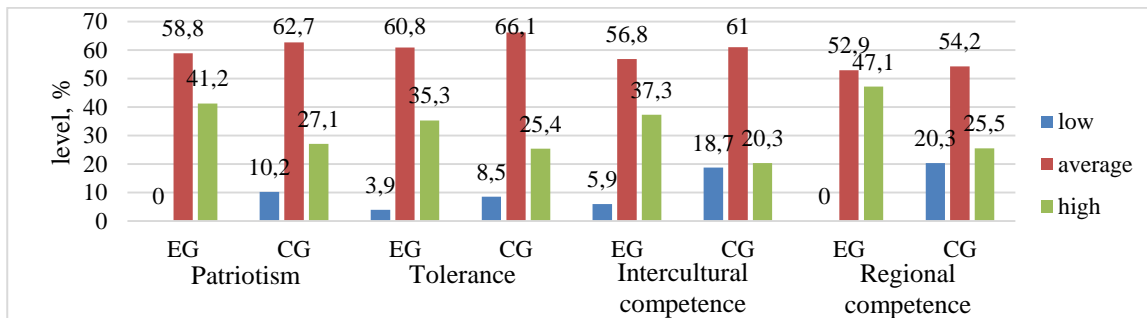
**Fig. 10.** Comparative analysis of the levels of development of components constituting the EPC of the future teacher before and after the experiment (experimental group)

Notes:

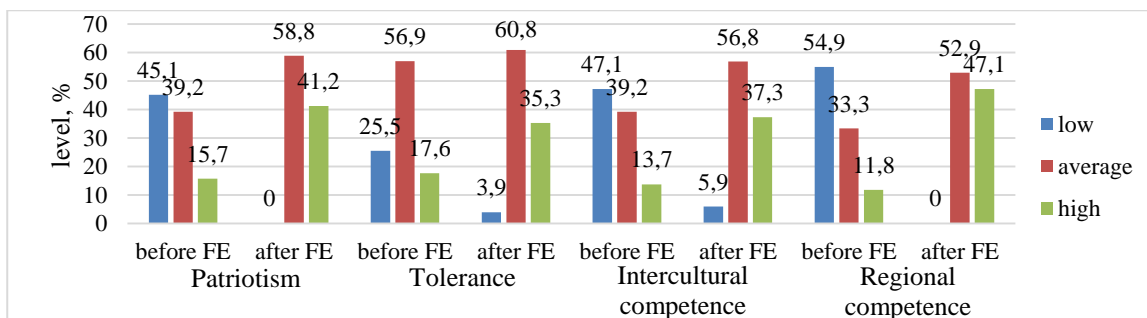
- CC – Cognitive Component
- MVC – Motivational Value Component
- ABC – Activity-Behavioral Component
- PFC – Professional-Functional Component
- PC – Personal Component
- FE – Formative Experiment

The development of EPC components significantly increased in the experimental group after the formative experiment. Figure 10 illustrates that the prevalence of a low score on **the cognitive component scale (CC)** decreased from 12.4 % before the experiment to 3.3 % after the formative experiment. Minor changes are observed in the average level: 64.6 % before and 57.5 % after the experiment. The share of the high level of development has increased significantly, from 23 % before the experiment to 39.2 % after.

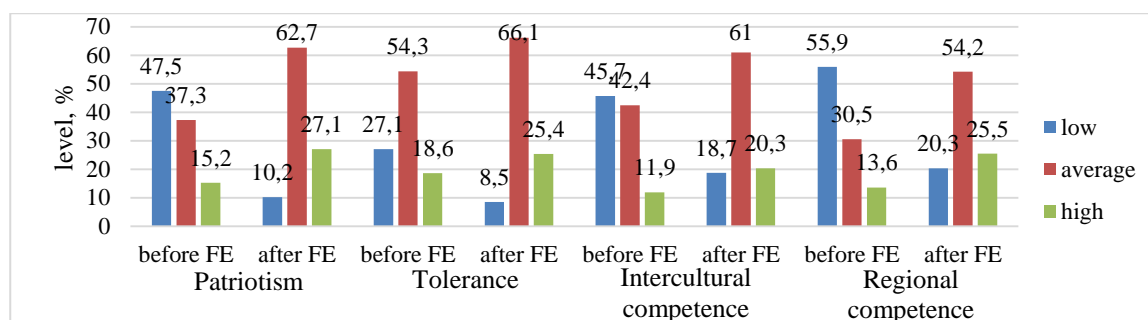
Diagnostic data on the control stage of the study demonstrate quite a high level of development of the components of future teachers' EPC in students in the EG. This testifies to the efficiency of the developed diagnostic program and model for the formation of the EPC for future teachers. However, the development of future teachers' EPC in the control group (Figure 7) also showed a positive change. The study results demonstrate that the indicators in the control groups did not remain the same because the students had several sociohumanitarian disciplines that contributed to their social identification and improved professional competence. That being stated, the changes recorded are not significant. Furthermore, the indicators in the experimental groups were much greater than those in the control groups. In Figures 11-13, we present the levels of development of future teachers' personal qualities after the formative experiment and by the results of assessment at the control stage, as well as a comparative analysis of the dynamics of indicators in the control and experimental groups before and after the formative experiment. The control group demonstrated a positive change in the development of the studied personal qualities. However, the dynamics of this improvement are also insignificant compared to the rise in the level of development of future teachers' personal qualities found in the experimental group.



**Fig. 11.** Level of development of the values of personal qualities for future teachers after the experiment



**Fig. 12.** Comparative analysis of the development of personal qualities among future teachers before and after the experiment (experimental group)



**Fig. 13.** Comparative analysis of the development of personal qualities among future teachers before and after the experiment (control group)

Notes:

FE – Formative Experiment

CG – Control Group

EG – Experimental Group

#### 4. Discussion

Education has always been viewed as a mechanism of social and cultural development (Burdina, 2006). Compared to other social systems, the education system possesses the greatest resources and potential for the civil upbringing of a person and provides an environment that projects social relations.

Contemporary researchers emphasize that ethnocultural education has major potential for the formation of civil accords, and the state should take advantage of it. On this matter, we concur with V.A. Tishkov and V.V. Stepanov (2017), who also stress the importance and necessity of preparing educational and methodical literature to improve the qualifications of teachers and educators as specialists in intercultural communication. Incorporation of the ethnic component in the educational programs of pedagogical universities and vocational schools will foster the development of patriotism, tolerance, and the intercultural and regional competencies of future teachers not only as professionally important but also as professionally necessary qualities. Kazakh scholar Sh. Mukhtarova (2008, p. 15) defines the ethnic component in the content of pedagogical education as "a humanitarian complex of knowledge, genetically conditioned by the development of ethnic identity". It is represented by a set of didactic units based on certain principles of its structuring. Our findings agree with the opinions of other researchers. This component has an ethno-pedagogical focus on the formation of the personal and professional qualities of future teachers". Mukhtarova argues that the essence of this concept lies in its focus on the development of the future teacher's multicultural personality as a bearer of active citizenship and a positively oriented national identity.

The current conditions of university and vocational school education and the reinforcement of economic and cultural associations create new conditions for personality development. The content of education should be oriented primarily on the value attitudes stemming from national and universal culture, where general human values operate in the images of ethnic culture. The educational and upbringing activities of national educational institutions need to employ the ethno-pedagogical ideas of the multinational people of Kazakhstan, as the teacher's personality serves as the individual bearer and creator of the sociopedagogical, spiritual, and moral conditions for the formation of the nation (Burdina, 2006).

Under the contemporary conditions of polyethnic Kazakhstan, favorable conditions for cultivating tolerance have emerged. First and foremost, the education system acts as a factor in the unity of people and can resolve the issue of fostering tolerant attitudes among the younger generation (Aubakirova et al., 2014). There is an urgent need for a new style of communication and behavior and for the choice of behavioral references and cultural values of new content, all of which will contribute to the harmonization of relations in modern society.

S. Aubakirova et al. (2018) find that modern education is especially critical for the formation of policies and principles of tolerance, as it serves as a model for building intercultural, interethnic, and interreligious relationships in the course of joint training and the formation of a multicultural system of education.

The ethnic component in the content of education is characterized by regional specificity. The regional identity of Kazakhstan is one of the means for the development of patriotism and social consciousness in the younger generation (Novossyolova et al., 2021). Programme and target objectives in the field of teacher training in the system of pedagogical education, particularly all forms of this training, should be focused on the system of spiritual and moral values dominant in the given society; the role of socioregional and ethnocultural factors in the training of educational personnel in Kazakhstan's system of pedagogical education should be enhanced (Mukhtarova, Malenko, 2018).

Upbringing work in educational institutions needs to be connected with real life and with the interests of specific regions (Burdina, 2006: 93). The incorporation of the ethnic component in the educational programs of pedagogical universities and vocational schools contributes to the formation of patriotism, tolerance, and intercultural and regional competencies in future teachers not only as a professionally important quality but also as a professionally necessary quality-the EPC (Aipova et al., 2021).

Considering the content of the disciplines studied in vocational school, we note that each discipline affects the development of the EPC to some extent among the personalities of pedagogy students. Different disciplines have varying degrees of influence on the development of an active civil stance and a positively oriented social consciousness since each discipline performs a specific task.

Thus, we conclude that the content of pedagogical education in vocational school comprises several components:

- general education disciplines,
- socioeconomic discipline,
- general humanities disciplines,
- general vocational disciplines,
- specialized disciplines,
- elective disciplines,
- Disciplines determined by the educational institution;
- vocational (teaching, pedagogical) practice.

The ethnic component (the same as the content of education in general) serves the purpose of helping students obtain knowledge, skills, abilities, and modes of action, as well as the experience of creative work and an emotionally valuable attitude toward the world, which ultimately ensures the harmonious development of personality. Therefore, in the system of pedagogical education, students acquire not only specialized competencies but also the values and ideals that define their worldview, civil position, and identity-i.e., the two main functional vectors of the ethnic component in the content of pedagogical education – the personality-oriented and vocational ones.

In the personality-oriented direction, we attribute the functions that foster the formation of an individual's personal qualities to the following: a sense of patriotism, tolerance, and intercultural and regional competence. The vocationally oriented tasks of the ethnic component in the content of pedagogical education, in turn, are logically inseparable from the tasks of personal development because the professional competence of a teacher is integral to his or her personality as a bearer of a special pedagogical worldview and ideals (Aipova et al., 2022; Lukianova, 2017).

In our view, the conducted work contributes to the enrichment of the modern science of Kazakhstan in the context of world science with the resultant research on the formation of the EPC by a future teacher, the main qualities of which are patriotism, tolerance, and intercultural and regional competence.

A limitation of the study is that the sampling was not probabilistic but rather was performed on the basis of the principle of convenience; subjects in the EG and CG were not selected randomly (probabilistic), which limits the possibility of generalizing the results of the study.

## **5. Conclusion**

General comparative analysis of the data provides evidence of a prominent effect on the studied quality of organized, systemic, and purposeful impact realized by the content, goal-setting, organizational, functional, and result blocks. The implementation of personality-activity, ethnocultural, competence, subject-centered, and systemic approaches, considering the identified patterns and principles, stage-by-stage implementation of the process of developing the EPC for a future teacher, and the selection of optimal forms, methods, and tools in the course of theoretical

and practical pedagogical training, are found to be very effective for the formation of the studied quality in the framework of the conducted research.

Thus, the ethnic component should undoubtedly meet the requirements of openness and adaptability in education and compliance with the ethnocultural demands and needs of students. Ethnoculturally oriented education content is not only the main tool for professional training of future specialists but also, first, a culture-forming element, the meaning of which is the upbringing of a multicultural personality, one of the main characteristics of which is the developed sense of patriotism, tolerance, and intercultural and regional competence.

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## **Interactive and Contact Education Technology for Laboratory Work With Haptic Gloves in a Virtual Environment**

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### **Abstract**

Interactive technologies identify the key positions of the education sector in the near future. The application of haptic interfaces and immersive approach in education dictated by the need to improve the efficiency of the educational process. The article describes the developed interactive and contact education technology of laboratory works with the use of haptic gloves in virtual environment (hereinafter – ICET), as well as the prototype of the haptic glove. The data demonstrating the high efficiency of educational material assimilation by students as compared to the traditional approach presented.

The aim of the article is to present and analyses the results of experimental research on the use of ICET by secondary school students during laboratory work in chemistry classes and on changes in the role of the teacher because of integrating immersive technologies into the educational process.

Based on the findings, the authors justify the necessity of using ICET in teaching sessions. The authors conclude that it is necessary to complement classical educational methods with immersive technologies in order to improve the quality of education in modern conditions.

The conducted research made it possible to obtain the results of practical experience in the implementation of training sessions in a virtual environment, taking into account the use of tactile devices for interaction with the simulation environment. Assessment of the level of residual knowledge of students shows the effectiveness of the integration of contact technologies with the virtual environment and proves the prospects for the development of tactile interfaces in education.

**Keywords:** interactive education, immersive technologies, haptic gloves, copy control, telescopic control, virtual reality, virtual reality education.

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## **1. Introduction**

### **1.1. Relevance and analysis of existing technologies and research**

Today, rapidly evolving digital technologies make it possible to create a living virtual (simulated by a computing system) environment. A wide range of specialised input/output devices - headphones, microphone, computer glasses, haptic gloves and suits, etc., enables user interaction with this environment.

One of the promising directions in the development of school education is the use of interactive technologies based on virtual reality (VR). This opens up opportunities in the creation and use of virtual laboratories for studying the world around us, forming skills and practicing skills for solving practical tasks, as well as for demonstrating their mastery and automated assessment (Uvarov, 2018). At the same time, virtual reality tools in the learning process should provide additional opportunities that traditional learning tools cannot provide. The relevance of the area under consideration according to (Issledovanie rynka..., 2022) supported by the following factors:

- The reduction in the price of technical equipment, over the past few years the prices of modern VR devices have managed to drop significantly, making them more affordable;
- The rapid growth of VR software, with several thousand different VR applications available today;

- The growth in VR investment – more than \$ 2.5 billion a year;
- The number of major VR companies is increasing, with more than 300 on the European market, and giants such as Oculus, HTC, Sony, Microsoft, Samsung and many others have been introducing their technology into the field for some time now;

- The implementation of VR technology in the fields of education, energy, metallurgy, advertising, engineering, telecommunications, etc.

Among the existing educational VR projects in the Russian Federation, the following solutions are worth mentioning (15 VR- i..., 2020):

- MEL Chemistry VR, VR lessons on the main chemistry topics of a school course, developed by MEL Chemistry (MEL Chemistry VR, 2022);

- “Visualisation of Biological Objects” software from Visual Science, an educational product VR animation of viruses, a series of educational posters with augmented reality, and interactive applications (Visualisation of biological objects, 2022);

- An interactive military history museum by Digital Media Lab (Virtual Digital Media Lab, 2022);

- Interactive VR visualisations and educational games from Luden.io (Luden.io, 2022);

- A series of VR experiences in physics, stereometry and social studies from “PhisikonLab” LLC (Virtual'nye praktikumy, 2022);

- Atlas VR by Terra-Tech, a Russian virtual reality platform powered by remotely sensed data that allows the creation of digital copies of investment projects, historical, geographical, environmental and other processes and phenomena (TerraTekh, 2022).

This article discusses the possibility of introducing one of the immersive learning methods at the intersection of reality and the virtual world into the educational process of both general school and additional education, which meets the challenges of today's educational system. It is an interactive contact education technology (ICET) based on the mechanism of student's interaction with the virtual educational environment with their hands through the use of haptic (haptic) gloves (HG).

The use of haptic interfaces and virtual reality applications for educational purposes has been discussed since the first decade of the 21st century (Christodoulou et al., 2005; Barfield, 2009).

Current articles (Sanfilippo et al., 2022; Edwards et al., 2019) reflect the results of experimental studies. However, the performance of information perception in (13) is rather poorly described.

The authors (Petrenko et al., 2020; Petrenko et al., 2019) consider the use of haptic gloves and virtual environments as complete learning tools.

Articles (Xanthidou et al., 2022) have described research on the application of HG for chemistry lessons in a virtual environment. The results of such studies confirm the increased level of student engagement and motivation when using HG in the classroom, as well as the adequacy of the proposed immersive technology as a learning tool.

HGs are now widely used in cybernetics and robotics (Galofaro et al., 2022; Cieřlik et al., 2022), especially in the development of copy control systems for robotic manipulators. Some

developers of immersive virtual reality devices offer tilted vibrating platforms as feedback (Zwoliński et al., 2022), but their use in the learning process is not yet possible due to insufficient development of hardware, methodology and software.

Existing HG analogues are shown in Figure 1: Peregrine Glove ST, Figure 1a (Peregrine Glove ST, 2022); Manus VR, Figure 1b (Manus VR, 2022); Plexus VR Glove, Figure 1c (Plexus VR Glove, 2022); CaptoGlove, Figure 1d (CaptoGlove, 2022); Avatar VR, Figure 1e (Avatar VR, 2); Noitom Hi5 VR Glove, Figure 1f (Noitom Hi5 VR Glove, 2022); Senso Glove Figure 1g, (Senso Glove, 2022); VRfree by Sensoryx, Figure 1h (VRfree by Sensoryx, 2022); VRgluv, Figure 1i (VRgluv, 2022).



**Fig. 1.** Haptic glove analogues for working in a virtual environment

Patent analogues of haptic gloves are also known, e.g. a haptic glove that functions as a computer mouse for virtual cursor movement and keystroke handling, described in patent US 6870526. The disadvantage of this device is that it is only designed to control the virtual cursor.

A device for generating control signals to manipulate virtual objects in a computer system according to gestures and positions of the operator's hand or other body part is described in patent US 7205979. A disadvantage of this device is its inability to operate without external sensors, making it difficult to operate the glove in some cases.

The closest analogue of the haptic glove under development is the device presented in US Patent US 9060385, Publ.: 16/06/2015. The prototype describes a virtual reality glove containing sensors located on the fingers of the glove and hand position sensors located on the phalanges of the fingers of the glove, with the sensors connected to a microprocessor. A disadvantage of the prototype and other known solutions, which use only sensors installed on the glove, is an accumulated error in determining the location of the user's hand, which makes it impossible to use such a system in practice without periodic calibration of the sensors. The frequency of calibration of the sensors depends on their accuracy, which affects the price of the product.

Based on an analysis of the methodological, software and hardware base for ICET, it was decided to develop a prototype of haptic gloves, virtual lessons and a methodological approach to their use in the educational process.

### 1.2. Purpose and objectives of the study

This article describes the prototyping of haptic gloves and virtual lessons to conduct research on their application in the educational process. The application of HG and virtual environment in

teaching is presented as a new form of interactive-contact laboratory work in a virtual environment.

The aim of the work is to create a prototype of an interactive-contact educational technology of laboratory works using HG in a virtual environment to conduct experimental research on the speed of learning of interactive-contact technology and the level of students' learning when using it in comparison with classical educational approaches on the example of the educational discipline of chemistry.

The work has the following objectives:

- Investigate the integration of immersive technologies into the educational process;
- Develop interactive and contact education technology;
- Conduct research into the speed of training level of educational technology and levels of learning in comparison with classical educational approaches.

## **2. Materials and methods**

### **2.1. Integrating immersive technologies into the educational process**

The dissemination of virtual reality technologies in Russian education is necessary and, above all, must meet the progressive trends of their global development.

The introduction of immersive technologies based on immersion into an artificially simulated (virtual) reality into the educational process becomes a new challenge for the teacher. In today's reality, he or she must master the role of «an observer and an active participant in communication, using his or her experience and authority to orient the learner in the zone of learning meanings, to change the observable parameters of the learning environment» (Sergeev, 2010).

The authors (Dunleavy et al., 2009; Maliy et al., 2018; Voykunsky et al., 2008) focus on different psycho-pedagogical aspects of the use of immersive technologies in education.

Dunleavy, M., Dede, C., Mitchell, R. believe that the familiar «lecturer function is giving way to a guide role that enhances the psychological effect of group communication with the virtual world» (Dunleavy et al., 2009).

According to D.V. Maliy, P.N. Medvedev, and M.G. Markova, immersive technologies will allow teachers to create conditions to increase students' motivation and develop their cognitive sphere (Maliy et al., 2018).

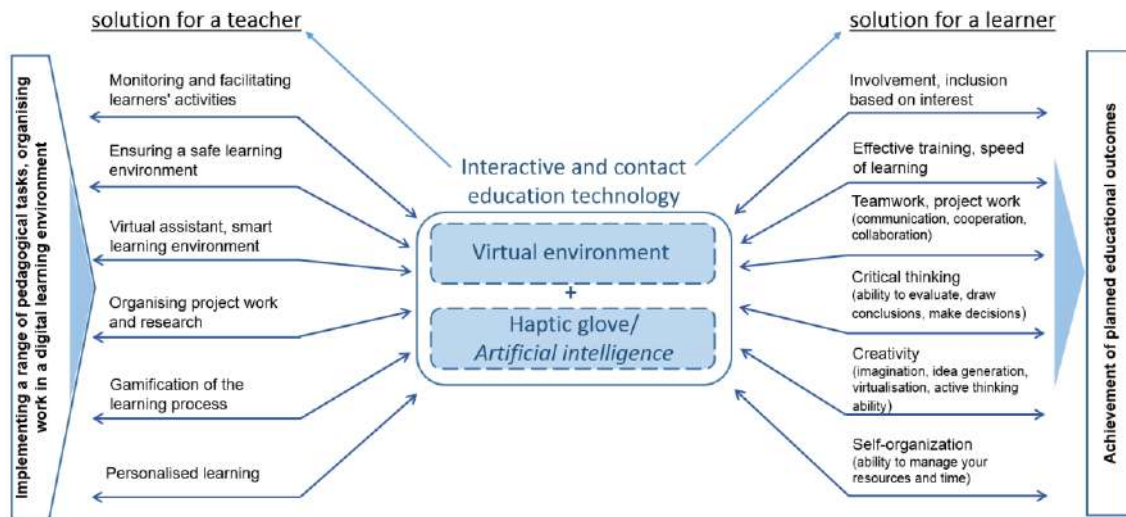
A number of 'old school' educators perceive virtual technology in education as an artificial world in which the pupil loses himself or herself and becomes steadily dependent on a fantasy environment. However, A.E. Voykunsky and G.Y. Menshikova prove that virtual reality does not cause inadequate thinking, does not reduce the level of reflection, does not carry a sense of bifurcation and loss of self as it, for example, occurs in the case of hypnosis or chemical influence on human (Voykunsky et al., 2008).

According to Microsoft Education, the use of virtual technologies attracts learners initially as entertaining and at the same time exploratory content. Compared to conventional learning activities, this format allows them to engage and retain their attention, which makes learning more productive (Preparing the Class of 2030; Preparing the Class of 20302022).

Thus, the effect of using immersive technology for educational purposes will be achieved if the following requirements are met:

- Designing components of a virtual environment that meet the requirements of educational standards;
- The need to create scenarios (guidelines) for interacting with visual interactive material;
- The need to create systems for modelling different educational practices for and with the learner to support processes for achieving learning outcomes;
- The need to develop a methodology for transferring selected elements of the school curriculum into virtual reality.

Interactive-contact educational technology enables a number of pedagogical tasks in the development of a digital learning environment (Figure 2), including control, gamification, personalisation of education and organisation of project-research work. For the learner, ICET is a means of achieving the necessary educational outcomes by increasing engagement, high speed of material assimilation, participation in team and project activities, activation of creativity and self-organisation.



**Fig. 2.** Integration of interactive and contact-based learning technologies in the educational process

The teacher's main task is to stimulate the learning process as much as possible by providing students with guided autonomy, the so-called facilitation. Students learn how to acquire knowledge independently, which is also facilitated by a smart learning environment mechanism and built-in virtual assistants. It provides the opportunity to practice the necessary skills repeatedly without risk and with minimal loss of time, without excluding the function of indirect control by the teacher. This form of lesson enables learning by unobtrusively memorising the material while repeating the script.

ICET allows the safe conduct of complex experimental works, pre-project simulation activities of students. Thus, simulation in education (simulation) is an interactive method of developing skills and abilities, in which real processes are reproduced (modelled). The use of virtual technologies attracts students due to the possible entertainment component, but at the same time it allows the teacher to organize productive project-research activity, to implement the learning process with the gamification elements (Gerasimova et al., 2021).

Immersive learning 'adjusts' the education to each student, taking into account his or her usual pace of learning at a level that suits him or her. In doing so, the teacher can track the individual route of each student, which is the impetus for personalised learning.

The ultimate goal of interactive and contact-based education technology is for students to achieve the intended learning outcomes (Figure 2).

In a virtual environment, a person cannot be distracted by external stimuli. And game-like problem situations engage students in problem solving, thereby allowing them to focus on the material as much as possible and expand their cognitive experience. With the HG and the easy-to-understand interface of the accompanying software, much of the learning material can be made applicable in real life later on.

This article proves that when ICET components are integrated into the teaching and learning process, students' learning speed increases, which in turn demonstrates the effectiveness of the technology.

Immersive technologies in education are also expected to provide students with the skills required in today's digital society, including teamwork and project work (communication, cooperation, collaboration), critical thinking (ability to evaluate, draw conclusions, make decisions), creativity (imagination, idea generation, virtualisation, ability to think practically) and self-organisation (ability to manage one's resources and time).

## 2.2. Development of interactive and contact educational technology

### 2.2.1. Development of a prototype of an interactive and contact laboratory system

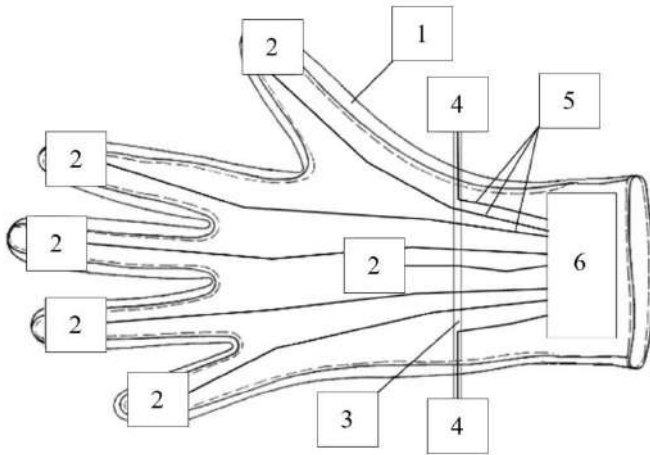
HG relates to an information input device for organising copy control of anthropomorphic manipulators, and can be used to acquire data on the position and orientation of the human hand,

as well as the orientation of the phalanges of its fingers. This information can then be used for real-time control of both robotic and virtual objects.

The technical result of the HG under development is the ability to transmit data about the position of the operator's hand and fingers to a computer or other device, while eliminating the accumulated measurement error of the glove-mounted sensors.

To achieve a technical result, HG 1 (Figure 3) contains sensors 2 located on the fingers of the glove, with the sensors connected to the control unit 6 and the control unit located on the back of the palm.

The sensors are gyroscopes and two light markers 4 mounted on rods 3 attached to the rear side, however the light markers are connected to the system board, which additionally contains a radio communication module for communication with a personal computer or other computing device via a radio link and a video camera is also connected to this device.



**Fig. 3.** Structure-algorithm diagram of the haptic glove

HG implements the following method of reading the position of a person's fingers and hand.

Gyroscope set 2 defines the orientation of the attached parts of the human hand as quaternions  $q'_0 - q'_5$ , where the quaternion  $q'_0$  corresponds to the measured orientation of the human palm, the quaternions  $q'_1 - q'_5$  correspond to the measured orientation of the human finger phalanges.

Control unit 6 reads the results of the gyroscope set 2 via the appropriate information channel. The control unit 6 then transmits the combined measurement results of the gyroscope set 2 to the personal computer 7 via the appropriate information channel.

The video camera 8 continuously captures the hand of the person with the visual markers 4 attached and transmits the results as an image stream to the personal computer 7.

The personal computer 7 collects and processes data from the control unit 6 and the video camera 8 to determine the position of the human palm as a three-dimensional vector  $p_0$ , orientation of a human palm in the form of a quaternion  $q_0$  and orientation of the human phalanges in the form of quaternions  $q_1 - q_5$ .

A quaternion is a hypercomplex number (a vector of four components) that allows you to describe the rotation of figures/points in space:

$$q = (w, x, y, z), \tag{1}$$

where  $w$  – component indirectly corresponding to the angle of rotation;  $(x, y, z)$  – vector indirectly corresponding to the axis of rotation.

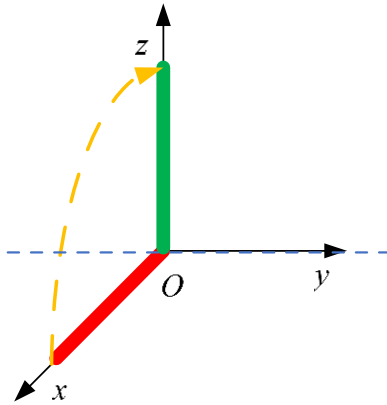
Suppose we need to rotate a figure about an axis (vector)  $v$  at an angle of  $\alpha$ . Then the components of the corresponding quaternion can be calculated by the formulas:

$$w = \cos \frac{\alpha}{2}, \tag{2}$$

$$(x, y, z) = v * \frac{\sin \alpha}{2}. \tag{3}$$

Example. Suppose we need to rotate by  $90^\circ$  along the axis  $Oy$  a segment that starts at the origin and runs along the axis  $Ox$ . In Figure 4, the coordinate axes are marked with black lines, the start position of the segment is marked with a red line, the end position is marked with a green

line, the motion path is marked with a dotted orange line, the rotation axis is marked with a dotted blue line.



**Fig. 4.** Example of a rotation task

The axis of rotation coincides with the axis of  $Oy$  therefore  $v = (0,1,0)$ . The angle of rotation  $\alpha = 90^\circ$ . According to formulae 2 and 3 we find the quaternion describing the rotation:

$$q = \left( \cos \frac{90^\circ}{2}, 0, \sin \frac{90^\circ}{2}, 0 \right). \quad (4)$$

If two consecutive rotations described by quaternions are required  $q_1, q_2$ , it is necessary to perform a rotation according to the quaternion corresponding to their vector product:

$$q = q_1 \times q_2. \quad (5)$$

For HG, quaternions are used in the following instances.

1. To rotate the virtual hand. At the initial moment of time the operator's hand must be pointed according to the initial position of the virtual hand (palm parallel to the ground, i.e. horizontally, fingers pointing diagonally away and to the left). After switching on the HG, the gyroscope mounted on the back of the palm gives out some initial ( $t = 0$ ) a non-zero quaternion  $q_h^{(0)}$ . Non-zero because the axes of the gyroscope have some unknown orientation. In this virtual environment, we need to obtain a «zero» (non-zero) rotation.

Subsequent measurements in the virtual environment do not use the absolute value of the quaternion  $q_h^{(i)}, i = 1, 2, \dots$ , produced by the gyroscope when measured at  $t$ -time, but the relative value. The relative value  $\Delta q_h^{(i)}$  is calculated by correcting for the quaternion  $q_h^{(0)}$  at the initial position of the operator's hand:

$$q_h^{(0)} \times \Delta q_h^{(i)} = q_h^{(i)}, \quad (6)$$

$$\Delta q_h^{(i)} = \left( q_h^{(0)} \right)^{-1} \times q_h^{(i)}. \quad (7)$$

Expression (7) is obtained by multiplying both parts of equation (6) by  $\left( q_h^{(0)} \right)^{-1}$ .

2. For bending virtual fingers. This situation is complicated by the fact that the finger is a sequential kinematic chain (Figure 5a) for which only the palm quaternions are known  $q_h$  and the last (third) phalanx  $q_{f3}$ .

3. A primitive version of finger flexion can be realised as follows (Figure 5b). Flexion in all joints except the first joint is ignored. In this case, the quaternion  $\Delta q_{f3}^{(i)}$  of the rotation in the joint between the palm and the finger at  $t$ -th moment can be found similarly to formula (7):

$$4. \quad \Delta q_{f3}^{(i)} = \left( q_h^{(i)} \right)^{-1} \times q_{f3}^{(i)}. \quad (8)$$

5. Note that in formula (8) the value of the quaternions at 0-th instant of time.

6. This «straight finger» option can be used as an intermediate implementation of finger bending.

7. A better option is to calculate quaternions of relative rotation  $\Delta q_{f1}, \Delta q_{f2}, \Delta q_{f3}$  in all joints of the finger. The condition must be fulfilled for consecutive rotation (finger flexion):

$$8. \quad q_{f3}^{(i)} = q_h^{(i)} \times \Delta q_{f1}^{(i)} \times \Delta q_{f2}^{(i)} \times \Delta q_{f3}^{(i)}. \quad (9)$$



9. Equation (9) has many roots. To solve it, the following calculation is proposed. Let:

10. 
$$\Delta q_{f1}^{(i)} \times \Delta q_{f2}^{(i)} \times \Delta q_{f3}^{(i)} = \Delta q^{(i)}. \tag{10}$$

11. Then:

12. 
$$q_{f3}^{(i)} = q_h^{(i)} \times \Delta q^{(i)}, \tag{11}$$

13. 
$$\Delta q^{(i)} = (q_h^{(i)})^{-1} \times q_{f3}^{(i)}. \tag{12}$$

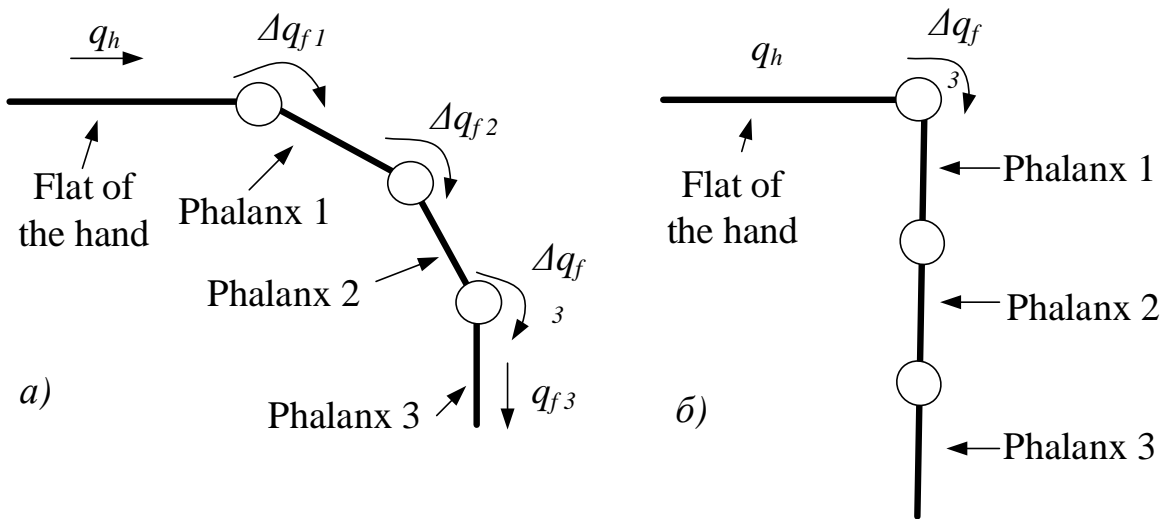
14. Let:

15. 
$$\Delta q_{f2}^{(i)} = \sqrt{\Delta q^{(i)}}, \tag{13}$$

16. Then:

17. 
$$\Delta q_{f1}^{(i)} = \Delta q_{f3}^{(i)} = \sqrt{\sqrt{\Delta q^{(i)}}}. \tag{14}$$

18. Thus, the desired  $\Delta q_{f1}, \Delta q_{f2}, \Delta q_{f3}$  can be found by successive calculations of expressions (12) to (14).



**Fig. 5.** Calculating quaternions for finger bending

The following is a variation of a calculation methodology that can be used on a personal computer 7 to convert the measured values of the orientation of human hand parts and the image flow obtained by the video camera 8 into the calculated position and orientation of the human hand, and the calculated orientation of the phalanges of his fingers.

Let the following input data be known. The measured orientations of human hand parts as quaternions  $q'_0 - q'_5$  where  $q'_0$  corresponds to the measured palm orientation and  $q'_1 - q'_5$  corresponds to the orientations of some phalanges of his fingers, images of the operator's hand with light markers fixed on them.

The purpose of the calculation is to determine the position  $p_0$  and orientation  $q_0$  of the human hand as well as the orientation  $q_1 - q_5$  phalanges of his fingers.

The following mathematical calculations can be used for the calculation.

The axes of a gyroscope performing a quaternion measurement  $q'_i, i = \overline{0;5}$  can have an arbitrary orientation. Therefore, in order to calibrate the axes, a person must bring his hand to some position corresponding to «zero» orientation of the palm. Let's denote it by  $q_i^{(0)}$  where «(0)» in upper index means some zero moment. In this case the orientation  $q_i^{(t)}$  at all further moments of time  $t$  can be calculated by formula:

$$q_i^{(t)} = q_i^{(t)} * [q_i^{(0)}]^{-1}. \tag{15}$$

Let the video camera be at the origin of the Cartesian coordinate system  $Oxyz$ . Let's point the axis  $Oz$  against the camera's line of sight, the axis  $Ox$  horizontally to the right, axis  $Oy$  vertically upwards.

The purpose of the calculation is to determine the position  $p_0$  of the hand, which can be described as the midpoint between two light markers. Let by digital processing of images obtained

from video camera 5, the apparent coordinates of the light markers can be obtained  $u$  и  $v$  on a two-dimensional image plane.

In this case, the relationship between the real position of the centre of the palm  $p_0 = (x_0, y_0, z_0)$  and the apparent coordinates  $u, v$  can be described by the following equations:

$$p_0 = \frac{p_1 + p_2}{2}, \quad (16)$$

$$Cu_1 = \sin \alpha_1, \quad (17)$$

$$Cu_2 = \sin \alpha_2, \quad (18)$$

$$Cv_1 = \sin \beta_1, \quad (19)$$

$$Cv_2 = \sin \beta_2, \quad (20)$$

$$\frac{x_1}{z_1} = \sin \alpha_1, \quad (21)$$

$$\frac{x_2}{z_2} = \sin \alpha_2, \quad (22)$$

$$\frac{y_1}{z_1} = \sin \beta_1, \quad (23)$$

$$\frac{y_2}{z_2} = \sin \beta_2, \quad (24)$$

$$(x_1 - x_2)^2 + (y_1 - y_2)^2 = d_{xy}^2, \quad (25)$$

$$z_1 - z_2 = d_z, \quad (26)$$

where  $p_1 = (x_1, y_1, z_1), p_2 = (x_2, y_2, z_2)$  – positions of the light markers;  $C$  – is the calibration factor, which can be selected by experiment;  $u_1, v_1$  and  $u_2, v_2$  – the visible coordinates of the first and second light marker in the flat image;  $\alpha_1, \alpha_2, \beta_1, \beta_2$  – the angles which form the planes passing through the light markers with the optical axis of the video camera 5;  $d_{xy}$  – the length of the projection on the plane  $xy$  segment  $d$ , which connects the light markers;  $d_z$  – the length of the projection on the axis  $z$  segment  $d$  connecting the light markers.

The projections of a segment  $d$  can be calculated by measuring its length and the quaternion  $q_0$  which describes its rotation in space.

By solving the above system of equations as well as by experimentally determining the coefficient of  $C$ , the position of palm centre can be calculated  $p_0$ , which confirms the feasibility of the proposed device.

Figure 6 shows the HG laboratory prototype designed according to the required input data.



**Fig. 6.** Photograph of a laboratory sample of haptic gloves

In order to make them easy to use, a prototype Flex-glove has been developed (Figure 7).

The proposed prototype is ergonomic and easy to use. Although the Flex sensors show less accuracy in operator hand positioning, the current accuracy, combined with the software shell, is sufficient for controlling objects in a virtual environment.

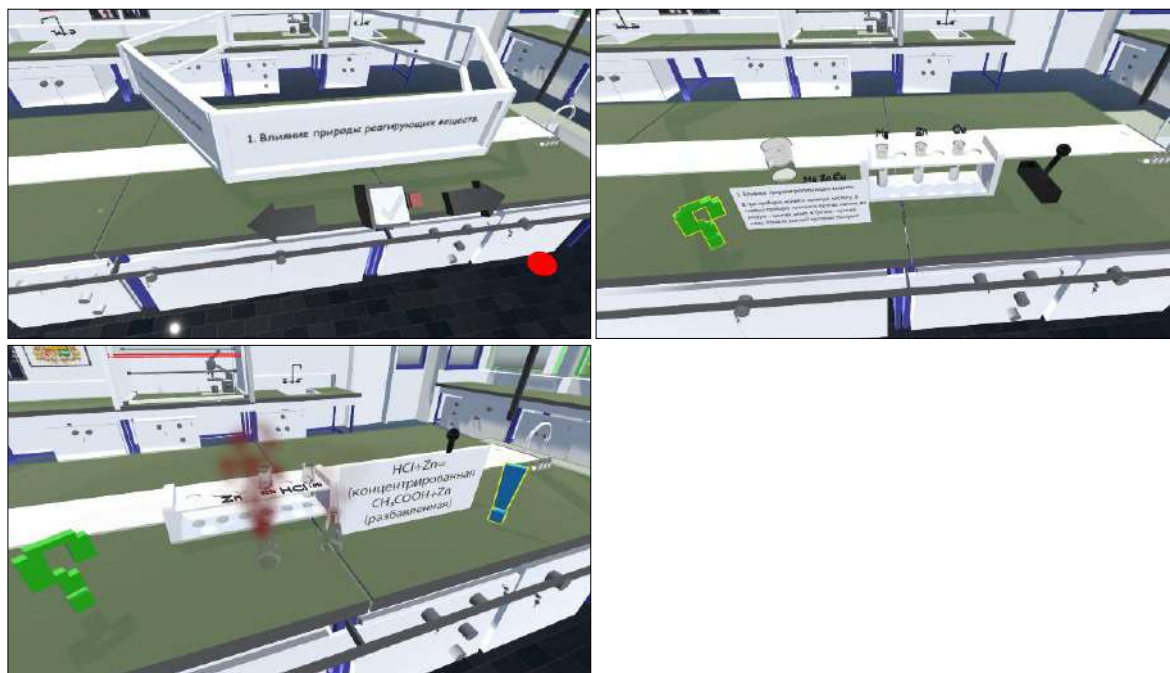


**Fig. 7.** Photograph of the haptic glove prototype

### 2.2.2. Developing an environment for interactive and contact lessons

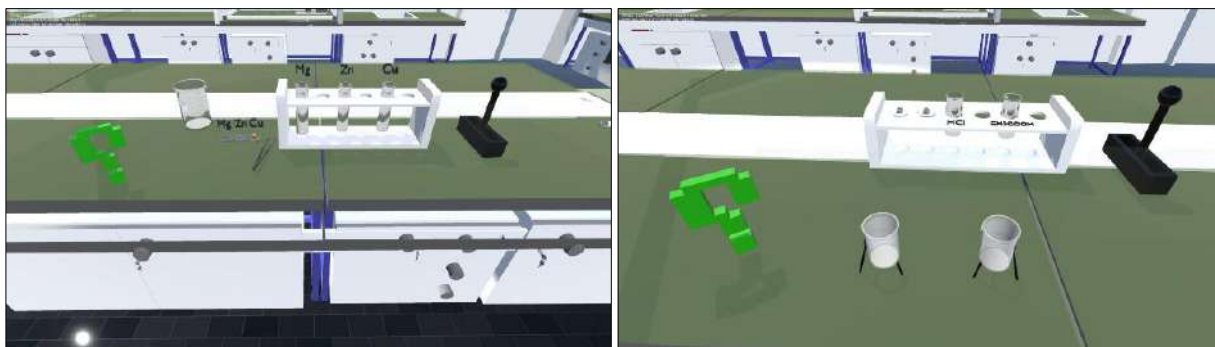
The software environment of the virtual lesson is written in Unity. At the moment 6 experiments for laboratory works on chemistry of the 9th grade on studying the influence of the conditions of a chemical reaction on its speed have been developed. At the beginning of the lesson, brief theoretical information and safety precautions for working with hydrochloric acid and an alcoholic torch are given.

The general interface of the room is shown in [Figure 8](#), where [8a](#) is the start menu, where the arrows allow you to select the experience, its name is written in the centre, there is a button to go to the experience and a key to turn off. [Figure 8b](#) shows the experience menu, where clicking on the green question displays explanations of the experience, the objects can be moved by the operator's hands, at the end of the experience it is necessary to pull the lever, which will return the operator to the start menu. [Figure 8c](#) shows an example of a chemical reaction and its formula.



**Fig. 8.** a) Start menu, b) Chemical experiment menu, c) Chemical reaction example

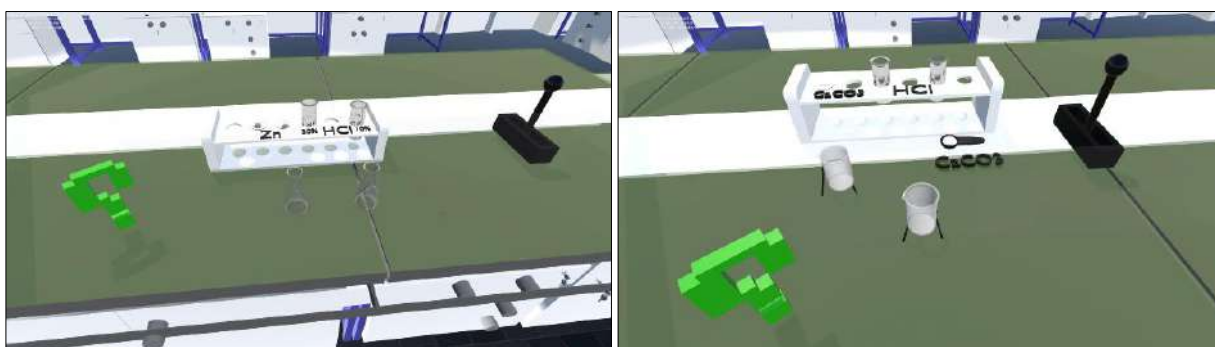
Experiment 1 of the effect of the nature of chemicals is shown in [Figure 9a](#). Pour hydrochloric acid into three test tubes: put a piece of magnesium into the first test tube, a piece of zinc into the second test tube and a piece of copper into the third test tube. Analyse which of the reactions proceeds faster.



**Fig. 9.** a) Experiment 1 – effect of nature of chemicals. b) Experiment 2 – effect of acid power

Experiment 2 of the effect of the power of acids is shown in [Figure 9b](#). Pour hydrochloric acid into one test tube and the same amount of acetic acid into another test tube. Put two zinc pellets into each test tube. Determine which reaction proceeds faster.

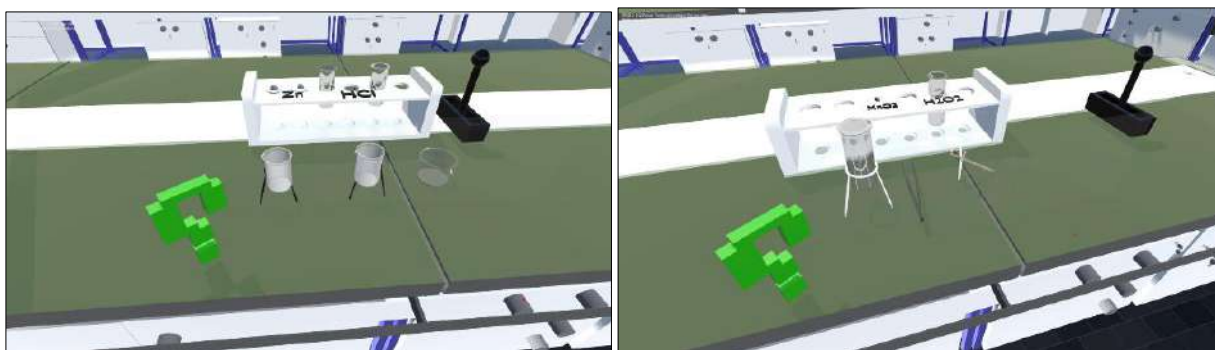
Experiment 3 of the effect of the concentration of reacting substances is shown in [Figure 10a](#). One zinc pellet each should be placed in two test tubes. Pour 1 ml of 30 % hydrochloric acid into one tube and 1 ml of 10 % hydrochloric acid into the other tube. Analyse in which test tube the reaction is more intense.



**Fig. 10.** a) Experiment 3 – effect of concentration of reactants, b) Experiment 4 – Influence of the contact surface of the reactants

Experiment 4 on the effect of the reagent contact surface is shown in [Figure 10b](#). Place a piece of chalk in one test tube and put some chalk powder in the other test tube. Pour 1.5 ml of hydrochloric acid of equal concentration into each tube. Analyse if there is a difference in the rate of gas release.

Experiment 5 of the effect of temperature is shown in [Figure 11a](#). Put one zinc pellet each into two test tubes. Pour 1 ml of hydrochloric acid of equal concentration into each test tube. Put one test tube in a beaker of hot water. Compare the intensity of the release of hydrogen bubbles in the test tubes and infer the effect of temperature on the rate of the chemical reaction.

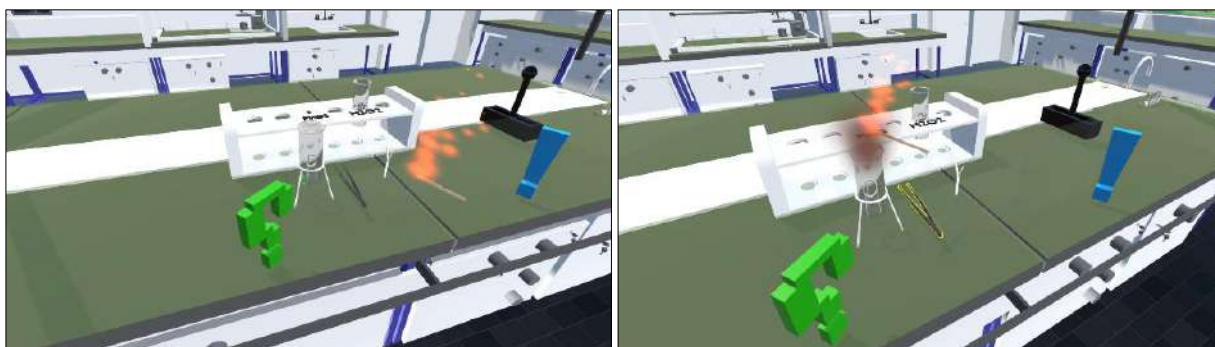


**Fig. 11.** a) Experiment 5 - effect of temperature, b) Experiment 6 – effect of gas on combustion

Experiment 6 on the effect of gas on combustion is shown in [Figure 11b](#). Pour 1 ml of hydrogen peroxide into test-tube 1 and introduce a smoldering kindling torch without touching the liquid. Record the observation. Then add a few crystals of  $MnO_2$  to the hydrogen peroxide and add the spud again. Analyse the result ([Figure 12](#)).

After completing the experiments, there is an opportunity to review the reactions in order to record the results in a notebook.

The advantage of using HG is to practice your reagent handling skills.



**Fig. 12.** Chemical reaction of gas effect on combustion

In the context of interactive work in a virtual environment, the learner is able to acquire the knowledge, skills and attitudes to perform chemistry laboratory work.

### 2.2.3. Technical implementation algorithm for an interactive and contact classroom system

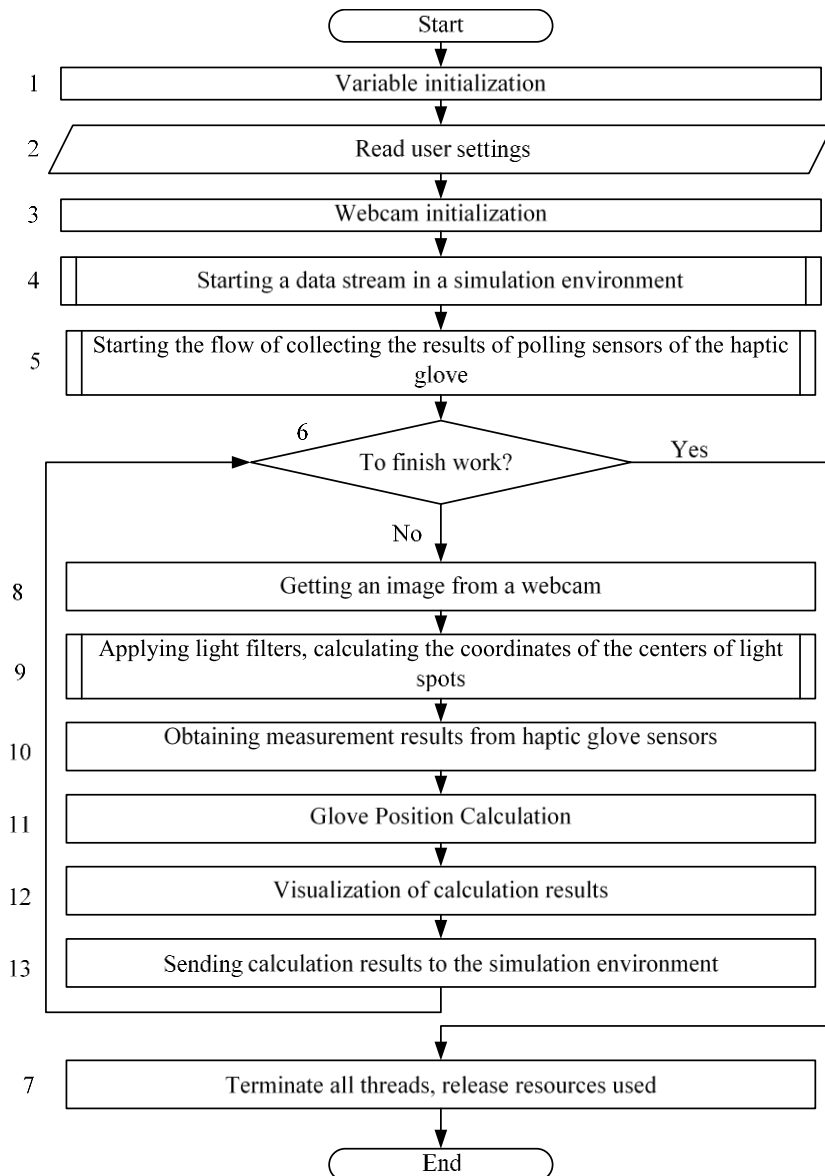
The server part is written in Python 3.8 for the Jupyter Notebook runtime. The server part performs the following functions:

- Collection of measurement results from HG sensors;
- Capture and process a video stream from a webcam;
- Calculation of the position and orientation of the palm and fingers of the human hand;
- Sending data to a Unity-based simulation environment.
- A generalised algorithm for the server part is shown in [Figure 13](#).

Consider the steps of the algorithm:

- Variable initialisation. Variables to be initialised include settings for webcam exposure, window size, IP address and port of the remote host, etc.
- Read user settings. This step reads settings such as the maximum and minimum values of light filters applied when processing images from the webcam. These settings are individual for each workstation, so they are stored in an external file.
- Initialise the webcam. The webcam is checked and connected to an available webcam, and the exposure, frequency and resolution are set.

- Running the data stream to the simulation environment. The server part is implemented as a multi-threaded application for asynchronous data collection from the HG, webcam, data processing and transfer of processing results to the simulation environment.



**Fig. 13.** Algorithm of the server part

1. Start the HG sensor measurement collection stream.
2. If the user signals the end of the work, step 7 is performed. If the work continues, step 8 is performed.
3. Completion of all threads, releasing the resources used. Completed threads include main thread, data transfer thread to simulation environment, HG sensor acquisition thread. Resources in use include webcams and network connection socket.
4. Obtaining an image from a webcam.
5. Application of light filters, calculation of coordinates of light spot centres. Based on the userdefined settings, the image from the webcam is digitally processed to identify the light markers and calculate the apparent two-dimensional coordinates of their centres. These variables are used in step 11.
6. Obtaining HG sensor polling results. These results are obtained from the corresponding HG sensor polling result acquisition thread being executed in parallel by using shared variables.

7. Calculation of the glove position. Based on the survey results from step 10 and the calculation results from step 9, calculate the Cartesian coordinates of HG.

8. Visualisation of the calculation results.

9. Sending calculation results to the simulation environment. Calculation results are sent via UDP to the Unity based simulation environment.

A video of the ICET prototype is available over the link ([Video of prototype work, 2022](#)).

#### **2.2.4. Teacher and learner interaction in a virtual laboratory environment**

Integration of interactive and contact education technologies in the educational process is shown in [Figure 2](#), according to this we will consider options for teacher-student interaction in a virtual laboratory (VL) environment using the example of a chemistry laboratory.

The VL-trainee interaction implies organisation of independent work (self-training, self-testing) of the trainees in the virtual laboratory as a simulation environment. In this case the individual pace of lessons is ensured in accordance with the learner's capabilities and abilities, the need for selfeducation is formed. If necessary, the learner can seek advice from a teacher or «virtual assistant».

The teacher-learner interaction can be used when working with a group of learners who are geographically located in the same or different classrooms, as well as remotely from each other and from the teacher, which makes it possible to organise online learning. It can be applied during the explanation of new material, demonstration experiment with the purpose of forming stable cognitive interests on the discussed problem and activation of the students' activity. The teacher works with all students simultaneously: discussing questions and tasks, analysing, comparing, summarising the results of judgements, instructing, setting up a student experiment.

Trainee-LL-trainee interaction involves the organisation of group (team) work by the trainees. A special case of this interaction is learner-trainee-LL-trainee interaction – the work of learners in pairs. The teacher is the organiser and coordinator (facilitator) of learners' face-to-face or online work.

Based on the ICET design produced, we will conduct pilot studies of the speed of training level of educational technology and the level of learning compared with classical educational approaches.

### **3. Results**

#### **3.1. Assessing the speed of learning of ICET technology**

A test group of 3 teachers aged 35, 42 and 53 and 18 pupils of the 9th grade of a comprehensive school was selected for the study. Photographs of the work with the test groups are shown in [Figure 14](#).

To investigate the speed of technology acquisition, the time required for a student to complete two experiments in a laboratory work without errors was measured ([Table 1](#), [Figure 15](#)).

In [Table 1](#), column 1 shows the sequence numbers of performers, column 2 shows the number of attempts, and column 3 shows the time spent by the performer on mastering the material from the start of the experiments, including time to correct mistakes made. It should be taken into account that some participants of the test group, having made a mistake in the course of work, started the attempt all over again.

Column 4 shows the execution time of the 6 laboratory works, including learning the requirements of the laboratory work (green question in the simulation) and recording in the notebook the final formulas for each experiment. Column 5 shows the time of the laboratory work consisting of 6 experiments (converted to minutes and seconds for convenience).



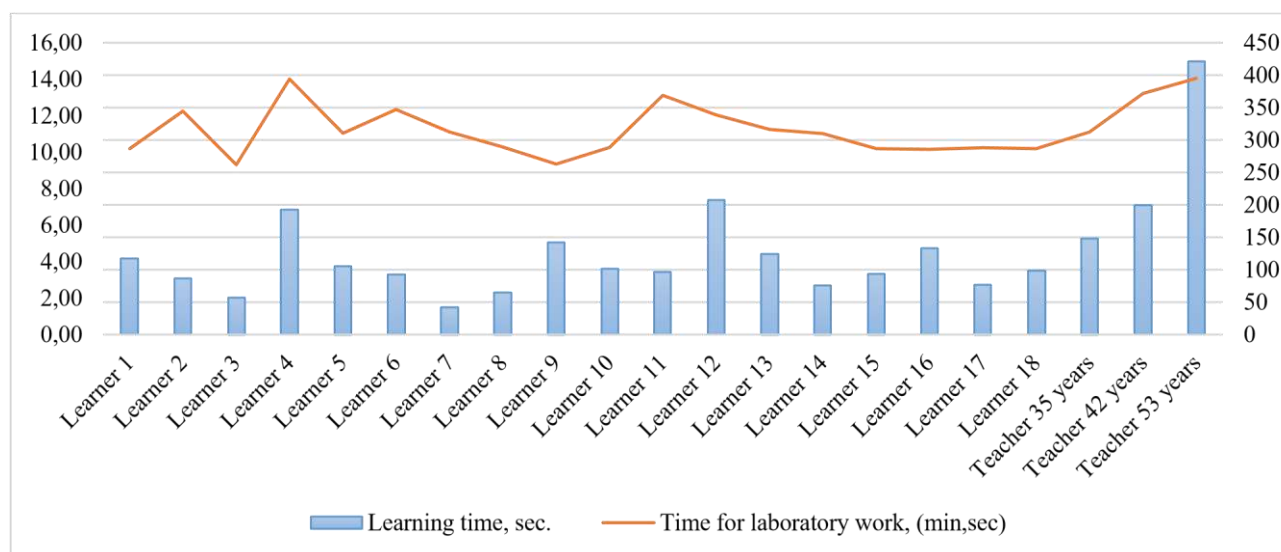
**Fig. 14.** Photograph of work with test groups

**Table 1.** Results of a study on learning speed using ICET

User	Number of attempts	Training time, sec	Time of laboratory work, sec	Time of laboratory work, (min, sec)
Learner 1	3	117	631	10,19
Learner 2	2	86	761	12,25
Learner 3	2	57	592	9,31
Learner 4	4	192	843	14,02
Learner 5	3	106	666	11,04
Learner 6	2	92	777	12,34
Learner 7	1	42	677	11,10
Learner 8	2	65	647	10,28
Learner 9	4	142	597	9,34
Learner 10	3	101	643	10,26
Learner 11	2	96	799	13,11
Learner 12	5	207	726	12,04
Learner 13	3	125	700	11,24
Learner 14	2	76	665	11,03
Learner 15	3	94	633	10,20
Learner 16	4	133	628	10,17
Learner 17	2	77	640	10,24
Learner 18	3	98	632	10,19
Average by learner	2,78	105,89	680,98	11,02



Teacher 35 years	4	148	678	11,11
Teacher 42 years	4	199	818	13,23
Teacher 53 years	8	421	849	14,05
Average by teacher	5.33	256,00	781,71	12,48



**Fig. 15.** Results of a study on the speed of learning and time to complete interactive and contact laboratory activities

The results of the study show that the pupil's habituation to steering via HG (proprioception) varies from 1 to 5 minutes. The average result was just under 2 minutes. At the same time, it took the pupils between 9.5 and 15 minutes to complete all the experiments of the laboratory work. The full cycle of laboratory work, taking into account learning the technology, learning how to perform the experiment and recording the results of chemical reactions was about 20 minutes.

The results of teachers' mastering of technology are mixed, the average speed of mastering is about 4-5 minutes, with an average of about 13 minutes spent on laboratory works. It is worth noting that due to the small sample of teachers the results may not be objective, however, on such a small sample it is noticeable that depending on the age of a teacher the time of mastering the technology increases proportionally.

### 3.2. Assessment of the learning level compared to classical approaches to education

Another test group of 15 Year 9 pupils was selected to assess learning levels. Pupils were divided into 3 test groups of 5 pupils each. Pupils in the first group performed laboratory work using real reagents. The second group watched the video tutorial of the laboratory work. The third group used the ICET.

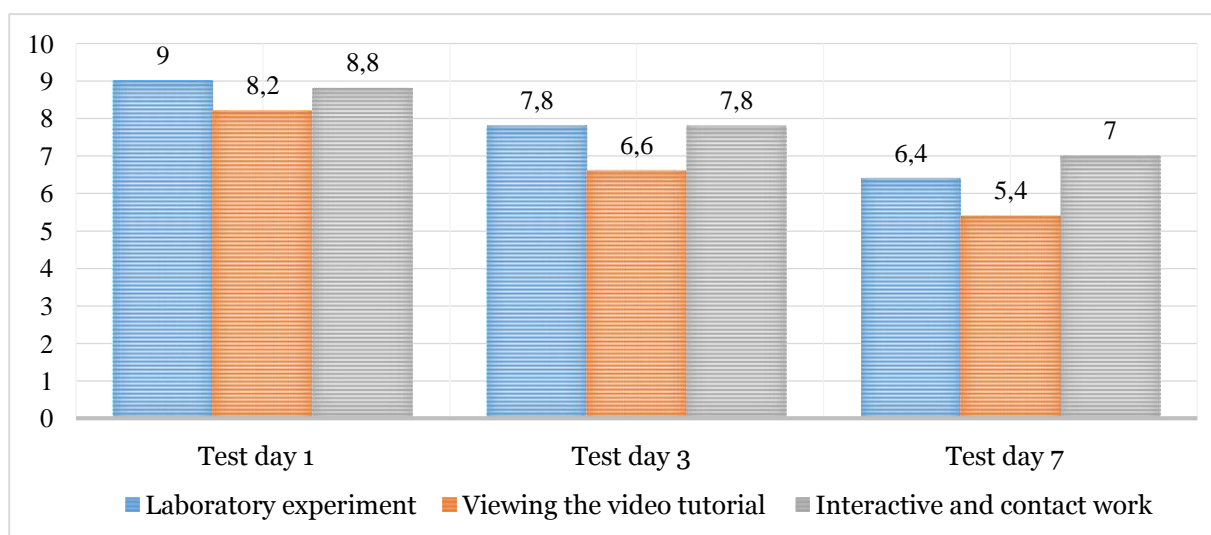
After completing the work, each group member was given a quiz consisting of 10 random questions on the laboratory work done. The total question bank was 30 questions. The test was administered 3 times. On the day of the laboratory work, 3 days after the laboratory work, and one week after the laboratory work.

The results of testing the study groups in the scoring system are presented in [Table 2](#) and [Figure 16](#).

**Table 2.** Assessment of learning levels of test groups of grade 9 pupils (points)

User	Learning tool	Test 1 day	Test day 3	Test day 7
Learner 1	Laboratory experience	8	6	5
19. Learner 2	20. Laboratory experience	21. 10	22. 9	23. 8
Learner 3	Laboratory experience	9	8	6

Learner 4	Laboratory experience	8	8	6
Learner 5	Laboratory experience	10	8	7
Average score	Laboratory experience	9,00	7,80	6,40
Learner 6	View video lesson	9	6	5
Learner 7	View video lesson	7	5	4
Learner 8	View video lesson	9	9	8
Learner 9	View video lesson	8	7	6
Learner 10	View video lesson	8	6	4
Average score	View video lesson	8,20	6,60	5,40
Learner 11	Interactive contact work	9	8	7
Learner 12	Interactive contact work	8	7	6
Learner 13	Interactive contact work	10	9	8
Learner 14	Interactive contact work	9	8	8
Learner 15	Interactive contact work	8	7	6
Average score	Interactive contact work	8,80	7,80	7,00



**Fig. 16.** Comparison of average learning assessment results of test groups of grade 9 students

According to the results, on the day of the laboratory work, the level of absorption of the participants in the first and third groups was almost identical (8.8 points versus 9 for the classical laboratory work with reagents).

However, 7 days after the laboratory work, participants in the third group had a slightly higher level of residual knowledge than students who had used the classical laboratory work method.

The results obtained explained by the high involvement of the student in the educational process and the interest in new technology.

From the results of the study, it is noticeable that group viewing of video lessons is an inefficient way of learning based on the data of Figure 16. Perhaps students are not interested in the passive format of watching videos of school experiments.

Thus, based on the results of the learning assessment, it can be concluded that ICET has been successfully implemented in the classroom.

#### 4. Discussion

The results of the conducted research show that the use of ICET in the main general education school can affect the quality of education by increasing the involvement of students and the level of residual knowledge.

In (Sahin et al., 2019), a study was made of the relationship between the performance of students in astronomy lessons in the traditional format and in the AR format. According to the results of the study, it was found that students in the AR-learning group had a higher level of academic achievement and a positive attitude towards the course than students in the traditional learning group. In the work, this considered as evidence of the positive effect of AR technology (Chang et al., 2021). There was a significant difference in performance between AR and the traditional group, with students who attended science classes using AR technology scoring higher on the Science Achievement Test than those who studied traditionally. Similar results also obtained in other well-known works (Cai et al., 2014; Abdusselam, 2014).

Regarding other works, I would like to note the shortcomings resulting from personal experience in conducting classes with the developed technology. The first barrier to the use of new technologies in education was the difficulty in the process of entering and controlling a group in a virtual environment, primarily associated with moderating a large flow of processes. A similar problem considered in (Nasser et al., 2020). However, in (Fransson et al., 2020), the emphasis placed on the fact that the development of technologies will make it possible to overcome this barrier in the near future due to the development of discipline in conducting classes of this kind.

An important factor is the need to organize work for teachers to pass the necessary advanced training courses in the field of immersive technologies in order to prevent a shortage of qualified personnel to carry out educational activities using VR.

The use of ICET broadens the range of possible practical elements in the lesson structure. The time is optimised for students and teachers while maintaining compliance of the subject work programmes with the requirements of the federal state educational standard.

Thus, the structure of a lesson using ICET involves a 40-minute lesson with the following allocation of time:

- 5 minutes – preparing the workplace,
- 5-10 minutes – explanation of the practical work by the teacher,
- 20 minutes – direct performance of the work using ICET,
- 5-10 minutes – discuss the results of the work and tidy up the workplace.

The following applications of ICET should be highlighted:

- Development and implementation in the digital learning environment (DLE) ecosystem in accordance with the national policy on digital transformation of education;
- Online learning, interactive, supplementary education, online olympiad movements;
- The implementation of educational programmes and hands-on training sessions in various disciplines by experienced teachers in small schools and schools in remote areas.

## **5. Conclusion**

This article describes the development of ICET. The article describes the development of an HG prototype and virtual lessons for conducting research on the application of immersive technologies in the educational process.

This article conducts experimental research on the speed of mastering ICET and the level of student learning when it is applied in comparison with classical educational approaches to chemistry lessons.

According to the results of a study on the speed at which pupils learn ICET technology, getting used to the controls via HGs averages just under 2 minutes. It took pupils between 9.5 and 15 minutes to complete the 6 experiments of the laboratory work. A complete laboratory work cycle, including learning the technology, learning how to perform the experiment and recording the results of chemical reactions, was around 20 minutes.

The learning assessment results show a positive score on the first day of testing, 8.8 versus 9 for the classical laboratory work with reagents.

However, 7 days after the laboratory work, the level of residual knowledge is not significantly higher than in classical laboratory work methods.

It is worth noting that classical laboratory work with reagents should be present in the educational process. However, research shows that the use of immersive technology has its advantages in the form of the possibility of diversity of forms of classes, increasing the level of involvement in the educational process while maintaining a high level of residual knowledge.

In the future, large-scale studies are planned, with more lessons both available in the curriculum and expanded with new reagents. It is planned to increase the test groups of students to

1,000. In addition, it is planned to conduct a study to identify the dependence of the speed of mastering the technology on the age of both pupils and teachers.

The development of a module for remote teacher access to virtual student laboratories during interactive and contact labs is planned in order to remotely monitor the progress of the student's work.

## 6. Acknowledgments

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## 7. Conflict of interest

The authors declare no conflict of interest.

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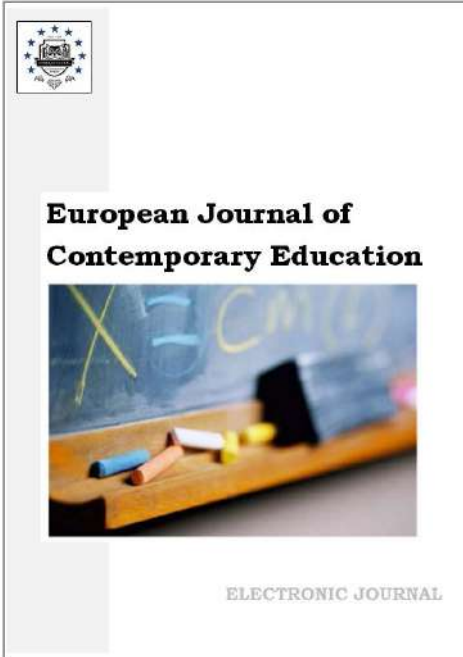
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## **From Ethical Principles to Practice: the Growing Importance of Moral Leadership in Education**

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### **Abstract**

This study delves into the increasingly recognized role of moral leadership in education, a pivotal force driving societal change and innovation. It explores the impact and intricacies of moral leadership, using bibliometric analysis to examine trends and developments in this field. The research highlights the shift towards ethical principles and commitment in educational leadership, emphasizing the profound effects of moral leadership in creating nurturing, innovative, and growth-oriented environments. Despite these positive impacts, challenges exist, including leaders who may compromise ethical foundations for power. The study employs bibliometric analysis to assess scholarly articles on moral leadership, utilizing the Scopus database to create a dataset of 258 articles published between 1912 and 2021. This method facilitates the examination of patterns, relationships, and structures across the literature. Analysis reveals a significant rise in publications on moral leadership, particularly since the 2000s, indicating growing academic interest and diversification in research outcomes. Key findings include the identification of trends and collaborations in moral leadership research, with the United States leading in contributions. The research spans various dimensions, from ethical challenges in crises to its role in governance, healthcare, and education. The study also uncovers five thematic clusters in moral leadership literature, ranging from paternalistic leadership to the role of moral leadership in business ethics. Implications of this study are far-reaching, extending beyond academia to practical applications in education, business, sports, and governance. It underscores the importance of moral leadership in shaping educational curriculums, influencing policy-making, and fostering ethical organizational climates.

**Keywords:** moral leadership, bibliometric, research trends, educational leadership.

### **1. Introduction**

In the ever-evolving tapestry of society, education stands as a pivotal force, driving change and innovation as we navigate through the currents of time. The increasing recognition of moral

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leadership's vital role within the educational landscape marks a significant shift in contemporary discourse, positioning it as an indispensable pillar in fostering resilient and effective educational institutions (Bafadal et al., 2021; Greenfield, 2004). This approach to leadership, which is rooted in strong ethical values and steadfast dedication, serves as a guiding light in the expansive field of educational theory and practice. It inspires teachers and school leaders to set a positive example and make influential choices based on a foundation of moral principles (Arjanto et al., 2023; Bafadal et al., 2021; Bao, Li, 2019).

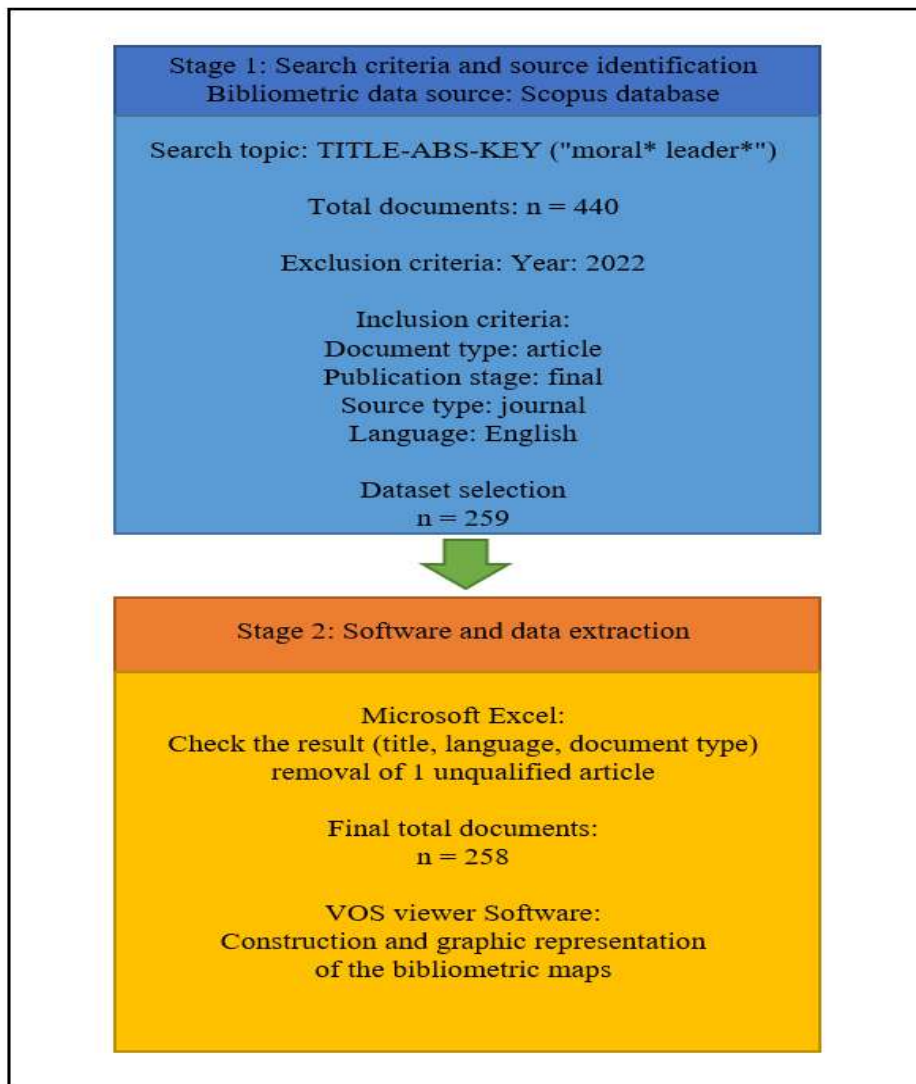
The advent of globalization and a heightened focus on transparency and accountability have thrust moral leadership into the spotlight, highlighting its critical importance in the educational sector. Leaders are now expected to exemplify actions and decisions rooted in ethical values, contributing to the collective progress of their institutions (Cherkowski, Brown, 2013; Davidson, Hughes, 2020; Kartini et al., 2023). While the positive effects of moral leadership are profound, creating nurturing environments that foster growth, creativity, and a commitment to societal betterment, it is crucial to acknowledge that not all leaders uphold these ideals. Some may succumb to the allure of power, engaging in practices that erode the ethical foundation of their institutions (Buka et al., 2018).

Moral leadership not only shapes the ethical climate of educational institutions but also acts as a catalyst for positive change, fostering environments rich in virtue, motivation, and innovation (Bafadal et al., 2023; Gu et al., 2020; Maqsoom et al., 2022). Educational communities under the influence of moral leadership are empowered and motivated, displaying heightened efficacy and a renewed commitment to learning and growth (Dedahanov et al., 2019; Lin et al., 2021). In response to the increasing relevance and complexity of moral leadership in education, there has been a surge in empirical research exploring this phenomenon. Innovative tools like bibliometric analysis and applications such as VOS Viewer have emerged, providing researchers with the means to objectively assess trends and developments within the field (van Eck, Waltman, 2010). These tools enable the visualization of intricate networks of ideas and progress, offering valuable insights into the evolution of moral leadership studies over time.

This study seeks to delve deeper into the intricacies of moral leadership within educational settings, exploring its impacts, challenges, and the nuances that define its role in shaping positive educational outcomes. By harnessing the latest research technologies and conducting extensive analyses, our objective is to offer a detailed and fluid comprehension of the existing condition of moral leadership in the educational context. This involves detecting current trends, identifying shortcomings in the existing body of literature, and suggesting potential paths for forthcoming academic research. Through the application of sophisticated research techniques and in-depth analysis, we strive to provide a profound and continuously updated perspective on moral leadership's role in education, focusing on identifying ongoing trends, exposing gaps in current studies, and outlining future research possibilities. Our ultimate goal is to contribute to the ongoing discourse on moral leadership, enhancing our collective knowledge and capacity to cultivate ethical, resilient, and effective educational institutions for the future.

## **2. Method**

Researchers employ bibliometric analysis as a quantitative method for generating maps based on bibliographic databases (Su et al., 2019). This study combines methods from statistics, mathematics, and other disciplines to scrutinize the differences in patterns, numerical connections, and organizational layouts across a range of literature categories. The scope of bibliometric analysis covers a broad spectrum of data from publications, including elements like keywords, frequency of words, authorship, publication dates, affiliating institutions, titles, thematic terms, instances of co-occurrence, mutual citations, referenced sources, details of citations, links between citations, publishing details, collaborative authors, language of the article, and the country of origin. Using the Scopus database, researchers applied the search formula TITLE-ABS-KEY ("moral\* leader\*") to identify articles on moral leadership published between 1912 and 2021. They utilized filters to select only journal articles in English. The collected papers were then imported into an Excel spreadsheet (CSV). Additionally, researchers manually verified the suitability of each publication based on year, title, language, and article type, excluding unrelated topics or non-English publications. As shown in Figure 1, a search strategy flow was employed. Ultimately, a dataset of 258 articles was compiled (Figure 1).



**Fig. 1** Methodological process of the bibliometric analysis

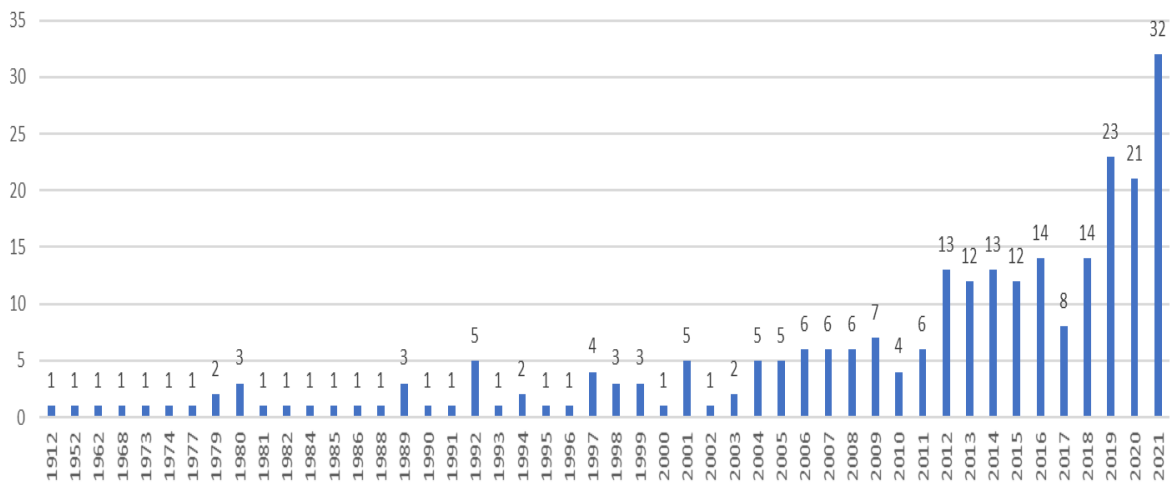
The application VOS Viewer was utilized to create network maps, which facilitated the visualization of connections between chosen elements, thereby making their interpretation more straightforward (Phoong et al., 2022). VOS Viewer software can map bibliographic data, including author keywords and shared citations (Navarro-Lopez et al., 2022). The collected data were then imported into the VOS Viewer for bibliometric analysis. Each label and line is represented by a node, with larger circles denoting higher importance. Additionally, the same color signifies that objects belong to the same cluster. The study's node types include author, country, keywords, and articles.

### 3. Results and discussion

#### 3.1. Publication analysis

A continuous rise in the volume of academic papers on a particular topic typically reflects a widening in the range of research findings during that period. This notion is based on the "information society" theory, which argues that an increase in information generation enhances the breadth of understanding and variety of perspectives within a specific field (Webster, 2014). Therefore, the ongoing growth in the number of publications addressing moral leadership not only signals an escalating academic focus but also implies an enrichment in the diversity of research findings in this domain. This trend underscores the need for comprehensive analysis to chart the future direction of research on moral leadership, focusing on its changing dynamics, emerging trends, and overall progression.





**Fig. 2.** Number of published articles on moral leadership (1912–2021)

The trend in the number of published articles and the significant fluctuations in the research scope of moral leadership over the entire study period are visually represented in [Figure 2](#). This graphical depiction provides a clear picture of the progressive journey of moral leadership research, encapsulating the periodic highs and lows in research output, thus offering a chronological mapping of the field's evolution. The scientific inquiry into moral leadership began as early as 1912, as evidenced by the pioneering article "Moral Leadership through Teachers and Officers" authored by Milton S. Littlefield. This article, published in the journal "Religious Education" by Taylor and Francis ([Littlefield, 1912](#)), laid the groundwork for future research by delving into the aspects of moral leadership in the context of educational institutions, and particularly in the roles of teachers and officers. Subsequently, there has been a consistent annual increase in the number of publications within the field, indicating a steady augmentation of knowledge and intellectual discourse on moral leadership. This growth has been especially prominent in the 2000s, echoing the shift towards moral and ethical considerations in leadership research witnessed in this period ([Ciulla, 2004](#)). Indeed, the highest productivity in the domain of moral leadership was recorded in 2021, with an unprecedented count of 32 papers. This indicates an increasing recognition of the significance of moral leadership in both academic and practical spheres and its burgeoning relevance in addressing contemporary leadership challenges ([Treviño et al., 2014](#)). It's important to note that the continually evolving field of moral leadership research, underscored by its increasing volume and diversity, necessitates periodic reviews. These reviews would facilitate a comprehensive understanding of the changing research landscape, thereby enabling researchers to better anticipate and respond to emergent trends and developments in moral leadership studies ([Avey et al., 2012](#)).

### 3.2. Article network analysis

#### 3.2.1. Co-authorship analysis by authors

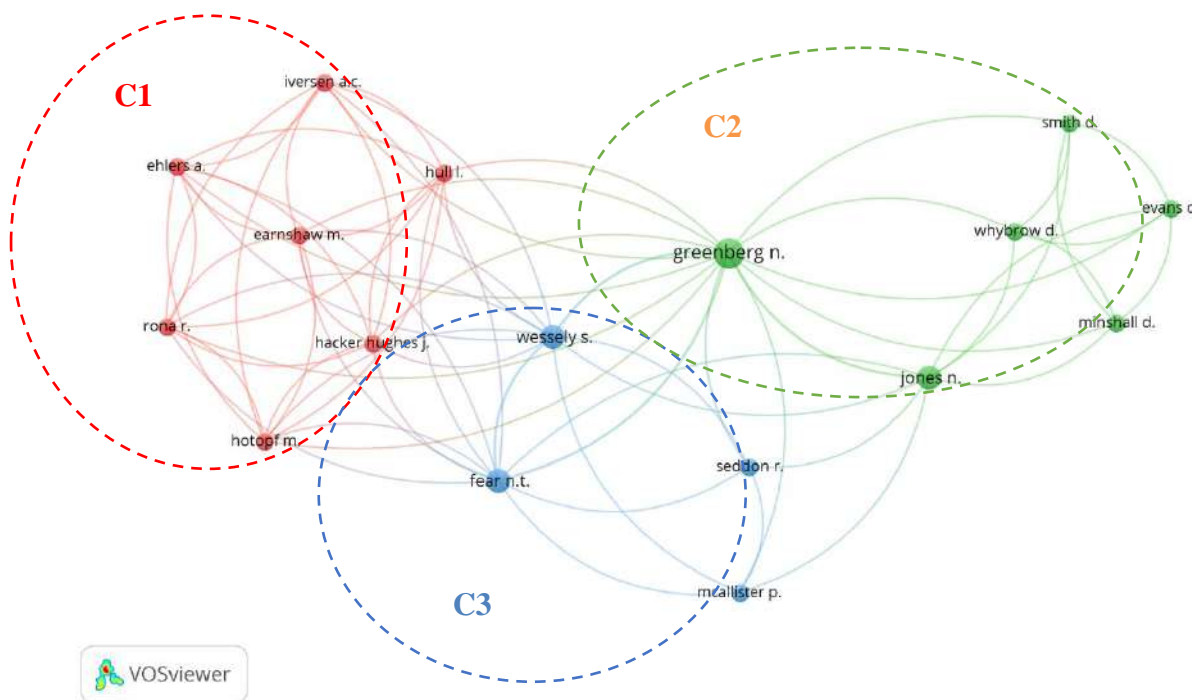
Between 1912 and 2021, 461 authors wrote about moral leadership. Figure 3 presents the visual mapping analysis results, using a minimum threshold of 1 article published per author and a minimum of 11 citations, resulting in the identification of 209 authors. However, only 17 authors were included in the visual mapping, as some authors were not related to each other. Citations are the most frequently used method to measure an author's or paper's influence, as they can easily identify existing scientific articles ([Rashid, 1991](#); [Zupic, Čater, 2015](#)). [Table 1](#) displays the top 10 authors by citation: N. Greenberg, N.T. Fear, S. Wessely, M. Earnshaw, A. Ehlers, J. Hacker Hughes, M. Hotopf, I. Hull, AC Iversen, and R. Rona.

**Table 1.** Top 10 authors of moral leadership scientific analysis (ranking by citations)

Rank	Author	Citation	Documents	Total Link Strength
1	Greenberg N.	362	3	19
2	Fear NT	351	2	14
3	Wessely S.	351	2	14
4	Earnshaw M.	228	1	9
5	Ehlers A.	228	1	9
6	Hacker Hughes J.	228	1	9
7	Hotopf M.	228	1	9
8	Hull I.	228	1	9
9	Iversen AC	228	1	9
10	Rona R.	228	1	9

Source: Scopus Database

In [Figure 3](#), the connecting lines among authors visually depict their collaborative ties, illustrating the ways in which they have jointly contributed to research in the field of moral leadership ([van Eck, Waltman, 2010](#)). These connections can be thought of as relational ties that occur due to the joint authorship of research publications, making it a useful tool for illustrating co-authorship networks ([Newman, 2004](#)). The clusters of authors are color-coded to denote separate collaborative groups.

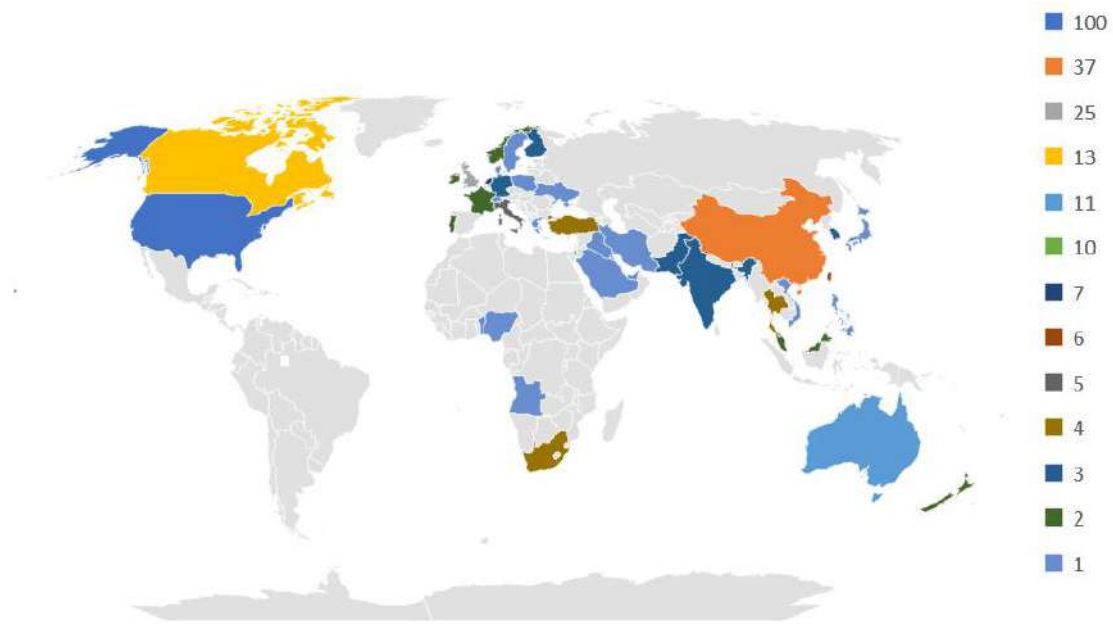
**Fig. 3.** Co-authorship network by the author of moral leadership

This visual mapping allows for a clear understanding of the interconnections and collaborations within and across these groups. Greenberg N., for example, is part of cluster 2 (C2), signifying his primary affiliation and collaboration with authors within this group. However, he also has a cross-border collaborative relationship with authors from cluster 1 (C1) and cluster 3 (C3). This implies that, although N. Greenberg has contributed significantly to the publications within his cluster, he has also co-authored with authors from other clusters, thus bridging different research groups. This ability to straddle clusters and bring diverse perspectives together can often lead to innovative research ([Burt, 2004](#)). These cross-border collaborations foster a more

comprehensive understanding of the research topic as they encompass varied perspectives and approaches to moral leadership. It reflects Greenberg N.'s adaptability in aligning with different research foci and an openness to diverse research methodologies and perspectives (Lee, Bozeman, 2005). This mapping also underlines the complex interconnections that exist in academic networks and the significant role these relationships play in driving research forward. By analyzing the collaborations between authors, we can gain insights into how knowledge is developed and disseminated in the field of moral leadership (Wuchty et al., 2007).

### 3.2.2. Co-authorship analysis by countries

Between 1912 and 2021, research on moral leadership encompassed contributions from 47 different countries. Leading in terms of publication significance were the United States (USA) with a contribution of 100 articles, followed by China with 37 articles, the United Kingdom presenting 25 articles, Canada with 13 articles, and Australia contributing 11 articles.



**Fig. 4.** Distribution of countries publishing articles on moral leadership

**Table 2** displays the five leading countries based on their overall link strength, a measure that indicates the collaborative intensity of authors from these countries (Phoong et al., 2022). This link strength, represented by lines connecting the countries, highlights the extent of their collaborative efforts. In this ranking, China emerges at the forefront with a link strength score of 25, followed by the United States (USA) with 23, Canada scoring 11, Australia with 8, and the United Kingdom registering a strength of 5.

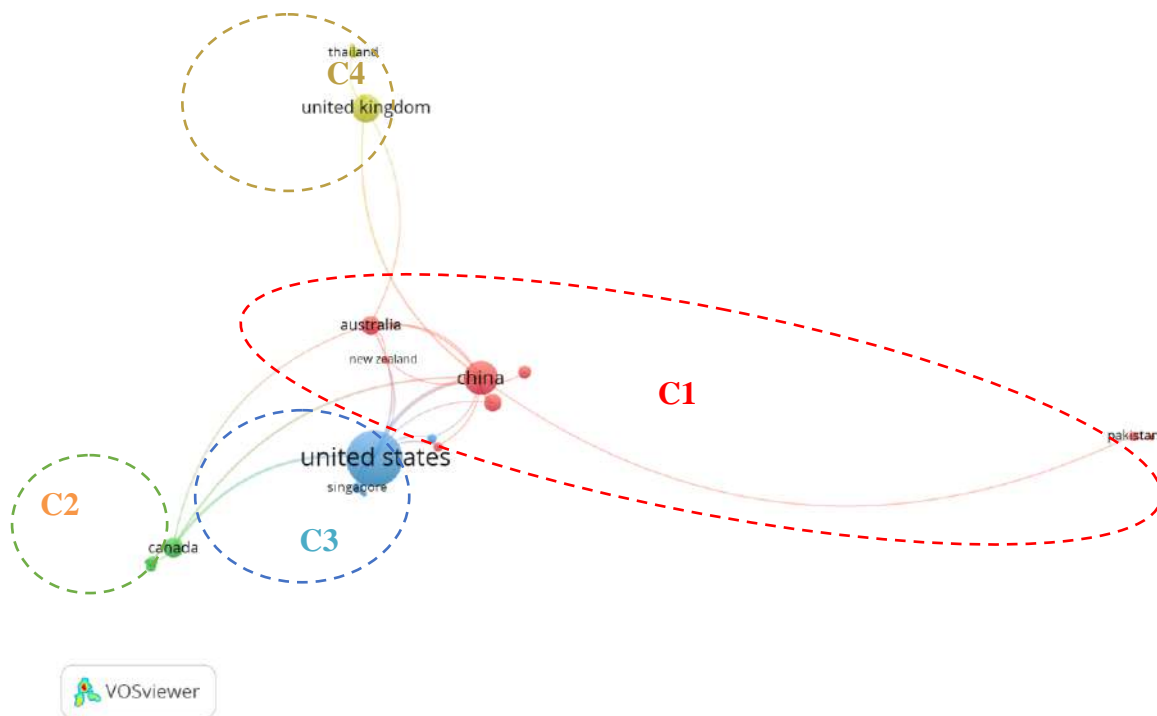
**Table 2.** Ranked five countries with the highest number of publications on moral leadership (ranking by total link strength)

Rank	Country	Documents	Citation	Total link strength
1	China	37	867	25
2	United States (USA)	100	1,657	23
3	Canada	13	158	11
4	Australia	11	161	8
5	United Kingdom	25	670	5

Source: Scopus Database

The researcher established a threshold of a minimum of 1 article published per country and at least 1 citation for conducting a network analysis of collaboration between countries, leading to

the selection of 39 countries. The resulting collaboration map consists of 25 links, as shown in Figure 5. Nodes represent each country based on the number of publications. Lines connecting these nodes indicate the presence of interconnections between the countries that form the cluster. There are four clusters: the first cluster (C1) includes China, Australia, New Zealand, Pakistan, Taiwan, Hong Kong, Germany, Denmark, Saudi Arabia, and the United Arab Emirates; the second cluster (C2) consists of Canada, South Africa, Sweden, and Turkey; the third cluster (C3) comprises the United States (USA), Singapore, South Korea, and Angola; the fourth cluster (C4) includes the United Kingdom, Thailand, Switzerland, and Vietnam.



**Fig. 5** Co-authorship networks by countries that publish articles on moral leadership

In Figure 5, the largest node diameter, represented by the United States (USA), illustrates that it is the leading country in the study of moral leadership. Node size in network analysis often represents the degree or centrality of a node, reflecting the magnitude of its influence or connections (Opsahl et al., 2010). In this case, it represents the high volume and diversity of moral leadership studies emanating from the USA. The research conducted in the USA spans a wide variety of dimensions within the field of moral leadership, demonstrating a comprehensive exploration of the topic. For instance, the essential role that moral leaders play in navigating the complex ethical challenges and humanitarian issues that arise in such crises is highlighted in Crawford's moral leadership analysis concerning the refugee crisis (Crawford, 2021). Ethical guidance can shape geopolitics and diplomacy in a rapidly transforming global landscape, further expanding on the role of moral leadership in changing international political systems (Larson, 2020). Similarly, the importance of moral leadership in achieving organizational accountability and fostering staff development (Kautzman, 2018). In the corporate domain, the necessity of moral leadership in contemporary businesses emphasizing the ethical duties of corporate leaders in maintaining corporate social responsibility (Adewuyi et al., 2018). Simultaneously, the significance of ethical guidance in democratic governance and constitutional processes, focusing on the role of moral leadership in democracy and constitutions (Newswander, 2012). The USA's leadership in moral leadership studies also extends to the healthcare and education sectors. Moral leadership within the context of nursing, underlining the need for ethical leaders in healthcare settings to ensure the best patient outcomes (Bjarnason, Lasala, 2011). The necessity of moral leadership in educational and school settings, demonstrating how it can positively influence school culture and student development (Evans, Shirley, 2008; Warsongko et al., 2021).

### 3.2.3. Keyword co-occurrence analysis by author keyword

Keywords are the core content or study of the article, and keywords with high frequency reflect research hotspots in the field (Zhu et al., 2022). Each keyword is represented by a node whose size is proportional to the frequency, and a more significant number of links indicates a more frequent occurrence of the keyword, as in Figures 6 and 7. The thickness of the joint reflects the strength of the joint. Analysis of the network between keywords with a minimum threshold of 2 articles published per keyword, 64 keywords were selected, resulting in a map of the cooperative relationship of countries with 63 links.

**Table 3.** The 30 keywords with the most frequency from the scientific analysis of moral leadership

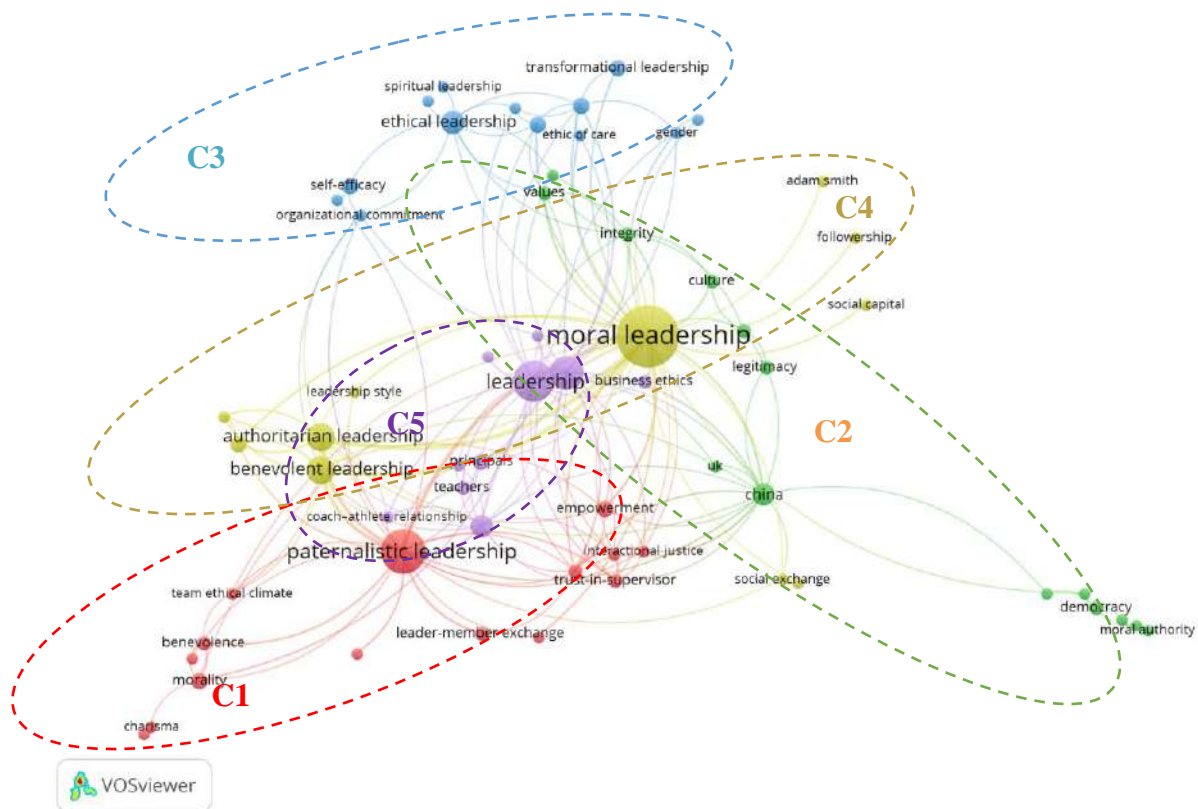
Rank	Keywords	Occurrences	Total link strength
1	Moral leadership	54	284
2	Paternalistic leadership	28	114
3	Leadership	24	95
4	Ethics	16	71
5	Authoritarian leadership	11	56
6	Benevolent leadership	11	53
7	Ethical leadership	8	34
8	Trust	7	39
9	Servant leadership	4	23
10	Empowerment	4	20
11	Authentic leadership	4	19
12	Employee voice	4	17
13	Morality	4	16
14	Self-efficacy	4	16
15	Principals	4	13
16	Transformational leadership	4	12
17	Democracy	3	18
18	Integrity	3	17
19	Values	3	17
20	Corruption	3	16
21	Culture	3	14
22	Teachers	3	11
23	Legitimacy	3	7
24	Race	2	19
25	Social capital	2	17
26	Gender	2	14
27	Civil society	2	13
28	Work performance	2	13
29	Leadership style	2	12
30	Charisma	2	11

Source: Scopus Database

Table 3 lists the top 30 high-frequency keywords. 'moral leadership' (54) was the most common, followed by 'paternalistic leadership' (28), leadership (24), ethics (16), authoritarian leadership (11), benevolent leadership (11), ethical leadership (8), and trust (7) shows that moral leadership is related to other leadership models or styles that have similarities in several dimensions and concepts of leadership. Using VOS Viewer, researchers categorized keywords scattered throughout the network and then grouped them based on the regular frequency that appeared most often. In bibliometric analysis, each cluster in the co-occurrence network map represents a theme and research focus in a particular area (Zhu et al., 2022).

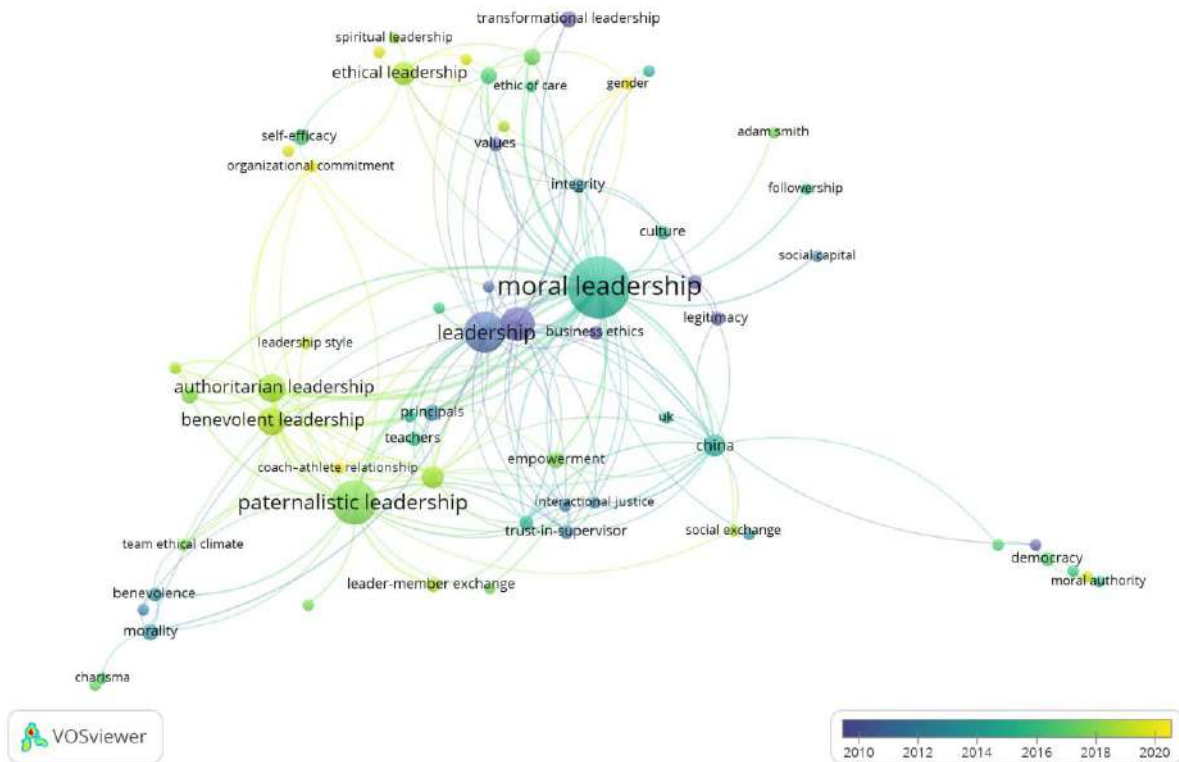
The recent examination of moral leadership research literature reveals the categorization of essential keywords into five distinct groups, each representing a specific aspect within the larger context of moral leadership studies. Figure 6 graphically displays this division into varied clusters, each with its unique thematic focus. Cluster C1, shown in red, highlights terms like 'paternalistic leadership', 'empowerment', and 'interactional justice', among others. These terms illuminate the multifaceted nature of moral leadership, particularly its connection to the broader concept of paternalistic leadership. This relationship significantly affects various organizational factors, notably employee empowerment and perceptions of justice and trust in leadership, thereby influencing their behavior as organizational citizens. In Cluster C2, colored green, terms such as

'democracy', 'moral authority', and 'integrity' are included, emphasizing key aspects of moral leadership. This cluster points to the essential role of democracy in moral leadership, stressing the need for leaders to uphold high moral standards, legitimacy, and integrity, thereby shaping the actions and perceptions of their followers. The third cluster, C3, presented in blue, merges terms like 'ethical leadership', 'transformational leadership', and 'gender'. This cluster explores the convergence of moral leadership with other leadership styles and its approach to significant issues such as gender equality and organizational commitment. Cluster C4, highlighted in yellow, comprises keywords like 'authoritarian leadership' and 'benevolent leadership', revealing the diverse dimensions within the paternalistic leadership framework. This cluster suggests that moral, authoritarian, and benevolent leadership styles, though part of the same paradigm, have distinct influences within an organizational context. Finally, Cluster C5, in purple, includes terms related to 'leadership' in various sectors like education, sports, and business. It emphasizes the impact of moral leadership in these fields, notably in shaping the attitudes of educators and the role of moral principles in business ethics. Together, these clusters provide a comprehensive and detailed view of the diverse areas within moral leadership research, enhancing our understanding of its complex dynamics and relevance in different contexts. This detailed study of the clusters contributes significantly to the existing knowledge in the field of moral leadership.



**Fig. 6.** Co-occurrence network map by author keywords from articles published on moral leadership

While research on moral leadership dates back to 1912, it wasn't until 2010 that a detailed keyword analysis in this area began, marking a significant progression in the field. Prior to 2010, no specific keywords had been associated with studies in this area. An overlay visual in [Figure 7](#) depicts the evolution of moral leadership research from 2010 through 2020. Before 2014, the focus was on terms like 'ethics', 'business ethics', and 'legitimacy', indicating a concentration on enhancing aspects of business, organizational, or national practices. From 2014 to 2018, the emphasis shifted to integrating moral leadership within the broader framework of paternalistic leadership, particularly in educational and organizational contexts, as reflected in keywords such as 'moral leadership', 'culture', and 'paternalistic leadership'. Post-2018, the scope of research broadened to incorporate topics like 'organizational commitment', 'gender', and 'authoritarian leadership', reflecting a deeper exploration into various aspects of moral leadership, including its role in authoritarian and benevolent leadership styles, and its relevance to contemporary issues.



**Fig. 7.** Overlay visualization of moral leadership based on author keywords

**3.3. Analysis of frequent citation by documents**

Analyzing the frequency of citations in academic documents provides a reliable and empirical strategy for identifying the most impactful papers in a particular area of study. This technique relies on the frequency of article citations as a foundational element of bibliometric analysis (Zhu et al., 2022). The effectiveness and accuracy of this approach are enhanced by its ability to quantitatively measure the influence exerted by various journals, individual studies, and researchers, making it a valuable tool in scholarly assessment (Ochoa Jiménez et al., 2022). In Table 4, the top ten articles receiving the most citations in the realm of moral leadership research, spanning the years 1912 to 2021, are listed.

**Table 4.** The top 10 most frequently cited documents/articles of moral leadership

Rank	Year	Documents/Articles	Citation	Ref.
1	2015	Does moral leadership enhance employee creativity?  Employee identification with leader and leader member exchange (LMX) in the Chinese context	196	Gu et al., 2015
2	2012	Moral leadership and work performance: testing the mediating and interaction effects in China	115	Wu, 2012
3	2015	Moralized leadership: the construction and consequences of ethical leader perceptions	94	Fehr et al., 2015
4	2014	Measuring the effects of safety management system practices, morality	85	Chen, Chen, 2014

		leadership, and self-efficacy on pilots' safety behaviors: safety motivation as a mediator		
5	2018	Construct redundancy in leader behaviors: a review and agenda for the future	81	Banks et al., 2018
6	2009	Effectiveness of a moral and benevolent leader: probing the interactions of the dimensions of paternalistic leadership	78	Niu et al., 2009
7	2001	Chinese culture and leadership	74	Wong, 2001
8	2014	Paternalistic leadership and employee voice: does information sharing matter?	67	Chan, 2014
9	2015	The Mediating effect of ethical climate on the relationship between paternalistic leadership and team identification: a team-level analysis in the Chinese context	66	Cheng, Wang, 2015
10	2007	Feeling trusted by business leaders in China: antecedents and the mediating role of value congruence	66	Lau et al., 2007

Source: Scopus Database

Table 4 showcases the top ten articles most frequently referenced in the field of moral leadership from 1912 to 2021, based on data from the Scopus Database. This data serves to empirically strengthen the analysis, affirming the soundness of the results obtained. Leading the list with 196 citations is "Does moral leadership enhance employee creativity? Employee identification with leader and leader-member exchange (LMX) in the Chinese context" (Gu et al., 2015). This research delves into how moral leadership influences employee creativity, introducing an innovative model that emphasizes the significance of employee identification with leaders and the dynamics of Leader-Member Exchange (LMX) in fostering creativity. Following closely is "Moral leadership and work performance: Testing the mediating and interaction effects in China" (Wu, 2012), which has received 115 citations. This study critically examines the operational dynamics of moral leadership and its implications for work performance, challenging the interaction between moral and authoritarian leadership styles in relation to employee trust and performance. The third most cited is "Moralized Leadership: The Construction and Consequences of Ethical Leader Perceptions" (Fehr et al., 2015), with 94 citations, investigates the development and impact of ethical leader perceptions, highlighting how moralization influences follower behavior driven by leaders' ethical values. These studies collectively underscore the fundamental role of moral leadership in both academia and practice, particularly in fostering employee creativity and enhancing work performance. The research suggests that moral leadership, coupled with strong leader-member relations, creates a conducive environment for creative output (Gu et al., 2015), echoing findings on the empowerment and safety felt by employees under moral leadership (Liu et al., 2012). Further illustrate the positive impact of moral leadership on work performance, spotlighting the crucial role of trust as an intermediary between leadership style and performance (Wu, 2012). Moreover, meta-analysis, confirms the significant role of ethical leadership in achieving positive organizational and individual outcomes, including job satisfaction, commitment, and performance at various levels (Piccolo et al., 2010). Nevertheless, the intricate nature of moral leadership and its diverse implications call for ongoing research to deepen the understanding of its influence over time (Treviño et al., 2014). This continuous research is essential for evolving and enhancing our grasp of how moral leadership shapes various outcomes in different organizational contexts.



### **3.4. Benefits for pedagogy**

Utilizing bibliometric analysis, researchers delve deep into the world of pedagogical science, identifying the most predominant themes and trends shaping the field. This comprehensive understanding enables researchers to identify not just the prevailing topics but also the gaps within the literature, pointing towards areas ripe for further exploration and investigation. Such an approach ensures that future research is strategically directed towards contributing meaningfully to the field. Concurrently, the identification of these thematic clusters fosters collaborative opportunities, encouraging researchers working on similar topics to form partnerships, share knowledge, and collectively advance the field. With this insight at their disposal, educators and those creating curricula are more equipped to develop teaching materials and curricular programs that are in sync with the latest trends in research. This ensures that the educational content delivered to students is both current and pertinent. Such synchronization not only elevates the quality of education but also aids in advancing the theoretical aspects of pedagogical science. Researchers, by examining these identified groupings, have the opportunity to expand upon existing knowledge, formulating innovative theories or models that more effectively elucidate the connections among various concepts. On the policy and practice front, the insights garnered from bibliometric analysis play a crucial role in informing evidence-based decisions for policymakers and practitioners in education. Understanding the key themes and trends within pedagogical science ensures that policies and practices are grounded in the latest research, fostering more effective and impactful outcomes in the educational landscape.

### **3.5. Implications**

This comprehensive analysis of moral leadership literature has significant implications for both academic and practical realms. In the academic realm, the heightened attention towards research in moral leadership, as indicated by the rising volume of related publications, signifies a notable evolution in the study of leadership. This trend signifies a deepened focus on morality in leadership and encourages further exploration and contribution in this area (Pasricha et al., 2018). In the context of educational leadership, this study's findings can guide curriculum development and pedagogical practices. By incorporating elements of moral leadership into educational curriculums, educators can cultivate moral awareness, ethical decision-making abilities, and benevolent attitudes among students (Starratt, 2004). Similarly, teachers and school administrators can imbibe moral leadership principles, fostering an environment of integrity, fairness, and ethical conduct (Greenfield, 2004; Gunawan et al., 2020). The analysis also revealed specific trends in moral leadership research, such as the convergence of paternalistic, benevolent, and moral leadership models. This knowledge can aid in refining leadership development programs, tailoring them to foster comprehensive leadership traits encompassing various dimensions of leadership (Pellegrini, Scandura, 2008). Furthermore, the study's implications extend to policy-making in educational institutions. The findings suggest that school leaders play a crucial role in shaping the moral and ethical climate of schools, influencing students' character development and staff's ethical conduct (Bafadal et al., 2020; Shapiro, Stefkovich, 2016). Therefore, the recruitment, selection, and development of school leaders should place a premium on their commitment to moral and ethical leadership.

Practical implications also exist for leadership across diverse sectors beyond education, such as business, sports, and governance. For instance, business leaders practicing moral leadership can contribute to creating ethical organizational climates, enhancing trust and commitment among employees (Brown et al., 2005). The study has also made visible the global network of authors and countries contributing to the discourse on moral leadership, underlining the need for international collaborations and knowledge sharing to advance the field. The results of this study, however, should be interpreted with caution considering the database and language biases inherent in the study. The bibliometric analysis primarily relied on English-language publications and utilized the Scopus database, potentially excluding relevant contributions in other languages and databases.

## **4. Conclusion**

The study of moral leadership has attracted significant attention both academically and globally, evidenced by the consistent increase in related publications, diverse authorship, and contributions from various countries. The field has undergone considerable development, expanding in scope and diversifying in viewpoints, all the while affirming the critical importance of moral leadership. The dynamic and collaborative academic network, encompassing a range of

collaborations and perspectives, has been instrumental in propelling this area of research. Additionally, the examination of frequently associated keywords has revealed how the focus areas of moral leadership research have evolved, encompassing everything from paternalistic approaches to democratic ideals and specific industry-related inquiries. The chronological mapping of these focus areas, transitioning from business ethics to enhancements in organizational structures, pedagogical aspects, and varying leadership styles like authoritarian and benevolent leadership, has deepened our comprehension of the field's progression. Notably, the review of highly cited works in this domain underscores moral leadership's role in fostering environments that nurture creativity, trust, and enhanced performance in organizations. However, these findings also indicate the necessity for ongoing research to further dissect the complex dynamics and situational variables that affect moral leadership's effectiveness. In summary, this body of research highlights the fundamental role of moral leadership across both scholarly and practical domains, showcasing its influence across different industries and its capability to meet modern leadership challenges. Therefore, continual investigation is essential to enrich and broaden our understanding of this vital aspect of leadership.

### 5. Conflict of interest

The authors affirmed that there is no conflict of interest in this article. Conceptualization, Paul Arjanto (P.A.) and Ibrahim Bafadal (I.B.); methodology, P.A. and I.B.; software, Adi Atmoko (A.A.); validation, Asep Sunandar (A.S.); formal analysis, A.S.; investigation, A.A.; resources, A.S.; data curation, A.A. and A.S.; writing—original draft preparation, P.A. and I.B.; writing—review and editing, A.A.; visualization, P.A.; supervision, I.B.; project administration, P.A.; funding acquisition, P.A.

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## **Integrative Technologies as a Means of Forming Metacognitive Competences In High Grade Students**

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### **Abstract**

The problem of the formation of metacognitive competencies in schoolchildren by means of pedagogical integration (integration of general and additional education, the use of inter- and intra-subject connections in regular and extracurricular activities) is of particular importance in the modern world. The identification of the nature and features of the influence of integrative technologies on the formation of metacognitive competencies among students of specialized senior classes of secondary schools is an urgent problem of modern education.

136 teenagers aged 15-18, students of the senior classes of secondary schools (68 students from classes with the implementation of integrative technologies) made up an experimental group. On the basis of interdisciplinary connections and integration of general and additional education, the subjects "Natural Science", "Communication", "Cognition" and "Synergetics" were studied. 68 schoolchildren of the same age (studying in traditional conditions) made up the control group. The pedagogical experiment lasted for two years.

The study was carried out using the author's methodology, the La Costa metacognitive behavior self-assessment scale, the metacognitive knowledge and metacognitive activity self-assessment methodology (M.M. Kashapov and Yu.V. Skvortsova), and the D. Everson. Statistical methods included the calculation of the Student's t-test and the Wilcoxon T-test.

Positive shifts in metacognitive competencies (reflexive ( $p < 0.01$ ), self-organizational ( $p < 0.01$ ) and regulatory ( $p < 0.001$ ), as well as metacognitive behavior ( $p < 0.01$ ) and metacognitive properties ( $p < 0.05$ ) were recorded by the end of the experiment in the main group. Similar changes were not recorded in the control group.

Integrative technologies are an effective means of forming and developing metacognitive competencies in high school students. In this regard, the feasibility of implementing a meta-subject

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approach and the introduction of integrative lessons and technologies into the educational process of the school has been proven.

**Keywords:** metacognitive competencies in schoolchildren, integration of general and additional education, youth.

### **1. Introduction**

Competence-based and meta-subject approaches underlie the new Federal State Educational Standards. The developed ability of students to learn and independently acquire new knowledge is recognized as one of the main results of education. This ensures their successful adaptation in rapidly changing living conditions (Shapoval, 2019).

The problem of the formation of metacognitive competencies in high school students by means of pedagogical integration (integration of general and additional education, the use of inter- and intra-subject connections) is of particular importance in the modern world. Integration of general and additional education is an irreversible process of development. It is associated with the reorganization of all types of education. The transition to a new structure in the educational environment and the unification of the educational space are focused on creating conditions for the development of each child's abilities, for the self-realization of children, the disclosure of their talents through new forms of meta-subject and convergent approaches. This definitely improves the quality of the pedagogical process.

This study is aimed at solving the identified problem of the influence of integrative academic subjects on the development of metacognitive competencies among students in high school secondary schools. The purpose of the work is to identify the nature and features of the influence of pedagogical integration.

The metacognitive approach is associated with the name of J. Flavell. It was in his works that the concept of metacognitivism as a new direction in psychological and pedagogical studies of the regulation of the personality's own cognitive processes was introduced for the first time. The question of "thinking about one's own thinking", its nature, mechanisms was raised by the researcher for the first time (Flavell, 1976). In the concept created by the author, metacognitive thinking stands out as an independent type of thinking and includes metacognitive knowledge.

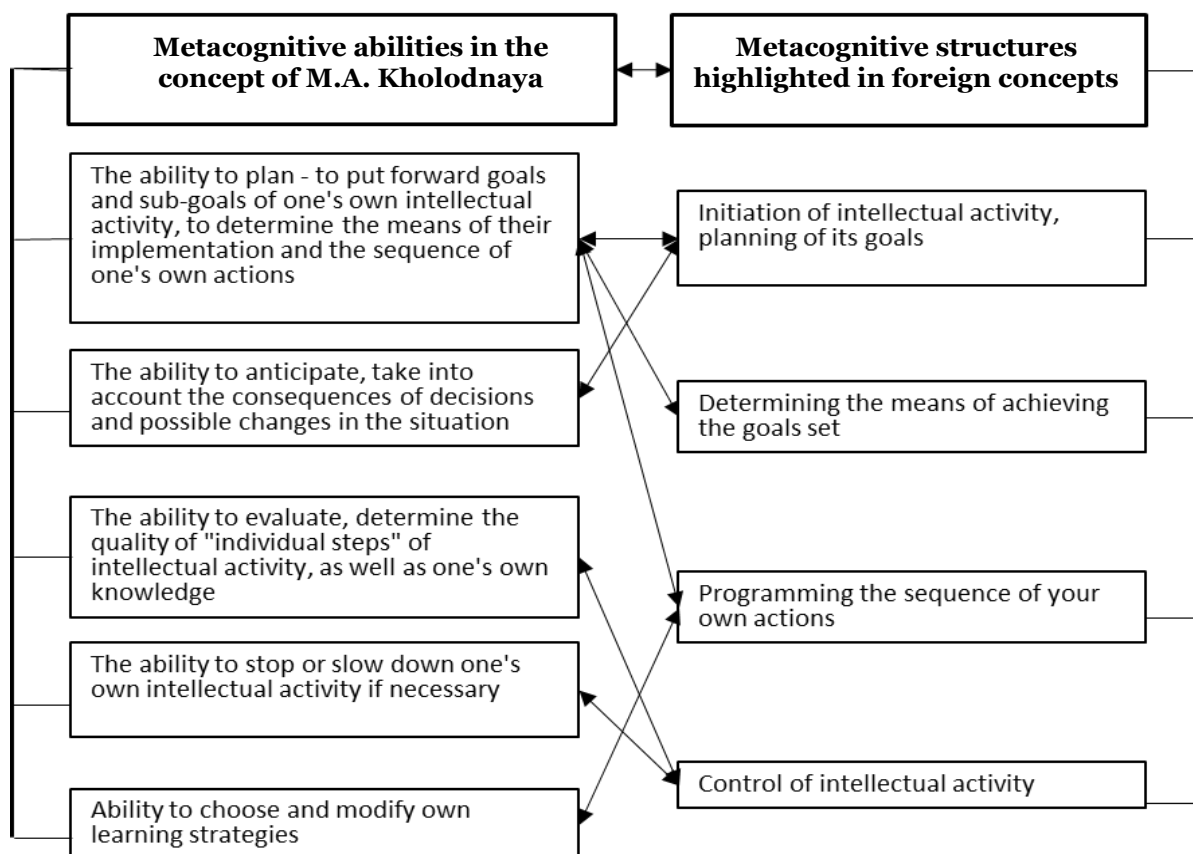
J. Flavell relies on the works of J. Piaget. He differentiates metacognitive thinking as arbitrary, controlled, planned, from formal mental operations. He thereby emphasizes the orientation of metacognitive thinking towards future mental activity for solving specific mental (cognitive) tasks (Flavell, 1976).

Theoretical analysis of foreign studies in the field of metacognitivism, the works of such researchers N. Brick, T. MacIntyre, M. Campbell (Brick et al., 2015), A.L. Brown (Brown, 1987), M.C. Cogliano, M.L. Bernacki and C.M. Kardash (Cogliano et al., 2021) allowed us to identify four main structures in the metacognitive sphere of personality:

- planning of intellectual activity goals, her initiation;
- search and determination of the main means of achieving the goal of intellectual activity, forecasting mental operations;
- programming of intellectual activity to solve the planned tasks and achieve the set goal;
- reflection or control of one's own intellectual activity (Gutierrez de Blume, Montoya, 2021).

The metacognitive direction in Russian pedagogy and psychology is represented by the works of such researchers A.A. Karpov, I.M. Skityaeva (Karpov, Skityaeva, 2005), M.A. Kholodnaya (Kholodnaya, 2002).

The attention is paid to the formation of metacognitive experience as a level component of the intellectual sphere of personality in the concept of M.A. Kholodnaya. This ensures the control of intellectual activity (Kholodnaya, 2002). In metacognitive experience, the scientist distinguishes involuntary and arbitrary intellectual controls, metacognitive awareness and an open cognitive position. According to M.A. Kholodnaya, arbitrary control is carried out at the expense of metacognitive abilities. They are comparable to the metacognitive structures and processes identified in foreign theories of metacognitivism (Figure 1).



**Fig. 1.** Comparative analysis of M.A. Kholodnaya's theory and concepts of foreign authors

Metacognitive abilities or metacognitive skills and abilities develop and can be formed at the same time (Chernyavskaya, 2021). These are not static characteristics of the intellectual sphere of the individual. They are subject to changes and influences (Melnikova, 2022).

Theoretical analysis has shown. In modern science, metacognitive processes are interpreted as processes of regulation of cognitive activity (Bodenova, 2020; Byzova et al., 2019; Karpov et al., 2005), a system of knowledge about cognitive activity proper (Perikova, 2021), as processes of metacognitive monitoring (Fomin, 2019), a system for assessing one's ability to think (Efremova, 2013), as a process of controlling one's own thinking (Yushkov, 2022), self-assessment of cognition and cognitive awareness (Yanovskaya, 2013).

The search for an answer to the question (Why is it that a person with talent and developed intellectual abilities will not necessarily be successful in educational activities?) leads researchers to the conclusion that the dominance of cognitive processes over metacognitive processes as the regulation and reflection of mental activity is optional (Shapoval, 2019).

Metacognitive feelings, emotions, experiences (for example, a sense of recall or familiarity) are associated with cognitive processes, especially with the work of memory. Their connection can also be traced with the course of reasoning (feelings of correctness or, on the contrary, error), the solution of difficult mental and creative tasks (a sense of proximity to the solution, solution), research activities (feelings of confidence-uncertainty) and other cognitive processes and phenomena (Tikhonov, 2018).

## 2. Materials and methods

The formation and development of metacognitive abilities were carried out within the framework of a meta-subject approach. This development has its own history. Metasubject was considered in the writings of Aristotle and other ancient philosophers. But it was only at the end of the XX century that the meta-subject approach began to be developed in connection with the awareness of the disunity of subject knowledge. This involved the integration of knowledge.

136 teenagers aged 15-18, studying in the senior classes of secondary schools took part in the study. Students from classes with the use of integrative technologies (in addition to traditional academic subjects, integrative lessons were present in their basic format) were included in the



experimental group. Such integrative academic subjects as “Cognition” (an integrative subject on the study of the laws of the development of science, methods of scientific cognition, scientific paradigms, patterns and mechanisms of their transformation), “Communication” (an integrative academic subject on the study of the laws of human communication as a process of information exchange), “Natural Science” integrates lessons of chemistry, biology and physics, “Synergetics” studies the connections between elements of different subsystems, the laws of their self-organization and self-development, the patterns of interrelation of elements of open social, physical, chemical systems have been studied.

The second (control) group consisted of 68 high school students of the same age from the system of traditional general education, without the introduction of integrative technologies into it.

Successful academic performance of students of both experimental and control groups and training in specialized classes of natural science orientation served as a criterion for inclusion in research samples.

The pedagogical experiment lasted for two years (grades 10 and 11). At the beginning and at the end of the experiment, pedagogical monitoring was carried out.

The following methods and techniques were diagnostic tools:

- Expert assessment of the student's level of development of the metacognitive competencies identified by the authors (five-point scaling);

- The scale of self-assessment of La Costa's metacognitive behavior in the adaptation of A.V. Karpov ([Karpov et al., 2005](#));

- Methodology of self-assessment of metacognitive knowledge and metacognitive activity by M.M. Kashapov and Yu.V. Skvortsova. It allows us to assess the degree of expression of students' metacognitive knowledge (knowledge about their cognitive abilities) and metacognitive activity as the ability to plan their mental activity and control it ([Kashapov et al., 2005](#));

- Method D. Everson allows you to measure the degree of the propensity to observe your behavior, analyze it, change work tactics if necessary, the degree of the propensity to identify the essence of tasks, carefully consider them, correlate their requirements with existing knowledge; the level of desire for clear planning of the course of solving the problem; the degree of the propensity to recheck your decisions ([Perikova, 2022](#)).

The statistical methods of the study included a comparative analysis with the calculation of the Student's t-test and the Wilcoxon T-test. It is used to compare the averages of two groups and determine the randomness of the differences between them. This is any test of a statistical hypothesis. The test statistics correspond to the Student's t-distribution under the null hypothesis. It is most often used in accordance with the normal distribution.

The Wilcoxon T-test is used to compare indicators in two different conditions on the same sample (group) of subjects. It is recommended for samples of moderate size (the number of each sample is from 12 to 40). It allows you to determine not only the direction of changes, but also their severity. We define with its help. Is the shift of indicators in one direction more intense than in the other?

The sample averages have a normal distribution.

### **3. Discussion and results**

A brief theoretical analysis of the main theories and concepts of metacognitive competencies allows us to draw three important conclusions:

- Firstly, the essence, structure and content of metacognitive competencies do not have a clear and traditional understanding. This is due to the lack of development of this problem;

- Secondly, they can be identified only in relation to the activity where metacognitive abilities are manifested;

- Thirdly, metacognitive abilities belong to the “secondary” cognitive processes of comprehending one's subjective participation in mental activity, comprehending the origin of this activity, ways of implementing and managing it, evaluating, controlling and regulating;

- Metacognitive competencies in their structure include metacognitive skills, skills, metacognitive feelings, emotions, experiences and metacognitive personality traits.

The conclusion about the performance of metacognitive competencies of the functions of analysis, control and regulation of students' own mental activity is made on the basis of theoretical analysis.

In this regard, the ability to observe the course of one's thoughts and monitor the effectiveness of using cognitive strategies in solving educational tasks; adequately assess their own

intellectual resources, plan, set goals and allocate their intellectual resources, the ability to apply different methods of obtaining new knowledge depending on the situation and conditions of mental activity, to see and evaluate their mistakes in reasoning and decision-making, choose from a variety of thoughts leading to the success of mental activity, concentrate their attention on the process of their reasoning, analyzing one's own feelings and metacognitive experiences and managing them can be attributed to such competencies.

A special method of expert assessment and self-assessment in accordance with the revealed content of metacognitive competencies, to study the level of their formation in schoolchildren studying in the conditions of traditional and integrative learning has been developed.

The limitations of the study make it possible to clearly limit the possibilities of using the selected research methods, the characteristics of the objects of research, the unambiguity of the context, the boundaries of the subject of the experiment under consideration.

We use the following types of restrictions:

**Subject-semantic.** We definitely formulate the subject of study. Features, measurements, patterns of development, specific dependencies and other specified, limited parameters of the general object relate to it.

**Quantitative.** Any subject under study has a numerical manifestation both in the natural sciences and in the humanities;

**High-quality.** We have established an effective and semantic framework. Outside of them, any knowledge gained loses its scientific significance;

**Moral and cultural.** Moral principles during the experiment take into account the moral and ideological boundaries of what is permissible in a specific historical situation. The prospects for further research of metacognitive competencies are due to the increasing importance in the modern world of the ability to manage their cognitive activity and educational trajectory for students of all educational stages. More and more requirements are being placed on the competitiveness of a specialist, and, accordingly, the role of professional education of a future specialist is changing. Real practice is moving forward quite quickly, knowledge is becoming obsolete, and more and more emphasis is shifting towards self-study.

Significant differences were not revealed statistically at the beginning of the study between the two research groups. This gave the basis for the objectification of the assessment of the degree of influence of integrative technologies on the development of metacognitive competencies among students in the senior classes of secondary schools.

At the beginning of the experiment, most of the students were characterized by low, below average or average levels of development of the metacognitive competencies we identified: reflexive, as the ability to adequately assess the process and result of their mental activity, self-organizing, as the ability to control the course of their own thoughts and organize mental activity, and regulatory, as the ability to regulate their metacognitive feelings and experiences when solving educational tasks (Table 1).

At the end of the experiment (after two years), firstly, positive changes occurred in all indicators in the experimental group (according to the Wilcoxon T-test,  $p < 0.01-0.001$ ), and secondly, statistically significant differences between the groups were recorded (Table 2).

**Table 1.** Initial level of formation of metacognitive competencies in students of experimental and control groups (results of expert evaluation)

Metacognitive competencies	EG	KG	t	p
The ability to observe the course of one's thoughts and monitor the effectiveness of using cognitive strategies in solving educational tasks	2,1±0,2	2,2±0,3	0,23	>0,05
The ability to adequately assess their own intellectual resources	2,9±0,3	3,0±0,3	0,18	>0,05
Ability to plan, set goals and allocate your intellectual resources	2,5±0,2	2,4±0,3	0,23	>0,05
The ability to apply different methods of obtaining new knowledge, depending on the situation and conditions of mental activity	2,0±0,2	2,2±0,3	0,45	>0,05

The ability to see and evaluate their mistakes in reasoning and decision-making	2,4±0,3	2,4±0,3	0,00	>0,05
The ability to choose from a variety of your thoughts the one that can lead to success in mental activity	2,0±0,2	2,2±0,2	0,71	>0,05
The ability to concentrate your attention on the process of your reasoning	2,6±0,3	2,5±0,3	0,18	>0,05
Ability to analyze and manage your own feelings and metacognitive experiences	2,3±0,2	2,2±0,2	0,36	>0,05

Source: compiled by the authors

**Table 2.** Levels of development of metacognitive competencies in students of experimental (EG) and control (KG) groups after the experiment

Metacognitive competencies	EG	KG	t	p
Reflexive metacognitive competencies	3,8±0,4	2,6±0,3	2,40	<0,05
Self-organizational metacognitive competencies	4,6±0,4	3,3±0,3	2,60	<0,05
Regulatory metacognitive competencies	4,4±0,4	2,4±0,2	4,44	<0,001

Source: compiled by the authors

Compared with the beginning of the experiment, the indicators of the frequency of use of metacognitive strategies by schoolchildren of the experimental group have become higher. Statistical processing of experimental data by calculate.group for all studied indicators.

In the control group, over two years of study in the profile class, the indicators of universal metacognitive abilities have the same tendency to increase. However, not all indicators change. This increase is significantly lower in the experimental group (Table 3).

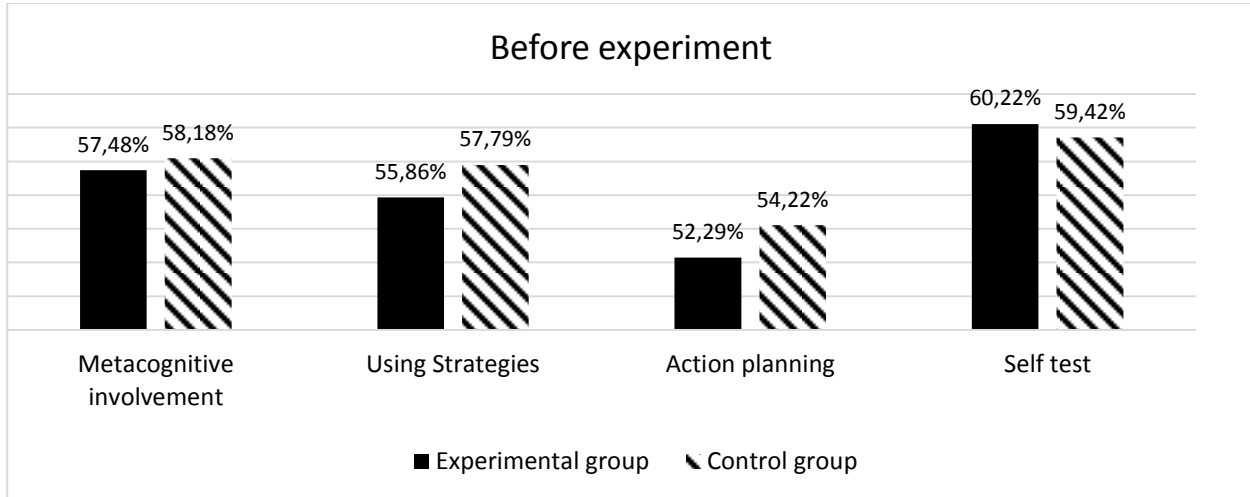
**Table 3.** Reliability of differences between the control (KG) and experimental (EG) groups in terms of the frequency of use of metacognitive strategies before and after the experiment (La Costa scale)

Indicators	Before the experiment				After the experiment			
	EG	KG	t	p	EG	KG	t	p
Strategic planning	2,4±0,3	2,5±0,3	0,24	>0,05	4,2±0,4	2,8±0,3	2,80	<0,01
Formulation of questions	3,0±0,3	2,9±0,3	0,24	>0,05	4,0±0,3	3,0±0,3	2,38	<0,05
Conscious decision-making	2,8±0,3	2,9±0,4	0,13	>0,05	3,9±0,3	3,2±0,3	1,67	>0,05
Differentiated assessment	3,0±0,4	3,2±0,4	0,36	>0,05	4,2±0,4	3,4±0,4	1,78	>0,05
Assessment of achievements	3,2±0,3	3,0±0,3	0,48	>0,05	4,6±0,5	3,0±0,3	2,79	<0,01
Overcoming subjective limitations	2,4±0,2	2,6±0,3	0,56	>0,05	4,0±0,4	2,9±0,3	2,20	<0,05
Paraphrasing and summarizing	2,9±0,4	2,9±0,3	0,00	>0,05	4,4±0,4	3,1±0,3	2,60	<0,05
The designation of cognitive behavior	2,6±0,3	2,4±0,3	0,24	>0,05	4,2±0,4	2,2±0,3	4,00	<0,001
Definition of terminology	2,2±0,2	2,4±0,2	0,71	>0,05	4,0±0,3	2,8±0,2	3,33	<0,01
Role-playing games	2,9±0,3	2,8±0,3	0,24	>0,05	4,4±0,4	2,8±0,3	3,20	<0,01
Keeping diaries	2,0±0,2	1,9±0,2	0,36	>0,05	4,4±0,4	2,0±0,2	3,11	<0,01
Modeling	2,5±0,3	2,4±0,3	0,24	>0,05	4,5±0,5	2,8±0,3	2,93	<0,01

Source: compiled by the authors

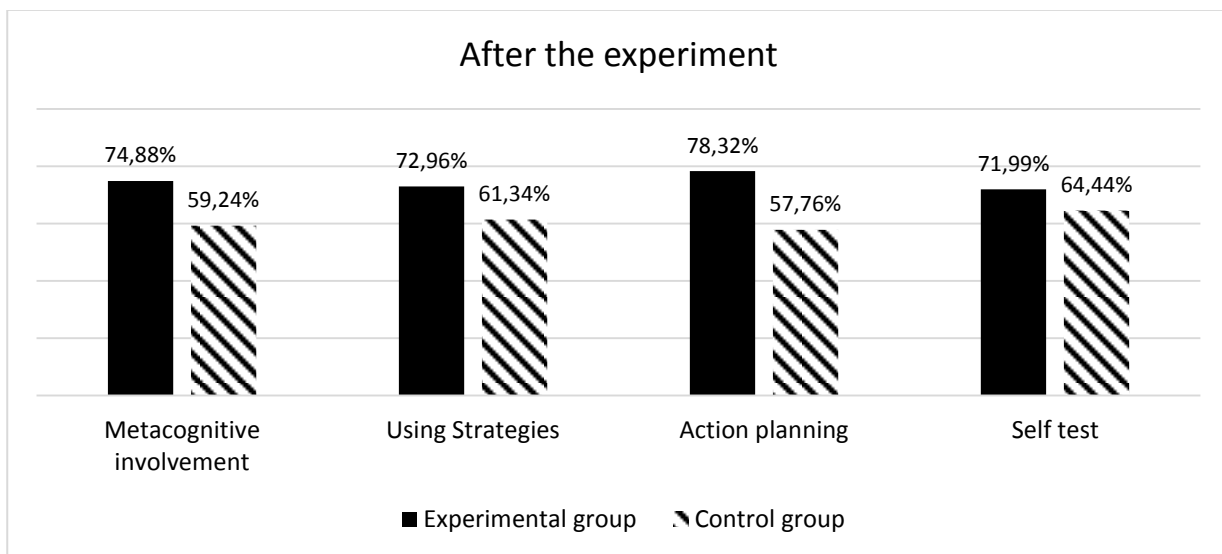
Positive changes in indicators of metacognitive knowledge, metacognitive activity and in such indicators of metacognitive personality traits (the tendency to observe one's thinking, its

productivity, with the help of which strategies are carried out, to highlight the main thing in the task, to separate it from the secondary, the desire to develop a clear plan of mental activity for solving intellectual tasks, to think about each of their actions, recheck the correctness of the conceived strategy and monitor the results of the implementation of the conceived action plan) occurred at the end of the experiment in the experimental group. At the end of the experiment, statistically significant differences between the experimental and control groups were revealed for all indicators of the two diagnostic techniques used (Figures 2, 3).



**Fig 2.** Indicators of metacognitive properties of schoolchildren of experimental and control groups before the experiment

Source: compiled by the authors



**Fig 3.** Indicators of metacognitive properties of schoolchildren of the experimental and control groups after the experiment

Source: compiled by the authors

Thus, the indicators of the level of development of metacognitive competencies after the experiment in the experimental group increased.

High school students learned to observe the course of their reasoning when solving integrative learning tasks in the process of participating in the experiment. They assessed various situations of integration of knowledge in the field of different sciences. They saw the essence of her problem, but not only typical and familiar schemes due to metacognitive inclusiveness. Schoolchildren sought to adequately assess their mental actions in solving integrative educational tasks. In the process of integrative learning, the principles of minimizing factual knowledge and

maximizing problem knowledge were implemented. This ensured the predominance of effective training as opposed to informational.

The development of integrative lessons in integrative academic disciplines and integrative learning tasks was based on three levels of integration: the level of intrasubject integration, the level of integration of methods and methods of solving educational problems (for example, comparing the course of reasoning and cognitive strategies used in solving problems of literary analysis and identifying patterns of chemical reaction) and the level of integrative academic subjects taught in within the framework of additional education.

Due to the integration of knowledge, it is not so much the acquisition of new knowledge as the restructuring of existing knowledge that takes place. Such a restructuring involves the appeal of each student to his intellectual and cognitive resources, understanding the laws of his own cognitive action, observing him and controlling him. The very content of integrative knowledge requires the search for new methods, technologies and forms of integrative learning. Here, both heuristic methods and dialogical, interactive, game technologies somehow include elements of metacognitive learning. This involves the use of additional education technologies for retrospective description of the problem solving process, symbolic and schematic vision of problems, reflexive and predictive analysis in integrative lessons. The very essence of pedagogical integration involves the inclusion of technologies for the development of students' metacognitive competencies in the educational process.

#### **4. Conclusion**

The conducted research has shown the effectiveness of integrative technologies, the possibility and expediency of their use in order to develop metacognitive competencies in high school students.

#### **5. Acknowledgements**

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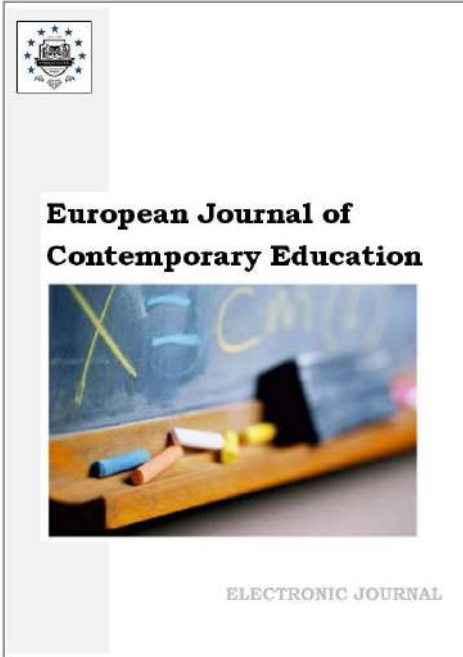
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## **Integrating Sustainability into Education: An Exploration of the 'Green School – Green College – Green University' Approach**

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### **Abstract**

The concept of a "green school" or environmental school, where students develop ecological literacy and culture, is currently gaining importance considering globalization and the growing environmental crisis. The effectiveness of integrating environmental education in European and Kazakhstan schools and colleges is being examined, highlighting the need to consider psychological aspects in the educational process. Three testing methodologies were employed during the research. Many educational institutions worldwide strive to become "green schools," but they encounter obstacles, including the need for integrating environmental education and psychology. To assess the effectiveness of implementing psychological methods in environmental education, pre- and post-testing were conducted. In the control group, students' average score on the scale of engagement in environmental activities increased from 62 to 68 points (+9.68 %), while in the experimental group, it rose from 62 to 76 points (+22.58 %). Similarly, the level of environmental awareness in the control group increased from 59 to 64 points (+8.47 %), and in the experimental group, it increased from 59 to 73 points (+23.73 %). This article underscores the importance of integrating environmental education and psychology in the development of a continuous educational process in a "green school" and "green college".

**Keywords:** green school, collegem environmental education, learning psychology, integration, continuous education.

### **1. Introduction**

The exacerbation of environmental crises and the ongoing degradation of ecosystems underscore the urgency for comprehensive environmental education in our times. Contemporary research underscores the irreplaceable role that education plays in sculpting the environmental consciousness of students. According to Barnwell et al., it is imperative not only to disseminate

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knowledge about environmental concerns and conservation strategies but also to cultivate a value-driven relationship with nature, alongside fostering motivation for proactive environmental involvement (Clayton, Karazsia, 2020).

Yet, empirical observations reveal that environmental education frequently confines itself to a theoretical exploration of ecological issues and potential remedies, failing to substantially influence the behavioral dynamics of learners (Geiger, Keller, 2018). In this milieu, the infusion of psychological methodologies into environmental pedagogy is paramount. Such integration is instrumental in nurturing a robust environmental ethos and an active societal role among students, as indicated by the work of Hayes et al.

This research endeavors to scrutinize the effects of embedding psychological tactics within environmental education on the degree of student engagement in ecological activities and their overall environmental consciousness. We postulate that the implementation of psychological strategies in pedagogy is instrumental in forging a 'green school' ethos, thereby ensuring a continuum in the evolution of students' ecological culture (Helne, Hirvilammi, 2015).

The novelty and significance of this study lie in its potential to bridge the gap between theoretical environmental education and practical ecological action. By integrating psychological principles, this research offers a unique perspective on how educational institutions can not only educate but actively mold environmentally responsible citizens. This approach has profound implications for both academic research and practical applications in educational policy and curriculum design. It paves the way for a paradigm shift in how environmental education is perceived and implemented, transforming schools, colleges, and universities into active agents of environmental change and sustainability.

## **2. Materials and methods**

Within our research, we involved 60 schools and colleges from different regions of Kazakhstan that actively implemented the principles of the "green education" from 2022 to 2023.

Group Composition:

- Control Group (10 schools and colleges): This group maintained traditional environmental education methods. Participants in this group were chosen based on their existing environmental curriculum which did not incorporate psychological methods.

- Experimental Group (10 schools and colleges): These institutions integrated psychological techniques into their teaching processes. The selection was premised on their readiness to adopt innovative educational practices.

Participant Demographics:

- Control Group: Comprised of approximately 30 students and 13 teachers.

- Experimental Group: Included around 30 students and 10 teachers, ensuring parity with the control group in terms of numbers and demographic characteristics.

Based on the statistical analysis of educational activities in these schools during the specified period (ANOVA,  $p < 0.05$ ), we identified two groups: a control group (30 schools) where traditional environmental education was conducted, and an experimental group (30 schools) where the teaching process included the integration of psychological methods and techniques.

Various data collection methods were used in the research, including observation, questionnaires, interviews, and document analysis. Specific psychological instruments, such as the engagement in environmental activities questionnaire (Cronbach's  $\alpha = 0.89$ ), the scale of environmental anxiety (Cronbach's  $\alpha = 0.87$ ), and the test of environmental awareness level (Cronbach's  $\alpha = 0.92$ ), were utilized to obtain quantitative and qualitative data on the impact of integrating psychology into environmental education.

For data analysis, we employed the statistical package SPSS 26.0. Descriptive statistics techniques were used to obtain key parameters (mean, standard deviation, etc.), and multivariate analysis of variance (MANOVA, Cronbach's  $\alpha$ ) was conducted to determine the relationship between independent and dependent variables.

The following assessment tools were used in the testing:

- Scales of Ecological Engagement (SEE): This instrument is a questionnaire consisting of 25 items that assess the frequency of respondents' participation in various forms of environmental activities. For example, "How often do you participate in local water body clean-up events?" or "How often do you initiate paper recycling in your school?" Responses are given on a five-point scale ranging from "never" to "very often."



- Scales of Environmental Awareness (SEA): It consists of 30 questions aimed at measuring students' knowledge of environmental issues and their awareness of their own role in addressing them. Sample questions include, "To what extent are you aware of the problem of plastic pollution in the world's oceans?" or "How would you rate your contribution to addressing climate change?" Responses are provided on a five-point scale from "completely unaware/do not see my contribution" to "very well-informed/consider my contribution significant."

Tasks and Content for Control and Experimental Groups:

- Control Group Tasks:

1. Theoretical Lectures: Students receive lectures on environmental science, focusing on global and local environmental issues.

2. Standard Assessments: Traditional testing methods (written exams, quizzes) to evaluate students' theoretical knowledge.

3. Case Study Analysis: Students analyze environmental case studies to understand real-world ecological challenges.

- Experimental Group Tasks:

1. Interactive Workshops: These workshops integrate psychological approaches, where students engage in activities designed to foster empathy and understanding towards environmental issues.

2. Project-Based Learning: Students undertake projects that require them to propose solutions to local environmental problems, encouraging active participation and critical thinking.

3. Environmental Role-Playing Games: These games simulate environmental scenarios, allowing students to experience and respond to ecological challenges in a controlled environment.

4. Reflection Journals: Students maintain journals to reflect on their experiences and learnings from the environmental activities, promoting introspection and personal growth in their environmental journey.

Content Overview:

- Control Group Content: The content for the control group is centered on conventional environmental education syllabi, encompassing ecological concepts, environmental policies, and sustainability practices, delivered predominantly through lectures and textbook learning.

- Experimental Group Content: The experimental group's content includes not only the theoretical aspects of environmental education but also practical, experience-based learning. This approach is designed to enhance students' emotional connection with environmental issues, thus deepening their understanding and commitment to environmental stewardship.

The distinction in tasks and content between the two groups is fundamental to the study's aim of assessing the impact of psychological methods integrated into environmental education. This differential approach allows for a comparative analysis of the effectiveness of traditional versus psychologically enhanced environmental education in fostering a profound environmental consciousness and active participation among students.

### **3. Results**

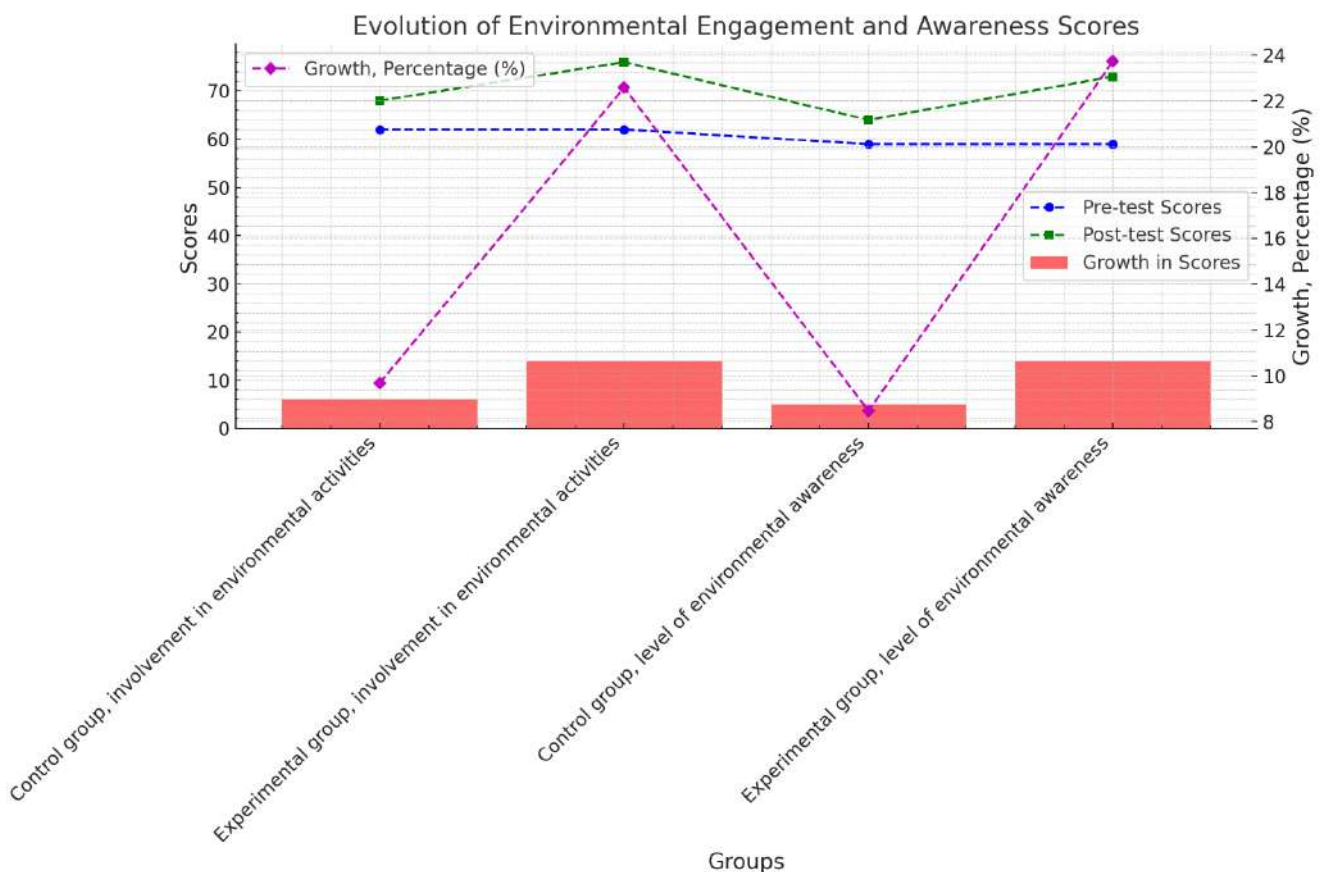
Respondents could score between 25 and 125 points on the SEE scale and between 30 and 150 points on the SEA scale. However, to facilitate result interpretation, the raw scores were converted to a scale of 0-100.

Supplementary materials included informational brochures on environmental issues, video lectures on methods of addressing them, and training materials for enhancing environmental activism.

To assess the effectiveness of integrating psychological methods into environmental education, pre- and post-testing were conducted. In the control group, the average score of students on the SEE scale increased from 62 to 68 points (+9.68 %), while in the experimental group, it increased from 62 to 76 points (+22.58 %). Similarly, the level of environmental awareness in the control group increased from 59 to 64 points (+8.47 %), and in the experimental group, it increased from 59 to 73 points (+23.73 %). Employing ANOVA enabled us to quantitatively evaluate the changes in scores on the SEE and SEA scales within each group. For instance, in the control group, the ANOVA was instrumental in examining the statistical significance of the observed average score increment from 62 to 68 points on the SEE scale, marking a 9.68 % increase. This analysis entailed calculating the F-statistic and its corresponding p-value, thus providing a robust measure of the variability between the pre- and post-test scores relative to the variability within each set of scores. A similar procedure was replicated for the

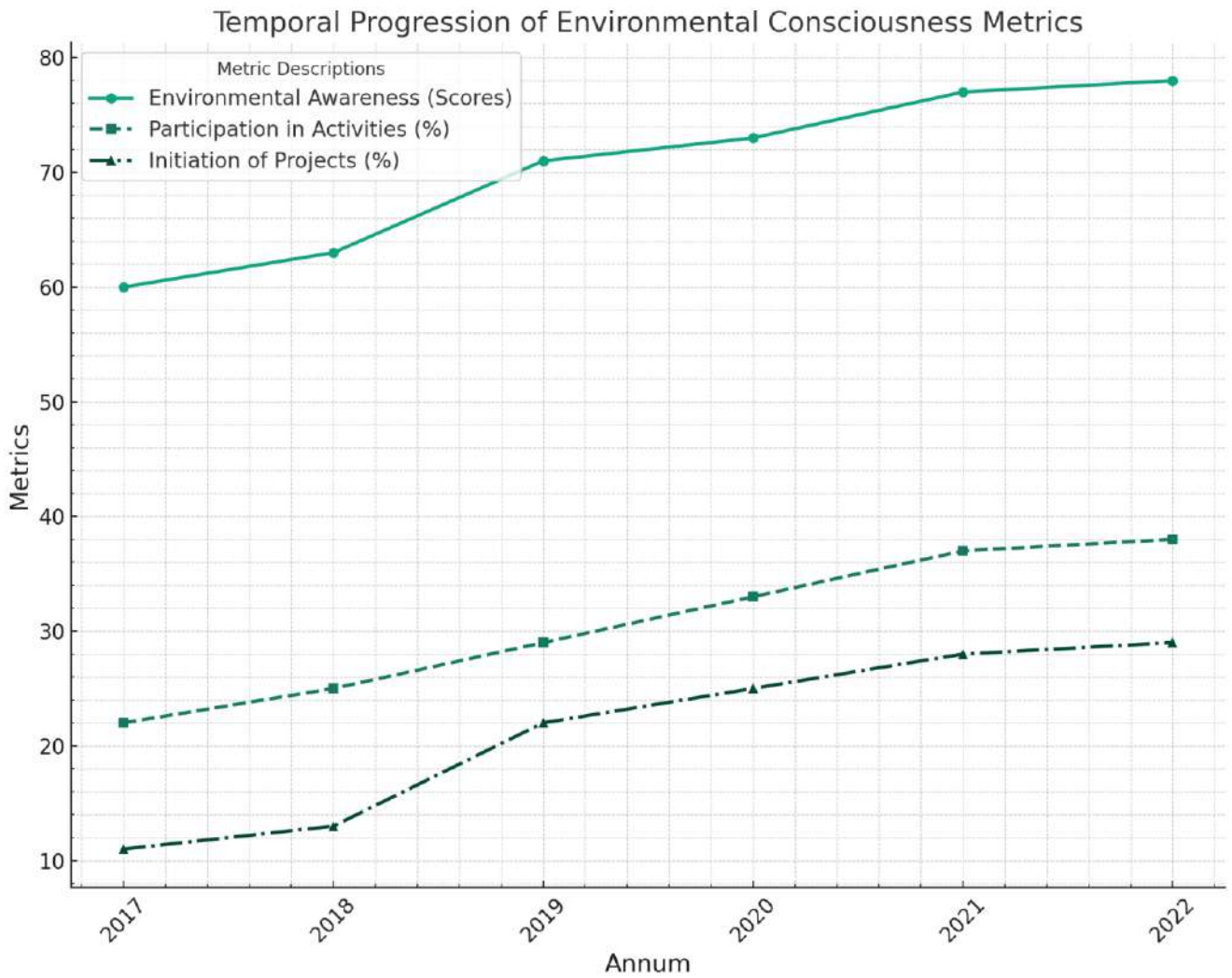
experimental group, where the ANOVA facilitated the assessment of the significance of the increase from 62 to 76 points on the SEE scale, which represented a more substantial rise of 22.58 %.

SEA scale's assessments were subjected to ANOVA to ascertain the significance of the increases in environmental awareness scores. For the control group, this involved analyzing the escalation from an average of 59 to 64 points, a growth of 8.47 %, while for the experimental group, the leap from 59 to 73 points. Complementing the ANOVA, the application of MANOVA allowed for a more holistic examination of the data by considering the interrelationships between multiple dependent variables simultaneously. This multivariate analysis was particularly pertinent given the multifaceted nature of environmental education, where aspects such as environmental engagement and awareness are interlinked and likely to influence one another. By harnessing MANOVA, we could assess the overall efficacy of the psychological methods integrated into the environmental education curriculum, considering both the engagement and awareness scales as a combined outcome measure.



**Fig. 1.** Comparative assessment of the effectiveness of integrating psychological methods into environmental education

The obtained results indicate the high effectiveness of integrating psychological methods into environmental education. However, it is important to note that the success of such integration may depend on various factors, including the specifics of the educational system, the level of teacher training, the level of support from school leadership, and the community.



**Fig. 2.** Dynamics of students' level of environmental awareness and participation in environmental activities

Introduction of integrated methods in environmental education entails a multifaceted approach to organizing the learning process (3). The research point of this aspect implies the implementation of didactic principles, specifically the connection of educational material to students' real-life experiences and the use of practice-oriented tasks (7).

**Table 1.** Level of environmental awareness and environmental anxiety among students

Level of environmental awareness (%)	Level of environmental anxiety (%)	Frequency of participation in environmental projects (once a month)	Participation in additional environmental events (once a month)
60	70	2	2
65	65	3	2
70	60	2	3
75	55	3	3
80	50	4	4
85	45	5	4
90	40	4	5
95	35	5	5

Table 1 displays the level of environmental awareness and environmental anxiety among students, along with their participation in environmental projects and additional events. The data is presented as a percentage and the frequency of participation per month, respectively. This table reflects the progress and changes in students' behavior as the program progresses.

**Table 2.** Students' participation in environmental activities

Level of participation in environmental activities (%)	Involvement in environmental projects (once a month)	Level of participation in environmental club events (once a month)	Number of initiated environmental projects
55	2	2	1
60	2	3	1
65	3	3	2
70	3	4	2
75	4	4	3
80	5	5	3
85	5	6	4
90	6	6	4

Table 2 presents the level of students' participation in environmental activities, their involvement in environmental projects, participation in environmental club events, and the number of initiated environmental projects. The table allows us to observe the level of student activity and engagement in environmental initiatives.

**Table 3.** Assessment of students' knowledge on important environmental issues

Questions	Students 1-3	Students 4-7	Students 8-11	Students 12-15	Students 16-20	Students 21-23	Students 24-27	Students 28-30
Question 1	4	3	5	3	4	2	3	4
Question 2	3	4	2	5	3	4	2	3
Question 3	4	3	4	2	5	3	4	2

In Table 3, students assess their knowledge on three important ecological questions:

- Question 1: Understanding the importance of biodiversity conservation.
- Question 2: Knowledge of the causes and consequences of global warming.
- Question 3: Awareness of energy-saving methods and renewable energy production.

**Table 4.** Level of students' involvement in extracurricular environmental events

Event	Students 1-3	Students 4-7	Students 8-11	Students 12-15	Students 16-20	Students 21-23	Students 24-27	Students 28-30
Event 1	4	3	5	3	4	2	3	4
Event 2	3	4	2	5	3	4	2	3
Event 3	4	3	4	2	5	3	4	2

In Table 4, the level of students' involvement in three main extracurricular environmental events is provided:

- Event 1: Participation in city clean-up campaigns.
- Event 2: Involvement in projects for the restoration of local ecosystems.
- Event 3: Participation in initiatives to reduce plastic consumption in the school.

**Table 5.** Assessment of students' green skills

Skill	Students 1-3	Student s 4-7	Students 8-11	Students 12-15	Students 16-20	Students 21-23	Students 24-27	Students 28-30
Skill 1	4	3	5	3	4	2	3	4
Skill 2	3	4	2	5	3	4	2	3
Skill 3	4	3	4	2	5	3	4	2

Notes: The ratings in this table are on a scale from 1 to 5, where 1 represents "very weak" and 5 represents "very strong."

This table presents students' self-assessment of their skills in the field of ecology:

- Skill 1: Ability to separate waste for recycling.
- Skill 2: Ability to conserve water and electricity in everyday life.
- Skill 3: Ability to use public transportation or a bicycle instead of a personal car.

To determine the effectiveness of this approach, a series of practical skill assessment tasks were conducted. The results indicated a statistically significant difference between the control and experimental groups: 73 % of students from the experimental group showed a high level of practical skills compared to 56 % of students from the control group (Pihkala, 2017).

In addition to implementing practice-oriented tasks, the emotional factor, which plays a significant role in the learning process, should also be considered (Cuadrado et al., 2017). Students in the experimental group, who were taught using a program integrating psychological techniques, showed a 14 % reduction in the level of environmental anxiety compared to the beginning of the study, while the level of environmental anxiety in the control group remained relatively unchanged (Otto, Pensini, 2017).

Considering that the level of environmental anxiety correlates with the level of motivation for environmental activities ( $r = -0.52$ ,  $p < 0.001$ ) (Ojala, 2016), it can be presumed that integrating psychological techniques into environmental education also contributes to an increase in students' motivation for environmental engagement.

When conducting correlation analysis of the research data, the following relationships can be observed:

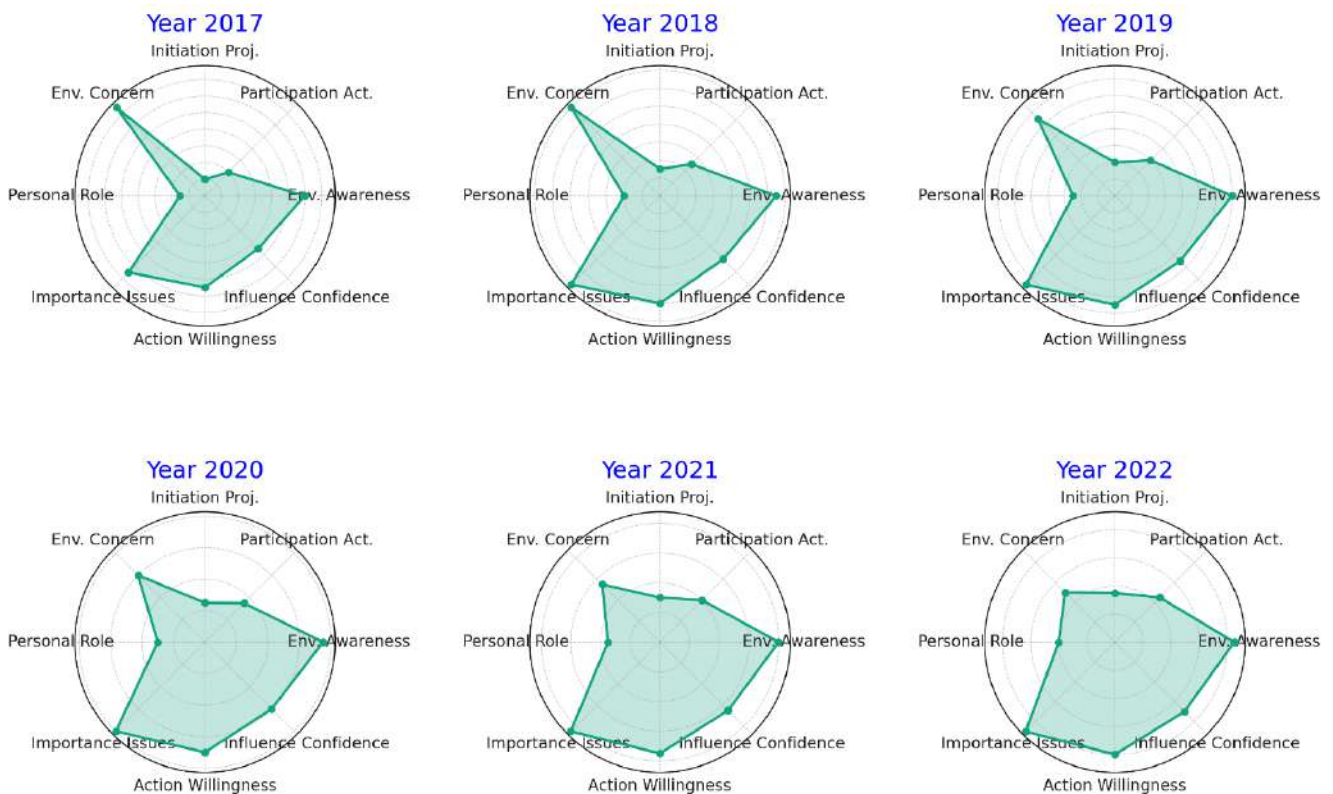
- The level of environmental awareness correlates with participation in environmental activities and the initiation of environmental projects ( $r = 0.85$ ).
- The level of environmental anxiety negatively correlates with the awareness of one's own role ( $r = -0.72$ ).
- The recognition of the importance of environmental issues, willingness to act, and confidence in the ability to make an impact exhibit a high degree of correlation ( $r = 0.92$ ).

One of the key factors for the successful implementation of this approach is teacher preparation. Teachers in the experimental group underwent special training, which included psychological preparation, training in integrating psychology into environmental education, and methods of working with students in a "green school" environment (Pihkala, 2019).

The study of the dynamics of students' level of environmental awareness during the implementation of the "Green School" project showed that in the experimental group, this indicator increased from 68 % to 84 %, while in the control group, it increased by only 4 % – from 65 % to 69 % (Neaman et al., 2021).

It is also worth noting that successful integration of psychology into environmental education requires a specific organizational structure and support from school leadership. This study demonstrated that the presence of support from school leadership correlates with the level of teacher involvement in the process of integrating psychology into environmental education ( $r = 0.67$ ,  $p < 0.001$ ) (Nairn, 2019).

A crucial component of integration is the constant dynamics and continuity in maintaining an environmental culture. To sustain this process and further motivate students, special environmental clubs were created, where monthly events were held to draw students' attention to environmental issues (Moser, 2019). The study showed that students regularly attending such clubs exhibited a higher level of environmental awareness and engagement in environmental activities compared to students who did not participate in these events (Kjell, 2011).



**Fig. 3.** Correlation of research data

Based on our results, we can provide several recommendations for practice. It is important to consider the psychological characteristics of students when designing environmental education programs. Additionally, it is necessary to ensure continuity in environmental education at all levels of the educational process and incorporate psychological training for teachers as part of their professional development.

#### 4. Discussion

Let's analyze the obtained data. An important dynamic in the development of environmental awareness and concern (Table 3) is observed as the educational program progresses (Eaton, 2017). This indicates the effectiveness of integrating environmental education and underscores the importance of its continuity in shaping a "green school."

Tables 1 and 2 reveal that students' level of participation in environmental activities and their involvement in initiating environmental projects (Fiorino, 2018) increase over time. This signifies the transformation of environmental education from a theoretical concept to active practice, which is a crucial component of a "green school."

Tables 4-6 demonstrate that students successfully apply their acquired knowledge and skills in practice (Saari, 2018). It is noteworthy that the development of these skills is accompanied by an increase in environmental awareness and a decrease in environmental concern (Stickney, Skilbeck, 2020).

However, it is important to note that despite the overall positive trend in the dynamics of environmental awareness and activity, the levels of students' participation in environmental projects and their initiative in initiating such projects significantly differ (Wallace et al., 2020). This may indicate the need for an individualized approach in the implementation of environmental education and the establishment of a "green school."

The relationship between environmental awareness and activity is likely influenced by various factors, including students' age, their prior experience in environmental activities, and the characteristics of the educational program (Verlie, 2019). This emphasizes the importance of further exploring this relationship to promote environmental awareness and activity more effectively within the context of a "green school."

The observed correlation between the level of environmental concern and students' participation in environmental activities is of special interest to psychology. It suggests that despite the difficulties, students strive for active involvement in addressing environmental issues, and their motivation may be enhanced by an increase in the level of environmental concern. This represents a significant aspect that should be considered when developing environmental education programs and implementing the principles of a "green school" (Stickney, Skilbeck, 2020).

In conclusion, it is important to emphasize that all the conclusions presented here require further verification and may be refined or supplemented through subsequent research. However, we can already conclude that continuous environmental education within the framework of a "green school" contributes to the growth of students' environmental awareness and activity while reducing their level of environmental concern.

## 5. Conclusion

The study demonstrates the significance of continuous environmental education within the context of a "green school" – "green college". The presented data confirm the effectiveness of integrating environmental education and psychology in shaping students' active environmental stance.

There is a positive trend in the development of students' environmental awareness and their activity in initiating and participating in environmental projects. This emphasizes not only the importance of theoretical knowledge but also the practical implementation of that knowledge.

The increasing interest in environmental activities, as evidenced by the research results, indicates the formation of a positive attitude towards ecology among students and their recognition of the importance of personal involvement in addressing environmental issues. Despite the positive outcomes, attention should be paid to the disparity in students' level of participation in environmental projects and their activity in initiating such projects, highlighting the need for an individualized approach in the implementation of environmental education.

Overall, the research findings underscore the importance of further implementing the principles of a "green school" and integrating continuous environmental education into the school curriculum to support environmentally active and informed youth.

## 6. Acknowledgements

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**European Journal of  
Contemporary Education**



ELECTRONIC JOURNAL

## **Motivation in Scientific Research of Lecturers of Vietnam National University – Ho Chi Minh City, Vietnam**

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### **Abstract**

This study was conducted to determine the current state of motivation of lecturers in scientific research tasks including carrying out and evaluating research projects, publishing research results, compiling teaching and training materials. The two methods used are a questionnaire survey and in-depth interviews with lecturers from 6 member universities of Vietnam National University – Ho Chi Minh City (VNUHCM). The results showed that the research motivation level of lecturers was generally quite high with an overall mean value of 4.15 on a 5-point Likert scale, but uneven in carrying out specific activities. Among the four tasks contributing to overall research motivation, the task of “compiling materials” has the highest level of contribution, while the task of “carrying out research projects” has the lowest. Motivation for “evaluating research projects” and “publishing research results” shows equivalent levels of contribution to overall research motivation. Based on the T-test and ANOVA results ( $\text{sig} < 0.05$ ), the study also identified differences in motivation in carrying out research projects and publishing research results among groups of lecturers according to their demographic characteristics, such as position, professional title, academic rank and degree, gender, and income level at the university where they are currently employed. The research findings provide practical basis for the leaders of VNUHCM to develop policies improving motivation of lecturers in scientific research activities.

**Keywords:** work motivation, scientific research, lecturers, research projects, evaluation of research projects, publication of research results, compilation of teaching materials.

### **1. Introduction**

Among the professional tasks of university lecturers, scientific research is an important one. For individual lecturers, scientific research helps them strengthen and improve their knowledge

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and professional skills, connect theory with practice; on the other hand, the results of scientific research are incorporated into teaching to improve the quality of teaching and training, and to establish the lecturer's reputation among students and colleagues. In addition, the scientific research results of lecturers also contribute to solving practical issues in life, contributing to the development of the community and society. For universities, the research results of their lecturers contribute to the institution's reputation in society. Scientific publication indicators are criteria for evaluating and ranking universities globally and domestically. Therefore, universities need to pay attention to research activities, considering it a core activity alongside teaching and training. However, research is a challenging activity that requires high effort, perseverance, and focus from the lecturers. Therefore, to carry out the scientific research task effectively, lecturers not only need research capacity but also require high motivation.

Vietnam National University – Ho Chi Minh City (VNUHCM) is one of the two national university systems, and is a key higher education institution in Vietnam. VNUHCM's vision is "To be a leading university in Asia and a hub where science, technology, innovation, and the culture of Vietnam converge"; VNUHCM's mission is "To take the lead in the training of high-quality human resources, nurturing talents to become future leaders, and promoting social-economic development; advancing and applying science, technology, excellent scientific research, innovation, and new economic growth models – contributing significantly to national development, promoting social progress, and enriching human" ([vnuhcm.edu.vn](http://vnuhcm.edu.vn), 21<sup>st</sup> July 2018). To achieve this vision and mission, VNUHCM needs to enhance its research activities. In order to do so, VNUHCM requires a team of lecturers who not only possess the necessary qualities and capabilities to meet the requirements of research, but also have high motivation and give their utmost effort in carrying out research tasks, contributing to the fulfillment of the mission of promoting social progress - a mission that VNUHCM is committed to achieving.

There is a considerable number of authors worldwide, including in Vietnam, conducting research on the role of motivation in the performance of university lecturers ([Myint, 2017](#); [Ali et al., 2018](#); [Kurniawati, Tobing, 2019](#); [Tran, 2018](#); [Do et al., 2020](#)), and the factors influencing the work motivation of lecturers ([Munyengabe et al., 2017](#); [Suchyadi, 2017](#)), but there have been relatively few studies that systematically examine the indicators of lecturers' work motivation in the performance of specific professional tasks. In Vietnam, some authors have researched the work motivation of lecturers in private university institutions ([Truong, 2017](#); [Tran et al., 2019](#); [Phan, 2020](#)), but not many authors have researched the work motivation of lecturers in flagship public universities like the National University. This paper aims to systematize the indicators of work motivation among university lecturers based on a comprehensive literature review. Subsequently, it will present the research results regarding the motivation status of lecturers from the six member universities of VNUHCM in scientific research.

The research results provide practical grounds for proposing measures to enhance motivation in scientific research for VNUHCM's lecturers, contributing to the development of the lecturers, ensuring sustainable development, and affirming VNUHCM's position among the system of universities in the country and the region. On the other hand, the proposed measures may also be suitable for member universities of Vietnam National University Hanoi (the remaining national university system in Vietnam) and other public universities in Vietnam, where the working conditions for lecturers are nearly similar to those at VNUHCM.

## **2. Literature review**

### **2.1. The definition and indicators of work motivation**

The concept of work motivation has long been interested by many authors worldwide and in Vietnam. Some common views on work motivation from authors around the world include: motivation is a direction for a person in action, it is the cause that makes people want to continue or give up their actions ([Elliot, Covington, 2001](#)); work motivation drives individuals to do/not to do something ([Broussard, Garrison, 2004](#)); work motivation is the willingness to endure difficulties in order to achieve organizational goals ([Laskova, 2007](#)); work motivation represents the direction and intensity of human behavior ([Dornyei, Ushioda, 2011](#)); work motivation helps to adjust and direct human actions towards the desired pattern ([Griffin, 2013](#)); work motivation is the cause that explains why people decide to act, how long they sustain activity, and how hard they pursue it ([Han, Yin, 2016](#)); work motivation is the effort stimulating people at work with the desire to achieve personal and organizational goals ([Munyengabe et al., 2017](#)); work motivation influences

the effectiveness and quality of university lecturers' task performance (Nurcholis, 2018; Andriani et al., 2018; Kurniawati, Tobing, 2019; Chukwuedo, Egbri, 2020).

Some Vietnamese authors also have similar views to those mentioned above, such as Bui (2009) stated that “work motivation is the internal factors that stimulate people to work positively under conditions that allow for high productivity and efficiency” (p. 89); Nguyen (2010) who researched on management theory said that “the concept of motivation is used in management to describe an internal force within each individual that enables them to determine the level and methods necessary to continuously make efforts in their work” (p. 234).

The views of the authors show that, despite different expressions, when referring to work motivation, they all emphasize that work motivation is not only the cause explaining why individuals decide to act, but more importantly, work motivation will sustain and encourage individuals to make their utmost efforts to achieve desired goals. In general, work motivation can be understood as an internal force that guides human behavior, helps individuals sustain their activities, and makes utmost efforts to achieve personal and organizational goals in their work.

A person's work motivation will be indicated through his or her attitude and behavior while working. The issue of the indicators of work motivation of employees in organizations in general and university lecturers in particular has not been directly and deeply studied by many domestic and international authors, almost only mentioned in definitions of work motivation; or indirectly mentioned in studies of another related issue to work motivation; or mentioned when designing surveys of factors affecting work motivation.

- Mentioning the indicators of work motivation in the definition of work motivation:

The definition of work motivation itself highlights prominent expressions when a person has work motivation: persistence and effort. Dornyei and Ushioda (2011) when emphasizing two aspects of work motivation, direction and intensity of behavior, also argued that the second aspect (intensity of behavior) is largely due to the persistence and effort of the individual.

Some Vietnamese authors also incorporate indicators of work motivation directly into the definition of work motivation, such as efforts and hard work, as presented by Bui (2009), Nguyen et al. (2012), Nguyen (2015). Furthermore, other manifestations of work motivation are desire and voluntariness, as found in the definition of work motivation presented by Truong (2017).

- Mentioning the indicators of work motivation when studying other related issues to work motivation:

When studying leadership and organizational management, Grieser (2017), in his book “The ten golden principles of leadership”, outlined the indicators of a motivated individual, such as “effort and discipline”, “passion and enthusiasm”, “optimistically pursuing goals”, and “voluntarily taking on extra work” (pp. 32-35); Nguyen (2010) in Theory of Management stated that “A person with great motivation will work hard, but someone who is not motivated to work will not” (p. 234). Therefore, the two authors mentioned above have addressed the manifestations of a motivated individual, which are the passionate and enthusiastic attitude towards work, dedication, hard work, industriousness, efforts, and voluntariness.

- Mentioning the indicators of work motivation when designing a survey on factors affecting work motivation:

Authors from various countries, including Vietnam, have focused their research on factors influencing the work motivation of educators in general and university lecturers in particular (Ebru, 2012; Firestone, 2014; Myint, 2017; Munyengabe et al., 2017; Andriani et al., 2018; Sinniah et al., 2018; Tran et al., 2019).

During the research on factors affecting work motivation, in order to design a scale measuring the influence of factors (independent variables) on work motivation (dependent variable), some authors have attempted to identify the indicators of work motivation (i.e. the observed variables within the dependent variable). Some authors who have done this include: Andriani et al. (2018) identified 10 indicators of a motivated individual, most of which are related to persistence in maintaining activities and perseverance in overcoming difficulties (p. 26). Other authors such as Watt and Richardson (2007); Muhammad and Sabeen (2011) have addressed the manifestations of enthusiasm, dedication, and effort in their studies. Some indicators of work motivation were found in surveys by Vietnamese authors on factors affecting university lecturers' work motivation, such as trying their best to complete the work despite difficulties, hard work (willingness to start the working day early or stay late to complete work, work without time management), excitement with work (Le, 2020: 32), good mood, enthusiasm,

agreement with the school's encouragement policies, and willingness to sacrifice their benefits for common goals (Phan, 2020: 35).

In summary, although there have not been direct and in-depth researches on the work motivation indicators of employees in general and university lecturers in particular, these indicators have been mentioned scattered in definitions and in some related research works on work motivation. Generally, university lecturers, when motivated to work, will have the following prominent indicators: Interested in performing tasks; Enthusiastic to perform tasks; Voluntary and willing to receive tasks; Dedicated and hardworking; Make efforts, try their best; Persistent to carry out to the end; Desire to achieve good results/ good performance.

### **2.2. Scientific research tasks of university lecturers**

In Vietnam, the scientific research tasks of university lecturers are specified in a number of documents published by the Government and the Ministry of Education and Training of Vietnam, such as the Law on Higher Education (The National Assembly..., 2012, Article 55); Law on amending and supplementing some articles of the Law on Higher Education (The National Assembly..., 2018, Clause 30); Circular No. 40/2020/TT-BGDĐT Regulations on codes, standards for professional titles, appointment and salary ranking for teaching officials in public higher education institutions (Ministry of Education..., 2020, Article 4, 5, 6, 7); Circular No. 20/2020/TT-BGDĐT Regulations on work regime of higher education lecturers (Ministry of Education..., 2020a, Article 5). Professional titles of Vietnamese university lecturers include senior lecturer (class I), main lecturer (class II), lecturer (class III), and teaching assistant. The basic tasks for class I, II and III lecturers are unchanged, only the leading role in performing tasks and high responsibilities in scientific publication for main lecturer and especially senior lecturers is increased.

Based on the above documents, scientific research tasks of Vietnamese university lecturers could include 4 following main activities:

- Carrying out scientific research projects (supervising or participating);
- Evaluating scientific research projects of colleagues and students;
- Publishing research results on scientific journals; presenting at scientific conferences;
- Compiling teaching and training materials.

Therefore, lecturers with motivation in scientific research are those who have indicators of motivation in carrying out the four activities mentioned above.

### **3. Materials and methods**

\* Research objectives: This study aims to determine the current motivation of VNUHCM lecturers in scientific research.

\* Research content: Motivation of VNUHCM lecturers: 1. In carrying out scientific research projects; 2. In evaluating scientific research projects of colleagues and students; 3. In publishing scientific research results in scientific journals; presenting at scientific conferences; 4. In compiling teaching and training materials.

The research questions are:

- What is the current level of motivation in carrying out scientific research activities of VNUHCM lecturers?

- Are there differences in motivation level of lecturers in carrying out scientific research activities based on demographic characteristics?

\* Research area: The study was carried out at 6 member universities of VNUHCM, which were encrypted from U1 to U6.

\* Research methods: The study uses a mixed-methods approach, combining both quantitative and qualitative methods, in which:

- Questionnaire survey is the key research method to collect data on motivation of lecturers in scientific research. The questionnaire is built based on literature review, the content includes 4 items (scientific research activities) with 28 observed variables (work motivation indicators). Participants were requested to rate a 5-point Likert scale, whereby 1 = totally disagree, 2 = somewhat disagree, 3 = neither agree nor disagree (neutral), 4 = somewhat agree, and 5 = totally agree. The questionnaire was conducted online (via Microsoft Forms) from August to October 2022 with 457 participants (Table 1). The results of the reliability test using Cronbach's Alpha showed that the scale met the requirements for reliability. The results of exploratory factor analysis (EFA) indicated that the number of factors and observed variables within each factor were appropriate. The scale is well-qualified for use.

- In-depth interviews were conducted following the questionnaire to clarify the data obtained from the questionnaire. The interviews were conducted both in-person and over the phone, took notes/recorded (with the participant's permission), and the results of the interviews were synthesized. The interview sample consisted of 18 lecturers randomly selected from the lecturer groups (Table 1). To secure participants' personal information, the lecturers' identities were encrypted from L1 to L18.

**Table 1.** Descriptive statistics of participants' demographics

Lecturer groups		Questionnaire survey		Interviews	
		N	%	N	%
Position	Manager	83	18.2	07	38.9
	Non-managerial lecturer	374	81.8	11	61.1
Academic title, degree	Senior lecturer – Professor, Associate Professor	26	5.7	03	16.7
	Main lecturer – Doctor	31	6.8	02	11.1
	Lecturer – Doctor	106	23.2	06	33.3
	Lecturer – Master	186	40.7	06	33.3
	Teaching assistant	89	19.5	01	5.6
Gender	Male	223	48.8	11	61.1
	Female	234	51.2	7	38.9
Age	Below 30 years old	116	25.4	03	16.7
	30 to below 40 years old	184	40.3	08	44.4
	40-50 years old	128	28.0	04	22.2
	Above 50 years old	29	6.3	03	16.7
Experience as a lecturer	Below 5 years	144	31.5	02	11.1
	5-10 years	114	24.9	09	50.0
	Above 10 years	199	43.5	07	38.9
Income level at university	Below 10 million VND	180	39.4		
	From 10 to 15 million VND	126	27.6		
	Above 15 million VND	151	33.0		
University	U1	150	32.8	03	16.7
	U2	79	17.3	03	16.7
	U3	56	12.3	03	16.7
	U4	79	17.3	03	16.7
	U5	49	10.7	03	16.7
	U6	44	9.6	03	16.7
Total		457	100	18	100

\* Data Analysis Techniques:

Using SPSS software: testing reliability and validity of the scale; descriptive statistics (mean, standard deviation) and inferential statistics (ANOVA and t-test) in describing and analyzing the current situation.

In addition, Partial Least Squares Structural Equation Modeling (PLS-SEM) (by SmartPLS software) is also used to evaluate the quality of the measurement model and structural model.

## 4. Results

### 4.1. Synthesized research results on VNUHCM lecturers' motivation in scientific research

The survey results using a questionnaire on the indicators of lecturers' motivation in carrying out scientific research activities are presented in Table 2.

Based on the descriptive statistics in Table 2, it can be observed that the overall motivation in scientific research among lecturers is evaluated at a fairly high level (the overall mean value of 4.15); in which, motivation in carrying out projects achieved the highest level (mean value of 4.22), while the lowest level is for motivation in research project evaluation (mean value of 4.10). Most of the motivation's indicators in carrying out 4 specific activities in scientific research tasks were self-evaluated by lecturers at a somewhat agree level.

**Table 2.** Lecturers' self-assessment on motivation's indicators in scientific research

No	Motivation's indicators in scientific research activities	Agreement level	
		Mean	SD
1	In carrying out scientific research projects (supervising or participating) (referred to as carrying out scientific research projects)	4.22	0.77
2	In evaluating scientific research projects of colleagues and students (referred to as evaluating scientific research projects)	4.10	0.72
3	In publishing research results on scientific journals; presenting at scientific conferences (referred to as writing scientific articles)	4.17	0.79
4	In compiling teaching and training materials (textbooks; monographs, reference books, guidebooks; internal circulating documents for teaching and training purposes) (referred to as compiling materials)	4.12	0.74
	Overall	4.15	0.63

However, to accurately analyze the level of expression of the 7 indicators in scientific research activities, as well as the contribution of 4 specific activities to the overall motivation in scientific research, the research team conducted further analysis using Partial Least Squares Structural Equation Modeling (PLS-SEM), obtaining the results as follows (Tables 3 and 4):

In terms of the expression level of the 7 indicators in scientific research motivation:

In the reflective measurement model, the close relationship between the observed variables and the structural variable (convergence) is evaluated by Outer Loading. If the observed variables have Outer Loading less than 0.7, they should be removed and the model should be reanalyzed (Hair et al., 2021). The results calculated by PLS-SEM in assessing the measurement model quality show that, all observed variables (indicators) have outer loading  $> 0.7$  (Table 3), so all of these variables meet the convergence criteria towards the structural variable (motivation in scientific research). Therefore, the indicators of excitement, enthusiasm, voluntariness, dedication, hard work, making effort, perseverance, and desire to complete tasks well all have a clear expression level of indicators for lecturers' motivation in carrying out all 4 scientific research activities.

**Table 3.** Expression levels of 7 indicators of motivation in scientific research

Motivation in scientific research	Indicators	Encoding	Outer loading ( $> 0.7$ )
Motivation in Carrying Out Scientific Research Projects (COSRP)	Excitement	COSRP1	0.919
	Enthusiasm	COSRP2	0.918
	Voluntariness	COSRP3	0.939
	Dedication, hard work	COSRP4	0.926
	Making effort	COSRP5	0.912
	Perseverance	COSRP6	0.875
	Desire	COSRP7	0.919
Motivation in Evaluating Scientific Research Projects (ESRP)	Excitement	ESRP1	0.914
	Enthusiasm	ESRP2	0.917
	Voluntariness	ESRP3	0.911
	Dedication, hard work	ESRP4	0.916
	Making effort	ESRP5	0.927
	Perseverance	ESRP6	0.921
	Desire	ESRP7	0.908
Motivation in Publishing Scientific Research Results (PSRR)	Excitement	PSRR1	0.931
	Enthusiasm	PSRR2	0.932
	Voluntariness	PSRR3	0.927
	Dedication, hard work	PSRR4	0.949
	Making effort	PSRR5	0.944
	Perseverance	PSRR6	0.928

	Desire	PSRR7	0.906
Motivation in Compiling Materials for teaching and training (CM)	Excitement	CM1	0.889
	Enthusiasm	CM2	0.928
	Voluntariness	CM3	0.906
	Dedication, hard work	CM4	0.937
	Making effort	CM5	0.924
	Perseverance	CM6	0.920
	Desire	CM7	0.902

In terms of the contribution level of motivation in carrying out each activity to the formation of overall research motivation:

In the formative measurement model, the influence of factors on the structural variable will be evaluated by Outer Weight (Hair et al., 2021). The results calculated by PLS-SEM in assessing the measurement model quality show the contribution level of factors (COSRP, ESRP, PSRR, CM) to the overall research motivation, as follows (Table 4):

**Table 4.** Contribution levels of motivation in carrying out 4 activities to the overall scientific research motivation (SR)

Connection	Outer weight	Level
COSRP -> SR	0.119	4
ESRP -> SR	0.236	2
PSRR -> SR	0.236	2
CM -> SR	0.616	1

Although the mean values in the descriptive statistics in Table 3 indicate that the motivation of teachers in “carrying out scientific research projects” is the highest; however, the Outer Weights in Table 4 show that among the 4 tasks contributing to overall research motivation, the task of “compiling materials” has the highest contribution level (0.616), and the lowest is the task of “carrying out scientific research projects” (0.119). Motivation in “evaluating scientific research projects” and “publishing scientific research results” have equivalent levels of contribution to the overall research motivation.

To further clarify the above analysis results, the research team conducted interviews with 18 lecturers from 6 member universities of VNUHCM. For the question about the assigned tasks and the request to “rank the tasks according to their own motivation level (from highest to lowest)”, only 5 out of 18 interviewed lecturers (27.8 %) ranked the task of conducting scientific research projects as the highest motivation level for themselves. All these 5 lecturers, when telling the reasons for the above ranking, mentioned their own tendencies, abilities and interests in scientific research, and had a clear understanding of the role of scientific research:

*“I enjoy participating in scientific research. Through research, I have discovered many useful things for my teaching activities; through research, I have found similarities and differences between theory and practice to enrich my teaching activities”* (L3 – Male, Senior Lecturer, Manager, 38 years old, 13 years of experience as a lecturer).

*“Such ranking is due to my own interest and inclination. I am most interested in scientific research and tend to decrease my teaching activities to focus on research”* (L13 – Female, Lecturer, M.S., 39 years old, 9 years of experience as a lecturer).

*“I realize that conducting scientific research brings the most value to myself. Through research, I have been able to enhance my own abilities, acquire new knowledge, and produce research projects that meet the requirements for applying for scholarships, sponsorships from organizations and businesses. Additionally, I am also able to create new values and technologies for society. In terms of economics, this activity has also helped me to earn additional income from various sources of funding. Therefore, for me personally, this is the biggest motivating task for myself”* (L5 – Male, Lecturer, M.S., 27 years old, 4 years of experience as a lecturer).

*“I have many scientific publications with high-ranking indexes.” “Research activities have helped me gain research experience and scientific publication skills, which in turn enable me to guide many students and graduates”* (L12 – Male, Manager, Lecturer, PhD., 42 years old, 15 years of experience as a lecturer).

“Scientific research activities create many opportunities for consolidating knowledge and expanding social relationships outside of university. Currently, I am coaching a group of research students, so I have a very high motivation to work” (L16 – Female, Manager, Lecturer, PhD., 43 years old, 20 years of experience as a lecturer).

Therefore, the lecturers who have high motivation in carrying out research projects are those who have a passion for research, research competence and experience, and a clear understanding of the importance of research in their professional activities. However, implementing scientific research projects is a difficult and demanding task that requires high competence and concentration. As a result, the proportion of interviewed lecturers who are ranked as having the highest motivation in this area is not high.

#### 4.2. Comparison of scientific research motivation of lecturers by demographics

The results of analyzing the differences by t-test and ANOVA are shown in [Tables 5-9](#).

**Table 5.** Comparison of scientific research motivation survey results of lecturers by age and university teaching experience

Scientific research activities	Level of agreement								ANOVA (< 0.05)
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	
<b>By age</b>									
	<b>&lt; 30 years old</b>		<b>30 - &lt; 40</b>		<b>40 - 50</b>		<b>&gt; 50 years old</b>		
COSRP	4.28	0.67	4.16	0.78	4.20	0.83	4.36	0.78	0.387
ESRP	4.24	0.68	4.07	0.75	4.02	0.73	4.18	0.62	0.091
PSRR	4.21	0.71	4.14	0.82	4.13	0.83	4.41	0.65	0.316
CM	4.18	0.72	4.07	0.74	4.11	0.76	4.30	0.77	0.338
<b>By university teaching experience</b>									
	<b>&lt; 5 years</b>		<b>5-10 years</b>		<b>&gt; 10 years</b>				
COSRP	4.25	0.73	4.12	0.77	4.25	0.79			0.323
ESRP	4.16	0.73	4.11	0.72	4.06	0.72			0.440
PSRR	4.19	0.75	4.04	0.85	4.24	0.77			0.078
CM	4.09	0.79	4.14	0.66	4.14	0.76			0.829

The ANOVA results in [Table 5](#) indicate no significant difference in motivation among lecturer groups based on age and university teaching experience in performing all tasks within the scientific research activities category (sig > 0.05).

The data in [Tables 6, 7, 8, 9](#) shows that there is a statistically significant difference (sig < 0.05) in motivation, mainly focused on the two tasks of “implementing scientific research projects” and “publishing research results”. These two tasks are the main focus and the most visible evidence of the university lecturers’ scientific research activities. In practice, these two tasks often go hand in hand; publishing research results in scientific journals/proceedings is a mandatory task for authors/research teams when their research projects are approved for implementation.

Specifically, there are differences in motivation in conducting research projects and publishing research results among the following groups of lecturers:

- By position (see [Table 6](#)): lecturers with management positions have higher motivation than non-managerial ones (motivation in scientific publications has mean values at 4.33 and 4.14, respectively).

**Table 6.** Comparison of scientific research motivation survey results of lecturers by position

Scientific research activities	Manager		Non-managerial Lecturer		T- test (< 0.05)
	Mean	SD	Mean	SD	
COSRP	4.35	0.78	4.18	0.76	0.070
ESRP	4.15	0.77	4.09	0.71	0.522
PSRR	4.33	0.82	4.14	0.78	<b>0.044</b>
CM	4.12	0.77	4.12	0.74	0.995



The interview results also showed that among the 5 lecturers who ranked scientific research motivation the highest, there were 3 managers. These are the leaders and professional managers of the faculty and discipline, so they need to assert their ability in scientific publication to lead the lecturers in their unit to carry out scientific research.

- By professional title, academic title and degree (see Table 7): the higher the professional title and academic title, the higher the motivation in carrying out research projects and publishing research results (as shown by the mean scores in Table 7).

**Table 7.** Comparison of scientific research motivation survey results of lecturers by professional title, academic title and degree

Scientific research activities	Mean	SD	Mean	SD	Mean	SD	Mean	SD	ANOVA (< 0.05)
<b>By professional title</b>									
	<b>Senior Lecturer</b>		<b>Main Lecturer</b>		<b>Lecturer</b>		<b>Teaching assistant</b>		
COSRP	4.63	0.57	4.41	0.58	4.14	0.80	4.04	0.75	<b>0.003</b>
ESRP	4.25	0.55	4.07	0.62	4.08	0.74	4.17	0.77	0.474
PSRR	4.59	0.56	4.39	0.65	4.09	0.81	4.05	0.79	<b>0.002</b>
CM	4.01	0.74	4.13	0.64	4.13	0.74	4.15	0.82	0.877
<b>By academic title, degree</b>									
	<b>Prof./Assoc. Prof.</b>		<b>PhD</b>		<b>M.S</b>				
COSRP	4.63	0.57	4.37	0.76	4.11	0.76			<b>0.000</b>
ESRP	4.25	0.55	4.14	0.70	4.08	0.74			0.404
PSRR	4.59	0.56	4.35	0.73	4.05	0.81			<b>0.000</b>
CM	4.01	0.74	4.16	0.73	4.12	0.75			0.594

The interview results also showed that, among the 5 lecturers who ranked scientific research motivation the highest, there were 1 senior lecturer (Assoc. Prof.) and 2 PhDs. According to the regulations on the duties of lecturers (as mentioned above), lecturers with higher professional titles and academic titles have higher research and scientific publication responsibilities (Ministry of Education..., 2020, Articles 4, 5, 6, 7); on the other hand, higher academic titles and degrees are evidence of expertise, capacity, and experience in research. Therefore, their research motivation levels are higher than those of lecturers with lower academic degrees or titles.

- By gender (see Table 8): male lecturers have higher motivation in research and publication than female lecturers (mean value of 4.32 and 4.12; 4.30 and 4.06, respectively).

**Table 8.** Comparison of scientific research motivation survey results of lecturers by gender

Scientific research activities	<b>Male</b>		<b>Female</b>		T- test (< 0.05)
	Mean	SD	Mean	SD	
COSRP	4.32	0.75	4.12	0.77	<b>0.005</b>
ESRP	4.10	0.72	4.11	0.73	0.810
PSRR	4.30	0.78	4.06	0.79	<b>0.002</b>
CM	4.07	0.81	4.18	0.68	0.131

The interview results also showed that only 2 female lecturers out of the 5 lecturers rated that they had the highest motivation in scientific research. This can be explained by the fact that female lecturers face more pressure in fulfilling their gender roles in the family, making it more difficult for them than male lecturers to carry out research projects and publish results (scientific articles/reports), which are difficult, demanding, and require high levels of concentration and focus.

- By the level of income at the workplace and by universities (see Table 9): Lecturers with higher income have higher motivation in scientific research and publication (as seen in the mean value of these groups in Table 9). This is also understandable since lecturers with higher income can focus more on research without worrying about financial constraints. In addition, lecturers'

motivation in research and publication also varies by their universities. The factors influencing motivation in the scientific research activities of lecturers from each member university of VNUHCM need to be analyzed in more detail in future studies.

**Table 9.** Comparison of scientific research motivation survey results of lecturers by income and universities

Scientific research activities	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	ANOVA (< 0.05)
<b>By income level at workplace</b>													
	<b>&lt; 10 million</b>		<b>10 - 15</b>		<b>&gt; 15 million</b>								
COSRP	4.13	0.79	4.15	0.81	4.38	0.67							<b>0.006</b>
ESRP	4.11	0.72	4.16	0.69	4.04	0.74							0.386
PSRR	4.10	0.81	4.11	0.78	4.32	0.75							<b>0.026</b>
CM	4.12	0.78	4.10	0.74	4.16	0.70							0.803
<b>By universities</b>													
	<b>U1</b>		<b>U2</b>		<b>U3</b>		<b>U4</b>		<b>U5</b>		<b>U6</b>		
COSRP	4.03	0.83	4.36	0.64	4.30	0.81	4.29	0.73	4.03	0.77	4.54	0.54	<b>0.009</b>
ESRP	4.09	0.73	4.25	0.68	4.14	0.67	4.11	0.70	3.79	0.72	4.18	0.78	<b>0.019</b>
PSRR	4.06	0.82	4.27	0.72	4.18	0.88	4.19	0.83	4.06	0.77	4.49	0.54	<b>0.028</b>
CM	4.17	0.74	4.02	0.84	4.09	0.80	4.12	0.80	4.10	0.56	4.24	0.58	0.632

### 5. Discussion

According to the first research question (What is the current level of motivation in carrying out scientific research activities of VNUHCM lecturers?), the research results indicate that the overall motivation of lecturers in research activities is quite high. However, their motivation in carrying out specific research tasks is uneven. Data analysis shows that motivation in “carrying out research projects” has the lowest contribution level, while motivation in “compiling materials” has the highest contribution level to the overall research motivation. Motivation in the 2 remaining activities has an equivalent contribution level.

The uneven level of motivation in carrying out different activities is due to:

Firstly, there are different characteristics of research activities. Carrying out a research project is a difficult task that requires not only research skills but also personal qualities such as perseverance and diligence. Furthermore, this also requires dedication. Only when lecturers are not hindered by difficulties in life can they focus on their research work. Meanwhile, compiling materials include all teaching-related materials, not only textbooks; monographs, reference books, guidebooks but also internal circulation materials that lecturers compile for teaching and training purposes. This is a task that lecturers undertake not only due to mandatory duties but also out of their own personal needs to better serve their teaching. Therefore, to enhance the motivation of lecturers in the group of research tasks, it is necessary to take gradual steps. In the short term, it is possible to focus on increasing lecturers' motivation in compiling teaching materials. Hair et al (2021), in their research, argued that to enhance a factor, one should focus on the connection with the highest level of influence on that factor (p. 219). According to this perspective, if we can enhance the motivation of teachers in compiling teaching materials in particular, it will significantly contribute to the overall motivation of teachers in the entire research group. This is also reasonable because compiling teaching materials is an indispensable task associating with teaching, which is the central task in the professional activities of university lecturers.

Secondly, the personal characteristics of lecturers. The interview results showed that lecturers with high motivation in carrying out research projects are those who have a passion for this work, have research capacity and experience, and have a clear understanding of the importance of research in their professional activities. Thus, in order to enhance motivation in

carrying out research projects, it is necessary to strengthen the awareness of lecturers about the importance of this activity. In addition, it is also necessary to identify the lecturers who have a passion for scientific research to encourage and create favorable conditions for them to conduct research. They will be the nucleus that drives and attracts other colleagues to participate in scientific research activities.

According to the second research question (“Are there differences in motivation of lecturers in carrying out scientific research activities based on demographic characteristics?”), the results showed that not all tasks in scientific research had motivational differences based on demographics. The motivational differences only focused on two tasks which are “carrying out research projects” and “publishing research results”. The differences in motivation in these two tasks were also not recorded for all groups of lecturers, but only for groups based on position, professional title, academic rank, gender, and income level at the current workplace. Based on these results, to enhance the motivation of lecturers in scientific research, member universities of VNUHCM and each faculty within each university should consider establishing research groups with leaders who are managers, lecturers with high academic title and degree. They will be the pioneers, attracting other lecturers, especially those who have a passion for scientific research, to participate in scientific research activities. In addition, attention should be paid to the income of lecturers, developing policies to reward lecturers participating in scientific research, allocating funding and appropriate incentives for implementing research projects and for publishing research results.

**Limitations and Suggestions for Further Studies:** The study was conducted on lecturers from public universities which are members of the national university, and has not been conducted on lecturers from other types of universities (private universities, public universities not affiliated with the national university). The study has also not mentioned yet the factors affecting the motivation of lecturers in research activities in general and in specific research activities; the factors affecting the research motivation of different groups of lecturers (by demographics).

The above issues need to be further investigated in future research studies.

## 6. Conclusion

An important professional task of university lecturers in Vietnam is scientific research. According to the regulations of the Ministry of Education and Training of Vietnam, this task includes four specific activities: carrying out research projects, evaluating research projects, publishing research results in scientific journals or presenting them at national and international scientific conferences, and compiling teaching and training materials.

The analysis of data collected from surveys and in-depth interviews with lecturers from 6 member universities of VNUHCM shows that the motivation of lecturers in scientific research, in general, is at a somewhat high level, but uneven in the implementation of specific activities.

The study also identified differences in motivation for conducting research projects and publishing research results among groups of lecturers based on their demographic characteristics, including position, professional title, academic rank and degree, gender and income level at their workplace.

The research results presented in the article provide practical basis for VNUHCM leaders to develop policies that enhance the motivation of lecturers in research activities.

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## **Vietnamese Postgraduate Students' Choices for Higher Education: Exploring How Marketing and Communication, Social, and Economic Factors Influence Their Decision-Making**

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### **Abstract**

Several factors have contributed to a downward trend in postgraduate education enrollment in Vietnamese higher education. Understanding postgraduate students' university choice criteria is crucial for developing effective marketing strategies in higher education settings. The purpose of this study was to investigate postgraduate students' perceptions of their university choices and to evaluate the correlations between their marketing and communication, social support, and economic factors and their university choices. A survey consisting of 401 questionnaires and 05 semi-structured interviews was conducted at some of the most prestigious multidisciplinary universities in Ho Chi Minh City, Vietnam. The findings reveal that postgraduate students generally show a high degree of agreement in their university choice decisions. Additionally, differences in demographic characteristics, such as family income and father's education, were found to influence their preferences. Furthermore, the study suggests that marketing and communication, social support, and economic factors have varying and significant impacts, both positive and negative, on their decisions. The results of this study hold theoretical and practical implications for Vietnamese higher education. Recommendations for university administrators and other stakeholders are also discussed.

**Keywords:** university choice decision, marketing and communication, social support, economic factor, Vietnamese postgraduate student.

### **1. Introduction**

The Vietnamese higher education system was heavily influenced by the Soviet academic system in the 1990s, in which universities mainly engage in teaching activities while research

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activities are carried out by research institutes (Clark, 2014). Over the last two decades, the Vietnamese government has strongly promoted the development of the higher education system. It has seen a remarkable growth in the number of universities and students, including both public and private institutions. For instance, the nation had 178 higher education institutions (HEIs) in 2000, of which 30 were private, with 795,600 students and the rest were public, with 103,900 students, respectively. By 2020, the number of universities and students will have more than doubled. There are 237 universities, including 172 public HEIs with 1,359,400 students and 65 private HEIs with 313,500 students (GSOV, 2005; GSOV, 2020). In addition, the number of postgraduate students has also increased rapidly over the past 10 years, with master's degree enrollment increasing from 62,705 in 2010 to 94,920 in 2020 and doctorate degree enrollment rising from 4,683 in 2010 to 11,054 in 2020 (GSOV, 2015; GSOV, 2020). In Vietnam, research has considered both positives and negatives, such as significant rise in institution numbers, educational accreditation, university financial autonomy, graduate unemployment, and opportunities in higher education (Dao, 2015; Pham, Vu, 2019). Students tend to carefully consider investing in higher education programs, after carefully weighing a number of criteria.

Previous research indicated that choosing a higher education institution is a high-risk decision, and deciding which university to study at can have long-term effects on students' careers (Walsh et al., 2015). The competition between universities to attract excellent students, faculty members, researchers, and financial aid is no longer limited to a single country or region but is now global, with 'an increase in the number of postgraduate students' playing an important role in these competitions (especially among Vietnamese public universities). Choosing an appropriate higher education institution for further study and research is a crucial decision for any student as it not only affects their future careers or their ability to avoid unprofitable investments for higher education but also affects learning motivation, academic achievements, and other correlations (Do et al., 2015).

Higher education institutions must develop more extensive marketing strategies based on the awareness of what postgraduate students seek at a HEI (Maniu, Maniu, 2014). In a fiercely competitive higher education market, a better understanding of postgraduate students' university choice can help promote marketing activities, admissions strategies, and refine curricula to entice more students to enroll in these programs (Adefulu et al., 2020; Do et al., 2015). Most research on how postgraduate students choose a university has been conducted in Western countries and has focused on differences in social class (Reay et al., 2005; Shaw, 2013). Similar research is less frequent in Vietnamese HEIs, especially for postgraduate students.

In light of the aforementioned points, the purpose of this study is to investigate postgraduate students' perceptions of their university selection decisions and to assess the relationship between marketing and communication, social support, and economic factors and university choice. This study seeks to address the following issues: (1) How do postgraduate students evaluate their university choice decisions? (2) Do demographic characteristics of postgraduate students influence their decision-making? (3) How do marketing and communication, social support, and economic factors influence their decision-making?

## **2. Literature Review**

### **University choice decisions and higher education**

Research on postgraduate program selection decision-making is widespread and has revealed many factors that postgraduate students must consider when making postgraduate program choices (Chen, 2007; Simões, Soares, 2010). It is generally assumed that earning a master's and doctorate degree is a good way to gain an advantage over others when building a good career or establishing a high position (Ha, 2016). However, the selection of postgraduate study, such as master and doctoral programs at HEIs is perhaps one of the most important decisions to make by postgraduate students and their families. It is a multi-stage decision-making process that requires the consideration of various important academic and non-academic factors, such as learner characteristics, information collection, and university and major characteristics as well as personal factors, including marriage, family and work (Kallio, 1993; Lei, Chuang, 2010).

According to Lei and Chuang (2010), graduates consider many factors when evaluating a school to receive postgraduate degrees, including institutional, curriculum, faculty, and personal factors. Various aspects have been used in studies to evaluate postgraduate students' university choice; for example, job opportunities inside and outside the school, the attractiveness of the school

(facilities and utility services) and the quality of learning (Lee et al., 2008), make new friends and gain hands-on experience in the field (Kim et al., 2007), academic reputation, program reputation or faculty professional reputation (Aydin, 2015, Briggs, Wilson, 2007; Keling, 2006; Raposo, Alves, 2007; Veloutsou et al., 2004), friendly service team and convenient service (Manoku, 2015), central location, campus, environment etc. (Raposo, Alves, 2007; Mubaira, Fatoki, 2012). The research results show that the assessment of students' choice decisions is determined by both academic factors (e.g., the caliber of academic staff, curricula, reputation of university or department, etc.) and non-academic ones (e.g., campus, facilities and student support services).

### **Factors influencing postgraduate students' university choice decisions**

There are numerous factors that influence postgraduate students' university selection decisions, with demographic characteristics, marketing and communication, social support, and economic factors being the most significant. Other determinants include housing, geographic location, family accommodations (Lei, Chuang, 2010), living conditions (Van Hoof et al., 2014), academic pulling, administrative pulling, ease of visa grant or immigration, and environmental factors (Chen, 2007), obtaining career-specific information, personal development, improved post-graduate income career and (Sheppard, 2013), development opportunities (Keling, 2006; Moore et al., 2009; Briggs, Wilson, 2007; Ingram et al., 2000). Furthermore, demographic characteristics, such as gender, age, socioeconomic status, race and ethnic composition, have an effect on their selection procedure (Aydin, 2015; Liu, Morgan, 2020). Individual factors such as motivation, beliefs, and interests, among others (e.g., gender, religion, race, etc.) are also shown to play an important role.

As previous studies have shown that marketing and communication factors have different influences on postgraduate students' university selection decisions (Adefulu et al., 2020; Chen, 2007; Thetsane et al., 2019), for example, social media networks such as YouTube, Facebook, Twitter... (Hayes et al., 2009; Winn et al., 2014); visiting the university (Ming, 2010); face-to-face and paper communications, email (Robinson, Stubberud, 2012). The procedure was also shown to be influenced by the team support, partnerships, and relationships with organizations (Manoku, 2015), conversations with family or spouse, and expectations of friends (Ha, 2016; Soutar, Turner, 2002), social life, and surrounding community (Briggs, Wilson, 2007; Manoku, 2015; Mubaira, Fatoki, 2012). These elements imply that the assistance or counsel of subjects in the surrounding social environment, such as advice from teachers, family, relatives, friends, and the university consulting team, has a certain influence on student motivation. Economic factors, such as increased post-graduate income (Sheppard, 2013), employment, development opportunities, or career opportunities (Keling, 2006; Moore et al., 2009), tuition fees, scholarships, costs beyond financial aid, financial incentives, financial aid (Cokgezen, 2014; Keling, 2006; Mertz et al., 2012), and work-related concerns (Ha, 2016), can also be considered. There has been little research on the influence of marketing and communication, social support, and economic factors on postgraduate students' choice decisions in Vietnam's higher education. Hence, this study was conducted to demonstrate the interplay between these factors among Vietnamese postgraduate students.

## **3. Methodology**

### **Sample**

A mixed-method approach was employed in the study, which included questionnaires and semi-structured interviews. A questionnaire survey was distributed to 450 full-time postgraduate students currently enrolled at Ho Chi Minh City's most prestigious multidisciplinary universities, among 172 public universities in Vietnam (MoET, 2021). This study was conducted with 401 students from a random sample of 450 postgraduate students, with an 89.11 % return rate by email, exceeding the 30 % response rate for analysis purposes (Dillman, 2000). This study also interviewed 05 postgraduate students who took part in the questionnaire survey.

A multipart questionnaire was used to collect respondents' personal information, data on their university choices, as well as marketing and communication, social support, and economic factors. This study's sample was divided by gender as follows: female students (50.6 %), male students (49.4 %). In terms of origins, 55.1 % are from cities, while the rest are from rural areas. For the educational level, 365 respondents (86.3 %) applied for a master's degree, and only 13.7 % for doctoral studies.



## Variables

In this study, the dependent variable was postgraduate students' university selection decisions. Postgraduate students made their university choices based on six factors: (1) accreditation of the programs, (2) a discipline with scientific training, (3) academic staff with a high-quality teaching and expertise in research area, (4) a faculty with a high level of internationalization in both teaching and research, (5) curriculum's quality and faculty's reputation, and (6) academic freedom. For each item, respondents were asked to rate the level of university choice decisions of postgraduate students on a five-point Likert scale ranging from 1 = 'strongly disagree' to 5 = 'strongly agree'.

To assess the validity and reliability of this constructed measurement for the university choice decisions of postgraduate students in this study, factor loading, the Kaiser-Meyer-Olkin test of sampling adequacy (KMO) and internal consistency analysis (Cronbach's) were performed. Factor loading values for items designed to measure each factor ranged from 0.667 to 0.752, all of which exceeded the threshold level of 0.6 (Hair et al., 2009). This indicates that all six factors were suitable for constructing university choice decisions. The KMO value was 0.851, surpassing the acceptable level of 0.6, which meets the requirement for a constructed variable in educational research (Beavers et al., 2013). In this study, the Cronbach's coefficient was 0.801, exceeding both the thresholds of 0.6 (Hair et al., 2009) and 0.7 (Nunnally, Bernstein, 1994), indicating satisfactory reliability. Based on the validation of construct reliability, we conclude that the research construct of postgraduate students' university choice decisions in this study is reliable.

Table 1 shows that the correlation coefficient ranges from 0.320 to 0.495, indicating a relatively high positive correlation between aspects influencing postgraduate students' university choice decisions. *Academic staff with a high-quality teaching and expertise in research area* and *accreditation of the programs* had the strongest relationship ( $r = .495$ ). The associations were found to be between *curriculum's quality and faculty's reputation* and *academic staff with a high-quality teaching and expertise in research area* ( $r = .320$ ).

**Table 1.** The results of correlation between six dimensions of postgraduate students' university choice decisions

	1	2	3	4	5	6
1. Accreditation of the programs	1					
2. A discipline with scientific training	.425**	1				
3. Academic staff with a high-quality teaching and expertise in research area	.495**	.391**	1			
4. A faculty with high level of internationalization in both teaching and research	.436**	.406**	.429**	1		
5. Curriculum's quality and faculty's reputation	.438**	.445**	.320**	.363**	1	
6. Academic freedom	.365**	.434**	.372**	.356**	.343**	1

Notes: \*\* Correlation is significant at the 0.01 level (2-tailed)

This study's independent variables were divided into four categories: postgraduate student demographic characteristics, marketing and communication, social support, and economic factors (see Table 3). Firstly, demographic characteristics of postgraduate students included (1) gender, (2) family income, (3) father's occupation, (4) mother's occupation, (5) father's education and (6) mother's education. Secondly, marketing and communication factors included: (1) television and radio media, (2) social networking sites, (3) advertisements on printed newspapers, (4) advertisements on electronic newspapers, and (5) visiting the school. Thirdly, social support factors included (1) advice from parents or guardians, (2) advice from the spouse, (3) advice from siblings, (4) advice from friends and colleagues, and (5) advice from the program advisor. Finally, economic factors include (1) more job opportunities inside and outside the university, (2) tuition fees proportional to the quality of training, (3) tuition fees proportional to the level, (4) reasonable accommodation and transportation costs, (5) study expenses fit family's financial situations, and (6) numerous sources of financial support. Table 2 displays the operational definitions, means (M), and standard deviations (SD) of the independent variables in detail.

**Table 2.** Coding schemes and proportions of the independent variables in this study**Demographic characteristics**

1. Gender: Female = 0, Male = 1
2. Family income (unit: USD): measured on a 6-point scale, where 1 = *under 1.300*, 2 = *1.300-1.740*, 3 = *1.741-2.180*, 4 = *2.181-2.620*, 5 = *2.621-3.060*, and 6 = *over 3.060*, ( $M = 4.71$ ,  $SD = 2.05$ ).
3. Father's occupation: measured on a 3-point scale, where 1 = *Blue collar*, and 2 = *White collar*, and 3 = *Professional/Executive* ( $M = 1.69$ ,  $SD = 0.73$ ).
4. Mother's occupation: measured on a 3-point scale, where 1 = *Blue collar*, and 2 = *White collar*, and 3 = *Professional/Executive* ( $M = 1.49$ ,  $SD = 0.69$ ).
5. Father's education: measured on a 6-point scale, where 1 = *primary education level* to 6 = *higher education level*, ( $M = 3.27$ ,  $SD = 1.45$ ).
6. Mother's education: measured on a 6-point scale, where 1 = *primary education level* to 6 = *higher education level*, ( $M = 3.18$ ,  $SD = 1.15$ ).

**Marketing and communication**

1. Television and radio media: measured on a 5-point scale, where 1 = *strongly disagree* and 5 = *strongly agree* ( $M = 1.98$ ,  $SD = .77$ ).
2. Social networking sites: measured on the same scale as that for the first item ( $M = 3.91$ ,  $SD = .64$ ).
3. Advertisements on printed newspapers: measured on the same scale as that for the first item ( $M = 3.69$ ,  $SD = .67$ ).
4. Advertisements on electronic newspapers: measured on the same scale as that for the first item ( $M = 3.82$ ,  $SD = .70$ ).
5. Visiting the school: measured on the same scale as that for the first item ( $M = 3.68$ ,  $SD = .70$ ).

**Social support factors**

1. Advice from parents or guardians: measured on a 5-point scale, where 1 = *strongly disagree* and 5 = *strongly agree* ( $M = 3.83$ ,  $SD = .81$ ).
2. Advice from the spouse: measured on the same scale as that for the first item ( $M = 3.67$ ,  $SD = .68$ ).
3. Advice from siblings: measured on the same scale as that for the first item ( $M = 3.56$ ,  $SD = .66$ ).
4. Advice from friends and colleagues: measured on the same scale as that for the first item ( $M = 3.59$ ,  $SD = .66$ ).
5. Advice from the program advisor: measured on the same scale as that for the first item ( $M = 3.71$ ,  $SD = .72$ ).

**Economic factors**

1. More job opportunities inside and outside the university: measured on a 5-point scale, where 1 = *strongly disagree* and 5 = *strongly agree* ( $M = 4.16$ ,  $SD = .88$ ).
2. Tuition fees proportional to the quality of training: measured on the same scale as that for the first item ( $M = 3.85$ ,  $SD = .77$ ).
3. Tuition fees proportional to the level: measured on the same scale as that for the first item ( $M = 3.97$ ,  $SD = .74$ ).
4. Reasonable accommodation and transportation costs: measured on the same scale as that for the first item ( $M = 3.82$ ,  $SD = .83$ ).
5. Study expenses fit family's financial situations: measured on the same scale as that for the first item ( $M = 3.92$ ,  $SD = .77$ ).
6. Numerous sources of financial support: measured on the same scale as that for the first item ( $M = 3.70$ ,  $SD = .87$ ).

Notes: every variable is measured with one question item

**Data analyses**

To analyze the data, this study used descriptive statistics, independent t-tests, analysis of variance (ANOVA), and multiple regression analyses were used. To understand the general level of postgraduate students' university choice decisions, descriptive analyses of the mean and standard

deviations were computed. The independent t-test and ANOVA were used to determine whether there were any significant differences between demographic characteristics and postgraduate students' university choice decisions. A series of separate stepwise multiple regression analyses were carried out to investigate the effects of marketing and communication, social support, and economic factors on postgraduate students' university choice decisions. Furthermore, the study conducted semi-structured interviews with 02 master's students (PS01-female and PS02-male) and 03 PhD students (PS03-female, PS04-male, and PS05-male) for approximately 45 minutes each.

#### 4. Results

##### The description of Vietnamese postgraduate students' university choice decisions

Table 3 presents the descriptive statistics for the dependent variable – postgraduate students' university choice decisions - based on the results of the six questionnaire items. The findings indicated that postgraduate students in Vietnamese higher education rated a fairly high degree of agreement on university choice decisions based on the overall  $M$  and  $SD$  for each value ( $M = 4.03$ ,  $SD = 0.50$ ).

**Table 3.** The results of  $M$ ,  $SD$ , factor analysis and reliability of the dependent variable in this study

Factors	$M(SD)$	range of score	factor loading
1. Accreditation of the programs	4.00 (.71)		.752
2. A discipline with scientific training	4.01 (.68)		.734
3. Academic staff with a high-quality teaching and expertise in research area	4.16 (.69)		.710
4. A faculty with high level of internationalization in both teaching and research	3.98 (.73)	1 - 5	.704
5. Curriculum's quality and faculty's reputation	4.06 (.72)		.680
6. Academic freedom	3.99 (.69)		.667
KMO value		.851	
Cronbach's $\alpha$		.801	
Total $M(SD)$		4.03 (.50)	

Notes: Data were analyzed with principal component analysis

For the six elements contributing to postgraduate students' institution selection, the findings in Table 3 also showed that they most agree with *Academic staff with a high-quality teaching and expertise in research area* ( $M = 4.16$ ,  $SD = 0.69$ ), followed by *curriculum's quality and faculty's reputation* ( $M = 4.06$ ,  $SD = 0.72$ ), *the discipline with a scientific training process* of  $M = 4.01$ ,  $SD = 0.68$ , and *the postgraduate curriculum with quality accreditation achievement* of  $M = 4.00$ ,  $SD = 0.71$ . They are least in agreement with *a faculty with a high level of internationalization in both teaching and research* ( $M = 3.98$ ,  $SD = 0.73$ ) and *academic freedom* ( $M = 3.99$ ,  $SD = 0.69$ ), respectively. The results of interviews with some postgraduate students showed that some factors to consider when choosing a university include: 1) program quality, 2) the reputation of the university, 3) the quality of the academic members and 4) the facilities of the university. A PhD student said:

... For me, the deciding factor in choosing this college to study is that I know it possesses prestige not only in academics but is also highly regarded by employers. Furthermore, I value the fact that the school has been evaluated for quality accreditation at the institutional level (PS05 – male)

Or a master student stated:

... I believe that there are numerous factors influencing the choices postgraduate students make when selecting a university, but I focused on two major ones: the quality of the programs and the quality of the academic staff who teach and supervise theses (PS02 – male).

The findings of the survey and interviews in this study revealed that students evaluated their university choice decision based on the quality of the curriculum and the competence of the academic staff. This implies that student expectations regarding these two factors can serve as a foundation to help them achieve various goals in their university selection process. Furthermore, the Vietnamese government mandates that higher education institutions participate in educational accreditation at both the programmatic and institutional levels. The accreditation criteria

emphasize the caliber of the academic staff in maintaining and improving the curriculum. Consequently, universities must prioritize and create optimal conditions for enhancing these two factors to meet student expectations and satisfy educational accreditation requirements.

### Comparison between demographic characteristics and the university choice decisions of Vietnamese postgraduate students

Table 4 provides insights into the demographic variations among postgraduate students when it comes to their selection of universities. The results of t-test ( $t = -1.384$ ,  $p > 0.05$ ) indicated there were no significant differences between male ( $M = 3.99$ ,  $SD = 0.49$ ) and female postgraduate students ( $M = 4.06$ ,  $SD = 0.50$ ) in their choice of university. Similarly, the ANOVA findings demonstrate that there were no significant differences between parents' occupation ( $F = 2.441$  for fathers and  $1.053$  for mothers,  $p > 0.05$ ) and mother's education level ( $F = 0.548$ ,  $p > 0.05$ ) with their decision. By contrast, their family income ( $F = 2.845$ ,  $p < 0.05$ ) and their education ( $F = 2.292$ ,  $p < 0.05$ ), significantly influenced postgraduate students' university choice decisions.

The findings of this research reveal that postgraduate students with a family income of \$2,180 or less (ranging from  $M = 4.12$  to  $4.41$ ) were more satisfied with their choices compared to students from high-income families with incomes of \$2,180 or more ( $M = 3.98$ ). Additionally, students whose fathers had education levels of junior high school ( $M = 4.11$ ,  $SD = 0.45$ ) or postgraduate education ( $M = 4.27$ ,  $SD = 0.50$ ) were more likely to pursue postgraduate programs than those with primary education levels ( $M = 3.92$ ,  $SD = 0.41$ ).

**Table 4.** Statistical analysis for postgraduate students' demographic characteristics and the university choice decisions

	Factors	M(SD)	t-test / F	post hoc
Gender	Male	3.99 (.49)	-1.384	-
	Female	4.06 (.50)		
Family income (USD)	under 1.300 (A)	4.12 (.61)	<b>2.845*</b>	A, B, C > F
	1.300-1.740 (B)	4.22 (.34)		
	1.741-2.180 (C)	4.41 (.69)		
	2.181-2.620 (D)	4.01 (.51)		
	2.621-3.060 (E)	4.20 (.53)		
	over 3.060 (F)	3.98 (.46)		
Father's occupation	Blue color	4.01 (.50)	2.441	-
	White color	4.02 (.49)		
	Professional/Executive	4.16 (.49)		
Mother's occupation	Blue color	4.04 (.50)	1.053	-
	White color	4.00 (.49)		
	Professional/Executive	4.13 (.52)		
Father's Education level	Primary education (A)	3.92 (.41)	<b>2.292*</b>	B, F > A
	Junior high school (B)	4.11 (.45)		
	Senior high school (C)	4.07 (.54)		
	Vocational education (D)	3.96 (.47)		
	Higher education (E)	4.03 (.55)		
	Postgraduate education (F)	4.27 (.50)		
Mother's education level	Primary education	4.00 (.44)	0.548	-
	Junior high school	4.08 (.50)		
	Senior high school	4.08 (.55)		
	Vocational education	3.98 (.45)		
	Higher education	4.03 (.51)		
	Postgraduate education	4.07 (.52)		

Notes: \*  $p < .05$

In the interview, a PhD student answered that:

... Due to the influence of traditional Vietnamese culture, fathers traditionally play a role as the family's breadwinner and often have a significant say in their children's education choices.

Therefore, the higher the education levels of parents, the more likely they are to want their children to follow in their footsteps (PS05 – male).

Or a master's student responded:

... In traditional Vietnamese society, fathers have a significant say in their children's careers and education. In my case, I believe my father's guidance is appropriate for pursuing further studies. Moreover, I see pursuing an advanced degree as a means to improve my family's quality of life (PS01 – female).

The study's findings, derived from survey research and interviews, highlighted similarities in postgraduate students' demographic characteristics and their university selection decisions. Universities should pay close attention to variables with statistical differences to provide timely and relevant support solutions when organizing enrollment activities. They should also develop strategies to enhance their image, reputation, and brand, as well as their curricula, to attract prospective postgraduate students.

### **Effects of marketing and communication, social support and economic factors on Vietnamese postgraduate students' university choice decisions**

Table 5 presents stepwise regression analyses for Models 1-4 to clearly illustrate the effects of marketing and communication, social support, and economic factors on postgraduate students' university choice decisions and Model 4 presents the combined effects. Different regression models provided different explanations for university choice decisions across different factors. These models explained 22.4 % of the variance in individuals' economic and social support-related factors (*Adj. R*<sup>2</sup> = .224). The diagnosis of multicollinearity yielded no value of variance inflation factor (VIF) in the regression model greater than 10 (in this study, VIF = 1.038 to 1.941), indicating no risk of serious model multicollinearity (Hair et al., 2009; StataCorp, 1997). The results show coefficients of  $\beta$  values, with  $\beta > 0$ , denoting a positive impact on postgraduate students' university choice decisions and vice versa.

The findings of Model 1 showed that two out of five marketing and communication factors' items (*social networking sites* and *advertisements on electronic newspapers*) exerted a substantial influence on the respondents' university choice decisions. This model also explained 8% percent of the university choice decisions of marketing and communication factors (*Adj. R*<sup>2</sup> = .080). Both marketing and communication factors' items had a favorable effect on their university choice decisions ( $\beta = .118$ ,  $p < 0.05$ , and  $\beta = .199$ ,  $p < 0.001$ , respectively). During the interview, a PhD student stated:

... As living in the digital era, promoting, marketing, and communicating about admissions or introducing school information through social platforms such as Youtube, Facebook, Twitter, and Fanpage... are inevitable. In addition, I think the school should maintain traditional channels such as email, and online newspapers..... (PS04 – male)

Or a masters' student added:

... I think that in the 4.0 technology era, it is indispensable to communicate information to learners, candidates... through digital platforms such as Tiktok, Facebook, Youtube... but face-to-face communication is also the channel learners expect because it provides an immediate interactive and lively visual dialogue for problems to be solved (PS01 – female)

Only one item in Model 2, *advice from the program advisor*, was positively linked to university selection ( $\beta = .278$ ,  $p < 0.001$ ), and this model explained 6.3 % variance in university choice decisions of social support factors (*Adj. R*<sup>2</sup> = .063). During the interview, a PhD student agreed:

... I realize that advice from many people when deciding on a university can sway my decision, but the one I listen to might be from my friends who have studied this program... as well as the person in charge of the program because they are the ones who can give the most accurate advice about the field. I'm going to choose based on my abilities and aspirations (PS03 – female)

Similar to Model 1, the findings of Model 3 show that two out of six economic factors' items have a positive influence on university choice decisions in the VNU-HCM postgraduate students, including *tuition fees proportional to the quality of training* ( $\beta = .232$ ,  $p < 0.001$ ) and *study expenses fit family's financial situations* ( $\beta = .166$ ,  $p < 0.01$ ). This model also explained 19.7 % (*Adj. R*<sup>2</sup> = .197) of the variance of university choice decisions of economic factors. A master' student stated during the interview:

... economic factors are also very important in deciding on a university because it involves many costs associated with the learning process... such as tuition fees, printing fees, accommodation costs, transportation costs, and so on (PSO2 – male)

Or a PhD student stated:

... the current transition to financial autonomy at universities has increased the cost of education not only for undergraduates but also for graduates... I am the primary breadwinner in my family, so when choosing a university for graduate studies, I consider really carefully the costs for the three to six years of doctoral program, such as studying fees, charges, and financial aid (PSO4 – male)

In the combined Model 4, only one item of social support factor (*advice from the program advisor*) consistently had their significant favorable effects on respondents' selection across models ( $\beta = .139, p < 0.05$ ). In addition, there are two new factors appearing in this model as the social support factor's item *advice from the spouse* ( $\beta = .243, p < 0.001$ ) and the economic factor's item *numerous sources of financial support* ( $\beta = .180, p < 0.001$ ). There are many marketing and communication, social support, and economic factors influencing university choice decisions as revealed by survey and interview results. HEIs need to pay attention to the elements that have a positive influence on their decisions in order to make future forecasts about policies to attract students with specific solutions, such as satisfying their needs, providing support services, offering advice to students in need, providing financial support, offering scholarships, and providing employment opportunities as teaching assistants.

**Table 5.** The results of regression analyses of marketing and communication, social support, and economic factors effects on postgraduate students' university choice decisions

	Model 1	Model 2	Model 3	Model 4	VIF
	Beta ( $\beta$ )				
<b>Marketing and communication factors</b>					
Television and radio media	.046			.032	1.038
Social networking sites	<b>.118*</b>			.021	1.216
Advertisements on printed newspapers	.071			.019	1.200
Advertisements on electronic newspapers	<b>.199***</b>			.098	1.370
Visiting the school	.024			-.023	1.164
<b>Social support factors</b>					
Advice from parents or guardians		-.021		-.071	1.353
Advice from the spouse		-.012		<b>.234**</b>	1.894
Advice from siblings		.025		.043	1.941
Advice from friends and colleagues		-.012		.012	1.557
Advice from the program advisor		<b>.278***</b>		<b>.139*</b>	1.649
<b>Economic factors</b>					
More job opportunities inside and outside the university			-.051	.051	1.439
Tuition fees proportional to the quality of training			<b>.232***</b>	-.024	1.304
Tuition fee suitable for level			.079	.015	1.269
Reasonable accommodation and transportation costs			.039	-.015	1.182
Study expenses fit family's financial situations			<b>.166**</b>	-.003	1.310
Numerous sources of financial support			.075	<b>.180**</b>	1.307
F	7.962 ***	6.405 ***	17.403 ***	8.204 ***	
Adj. R <sup>2</sup>	.080	.063	.197	.224	

Notes: \* p < .05, \*\*p < .01, \*\*\* p < .0

## 5. Discussion

Regarding research question 1, the results of this study align with the findings of Lei and Chuang (2010) and Van Hoof et al. (2014). These studies indicate that numerous factors influence postgraduate students' decisions on which university to apply to for their postgraduate degrees. These factors encompass a wide range of considerations, including university rankings, campus amenities, library collections, class sizes, overall program sizes, faculty attributes, faculty research interests, faculty reputations, the availability of child-care, housing, geographic location, family accommodations, and the quality of the admission process.

However, our study particularly resonates with previous research in two areas: program factors (e.g., department ranking, overall program size) and faculty factors (e.g., faculty research interests, faculty publications, faculty reputation). Notably, Kallio's (1995) research suggests that personal factors (as mentioned by Van Hoof et al., 2014) and family-related factors (e.g., family accommodations, job opportunities for a spouse) significantly influence the university choice decisions of postgraduate students. Unfortunately, the majority of research on postgraduate students' university choice decisions has been conducted in developed countries (e.g., the United Kingdom, Australia, the United States) and some developing nations (e.g., Malaysia and Indonesia), as demonstrated by Adefulu, Farinloye, and Mogaji (2020). Therefore, additional research, especially in developing countries like Vietnam, is needed to provide a foundation for cross-country comparisons and to enhance the theoretical and practical understanding of this topic.

Moving to research question 2, the findings of this study are consistent with those of Aydin and Bayir (2016), Declercq and Verboven (2015), Obermeit (2012), and Steiner and Wrohlich (2012). These studies confirm that family income and parental education significantly impact the university choice decisions of postgraduate students. Prior research also underscores that the relationship between family income and university choice decisions has not received adequate attention (Kinsler, Pavan, 2011), and these two factors yield different outcomes. For instance, Sidin, Hussin, and Soon (2003) observed that family income influences postgraduate students' choices between public and private universities, with students from lower-income families being less likely to attend private institutions. Conversely, high-income families are less price-sensitive when selecting a university (Fuller et al., 1982) and tend to opt for high-quality institutions, in contrast to low-income families (Long, 2004). However, as noted by Sojkin, Bartkowiak, and Skuza (2012), their research found no significant differences between postgraduate students' family income and university choice decisions. The research by Declercq and Verboven (2015) revealed that students with disadvantaged family backgrounds, including lower family income and parental education, face limitations in accessing higher education compared to their counterparts with more favorable family backgrounds. Our study employed various methods and instruments to assess postgraduate students' preferences across diverse disciplines and majors, yielding varied results.

Regarding research question 3, our study demonstrated that marketing and communication, social support, and economic factors are closely linked to the university choice decisions of Vietnamese postgraduate students. In the realm of marketing and communication factors, our findings are consistent with those of Adefulu et al. (2020), Hayes et al. (2009), Chen (2007), Thetsane et al. (2019), and Winn et al. (2014). Research by Yamamoto (2006) and Steele (2002) underscored the importance of marketing and communication tools such as brochures, posters, meetings, sponsorships, billboards, web pages, TV and newspaper advertisements, as well as social networking sites (e.g., YouTube, Facebook, Twitter) in the decision-making process of postgraduate students.

As for social support factors, our study did not yield substantial empirical data showing a significant association between advice from program advisors and university choice decisions among postgraduate students. However, research by Hossler, Schmit, and Vesper (1999) and McDonough (1997) highlighted the strong influence of parental advice, particularly in terms of financial support. Peers and colleagues were also noted as important influencers in students' decisions to pursue higher education, serving as sources of crucial university information (Kim, Gasman, 2011). These findings indicate that intrinsic factors play a significant role in influencing postgraduate students' college choices, underscoring the importance for admissions officers to develop strategic marketing plans to meet students' needs, aspirations, and expectations, ultimately boosting enrollment in postgraduate programs at the university.

From an economic perspective, Fernandez (2010) discovered that the university choice of postgraduate students is influenced by the benefits they perceive relative to other institutions. Before making their decisions, students often estimate the overall costs they will incur during their studies,

including not only tuition but also expenses like rent, food, transportation, and more (Briggs, Wilson, 2007; Cokgezen, 2014). Postgraduate students also assess whether their investment in postgraduate education will align with their expectations in terms of job prospects, income potential, and career advancement (Paulsen, 2001; DesJardins, Toutkoushian, 2005). Tuition fees also factor into their decisions, particularly for low-income students who are more price-sensitive (Heller, 1997). Financial aid has a positive impact on students' choices as it mitigates their financial burden (Foskett et al., 2006). As such, economic factors play a significant role, and universities must offer support throughout the students' academic journey, not only in marketing but also in addressing their financial needs, particularly in the context of Vietnam's universities facing rising education costs.

## **6. Conclusion**

The study explored Vietnamese postgraduate students' perceptions in terms of their university choice and the relationship between postgraduate student demographic characteristics, marketing and communication, social support, and economic factors to ones was examined. The findings revealed that postgraduate students rated a fairly high degree of agreement on university choice decisions. Furthermore, the findings suggest that postgraduate students' demographic characteristics, such family income and father's education, have different impacts on their decision-making. Finally, social support and economic factors (e.g., advice from the spouse, advice from the program advisor, and numerous sources of financial support) have a close relationship with their decisions. In the process of developing a comprehensive solution to increase the ability to recruit students, policymakers and university administrators should prioritize these factors over others. In addition, university administrators and experts still have much room to improve the approach to attracting students to postgraduate programs through modern curriculum design, support services, incentives, or student remuneration policies.

Although there have been many previous studies on university choice decisions, little is known about how these decisions correlate to marketing and communication, social support, and economic factors in developing nations, such as Vietnam. The findings of this study help to fill critical gaps in both theories and practices on this topic. It is hoped that the barriers to in the process of choosing a university discovered in this study are useful for university administrators and other stakeholders in developing and implementing a strategic marketing campaign in the increasingly competitive market for higher education institutions.

## **7. Limitations**

While the study was carefully designed and conducted, it has some limitations. The primary limitation is that the samples were exclusively collected from postgraduate students at the Vietnam National University of Ho Chi Minh City, one of the most reputable multidisciplinary universities in Vietnam. Therefore, future research should aim to collect student samples from a broader range of higher education levels and disciplines, while also considering other influencing factors. This approach would help gather more comprehensive empirical data regarding the assessment of universities by Vietnamese postgraduate students.

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The author declared no potential conflict of interest with respect to the authorship and publication of this article.

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## **Intellectual Support of the Students' Research Activities in Mathematics: Experimental Verification of Effectiveness A Hybrid Learning System**

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### **Abstract**

The research is devoted to the study of the phenomenon of research activity, as well as the search for effective didactic mechanisms for its development. The most promising direction of activating the research activities of trainees is proposed – the development of learning systems based on artificial intelligence methods. This tool is notable for its flexible interface, the ability to adapt to the unique characteristics of each user and focus on their cognitive capabilities. In addition, it makes it possible to create parametric models of students, taking into account their individual level of cognitive development, as well as to differentiate educational material. The authors developed a hybrid intelligent learning system to support students' research activities and introduced it into the practice of teaching mathematics. In this regard, the problem of verifying the effectiveness of the functioning of this system with innovative organizational and methodological support has been updated. The effectiveness was tested on the basis of the developed parameters of scientific potential, reflecting the specifics of research activities in the field of mathematics (personal, activity, communicative, effective), using the module of a hybrid intelligent learning system. The audit established statistically significant dynamics for all the studied indicators.

**Keywords:** methods of mathematics, research activities, intellectual management, educational system, criteria system.

### **1. Introduction**

In the context of a large-scale transformation of the socio-economic and cultural spheres of public life, the role of education as a purposeful process of intellectual, spiritual, moral, creative and professional development of an individual is significantly increasing, the generally recognized result of which is the formation of a highly developed, competitive personality. Modern research in the field of psychology and pedagogy confirms that universal skills (such as creativity, the ability to actively learn,

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creativity) are manifested most effectively in the process of independent search and formulation of problems, generation of original ideas and solutions, as well as the application of knowledge in new situations, especially in the framework of educational activities with a research focus.

The actualization of the problem of introducing a research approach to teaching is determined by the implementation of international scientific and educational projects aimed at developing models of research training in the field of mathematical education (InnoMathEd, Fibonacci, KeyCoMath, Scientix2, etc.). The rich potential of mathematical disciplines in the development of students' research skills is due to the uniqueness of the mathematical method based on the application of basic intellectual operations (analysis and synthesis, analogy, generalization and concretization), as well as universal abilities to prove, model, plan, and design.

This article highlights the issues of studying research activities as an important contribution to the development of the theory and methodology of teaching and upbringing in general and for a deeper understanding of the contribution of various disciplines, in particular mathematics, to the development of this phenomenon. A review of the scientific literature devoted to conceptual, theoretical, methodological, procedural and technological issues of the development of research activities (Kleshcheva, 2015; Savenkov, 2013), allowed to formulate a definition reflecting the essence of this phenomenon: "research activity is an active, creative process carried out in a state of uncertainty, aimed at obtaining subjectively new knowledge about the world around students through the application of the scientific method, as well as the formation of new personal structures (scientific thinking, scientific worldview, research experience)" (Dvoryatkina i dr., 2021). We consider research activity as a unique form of education, where participants in the educational process actively master theoretical and empirical methods of scientific knowledge, form research skills and interact with each other.

Most of the educational projects currently being implemented are aimed at using computer and network technologies that stimulate the rapid development of the digital educational environment, the constant updating of organizational forms and teaching methods, and the development of a methodology for managing research activities in automated learning systems (Guryanov, 2015; Kureichik, Bova, 2014; Lavrov, Barchenko, 2005; Cheng et al., 2020; Holmes et al., 2019; Klašnja-Milićević et al., 2017; Kozlov, Kozlova, 2012; Maaliw, 2020; Sinatra et al., 2020; Van der Linden, 2010). The most promising developments in this area include learning systems based on artificial intelligence methods, characterized by a flexible interface and a high degree of adaptability. Widespread foreign intelligent learning systems are Century Tech, Math-u-See, MATHia by Carnegie Learning, Education Perfect, Yixue Education, Wayang Outpost.

However, in Russia, learning systems based on an intellectual approach are rarely used in school education. Despite the large number of scientific papers devoted to intellectual support of educational research, including the creation and application of adaptive educational materials (Nirmalakhandan, 2007), the development of methodological tools that realize the possibility of solving problems based on the initiation of dialogue (Jonassen, 2000), many experts consider research activities to be too complex, inaccessible to modeling as a type of intellectual and creative activity and they assess its management as a very difficult task, within the framework of which the teacher cannot always control the process of achieving learning outcomes and adapt teaching methods to the individual characteristics of the student (Poddyakov, 2015; Savenkov, 2013).

As part of the implementation of the scientific project "Organization of a hybrid intellectual learning environment in the context of digitalization of general education (using the example of mathematics)", the authors created a hybrid intelligent learning system (HILS) based on artificial intelligence methods for the effective organization and support of students' research activities in the field of mathematics. This system has been implemented in the process of teaching mathematics at school.

When teaching mathematics at HILS, the research activity of students is realized in the process of solving an integral system of non-standard tasks of a motivational and applied nature, which are characterized by the lack of algorithmization, the multivariance of hypotheses and solutions, the need to establish diverse connections and relationships experimentally or theoretically. As a result of such activities, students discover new knowledge, master the methods of scientific knowledge that allow them to delve deeper into the essence of mathematical theories.

The purpose of the study is to develop diagnostic tools for assessing the formation of research activities of trainees and on the basis of statistical methods for verifying the effectiveness of the

functioning of an intelligent learning system with innovative organizational and methodological support that supports research activities.

## 2. Methodology

Within the framework of the study, in order to assess the effectiveness of the functioning of a hybrid intelligent mathematics teaching system, the procedural side of research activity was taken into account when developing a system of criteria, which made it possible to consider it in line with a system-activity approach and assess the formation of such structural components as motive, purpose, conditions, actions, operations. From these positions, the main criteria for assessing the formation of research activities of high school students in teaching mathematics are: motivational and value-based (motivation and value orientation to research activities), cognitive (understanding the structure and methods of solving research problems), operational and activity-based (planning, hypotheses and their justification, rational use of time and resources, as well as teamwork in a group, mutual control), creative (creative attitude to educational and cognitive tasks), communicative (using communication as the main means of interaction and cooperation), reflexive-evaluative (analysis and evaluation of one's activities) (Smirnov et al., 2023). Table 1 presents the characteristics of the listed block of criteria, as well as a set of indicators reflecting the individual characteristics of each criterion. The indicators under consideration act as specific measures of criteria, opening up the possibility for their observation and measurement.

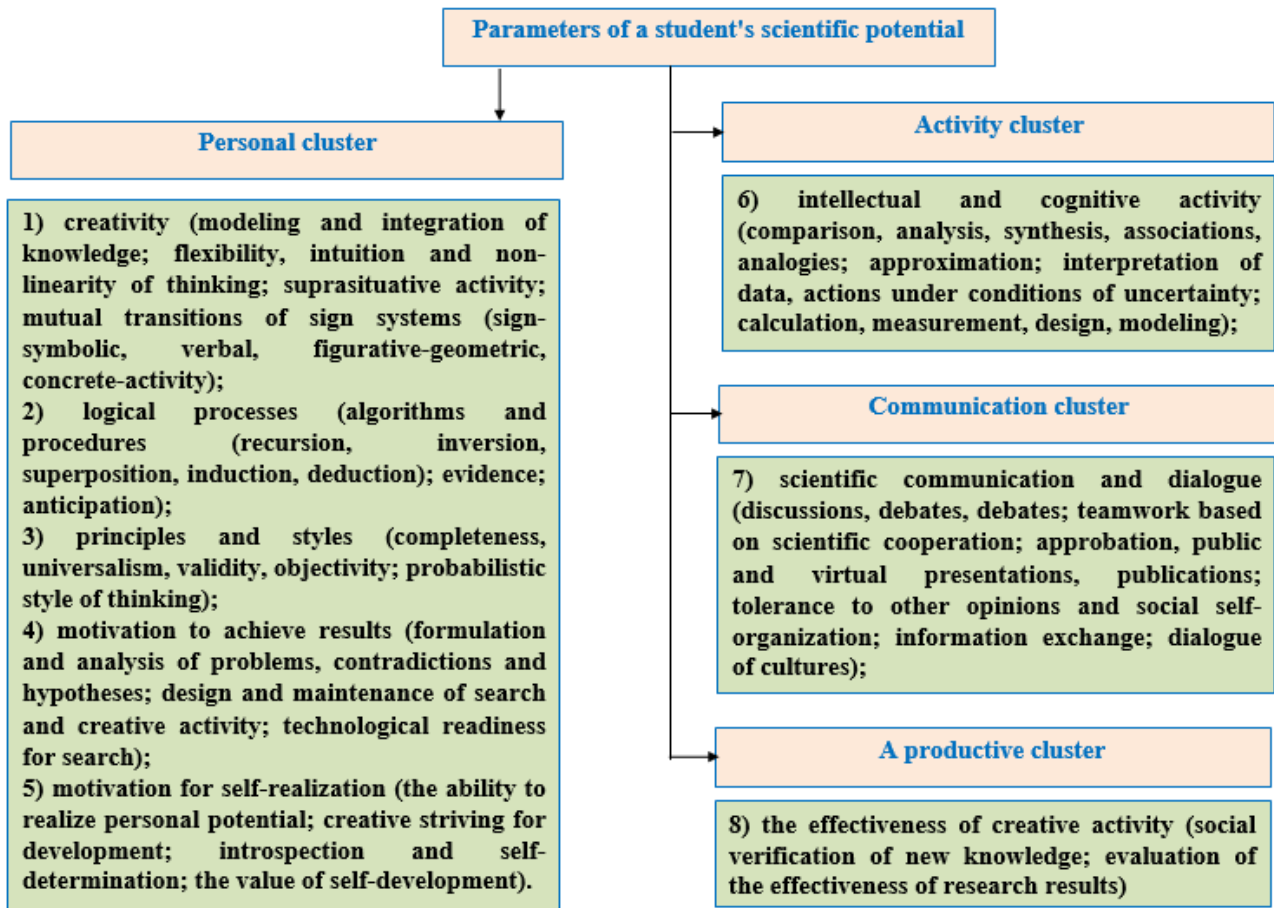
**Table 1.** A system of criteria and indicators for assessing the formation of students' research activities in teaching mathematics

Criteria	Indicators
<b>Value-motivational:</b> awareness of the importance of research activity as a component of a subjective position	-the presence of a cognitive need, -acceptance of the importance of mastering research skills, -conviction of the personal and social significance of the research being conducted
<b>Cognitive:</b> knowledge of the essence of research activity, availability of a system of special (mathematical) and methodological knowledge	-proficiency in various methods and techniques of research activity, skills for solving atypical cognitive problems, -formation of instructional-theoretical, technological and axiological components of research skills
<b>Operational-activity:</b> possession of key research skills	- ability to plan, organize, regulate and control research activities, - analytical and synthetic skills, skills of formulating hypotheses, defining a generic concept, as well as constructing proofs and refutations
<b>Creative:</b> the ability to think creatively and find non-standard solutions to problems	-independence of the idea and originality of problem solving, -the ability to transfer knowledge and methods of activity to a new situation, - independent search for sources of new knowledge, creative approach to the development of a new product
<b>Communicative:</b> the ability to build relationships between subjects of research activity	-communication and cooperation with research subjects, -readiness to overcome conflict situations, -the ability to defend one's own position using various types of speech activity
<b>Reflexive-evaluative:</b> self-criticism and objective self-assessment in research activities	-argumentation of the reasons for the failure to achieve the planned result, -detecting your own mistakes in your activities and determining ways to eliminate them, -the adequacy of the assessment of their capabilities.

In order to identify the effectiveness of the impact of the intellectual learning system on the level of development of students' research activities, preliminary and final monitoring of individual

psychological characteristics was carried out on the basis of the developed set of criteria. At the same time, the quality of achievement of each of the criteria was assessed by a set of personalized parameters of scientific potential, the actualization of which is designed to ensure the adaptability of the hybrid intellectual system to the level of development of the motivational-need, emotional-volitional and cognitive spheres of each student. In general, research potential is understood as a set of unique personal aspects of the student, which affect his willingness and ability to intellectual research activities.

As a result of the study, four clusters of scientific potential parameters were identified, containing specific characteristics of research activity in the environment of HILS (Figure 1): personal (achievement orientation, stylistic features of thinking, logical component of cognition); activity (cognitive processes, visual and analytical-synthetic thinking, computing and design skills); communicative (empathic abilities, communicative tolerance, verbal intelligence); productive (originality, creative activity) (Dvoryatkina et al., 2021). The experimental verification of the effectiveness of the research activities of schoolchildren based on the intellectual management of mathematics teaching in the HILS was carried out with the participation of 1st and 2nd year students of the Institute of Secondary Vocational Education of I.A. Bunin Yelets State University, as well as high school students of Yelets schools. The experiment was conducted during the 2019–2020, 2020–2021, 2022–2023 academic years. A total of 131 students took part in the experiment.

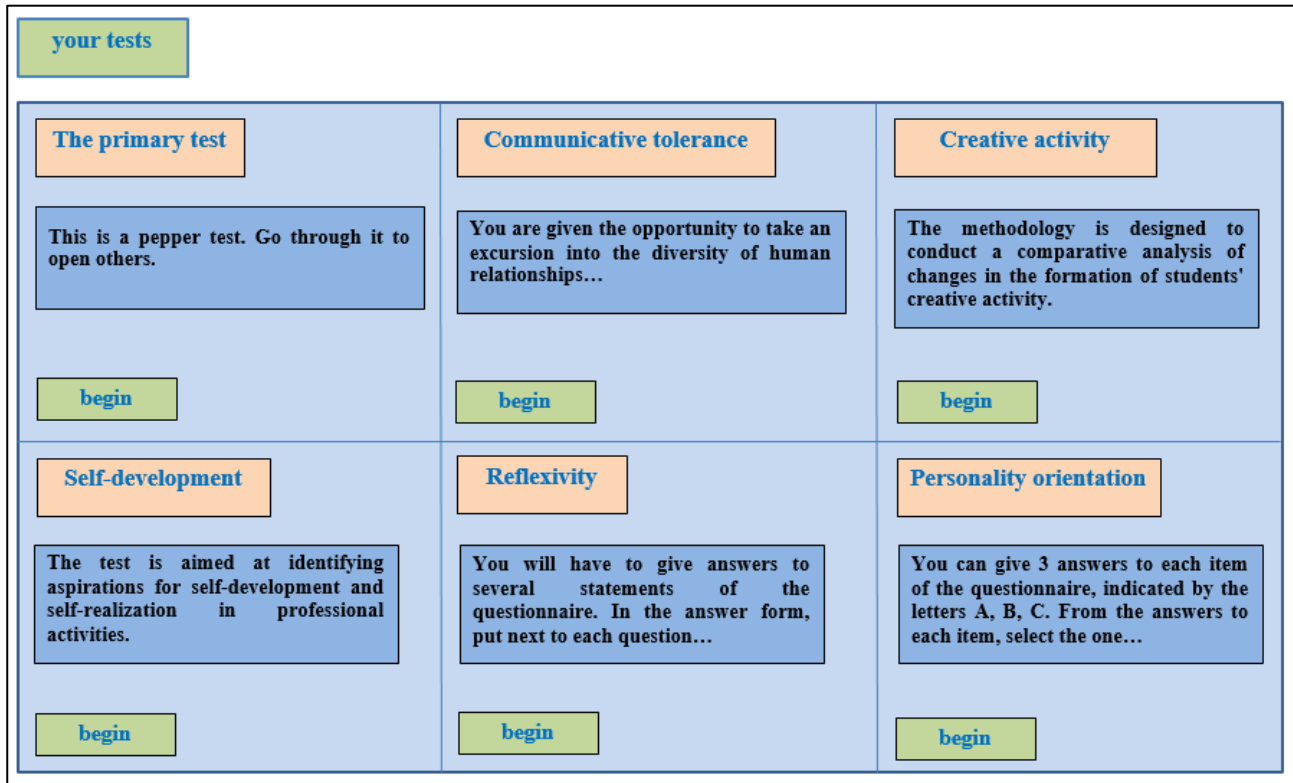


**Fig. 1.** Distribution of scientific potential parameters by clusters of individual characteristics of research activities in the field of mathematics

The main sampling strategy for statistical verification of the effectiveness of the functioning of an intelligent learning system was the method of forming a simple random sample – a simple non-repetitive sample. The main focus during group creation was on uniformity and representativeness, which is crucial for statistical processing of research results. In particular, an equal number of boys and girls with an average level of academic achievement in mathematics were selected for each age or class. The choice of teachers of these disciplines was carried out according to the principle of the same rating (pedagogical knowledge and skills). Descriptive

statistics methods were used to process experimental data, as well as the following statistical criteria – the nonparametric G-criterion of signs, the Wilcoxon T-criterion, the multifunctional  $\phi$ -criterion, the Piron  $\chi^2$ -criterion and the parametric Student t-criterion.

To diagnose scientific potential, a set of qualimetric techniques was used, such as testing, psychodiagnostics, and expert assessment. At the same time, the activities of the trainees were monitored, group work, communication situations, discussions and procedures for the protection of research projects were analyzed. The initial, current and final measurements of the parameters of scientific potential were carried out using the module of a hybrid intelligent learning system (Figure 2) (Dvoryatkina, Golovin, 2023).



**Fig. 2.** A diagnostic testing environment for evaluating the effectiveness of the functioning of the HILS, accompanied by the research activities of schoolchildren in mathematics

In particular, the Amthauer intelligence structure test was used to evaluate such parameters as "Mastery of logical operations", "Intellectual and cognitive activity". The study and evaluation of the "Creativity" parameter was carried out using the D. Creativity questionnaire. Johnson. Diagnostics of the parameters "Motivation to achieve the goal" and "Motivation for self-realization" was performed by conducting a questionnaire test by A. Mehrabian and a test "Reflection on self-development" by L.N. Berezhnova, respectively. A questionnaire developed on the basis of theoretical assumptions about the structure of human values (M. Rokich) was used to study the parameter "Value orientations and the significance of research activities". The parameter "Thinking styles" was evaluated by means of the A. Alekseev, L. Gromova "Individual thinking styles" test. Despite the difficult diagnosability of the parameter "Scientific communication", the authors justified and considered the method of diagnosing the orientation of the personality of B. Bass for its assessment.

Empirically obtained weight values of the parameters of scientific potential made it possible to establish threshold values of diagnostic criteria for assessing the quality of research activities of high school students in teaching mathematics in a hybrid intellectual environment and to assess the level of manifestation of each of the criteria in 3 positions – low, medium, high. For example, the levels of development of the motivational and value component are presented as follows: low is a manifestation of situational passivity in relation to research activities; medium – active and conscious application of the research approach; high – clear internal motivation and a high degree of activity in research behavior. The gradation of the levels of formation of the creative component



has the following characteristics: low – performing research tasks based on trivial representations; medium – the presence of individual elements of creativity in research procedures; high – the use of a creative search approach in solving mathematical problems.

### 3. Results

The study used several quantitative indicators of scientific potential to assess the effectiveness of the intellectual system. During experimental work, a cluster of individual characteristics of research activity was formed, which established statistically significant differences in the parameter "Logical processes". The sample consisted of 16 randomly selected trainees. Measurements were made before and after the experimental training. Prior to experimental training, the sample mean and standard deviations were  $\bar{x} = 35,56$ ;  $\sigma = 6,87$ , after the experimental –  $\bar{x} = 43,75$ ;  $\sigma = 4,47$ . Verification using the Student's t-test for dependent samples revealed that  $t_{emp} = 2,49 > t_{kr}(0,05; 15) = 1,75$ .

According to the parameter "Motivation for self-realization" of the personality cluster, an experimental check revealed significant differences in the level of self-development before and after working in a hybrid intellectual learning system. The distribution of the total number of points by levels obtained as a result of testing of trainees is shown in Table 2. As a result of data clustering, three groups of trainees with different levels of self-realization were identified: an insufficient level of self-realization, with an average level of self-realization and a high level of self-realization.

**Table 2.** Distribution of the total number of points of the trainees

Levels	Total points	Before, %	After, %
Low	18-29	44	6
Medium	30-39	50	75
High	40-49	6	19

The Pearson  $\chi^2$  criterion was used as the main statistical method to identify differences between two empirical distributions ( $\chi^2 = 6,3$ ,  $p < 0,021$ ,  $df = 2$ ). The motive for self-realization has a positive effect on the ability to develop various ideas, solve various problems, formulate hypotheses, i.e. on the implementation of research activities by students. Motivation to achieve results was measured using questions taken from the A. Mehrabian questionnaire, which has two forms – for boys and girls and includes 32 and 30 questions, respectively. Two types of motives were taken into account: the desire for success and the desire to avoid failure. To select the dominant motive, the scores were summed up and the subjects were divided into two contrasting groups: 165-210 points (motivation to achieve success); 76-164 points (motivation to avoid failure). If empirical data fall within the range of 30-75 points, it is impossible to draw a conclusion about the dominant motive (Table 3).

**Table 3.** Distribution of respondents by motivation for achieving results

	The dominance of motivation for success	The dominance of the motivation of avoiding failure or there is no dominant motive
<b>Before</b>	12,5 %	87,5 %
<b>After</b>	37,5 %	62,5 %

The angular Fisher transform was used to assess whether the differences in the proportions of the characteristic characteristics between the two samples were reliable. Significant differences between the "before" and "after" indicators were found at a 5 % significance level: ( $\varphi_{emp}^* = 1,68 > \varphi_{kr}^* = 1,64$ ). This allowed us to reject the hypothesis that there were no differences in the manifestation of the studied effect (dominance of motivation for success) in the trainees before and

after the experimental exposure. Thus, respondents with a predominant motivation for the result are characterized by a high level of scientific potential.

The conducted experiment allowed us to establish a significant difference in the level of creativity of the trainees before and after the experimental exposure. The innovative approach proposed by the authors contributes not only to a deep understanding of mathematics, but also ensures the development of mathematical creativity. If before experimental training, the values of high and low levels of creativity among schoolchildren were 6 % and 43 %, respectively, then after studying at the HILS, it was possible to observe indicators in 6 % and 62 % of respondents. On the basis of Pearson's  $\chi^2$  criterion, significant differences in the level of creativity before and after experimental exposure were established:  $\chi_{emp}^2 = 7,5 \geq \chi_{kr}^2(0,05;2) = 5,99$ .

The results obtained confirm the conclusions of studies that found that the search for solutions to complex problems in a hybrid open environment contributes to the acquisition of creative thinking skills (Waldrop, 2015; Hämäläinen, Vähäsantanen, 2011; Tan, 2009). In turn, Gerald F. Smith notes that the knowledge-intensive nature of innovative tasks creates the possibility of generating productive ideas and developing creativity (Gerald, 2003). Thus, students with a high level of creativity can achieve high results in the scientific field.

The distribution of trainees by levels of development of the parameter "Principles and styles" is shown in Table 4. It is obvious that the entire range of cognitive thinking styles is represented in the studied sample, while the predominant thinking styles of the trainees are idealistic (assessment of problem solving based on intuition, a broad information basis, formal logic, emotional states, subjective assessments and values) and pragmatic (reliance on individual experience in solving problems, focus on fast and the specific result of the activity, the use of widely available materials and information). The preference for practical activities, practice-oriented thinking, and the desire to control ongoing processes have a positive impact on readiness for research activities. At the same time, intuitiveness, increased interest in the goals and motives of research activities, and a tendency to control have a positive impact on the innovative nature of research activities.

**Table 4.** Distribution of thinking styles before and after experimental learning

Styles	before(%)	after (%)
analytical	13	42
synthetic	23	36
idealistic	45	33
pragmatic	39	29
realistic	33	25

The analysis of the distribution of stylistic features of thinking has established that after experimental training, the predominant analytical style of thinking is characterized by a tendency to systematic and comprehensive consideration of the object under study, a logical way of solving problems, and synthetic, expressed in the ability to combine various methods, conduct thought experiments, generate new ideas. In the course of research activities in a hybrid intellectual environment, such significant features as a tendency to in-depth analysis of issues, comprehensive and systematic consideration of the problem in those aspects that are set by objective criteria were formed. A slight change in the percentage of students with one of the most complex skills and a synthetic style of thinking that is difficult to develop after experimental training is due to a change in the conditions and means of learning. The ability to plan, design a solution to a problem, establish relationships between the elements of problem solving, and find a fundamentally new solution to a problem initiated the intensification of research activities. The combination of analysis and synthesis is a systematic thinking necessary to obtain a comprehensive understanding of a complex situation and problem and is an important element of research activity (Bartlett, 2001).

At the significance level of 0.05 %, the absence of significant differences in stylistic features among the trainees before and after experimental training was revealed (Table 5). The Student's t-test proved the normality of the trait distribution, and the accuracy of mode, median, and sample average was confirmed by using the 3-sigma rule.

**Table 5.** Comparison of the average of two samples based on the application of the Student's t-test

Styles	The empirical value of the t-test	The critical value of the t-criterion	$(\bar{x}; \sigma)$ , before	$(\bar{x}; \sigma)$ , after
analytical	1,8144	2,0211	(50,09; 7,81)	(52,00; 7,36)
synthetic	0,8545	2,0395	(55,86; 12,06)	(53,4; 5,82)
idealistic	1,0712	2,0227	(53,40; 7,81)	(51,09; 7,80)
pragmatic	0,5579	2,0322	(58,20; 9,93)	(56,81; 5,70)
realistic	0,9684	2,0369	(56,13; 11,46)	(53,45; 5,87)

Analyzing the results for the activity cluster (the parameter individual cognitive activity), we can conclude that there are minor differences in the shift of the obtained indicators. Applying the Student's t-test, it was decided to reject the null hypothesis at a 5 % significance level about the equality of the average two samples before and after experimental training  $t_{emp} = 2,16 < t_{kr}(0,05; 15) = 2,13$ . The "Paired two-sample t-test for averages" mode of the Excel TP was used for verification. Thus, a slight dynamics of intellectual cognitive activity was established due to the provision of a hybrid intellectual system for the regularity of tasks, a high level of independence of trainees, constant monitoring, self-organization of trainees, motivation for a sequence of actions and the need for intellectual activity.

Scientific communication in research activities serves as a presentation and measure of scientific productivity, an effective way to convey complex information, especially to an audience that is outside the field of scientific research, and is also necessary in communication activities with oneself, for example, in order to deal with complex mathematical concepts, focus on determining learning outcomes, etc. However, statistical verification using the G-criterion of signs did not reveal significant differences in the dynamics of scientific communication development at the 5 % significance level:  $G_{emp} = 4 > G_{kr} = 2$  (0,05; 11 – the number of typical shifts). The axes of significance in this criterion are inverted. Therefore, the null hypothesis is accepted: the increase in the level of scientific communication is accidental. This result is quite expected due to the fact that many aspects of the traditional model of scientific communication (scientific discussion of a question or group of questions, communicative interaction, communicative culture) are difficult to form when working in an intellectual learning environment. Verbal scientific communication in the form of an active dialogue or discussion is necessary.

The effectiveness of creative activity was tested on the basis of the Wilcoxon T-test. A significant change in the positive dynamics of this indicator was found at the 1 % significance level:  $T_{emp} = 24 > T_{kr}(0,01; 16 - \text{total number of respondents}) = 23$  (the axes of significance in this criterion are inverted). Therefore, the null hypothesis is rejected: the intensity of shifts in the direction of increasing the level of creative activity does not exceed this indicator in the direction of decreasing. Creative activity is characterized by independent and original solutions to complex problems, the desire to penetrate deeply into the essence of phenomena, the active search for non-standard solutions, the free transfer of knowledge and skills to new situations. Therefore, this personality quality is an effective source of personal development and an important indicator of the level of formation of research activity, and a hybrid intellectual environment creates conditions for its effective development by solving complex, non-standard research tasks.

#### 4. Discussion

The monitoring of the individual psychological characteristics of students made it possible to identify the optimal parameters of the psychological readiness of schoolchildren for research activities in the context of the implementation of a hybrid intellectual learning environment, among which the authors include motivation to achieve goals and motivation for self-realization, value orientations and the importance of research activities, the cognitive component of creativity, mastery of logical operations, thinking styles, skills, skills and experience design and research activities, readiness for scientific communication and dialogue. Thus, personalized parameters of scientific potential, grouped into four clusters (personal, communicative, activity, and productive), were introduced into the scientific field, which determine the content of the structured educational content of the intellectual learning system.

The theoretical value of the results obtained consists in expanding the conceptual understanding of the system of psychodiagnostic research of the quality and success of students' research activities in the context of the implementation of a hybrid intellectual environment. The developed diagnostic complex for assessing the parameters of scientific potential is important both for psychological science and for the theory and practice of introducing intelligent systems into the field of education.

The practical value of the experimental results lies in the fact that they act as the technological basis for the formation of a set of parameters of the integrated model of the learner for setting adaptation algorithms, as well as the preliminary formation of a system of didactic, setting-target, meaningful and logical-structural conditions in order to minimize the imprinting time of a hybrid intelligent system by selecting the topology of a neural network. The diagnostic experiment investigated how the saturation factor of the information environment affects the psychological readiness of students for research activities. A significant positive effect has been established on such indicators as principles and styles, motivation to achieve, and logic processes of early immersion in the academic scientific space.

The results obtained do not contradict the already available data in the field of activating the research potential of trainees through modern methods and tools (Bartlett, 2001; Gerald, 2003; Waldrop, 2015; Hämäläinen, Vähäsantanen, 2011; Tan, 2009). At the same time, the proposed technological solution has a number of advantages over previously developed intelligent learning systems. Utilizing a blend of methodologies in the creation of an advanced system is crucial to mitigate the potential dangers linked to inaccuracies in tracking individual paths. The developed intellectual system is not only focused on teaching subject knowledge and skills, but also contributes to the effective development of the student's personality through involvement in the process of solving non-standard mathematical problems, which generally contributes to the formation of a stable knowledge system, the development of cognitive abilities, motivation, and research thinking. The outcome of research endeavors focused on the advancement of comprehensive constructs of intricate knowledge is the expansion of scientific capacity, ingenuity, and analytical reasoning, consequently leading to an enhancement in the standard of mathematical instruction in educational institutions.

Optimization of algorithms for building a knowledge space; improvement of technologies for storing, processing and presenting the structure of knowledge; detailing the complex of psychological and pedagogical conditions for the use of a hybrid intelligent mathematics teaching system; expansion and enrichment of organizational and methodological support for the functioning of this system can be considered as prospects for further research in the process of testing an intelligent mathematics teaching system. The solution of these large-scale tasks will contribute to the further transformation of the landscape of traditional mathematical education in the direction of creating a high-tech educational space in which artificial intelligence mechanisms act as a means of interactive interaction of all subjects in the context of global scientific discourse.

However, despite the identified positive effects of the introduction of a hybrid intellectual system in the process of teaching mathematics (the possibility of personalizing learning, building an individual educational trajectory, developing important social skills such as creativity, critical thinking, self-regulation of behavior), a number of potential problems and limitations associated with the process of incorporating this technological solution into the educational environment can be indicated schools. In particular, they should include the presence of limiting characteristics of the degree of intellectualization of the system, established by the developers and limiting its capabilities in terms of self-learning, data synthesis and analysis, perception of the full range of the sensory-emotional sphere of subjects of education, as a result of which the system remains only a means of simulating the situation of "live communication". On the other hand, the desire of developers to strengthen the autonomous nature of the functioning of a hybrid intelligent system requires continuous analysis of the dynamics of its operation, assessment of the correlation dependence of the implemented algorithms and learning outcomes, predictive analytics, which significantly complicates the process of integrating such software products with the digital educational environment.

## **5. Conclusion**

During the investigation, the researchers formulated a set of standards for measuring the efficiency of the mixed cognitive system of math instruction, enabling a thorough evaluation of the

development of all essential elements of students' academic performance – motivational, cognitive, activity, communicative, reflective. The developed criteria and indicators are able to provide an objective assessment of the dynamics of the development of research activities of high school students in the process of teaching mathematics, which makes a significant contribution to the expansion of organizational and methodological support for the process of teaching mathematics using innovative digital technologies.

Monitoring of the individual psychological characteristics of the formation of the parameters of scientific potential before and after the application of the system of intellectual support of research activities based on a set of qualimetric techniques makes it possible to more accurately select the content of structured educational content, differentiate the levels of success and quality of research activities in the layers of a hybrid neural network.

An analysis of the empirical results of the study using a set of mathematical and statistical methods showed a positive dynamics in the level of development of research skills and abilities in experimental groups of students, ensuring the reliability of previously obtained theoretical conclusions about increasing the level of research potential in the context of the implementation of a hybrid intellectual system of teaching mathematics.

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## **Improvement of the Learning Process: the Experience of Introducing a Cumulative System in Assessing Student Learning Success in Distance Learning**

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### **Abstract**

In today's world, in the context of developing digitalization, difficult epidemiological conditions due to the COVID-19 pandemic, and the recent quarantine restrictions, the educational process has been predominantly distant or independent for students. In this light, there arises the need to research and apply innovative methods for the assessment of learning success in distance learning. The purpose of the article was to develop a system for evaluating the success of students' educational activities in an online learning environment. The paper reviews the current state of online learning under quarantine restrictions due to COVID-19 and the features of this learning process for all its participants. The study proposes a system for the assessment of learning outcomes, the core idea of which is the presence of two primary parts of assessment: compulsory (aimed largely at the assessment of knowledge and skills) and elective (providing for the expression of creativity and the development of a personal development trajectory). The results of a pedagogical experiment support the research hypothesis that the establishment of an assessment system based on students' conscious construction of their total number of points for the academic discipline considerably raises the level of motivation and the quality of learning.

**Keywords:** online learning, students, teachers, grading system, learning success, learning motivation.

### **1. Introduction**

With the advent of the COVID-19 pandemic, universities in many countries had to considerably reorganize the learning process to minimize the potential negative consequences of

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the pandemic. Higher education institutions were forced to adapt to the conditions that demanded a transition from traditional in-person training to online learning (Engzell et al., 2020). In the period of quarantine restrictions related to COVID-19, online learning using digital technology became the predominant method of organizing university educational activities.

Researchers argue that the new paradigm of online learning relies on the theory of constructivism, which suggests that the learning process assumes the student's active participation in the educational process. Under this approach, the student not merely receives and accumulates knowledge but uses critical thinking, develops their own position, searches for creative ways to solve problems, and constructs knowledge independently or in a team with other students. In addition, this pedagogical approach enables students to decide on the relevance and validity of the data in the flow of information received (Khribi et al., 2009). All these characteristics imply the organization of a learning process the active center of which is the student themselves and their striving for self-development, self-discipline, and self-realization (Joksimović et al., 2015). We proceed from the conviction that before the introduction of online technologies, many students understood their responsibility for their learning outcomes and assumed an active position grounded in the development of social competence and self-organization. However, with the development of the pedagogical approach in which the learning process is centered around the student, the introduction of forms of training that utilize digital technology allows interested students to achieve better learning results. The striving for new achievements and the joint creative work of the teacher and the student in performing learning tasks, as evidenced by research (Picciano, 2017), have majorly changed both in content and outcomes.

For the performance of learning tasks, universities introduce into the educational practice both synchronous and asynchronous online learning courses. Synchronous courses allow students to attend them online in real time in accordance with the schedule provided by their universities. Asynchronous courses, in turn, take a flexible approach, enabling students to create an individual learning schedule and determine their learning hours with consideration of their specific individual needs. With this form of learning, students can develop their sense of responsibility and self-discipline, which are vital components in future professional practice (Keskin, Yurdugül, 2020). Asynchronous learning gives students the opportunity to work with educational materials and complete assignments at their own pace, without the limitations of a fixed schedule (Arthur-Nyarko et al., 2020). For example, this option is suitable for students, who are limited in time due to a busy work schedule or wish to study separately rather than in an academic group (Zaheer, Munir, 2020) if the curriculum allows it. Researchers note that having the opportunity to work in a comfortable environment with free access to the Internet, students consider this type of learning the most appealing and efficient (Ferraro et al., 2021).

In Russia, the quarantine restrictions put in place in 2020–2022 due to the COVID-19 pandemic (Iakobiuk, 2020) necessitated the transformation of the traditional education system. As in most countries, Russian schools and universities quickly switched to online learning platforms to ensure the accessibility of education. As the situation evolved, however, blended learning gained in popularity and became more convenient. The blended learning approach combines online classes with face-to-face classroom instruction, so it was viewed as a balanced and efficient way to mitigate the issues associated with the pandemic while ensuring that students remained engaged and had access to a quality education (Podlesek, Kavcic, 2021). Furthermore, according to students themselves, this form of training gives the opportunity to rationally plan attendance in courses that they cannot attend in full due to the epidemiological circumstances faced (Mohammad AlHamad, 2020). That notwithstanding, students attach great importance to communication with the teacher and the academic group, as this environment gives students the opportunity to actively participate in discussions, ask questions, seek clarification, and collaborate within the team (Cao et al., 2020). This aspect of group activity allows the student to gain greater motivation for self-improvement, although it can also have the opposite effect. Students may experience a decrease in motivation if they consider their own efforts insignificant compared to the achievements of their peers (Zhang, Lin, 2020).

An obvious advantage of blended learning is the ability to divide the learning process into theoretical and practical components. Lectures, seminars, and webinars on certain subjects are held online, while laboratory work, applied research, and practical classes can take place in person, considering all quarantine restrictions and using the necessary personal safety items (Ocak, 2011).



Thus, we come to the conclusions that allow us to identify the key results achieved in the period of active implementation of online learning in universities, the practices that universities should preserve in their educational practice, and the issues that need to be solved to improve the efficiency of online learning.

1. Active introduction of online learning has helped teachers and students to master and apply information competence and be active participants in the virtual educational process (Keengwe, Georgina, 2012). By virtue of online learning, students do not necessarily have to follow or use specific methods or approaches to completing assignments. In this context, teachers can organize the educational process in such a way that students are able to analyze both the intermediary and final results of their work by going beyond simple grading and providing meaningful feedback (Palmer, Holt, 2008).

2. Online learning has revealed the need for the active development of self-grading and self-organization systems on the part of the student. As students acquire greater freedom of action and the opportunity to make their own decisions on the performance of assignments, the teacher must not only teach a subject but also teach students to identify their strengths and weaknesses in the knowledge of it.

3. Teachers have received additional tools for the assessment of students' performance in the form of individual assignments that reveal the creative side of the personality and testing that gives information about the level of thematic knowledge of the discipline (Alvarez, 2021; Firat, 2016). Case studies (real situations that occur in professional practice), group projects (preferably with role distribution), discussions for the purpose of developing alternative solutions to problems (alternative thinking), and virtual presentations can become the types of educational activities that, on the one hand, develop students' ability to critically evaluate their learning outcomes (Lee, 2020). On the other hand, these activities correspond to the principle of teachers assessing the work of students based on the observation of their behavior in the educational environment and the ways they approach tasks of varying difficulty (Arnò et al., 2021).

4. Teachers need to develop an individual strategy for effective learning based on tasks of varying difficulty and the personalization of teacher-student interaction in the educational process. A critical task is to find a balance between the difficulty of tasks and students' interest, as prolonged negative experiences can diminish motivation and interest in the subject. For this reason, when organizing online classes, the teacher must set specific goals for each assignment, help develop strategies for their completion, provide relevant examples of their performance, make students critically evaluate each of them and draw constructive conclusions at each stage of performing the assignment, and support students' interest (Rapanta et al., 2020).

Proceeding from the above and considering the existing requirements for the system of assessment of students' success in educational activity (objectivity, comprehensiveness, systematicity, efficiency, planning, etc.), the purpose of this article is to develop a cumulative system for evaluating the success of students' educational activities in the context of online education. Such an assessment system can be applied not only under quarantine but also under any other circumstances where the use of online learning is possible. In an era when distance learning may become a necessity for a variety of reasons, such as pandemics and geopolitical issues, it is crucial to have an adaptable and reliable assessment system.

The research hypothesis put forward is that as a result of creating an assessment system based on students' conscious construction of the total number of points received as a result of mastering the academic discipline, the level of motivation and quality of learning significantly increase.

## **2. Methods**

For the purpose of achieving the goal of the study, we used several methods, among which we must primarily emphasize the analysis of psychological, pedagogical, scientific, and methodological literature, the survey method, and a pedagogical experiment.

The leading method of research was a pedagogical experiment, which was conducted in the second semester of the 2021–2022 academic year based on three universities: the Peoples' Friendship University of Russia, Financial University under the Government of the Russian Federation, and Moscow State University of Psychology and Education. One experimental (EG) and one control (CG) group were chosen in each university. The study involved a total of 74 2nd-year students. The experimental and control groups were formed based on the existing academic groups.

The experiment was conducted in several stages (Table 1).

**Table 1.** Stages of the pedagogical experiment

Stage	Content of the stage
Preparatory	determination of the relevance, goal, objectives, object, and subject of the study
Organizational	preparation methodical support for experimental assessment, selection of participants
Practical	introduction of a cumulative system in the assessment of individual academic disciplines
Summarizing	verification of results (determining the dynamics of indicators of students' success in learning)

The experimental study was conducted as part of the teaching of specialized disciplines in the natural conditions of distance learning with the use of the Moodle distance learning system. Being a well-recognized learning management system (LMS), Moodle offers several functions that simplify distance learning, which makes it suitable for conducting educational experiments in a virtual environment. Given that the pedagogical experiment was conducted in three separate universities, it was important to use a reliable and scalable platform able to satisfy a variety of needs. Moodle, with its customizable features, allows faculty to create and manage courses, grades, and communication tools, providing uniformity across institutions. In addition, the system's ability to support a significant number of users simultaneously facilitated the smooth participation of 74 2nd-year students from various academic groups.

Structurally, the disciplines consisted of 10 topics and, according to the working curriculum, had the following distribution of hours: lectures – 20 hours; practical classes – 20 hours; seminars – 20 hours.

Accumulation of points within each topic was carried out by means of the system developed as part of this study, which included two constituent parts of assessment: compulsory and elective. The compulsory component was comprised of the following components (Table 2).

**Table 2.** Accumulation of points for the compulsory part of the learning assessment system

Task	Maximum score
Results of working with the lecture (Moodle)	3
Express control on the results of the study of a topic	3
Performance of a practical assignment	5
Participation in a seminar class (at least one report)	5

The elective part assumed students chose from the following types of tasks (Table 3).

**Table 3.** Accumulation of points for the elective part of the learning assessment system

Task	Maximum score	Conditions of completion during the semester
Reports with the use of visual aids (own infographics, presentations)	5	No limitations
Organization and implementation of a practical/seminar class	5	On the topics of the discipline
Execution of a learning project	8	Topics are approved by the teacher
Development of visual aids on the topics of the discipline (creation of video clips)	8	Topics are approved by the teacher
Writing an article/report abstract	10	In accordance with the terms of the conference

Success in learning was determined using the formula: (number of “excellent” grades + number of “good” grades x 0.64 + number of “satisfactory” grades x 0.36 + number of “passing” grades x 0.16 + number of “not passing” grades x 0.08) x 100 %/total number of students.

Subsequent processing of the results of the pedagogical experiment was carried out using mathematical statistical methods. The task was to detect differences in the distribution of a certain attribute (learning success) when comparing two empirical distributions. Pearson's  $\chi^2$  criterion was used for this purpose. The scale of measurements had two categories ("successful" and "unsuccessful"), hence, the number of degrees of freedom  $\nu = 1$ .

Null hypothesis  $H_0$ : there are no differences in learning success between the CG and EG groups.

Alternative hypothesis  $H_1$ : there are significant differences in learning success between the CG and EG.

### 3. Results

Prior to the introduction of the proposed assessment system, learning success in the EG and CG was analyzed for the previous semester. The results showed that the two groups were almost identical in success indicators (72 and 74 %, respectively). The overall level of quality when compiling the EG and CG scores for the discipline demonstrated results of 85 and 77 %, respectively (Table 4).

**Table 4.** Comparative analysis of success in learning in the experimental and control groups

No.	Group	Number of students	Learning success, %	
			previous semester	current semester
1	CG	74	74 %	77 %
2	EG	72	72 %	85 %

Table 4 shows that the pedagogical effect in the EG was 13 % in contrast to 3 % in the CG, which proves the pedagogical efficiency of the proposed experimental assessment of learning outcomes.

From the table of  $\chi^2$  values for the significance level  $\alpha = 0.05$  and the number of degrees of freedom  $\nu = 1$  we determined the critical value of the statistic  $\chi^2_{crit} = 3.841$ . Since the calculated value of  $\chi^2 < \chi^2_{crit}$  ( $1.494 < 3.841$ ) before the teaching experiment, i.e., did not fall into the critical region, at the beginning of the experiment the CG and EG were not significantly different in learning success.

Calculation of the  $\chi^2$  criterion for the CG and EG after the pedagogical experiment showed that  $\chi^2 > \chi^2_{crit}$  ( $21.364 > 3.841$ ). This constituted grounds for rejecting the null hypothesis  $H_0$ . The acceptance of the alternative hypothesis  $H_1$  made it possible to argue that these samples had statistically significant differences.

Given that in the experimental groups student training was performed with the use of the cumulative system of assessment of academic performance under quarantine restrictions, it can be argued to be the factor contributing to higher results. Therefore, the proposed hypothesis can be considered experimentally confirmed.

In addition, we should note the elective tasks chosen by EG students most often (Table 5).

**Table 5.** The choice of components in the elective part

Indicator	Value
Reports with the use of visual aids (own infographics, presentations)	100 % of EG students
Organization and implementation of a practical/seminar class	20 % of EG students
Execution of a learning project	20 % of EG students
Development of visual aids on the topics of the discipline (creation of video clips)	2 % of EG students
Writing an article/report abstract	30 % of EG students

A survey conducted after the completion of the discipline indicated that 85 % of EG students believed the opportunity to choose disciplines increased the level of motivation. Only 5 % considered this scale too complicated. 90 % agreed that this method of accumulation of points should be actively introduced in the educational process.

Based on the above, it can be concluded that the hypothesis put forward at the beginning of the experiment was confirmed. Survey results demonstrated an increase in students' motivation for educational activity and a positive change in the quality of education.

The proposed compulsory and elective components in the system of assessment are recommended. Their structure is determined by the specifics of the discipline, its goals, etc. However, the general principles of construction of such an assessment system can be applied in teaching both the humanities and exact sciences.

#### **4. Discussion**

We would like to emphasize that the proposed assessment system can utilize the cumulative approach to assessing the success of learning.

In particular, with respect to students, this system encourages awareness of the need for systematic work on the implementation of an individual curriculum; for timely evaluation of the quality of one's work in the study of the discipline and completion of all types of academic load before the exam session; for the development of the ability to self-assessment as a means of self-development and self-control; for making adjustments to one's independent work throughout the semester.

However, a considerable part of students in Russian universities are not fully ready for self-education and need a certain degree of control on the part of the teacher, who must explain and demonstrate how to focus on achieving the expected goal and what efforts are needed for it (Weiner, Hurtz, 2017).

Implementation of this cumulative system in the educational process requires particular attention to the increased workload of teachers with respect to grading. This drawback can be compensated for by using an electronic grade book (or, for example, Excel spreadsheets), as well as precise planning and establishing grading criteria (development of a technological map for the discipline).

This raises the need for retraining courses and masterclasses for university research and pedagogical staff to improve their skills and abilities in using online platforms along with their digital literacy (Joksimović et al., 2015), the application of new approaches in learning and teaching (Ferraro et al., 2021), mastery of the skills of working in a digital learning environment, and content and quality-related revision and reorganization of the structure of academic courses and the educational process overall (Keskin, Yurdugül, 2020).

The cumulative system of assessment of academic performance enables research and pedagogical staff to plan the educational process in the discipline and stimulate systematic work of students throughout the academic semester; to increase students' competition in learning to activate the personal factor based on the assessment of the real place the student takes among peers according to their results; to make timely adjustments to the organization of the educational process and the methods and means of teaching used.

The training of research and pedagogical personnel is directly connected to the mastery of new teaching methods that would provide a different perspective on the learning process. Since the beginning of the quarantine restrictions and the transition to online learning, teachers at Russian universities have started teaching in the new format while applying the same methods and tools that are typical for classroom-based learning (Iakobiuk, 2020; Zaheer, Munir, 2020). This resulted in a decline in student interest in the learning process (Podlesek, Kavcic, 2021).

We believe that the content of the discipline taught is a highly important aspect of an online class. In the long run, the teacher must learn to organize the material of the class, define the intermediate and final goal of the course, share with students their expectations (not requirements) for a positive result of joint learning interaction, provide students with all the necessary materials and access to electronic resources and virtual learning environment for students to outline their own perspectives on the study of this discipline, give students information about the list of tasks to be completed by the end of the course and the grading system, and, most importantly, inform students about alternatives for the class in the event of technical problems or other complications that might prevent them from attending the class. The schedule of lessons should be formed in accordance with the needs of the student at a clearly defined time, and the amount of individual work should be monitored and kept at a moderate level.

It is important to note that to simplify online learning, Russian universities have created a virtual learning environment that allows instantly grading students' work and forming informative feedback on the work (Iakobiuk, 2020). This is an interactive online platform that provides

students with information about the content of disciplines, working curricula, plans of practical classes, the list of group and individual assignments, the faculty members teaching the discipline, and the system of assessment of learning outcomes.

Particular attention should be paid to the etiquette of online communication as an inherent component in effective online learning. Online learning forces students to take responsibility for their learning activities. In the absence of direct control from the teacher, students should allocate time to critically analyze each completed task (Mohammad AlHamad, 2020). These efforts will contribute to their concentration, purposefulness, and self-development.

The limitations of the study include the size and age composition of the participants in the pedagogical experiment.

The prospect of further research is the analysis of the prospects of the proposed evaluation system at the present time after the lifting of quarantine restrictions.

## 5. Conclusion

Blended learning, an educational approach that combines face-to-face classroom methods with online learning, has become a powerful tool in today's educational landscape. This approach is especially relevant in an era marked by technological advances and the need for flexible educational models due to various factors such as pandemics and globalization.

In this light, we conclude that the application of a blended cumulative learning system combines the strengths of both traditional face-to-face and online learning methodologies. Because of its hybrid nature, it caters to a variety of learning preferences and styles, making education more accessible and personalized. Moreover, the application of a cumulative system to a blended learning structure can advance the learning process by providing a more holistic, adaptable, and informed approach to education. This synthesis is likely to lead to better student outcomes and a more efficient educational process.

In addition, blended learning combined with a cumulative assessment system can create a more inclusive learning environment. Some students may excel in face-to-face interactions, while others may thrive in online learning. By using a variety of teaching methods and assessment strategies, teachers can ensure that all students have an equal opportunity to succeed.

As education continues to evolve, it is critical that institutions and educators consider adopting and improving blended learning strategies. Through the adaptation and incorporation of new assessment systems, blended learning can not only deliver better learning outcomes, but also make the learning process more inclusive, dynamic, and effective.

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## Digital Violence in Affective-Sexual Relationships among Spanish University Students

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### Abstract

Information and Communication Technologies (ICT) have brought about new forms of contact and interpersonal relationships, as well as a new space in which to deploy digital violence in the form of abuse, harassment, intimidation and behaviours of control and coercion through electronic media. This research analyses whether ICTs are the cause of a new form of digital violence and studies the prevalence of this digital violence exercised through screens among university couples. Applying a quantitative methodology, a two-stage random cluster sampling of 528 ( $M_{Age} = 24.29$ ;  $SD = 21.41$ ; 69.5 % female) Spanish university students was carried out. As a research instrument, we used the Digital Violence Questionnaire (DVQ), created for the detection, measurement and analysis of digital violence within affective-sexual relationships, which is composed of seven factors and a total of 55 variables presented in 30 items. The main results by factors were: factor 1, "Cyberstalking of the other", 10.89 %; factor 2, "Coercive Control", 11.72 %; factor 3, "Emotional Abuse", 18.37 %; factor 4, "Denigration", 6.86 %; factor 5, "First person Cyberstalking", 10.58 %; factor 6, "Isolation", 14.51 %; factor 7, "Domination" 20.02 %. Thus, the results show a slight tolerance towards digital violence among Spanish students, with a low prevalence where women have the highest percentages. Despite this, it is concluded that, taking into account the impact that electronic media have on younger populations in their social interactions and interpersonal relationships, the educational and university context should be the object of the creation of different awareness, prevention and specific training programmes against this digital violence.

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**Keywords:** digital violence, DVQ, cyberstalking, university students, social networks, information and communication technology.

### **1. Introduction**

As stated by Paulet and Chawdhry (2020), the growth and use of information and communication technologies (ICT) in society have brought numerous benefits, as well as a large number of detriments (Cabello, 2013), mainly for the youth population as the predominant sector in digital consumption. The growing number of investigations in the field of digital violence evidences the notable increase in cases in which abuse and harassment occurring among users of virtual spaces are reported and denounced, giving rise to an emerging social and public health problem (Jaén et al., 2017). Research conducted around the world on young people and university students, aged between 18 and 30 years approximately, have detected digital violence among their interpersonal relationships, finding significant variability among the results. For example, Spitzberg (2002) concluded that at least half of the young victims who claimed to have suffered situations of abuse and harassment through electronic media had identified their partner as the perpetrator. For their part, Strawhun et al. (2013) also reported that 20.5 % of their surveyed subjects were victims of cyberstalking, while Dreßing et al. (2014) reported a prevalence of 6.5 %. For Berry and Bainbridge (2017), it was 20 and 34 % of respondents who had experienced cyberstalking. More recently, Maran and Begotti (2019) found that 46 % of their respondents had been victims of cyberstalking. In addition, DeKeseredy et al. (2019) reported that 35 % of respondents had been victims of technology-enabled stalking.

As can be seen, two deductions can be found from this brief review. First, most studies name the object of study at hand as "cyberbullying" or "cyberstalking" in its English translation (Marcum, Higgings, 2021; Strawhun et al., 2013). Thus, these concepts go through the continuous overlapping of the definitions provided in each of the allusions to harassment, abuse, coercion and cyber control behaviours, indicating that they are essentially the same type of cybercrime despite the different terms. However, it is detected that both terms, "cyberbullying" or "cyberstalking", leave out other conducts and behaviours in the phenomenon that happens due to the interaction between users through electronic media (Montero-Fernández et al., 2022). Thus, the digital violence referred to here and concerning affective-sexual relationships, involves not only cyberstalking but also coercion and coercion, intimidation, domination, threat, surveillance and control between the members of a couple, among other forms of manifestation. Secondly, following Kaur et al. (2021), these studies suggest a clear lack of consensus on the prevalence of cyberstalking. Related to the first assessment, a controversy in the results and a lack of consensus is identified due to the diversity of terminologies to name such digital violence and the conceptualization of some of its manifestations in the form of cyberstalking or cyber harassment as a distinct phenomenon (Dhillon, Smith, 2019; Fissel, 2018; Spitzberg, 2017).

In terms of addressing typologies on digital violence, only a few studies have attempted to classify the different forms of digital violence that an individual can perpetrate or experience (Maran, Begotti, 2019), such as intimate partner harassment (Marcum et al., 2017; Montero-Fernández et al. 2022; Smoker and March, 2017; Woodlock, 2017). One of the studies establishes a double classification with face-to-face psychological violence, first, based on insults, threats and publication of materials that seek to denigrate or threaten the victim; and, second, with control through electronic media (Calvete et al., 2019). The work of Darvell et al. (2011) distinguishes four types of abuse in digital violence: electronic hostility, which deals with the publication or sending of threatening and insulting messages in digital spaces; intrusiveness, referring to control, change of passwords and creation of false profiles; electronic humiliation, concerning the publication of photos or information to humiliate the victim; and electronic exclusion, on the elimination, exclusion or blocking in social networks. Coinciding with the typology of digital violence established in the work of Montero-Fernández et al. (2022), the present research is based on cyberstalking, coercive control, emotional abuse, denigration, isolation and domination.

Alluding to the prevalence and expression of digital violence analysed in previous research, one of the most studied manifestations of digital violence are the behaviours of control or surveillance of the partner or ex-partner in digital spaces (Brown, Hegarty, 2018). Likewise, a study with a Mexican adolescent population (between 12 and 19 years of age) is cited, where up to 25 % of the sample claims to have been exposed to abusive behaviours in the partner through electronic media (Jaén et al., 2017). Other manifestations of digital violence include following and monitoring



a partner (Lyndon et al., 2011); sending threatening or rude emails and messages (Hinduja, Patchin, 2011); and posting humiliating photographs (Hinduja, Patchin, 2011; Lyndon et al., 2011). With respect to the risk factors for cyber-perpetration and cyber-victimization, jealousy towards the other partner is one of the main causes of these controlling behaviours (Rey-Anacona et al., 2014). Likewise, previous victimization of having been bullied was found to be an important variable in the recidivism towards suffering this violence again (Holmes et al., 2022). Analysing the circumstances of the global pandemic due to COVID-19 and its confinement, the work of Caurcel-Cara and Crisol-Moya (2022) detected a decrease in cyber-victimization resulting in 8 % among university students. It should be noted that, in long-distance relationships, social networks were used more to monitor the partner (Billedo et al., 2015). However, age, maturity and stability of the relationship are a factor in the decrease of aggression and abuse in technological spaces (Rodriguez, Rodriguez, 2016). At the same time, it should be pointed out that both boys and girls exercise these online aggressions and abuses towards their partners (Piquer et al., 2017). In the study by Borrajo and Gámez (2015), analysing the various forms of control and surveillance in the couple that occur in social networks, it is deduced that the prevalence of these behaviours among young Spanish adults is 75 % for perpetration and 82 % for victimization. It is interesting to note that, in turn, an academic debate has been opened regarding the possibility of considering digital violence, and its manifestations, as a subset of traditional violence or perhaps an extension due to comparable consequences. This academic debate and its relevant discussions can be linked to the discrepancies manifested in the different contexts and social interactions in which this violence unfolds, taking into account the anonymous and controlling nature granted by the use of technological devices (Gómez-Tabares, Correa-Duque, 2022). In the words of Muñiz and Fonseca (2017), this digital violence can be considered, in many cases, a precursor of physical violence and, in others, a reflection of a type of violence that transcends screens. In this sense, this paper proposes the hypothesis that violence exercised through telematic media will result in a new form of violence not directly related to traditional violence outside the screens, since digital violence may manifest itself as an isolated phenomenon in many cases and/or complement traditional violence.

On the other hand, other previous studies have shown that many young women admit to engaging in these abusive behaviours on their partners, although in most cases they are not identified as abusive (Muñoz et al., 2011). Consequently, this tolerance, legitimization and normalization of online aggression and abuse allows its practice and reproduction within the relational dynamics of the young couple (Borrajo, Gámez, 2015). Following González-Gijón and Soriano-Díaz (2021), today's society demands that the young population be aware of this social problem and be able to identify it. For this reason, this research pursues the study of digital violence through the Digital Violence Questionnaire (DVQ), an instrument devised as a strategy to measure the existence, typology and prevalence of digital violence in affective-sexual relationships with the ultimate goal of preventing it in the target population.

The present research proposes as object of study the digital violence that happens through the use of ICT and all its electronic devices of common use within the affective-sexual relationships of the university population. In accordance with the object of study, the main objective of the research is to study the detection and prevalence of digital violence, exercised through screens, among university couples. It also seeks to refute the hypothesis by analysing whether ICTs are the cause of a new form of violence or are simply a new alternative way to deploy the traditional violence already observed.

## **2. Method**

### **2.1. Sample**

This study was carried out at the University of Huelva (Spain), starting in the 2017/2018 academic year and concluding the fieldwork in the 2018/2019 academic year. The student population of this university, in the 2017/2018 academic year amounted to about 11251 subjects. Using the total student body as the population data, with a confidence level of 95 % and assuming a sampling error of 4.17 %, a sample of 528 students was obtained. Of this total number, 69.5 % were female (367) and 30.5 % were male (160). The mean age was 24.29 years, with a standard deviation of 21.41 years. Regarding nationality and place of birth, 50.6% of the sample was from Huelva (267). Describing by Spanish provinces, 25.5 % were from Seville (124), 6.8 % were from Cadiz, 1.2 % were from Granada (6), 1.2 % were from Malaga (6), 1.3 % were from Jaen (7), 3.2 % were from Cordoba (17), 0.8 % were from the Canary Islands (4), 3.5 % were from Badajoz (18), 0.8 %

were from Cáceres (4), 1.3 % were from Madrid (7), 0.4 % were from Valencia (2) and the rest of the sample with 0.2 % of presence belonged to Murcia (1), Zaragoza (1), La Coruña (1), Ávila (1), Oviedo (1), Vizcaya (1) and Toledo (1). The last 2 % of the sample was of foreign origin, with 9 people from Brazil, Colombia, Ukraine, Italy, France, Armenia, Ecuador, Venezuela and Western Sahara among the nationalities represented.

This student body at the University of Huelva came from academic disciplines including: Double Degree in Translation and Interpretation and Humanities (1.3 %), Physical Activity and Sports Sciences (13.3 %), Master's Degree in Educommunication (1.9 %), Industrial Chemical Engineering (0.8 %), Psychology (10.6 %), Primary Education (12.5 %), Early Childhood Education (12.1 %), Social Education (2.1 %), Social Work (12.9 %), Computer Engineering (0.2 %), Industrial Engineering (0.2 %), History (0.4 %), Hispanic Philology (0.8 %), English Studies (2.5 %), English Philology (0.2 %), Double degree in English Studies and Hispanic Philology (1.1%), Cultural Management (2.5 %), Tourism (3.4 %), MAES Master's Degree (University Master's Degree in Teaching in Compulsory Secondary Education and Baccalaureate, Vocational Training and Language Teaching) (20.5 %), Doctorate (0.6 %) and other Master's Degree studies (0.4 %) unspecified.

### 2.2. Instrument

In accordance with the description of the DVQ instrument, the first part studies the sociodemographic and relational variables in courtship, preserving the anonymity of the questionnaire. Among these variables are the type of family in which the subject lives, socioeconomic level, point of view of religion, educational level of the reference family figures, number of romantic relationships and their duration, sexual orientation, type of romantic relationship, frequency of contacts and expectations for the future of the relationship. These sociodemographic and relational data in courtship were collected from multiple-choice and closed-ended questions. The second part consists of seven factors of digital violence with a total of 55 variables presented in the form of 30 items with a Likert-type response format. The premises of the questionnaire are written in infinitive to facilitate the double possibility of response in its majority (you to your partner, your partner to you), allowing the measurement of perpetration and victimization in the prevalence of digital violence, in addition to identifying whether aggressions and abusive behaviours are bidirectional in nature.

### 2.3. Procedure

Following the work of Montero and León (2007), this research proposes a quantitative methodology in a descriptive study of populations through surveys with cross-sectional probabilistic samples. For this purpose, the DVQ (2022), an ad hoc questionnaire is used for the detection, measurement and analysis of digital violence within affective-sexual relationships.

To form the sample, a selection of the class-groups and the degrees that made up each of the faculties was carried out by means of a two-stage random cluster sampling. In the first stage of sampling, a random sample of degrees studied at the University of Huelva was selected and, in the second stage, a random sample was taken of the elements and class-groups, as well as of the subjects within each degree. The inclusion criteria were adjusted to university membership as students and the fact of having or having had an affective-sexual relationship of at least six months in such affective-sexual relationship.

With respect to the ethics of the research, an agreement was previously made with the subjects in which, through a participation sheet, the anonymous nature of the questionnaire was specified and the general lines of the study in question were explained, reminding them of their freedom at all times to abandon their participation. Thus, the aim is to make the potential subjects aware of their personal contribution and the importance of participating in the study, as well as to ensure that they give their express consent to what has been asked, without any confusion or ambiguity. Participants are reminded that the research area is of a very sensitive nature, which some participants may find distressing, so if they feel that they may be affected by any of the questions, they are asked not to respond or participate in the study.

### 2.4. Data analysis

The reliability of the scale was estimated by Cronbach's alpha coefficient, with a value of 0.945. The mean score and standard deviation of the subjects in the questionnaire is 80.05 and 21.41, respectively. Therefore, it is determined that the Digital Violence Questionnaire (DVQ) presents a high internal consistency resulting in a valid and reliable instrument, as well as suitable for the detection and prevention of digital violence. It is also mentioned that the sample distribution did not meet the normality assumption ( $p = 0.000$ ), calculated through the

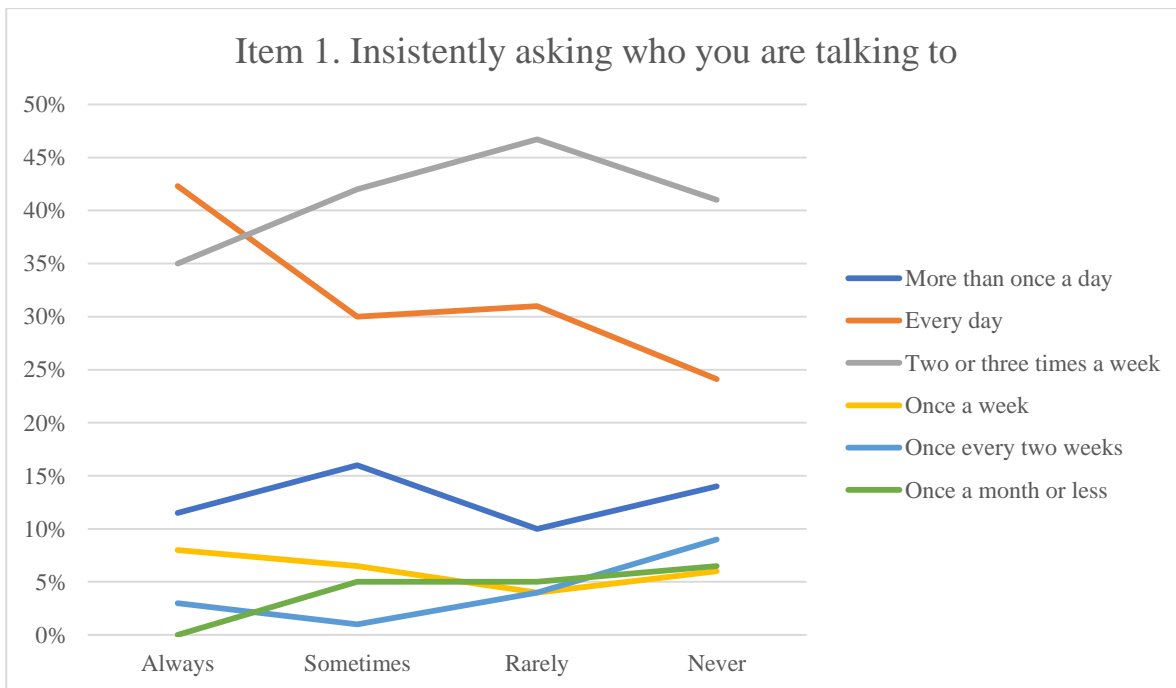
Kolmogorov-Smirnov test, so non-parametric statistics were used. The data analysis of this work was carried out with SPSS version 15.

### **3. Results**

Of the total sample (N = 528), 60.6 % (229 women and 91 men) said they were in a relationship. The duration of these relationships was from 6 months to 1 year for 12.5 %; from 1 year to 2 years for 22.4 %; from 2 to 3 years of relationship for 13 %; from 3 to 5 years for 23.7 %; from 5 to 10 years for 24%, from 10 years onwards 4.4 %. Regarding the type of relationship that the participants claimed to have, we find that 3.6 % maintained a sporadic relationship; 10.1 % were in a casual relationship, designated as a relationship with frequent contact but without commitment; 71.6 % were in a serious and/or stable relationship; and 13.8 % said they were in a relationship with a commitment to marriage or living together. Analysing these percentages in more detail by correlating the type of relationship and the sex of the person, we can see a tendency to designate relationships among girls as slightly more stable and serious than among the boys in the sample. Thus, 14.2 % of girls indicated that they were in a committed relationship compared to 13.3 % of boys; 74.2 % of girls were in a serious relationship compared to 67.7 % of boys. In casual relationships, boys scored higher with 15 % vs. 8.2 % of girls, and in sporadic relationships both sexes scored 3.3 %. Of these relationships, 12.7 % maintained direct, face-to-face contact with the partner more than once a day; 28.6% did so every day; 42.8 % saw each other two or three times a week; 5.3 % saw each other once a week; 4.5 % were together once every two weeks; and 4.7 % saw each other once a month or less.

Regarding sexual orientation, 5.4 % said they were homosexual (10 females and 17 males); 1.6 %, bisexual (6 females and 1 male) and 93 %, heterosexual (347 females and 142 males). In relation to their marital status, 96 % indicated that they were single (504), 3 % were married (14), 0.5 % were cohabiting (2) and another 0.5% were divorced (2). Regarding the type of family in which they had grown up, 82 % said they had grown up in a nuclear family (429), 0.7 % in an adoptive family (3), 12 % were in a single-parent family (62), 3 % in a reconstituted family (16), 2 % in an extended family (10) and only 0.3 % in a homoparental family (1). The majority of the respondents claimed to be in a medium socioeconomic bracket; 47.3% said they were in the upper-middle range (244), while another 49.8 % said they belonged to the lower-middle (257). The remaining 2.9 % of the sample did not answer this question. Regarding the importance of religion in their lives, 7.6 % considered it very important (40), 15.9 % found it quite important (84), 50.8 % stated that it was not very important (268) and for 25 % religion was non-existent in their lives (132). A final percentage of 0.7 % corresponded to missing values for this variable.

The main results of the factors were: factor 1, "Cyberstalking of the other", 10.89 %; factor 2, "Coercive Control", 11.72 %; factor 3, "Emotional Abuse", 18.37 %; factor 4, "Denigration", 6.86 %; factor 5, "First-person cyberstalking", 10.58 %; factor 6, "Isolation", 14.51 %; factor 7, "Domination" 20.02 %. The most salient results for each of the factors are presented below. Starting with factor one, called "Cyberstalking of the other (by the partner)" and referring to all those actions carried out by the other partner through some electronic device and involving supervision, extortion and control of activities and social contacts on the Internet, causing an annoying situation and/or harm to the person. This factor resulted in a percentage prevalence of digital violence of 10.89 %. In this factor, a negative and very majority tendency was recognised in the population studied towards supervision, extortion and control of activities and social contacts through electronic devices, causing an annoying and/or harmful situation in the partner, given that the percentages of the "never" option amounted to 70 and 80 % in the majority of the variables, for both boys and girls. However, one of the results in this factor should be highlighted, which deals with "insistently asking who you are talking to", represented in item one. It was appreciated that 20 % of the participants marked the "sometimes" option for this action, admitting that their partners had read the personal conversations of their corresponding partners three to five times in the affective-sexual relationship. The impact of direct contact with the partner shows the upward trend in this behaviour when the partners see each other every day and two or three days a week, according to the opinion of the sample participants about their partners, as can be seen in [Figure 1](#). Likewise, if the aforementioned "sometimes" responses are taken into account, 10.6 % of subjects considered religion "very important", 14.4 % "quite important", 54.8 % "not very important", and for 20.2 % religion was non-existent.

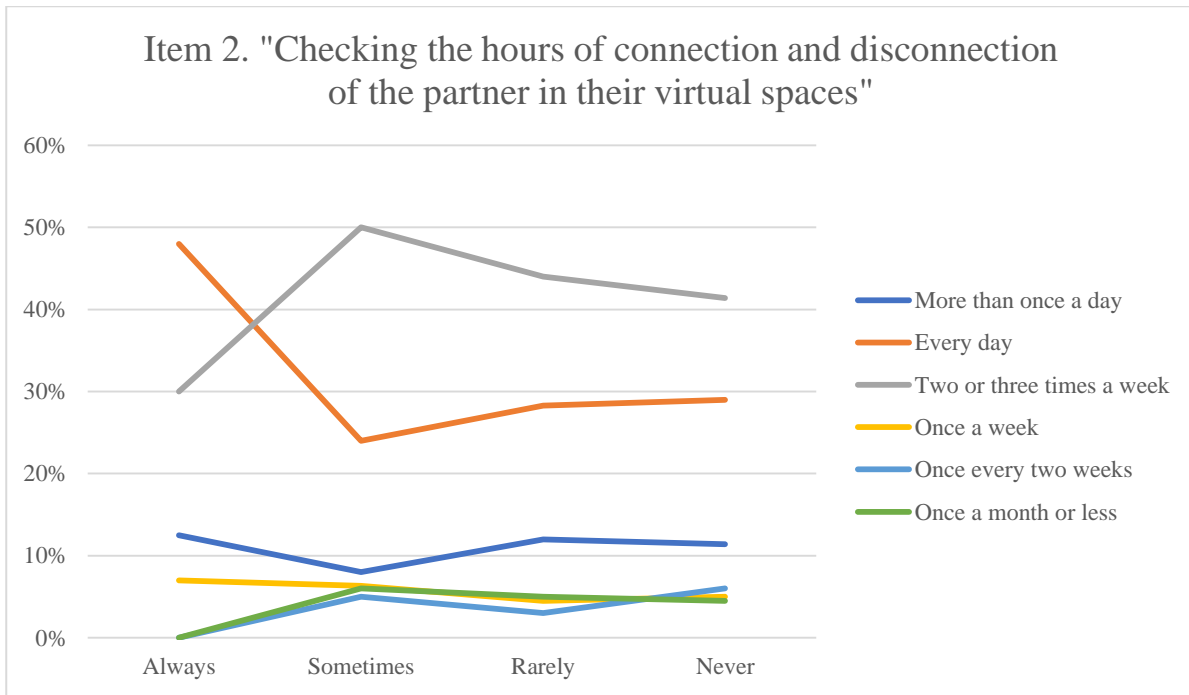


**Fig. 1.** Results of factor one correlated with the frequency of direct contact in the affective-sexual relationship

Continuing with factor one, the behaviour of "reading the partner's personal conversations" is highlighted in item six, where the girls indicated that 3.7 % of their partners did it "always", 9.9 % did it "sometimes"; 22 %, "rarely" and 64.5 % did it "never". As for the male participants about their partners, the percentages were also similar, with 1.3 % "always", 10.3 % "sometimes", 26.9 % "rarely" and 61.5 % "never".

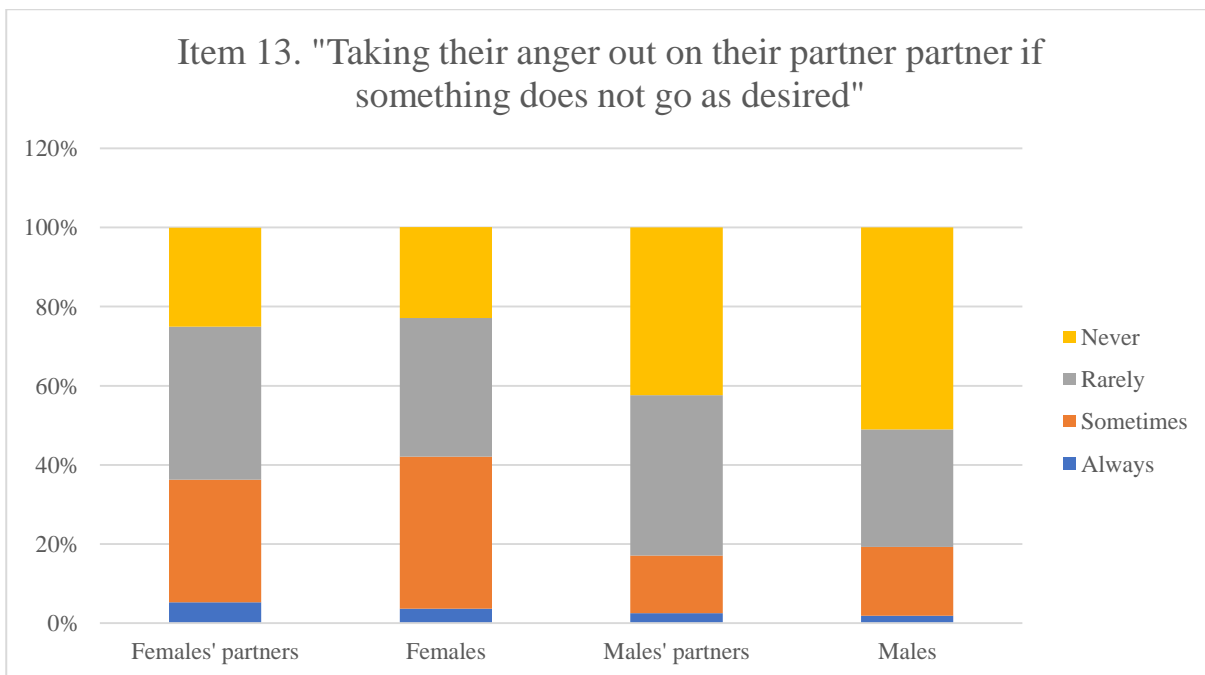
In factor two, called "Coercive Control", consisting of control of the partner using intimidation and blackmail studies the following items, mostly negative percentages were found towards the prevalence of this digital violence. This factor resulted in a percentage of prevalence of digital violence of 11.72 %. However, it is worth highlighting item two, which deals with "checking the hours of connection and disconnection of the partner in their virtual spaces", where more than 20 % of boys and girls had also done it "sometimes" and almost 10 % had done it "always". Specifically, women admitted a slightly higher percentage when confirming this control of online activity by their partners in the "always" option. However, in all percentages for this item, males stated that these behaviours were performed more frequently by their partners than by themselves in the same affective-sexual relationship they were in. This same trend in males is seen in the analysis of items three and four.

Likewise, highlighting the analysis of "checking the hours of connection and disconnection of the partner in their virtual spaces", shown in item two of the questionnaire, it was also slightly appreciated how daily and frequent contact during the week created an upward trend towards this type of control of the partner, according to what the participants in the sample expressed about their partners. [Figure 2](#) below reflects these results, with their corresponding correlation with the frequency of direct contact with the partner. As was the case with factor one, it is slightly noticeable how daily and frequent contact during the week creates an upward trend towards carrying out what this second item expresses, according to the sample participants about their partners.



**Fig. 2.** Results of factor two correlated with the frequency of direct contact in the affective-sexual relationship

Analysing factor three, called "Emotional Abuse", involves humiliating and degrading attacks on the partner's self-esteem. This factor obtained a percentage prevalence of digital violence of 18.37 %. In this factor, the prevalence of 20 % to 30 % of "sometimes" was observed in items 13, 14, 20 and 23, designated by the participating subjects of the sample on behaviours related to humiliating and degrading attacks to the partner's self-esteem. Highlighting the behaviour of "taking their anger out on their partner if something does not go as desired" and represented in item 13 of the questionnaire, the girls admitted doing it in their relationships 20 % more times in the response of "sometimes" than the boys in the sample and is represented in the following [Figure 3](#).



**Fig. 3.** Results of factor three of the DVQ questionnaire ([Montero-Fernández et al., 2022](#))

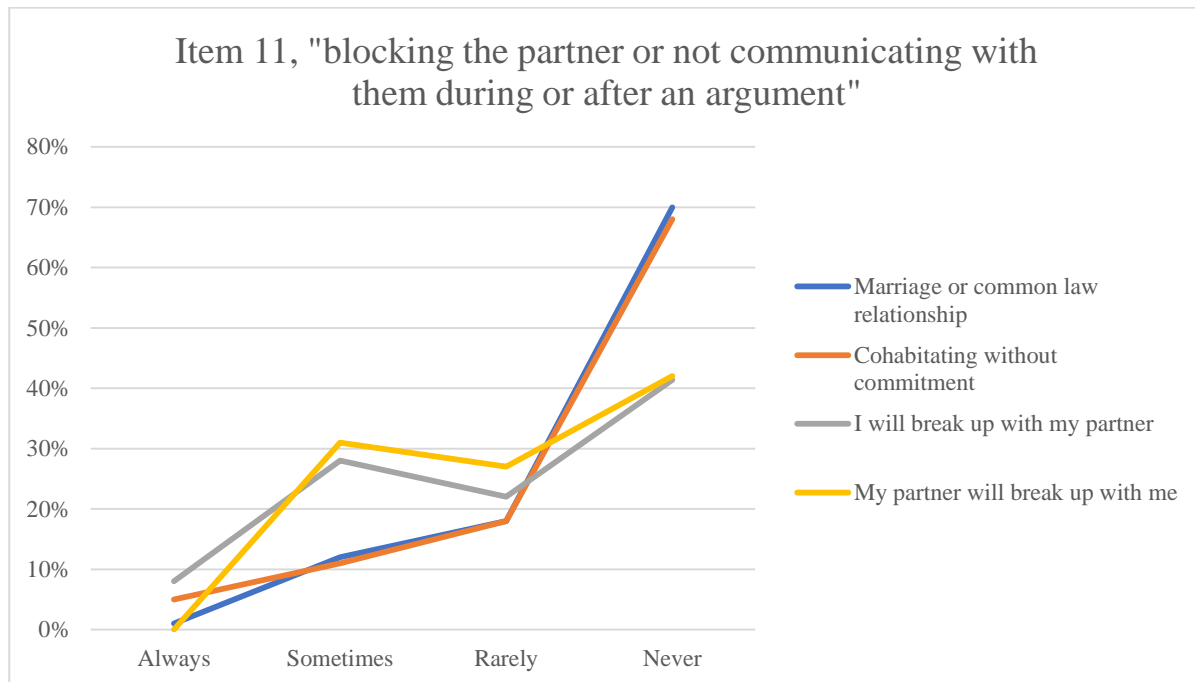
It is also pertinent to address another of the behaviours studied in factor three, "yelling at one's partner", which is included in item 23 of the questionnaire. The girls recognised that their partners did it "always" in 2.3 %, "sometimes" in 22.9 %, "rarely" in 32.5 % and 42.4 % did it "never". At the same time, they admitted to doing it in their relationships in 2.8 % "always", 21.7 % "sometimes", 30.9 % "rarely" and 44.6 % "never". Boys said their partners yelled "always" in 1.9 %, 11.5 % "sometimes", 32.7 % "rarely" and 53.8 % had done it "never". However, boys confessed to doing it "always" by 3.2 %, "sometimes" by 11.4 %, "rarely" by 32.9 % and "never" by 52.5 %. "Leaving the partner alone or cutting off communication when there is an argument or after a fight" is another of the variables studied in factor three, represented in item 25. Females in the sample stated that their partners did it "always" in 6.1 %, 23.1 % "sometimes", 30.4 % "rarely" and 40.4 % "never". Males confessed that their partners "always" did it by 5.1 %, 13.9 % "sometimes", 25.3 % "rarely" and 55.7 % "never".

Factor four studies "Denigration", involving threats and intense verbal aggression and analysed from the perspective of the individual participant about his or her own actions within the couple relationship in most cases. This factor had a prevalence percentage of digital violence of 6.86 %. In many of the items of this factor it is reached, by the sample, 80 % and almost 90 % in the "never" option, indicating the low prevalence of these variables in the studied population. "Imposing prohibitions or rules unilaterally in the relationship" is one of the variables analysed in this factor four and is presented in item 15. Here, the females began by saying that they carried out this action "always" in 0.6 %, 5.2 % "sometimes", 14.9 % "rarely" and up to 79.4 % "never". The males in this item stated that in no case had they carried out this behaviour with the option of "never", only 3.9 % marked the option of "sometimes", 14.3% did so for "rarely" and a resounding 81.8 % said it was "never". Another item of this factor, item 20, on "blaming the partner for the bad things that happen", was analysed in factor three of "Emotional Abuse" from the perspective of the respondents about their partners. However, in this factor "Denigration" is analysed from the individual's own point of view, where very similar and slightly lower percentages are extracted in the consequent prevalence of the behaviour described in the item. According to the women's response, 0.6 % "always", 11.6 % "sometimes", 23.4 % "rarely" and 64.1 % "never". According to the male respondents, 1.9 % were "always", 5.2 % "sometimes", 20.1 % "rarely" and 72.7 % "never".

Moving on to factor five, called "First-person cyberstalking", which is parallel to factor one, since it studies some of the behaviours that occur through some electronic device and involve monitoring, supervision and control of the digital interactions of the couple, being carried out in first person by the respondents. This factor obtained a prevalence percentage of digital violence of 10.58 %. Thus, in the behaviour of "insistently asking who you are talking to" to answered in first person, and previously analysed in factor one with respect to the partner, it was appreciated that more girls confessed to having carried out this behaviour within their affective-sexual relationships. Girls in the sample reported doing it 2.2 % "always", 21.3 % "sometimes", 38.2 % "rarely" and 38.2 % "never". Boys admitted to doing it 1.9 % "always", 9.1 % "sometimes", 34.4 % "rarely" and 54.5% "never". The premise of "reading the partner's personal conversations", expressed in item six, is also exemplified, where, again, girls and boys again aligned their opinions considering that they did it "always" 1.7 % and 0.6 %, differed more in the option of "sometimes" with a confirmation of 6.6 % in girls and 2.6% in boys, 27.4 % and 26.6 % of "few times", and 64.4 % and 70.1 % of "never", both for girls and boys, respectively.

Coming to factor 6, designated as "Isolation", the avoidance of the partner during conflict and the denial of emotional availability or contact with the partner in a cold or punitive manner will be examined. This factor obtained a percentage prevalence of digital violence of 14.51 %. In this factor, the digital violence expressed in items 11 and 25 stands out, which deal with "blocking the partner or not communicating with the partner during or after an argument" and "leaving the partner alone or cutting off communication when there is an argument or after a fight", respectively. In both items, the prevalence of having performed this behaviour three to five times in the couple's relationship reaches 20 %. For item 11, the influence of the frequency of contact is also analysed, where no outstanding results are observed. However, the relationship of the results of this item with the expectation that the subjects have about their affective-sexual relationship is analysed in [Figure 4](#) below. In this graph, there is a significantly lower prevalence of acting by "blocking" the partner and cutting off communication with him/her in affective-sexual relationships where there is an idea of a future, whether marriage, cohabitation or living together. Continuing with the results of this item 11, when this question of blocking the partner was asked in the first person, the slightly

higher percentage for girls than for boys is striking. Girls admitted to doing it "always" by 3.4 %, 16.4 % of "sometimes", 21.8 % of "rarely" and 58.5 % of "never". Boys claimed 4.5 % it was "always", 12.2 % it was "sometimes", 15.4 % it was "rarely" and 67.9 % it was "never".



**Fig. 4.** Results factor six correlated with the expectation of the future in the affective-sexual relationship

The last item of this factor six, item 25, investigates the premise and action of "leaving the partner alone or cutting off communication when there is an argument or after a fight", also analysed in factor three, referring to the partners of the participating subjects and closely related to item 11. In the present factor, the consideration of the actions that the participants themselves admit to is analysed. Thus, the girls confirmed that they had manifested this behaviour "always" in 4 %, 22.3 % "sometimes", 31.1 % "rarely" and 42.7 % "never". As for the boys, they reported having engaged in this behaviour "always" in 2.6 % of the cases, 17.3 % "sometimes", 19.9 % "rarely" and 60.3 % "never".

Factor seven, "Domination", studies the manipulation of the partner to decide what is believed to be best for him/her. This factor found a prevalence percentage of digital violence of 20.02 %. This factor focuses its analysis on the study of "trying to decide what is best for the partner, even if he/she does not agree", collected in item 19 of the questionnaire. It was striking that the female and male participants claimed, with a slightly higher percentage, to take sides in deciding what their partners should do without the latter's consent when asked in the first person about their own actions, in contrast to what social desirability would advocate about confessing their own behaviours in the affective-sexual relationships of which they are a part. The women participants considered that their partners performed this action "always" in 12.9 %, "sometimes" in 18.8 %, "rarely" in 26.9 % and 41.5 % did not do it "ever". However, women expressed that they themselves tried to decide what was best for their partners "always" in 14.5 %, "sometimes" in 21.9 %, "rarely" in 23.9 % and "never" in 39.8%. Males, in their case, were of the opinion that their partners performed this action "always" in 8.2 %, in 22.2 % it was "sometimes", in 32.9 % it was "rarely" and in 36.7 % it was "never". Respectively, for the same item and referring to their own actions, the percentages for males were 9.6 % for "always", 23.7 % for "sometimes", 25.6 % for "rarely" and 41 % for "never".

#### 4. Discussion

The results of our research coincide with those of Spitzberg (2002) and Woodlock (2017), since in all cases the participants in this study recognise more cyberstalking in the attitudes and actions of their partners than in their own. Observing the prevalence found in this study, with a

Spanish sample, the results are quite similar to those found in the research by Strawhun et al. (2013) and DeKeseredy et al. (2019). In this way, it is observed that the entire sample exhibits, in a majority of cases, the absence of affirmation and acceptance of violence through screens in their affective-sexual relationships, as was also extracted from the studies by Caurcel-Cara and Crisol-Moya (2022).

Recalling Piquer et al. (2017), it should be pointed out that both boys and girls have exercised these online aggressions and abuses towards their partners. Highlighting the difference between women and men as one of the risk factors in cyber-perpetration and cyber-victimization in the cases studied and coinciding with the works of Kalaitzaki (2020), Smoker and March (2017), Strawhun et al. (2013), Van Baak and Hayes (2018), it is concluded that women in this Spanish sample exercise greater digital violence than in the cases of their male partners, given that they responded more affirmatively in almost all the items studied. In other words, women in this sample identify more cyberstalking than men in their own attitudes and actions. At the same time, men also detect this type of digital violence in a slightly higher percentage in their partners, mostly heterosexuals, within this sample.

Referring to nationalities and races, this research also does not find outstanding results in cyber-victimization and cyber-perpetration, agreeing with the studies of Navarro et al. (2016) and Smith-Darden et al. (2017). Mentioning the sentimental situation and marital status of the participants, no results are obtained that can be assessed and discussed with the finding of Reyns et al. (2011), about single people being 1.5 times more likely to be victims than people in a relationship, given that 96 % of this sample claimed to be single. As for the rest of the risk factors and variables previously analysed in studies on cyberstalking and others taken into account in this research, such as academic disciplines, the type of family they come from, the type of relationship, duration of the relationship, encounters with the partner, religion, etc., no relevant results are found to be highlighted in the findings of this research.

Reviewing the main objective of this research and after the analysis of the results, a low, but important, prevalence of digital violence in the population studied can be seen, which does not reach 20 %. It is interesting to highlight that the factor with the highest score was 7, "Domination" 20.02 %; followed by 3, "Emotional Abuse"; and 6, "Isolation". The lowest scoring factors were 4, "Denigration", with 6.86 %; 5, "First-person cyberstalking", with 10.58 %; and 1, "Cyberstalking of the other", 10.89 %. This shows that the new form of violence in the form of behaviours and attitudes of abuse, harassment and control through electronic media are these constructs that are part of the traditional conceptualization of violence. A confluence of behaviours of psychological violence popularly observed and judged in society can be seen, which make up the slight tolerance and normalization of digital violence among students at the University of Huelva. Thus, the hypothesis put forward in this work that digital violence constitutes a new form of violence not directly related to off-screen violence can be confirmed, which in turn demonstrates and justifies the extension of the simplistic concept of "cyberstalking" by the so-called digital violence.

It is concluded that, in the aim of this study, i.e. the analysis of new technologies and their impact on affective-sexual relationships among Spanish university students, this research shows the low but important presence of digital violence. A digital violence not identified as such by the sample surveyed, in many cases, as shown in the analysis of the results achieved. It is a violence that can manifest itself very easily among the young population, without the need to be linked to off-screen violence. However, taking into account the impact that electronic media has on the youngest populations in their social interactions and their first interpersonal relationships, the educational and university context should be the target of different programmes to raise awareness and prevent this digital violence. Thus, after analysis of the sample reality, it is possible to proceed to the creation of specific training programmes on digital violence through the design of discussion, reflection and analysis activities according to the characteristics of the context of its application.

It is also pertinent to mention some of the limitations encountered throughout this research. The access and selection of the university population at the University of Huelva, in the two-stage random cluster sampling, could have biased the sample by university disciplines in a less equitable manner. Likewise, an influence could be deduced of the university context, where the fieldwork was carried out, related to a tendency towards social desirability and less accurate response to the actions of the participating subjects. In the same way, one could allude to the impossibility of the analysis and comparison of races, nationalities and civil status due to the scarcity of representation in the sample obtained. As an example, due to the low representation in this sample of LGBTIQ+, a paucity of data is detected for comparison with the studies of Chen et al. (2020), where it is



suggested that LGBTIQ+ populations are victimized at higher rates than non-LGBTIQ+ populations. However, despite the limitations that this study has presented, this research represents a further step forward in the arduous task of conceptualizing and determining digital violence, in all its terms, through a comprehensive analysis.

Finally, the proposals for future research will consider the correction of the limitations mentioned in the previous paragraph, as well as the ambiguity in the concept of cyberbullying itself as the object of this research. Further exploration of the risk factors in cyber-perpetration and cyber-victimisation of this phenomenon of digital violence is thus encouraged, in order to be able to act more effectively in the corresponding prevention and detection of digital violence.

## 5. Conclusion

According to the results presented, the tendency towards a negative response of disagreement with these premises related to online control and abuse behaviours and behaviours that young people show with their partners in affective-sexual relationships could be explained by a phenomenon of non-identification and legitimization of these practices, as well as a consequence of social desirability, pointing towards what is socially correct.

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## **Pushing Horizons of the English Language Classroom: Edutainment as a Tool to Boost Innovative Potential of Engineering Students**

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### **Abstract**

As the world faces unprecedented diverse change, the future viability of any company depends essentially on whether and to what extent its employees can build the innovation of tomorrow as well as tackle problems in the workplace. To transform ideas into value-creating and beneficial reality, would-be engineering specialists are to have access to the educational opportunities that enhance their innovative potential. English proficiency for specialists in the field of Engineering and Technology today is not only social, but also an economic necessity for successful innovation. The ESP approach is believed both to increase the relevance of what the students are learning and to enable them to use English they know to learn even more English, since their interest in their field will motivate them. As fluency in ESP is considered to be equally important as major related abilities therefore teaching methods and approaches are to be adjusted to educational goals, current resources and emerging trends that should be timely noticed. The research focuses on describing the model of teaching an ESP course based on the edutainment technology which ensures advance in English as well as innovative potential development. The study comprises a theoretical basis, a methodology including instructional design and measurement methods evaluating effectiveness of the entire model. Students are trained by being involved into solving a variety of tasks many of which require conceptualization, up-to-date technologies and strategic insights such as role-plays and simulation of managing potential workplace issues. The results indicate that the edutainment model of teaching ESP course allows for alterations in engineering students' personality characteristics, thereby enabling their innovative potential development. The findings of the study would provide foreign language teachers with a tool of qualifying students in two directions: their innovative potential is strengthened through acquiring soft skills; English proficiency is improved.

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## 1. Introduction

Nowadays uncertainty is accepted as a constant companion of society. The world is undergoing large-scale diverse change: from the format of knowledge representation along with radical political and social turmoil and highly disruptive inventions. The dynamics of profound transformations has intensified in recent decades thanks to the market economy the essence of which is increasingly conducive to radical innovation. Due to the constant and rapid development, taking place in science and technology certain alumni's competences become irrelevant even before graduates receive diplomas of higher education. In view of the possibility of reforms, abilities to anticipate changes and proactively respond to the new in the outside world with something new in the interior world have been the indicators for the sustainability of humanity. Such personalities who create innovations are needed especially in engineering field, alumni of which are expected to work on breakthrough technologies, design mining systems as well as nuclear power plants, and other critical infrastructure objects. In recent decades the inherent pressure on the education throughout the world is greatly multiplying by the level of innovation. Higher education can only handle this by being constantly prepared to provide a framework for implementing new ideas and developing competences needed to respond to these challenges (Litvinenko et al., 2022; Pashkevich, Danilov, 2023; Kretschmann et al., 2020). Mastery of foreign languages serves as a career booster required to ensure that graduates of technical universities have a competitive edge in the labour market. For this reason, language tutors have integrated the same kinds of technology into their courses which their learners are expected to use in their future jobs, whether it is online communication through web chats, mobile devices with the Internet as a source for authentic materials, IT for automation of mining industry, digital technologies taken a hold in society, virtual conferencing platforms, etc. (Matrokhina et al., 2023; Skornyakova, Vinogradova, 2022; Almusaed et al., 2023). Thus, possible innovative capacity and actual innovative actions are the keys to the survival in the competitive labour market (Litvinenko et al., 2023). Innovations are likely to be the result of teamwork; the members of such teams are more or more frequently from different countries. For innovative development intercultural competence, knowledge of diversity and foreign language proficiency are required. Students are intended to have applicable knowledge and abilities. It means the systematic cooperation between educational institutions and industries.

The goal of the current study was twofold: to introduce a comprehensive foreign-language teaching model making accommodating for the foreign language communicative competence development engaging and fascinating yet still with special reference to innovative potential advancement, and to assess the innovation level of engineering students.

This raised the following research questions:

1. What are ESP students' needs within mineral resource sector?
2. Why should ESP teachers be concerned with the edutainment educational technologies?
3. How to design or/and choose creative activities to facilitate the development of both communicative competences in a foreign language and engineering students' innovative potential?
4. What is the level of innovation of engineering students after studies based on the edutainment model proposed?

In our research we consider innovative potential of engineering students as an ability to envision possibilities and transforming novel ideas into practical solutions within the mineral resource sector. Despite the fact that researchers have already emphasised that innovative potential is to be developed in order to turn creative ideas into reality there are still few learning models provided innovative competences formation (Udina, Khromov, 2015). Analysis of scientific literature and Internet sources justifies that the concept of the technology combining education and entertainment is less researched especially concerning foreign language training of engineering students (Mikeshin, 2022; Elghomary et al., 2022). It is necessary to spend more time reflecting on how engineering students can be trained to be innovators within foreign-language learning.

## Background of edutainment environment

Going beyond the traditional system of higher education with conventional language teaching methods, which give passive roles to students, some technologies strive to engage learners in the

educational process and seem to be an alternative to academic education (Motteram, 2013; Vinogradova et al., 2022; Sveshnikova et al., 2022). One of them is edutainment learning technology coined by R. Heyman in the 1970s that still has much to offer. Edutainment is defined in different ways depending on whether it is considered as a process (what we do), environment (where we do) or a product (what we make) (Chilingaryan, Zvereva, 2020; Yukhmina, Obvintseva, 2023; Hunt et al., 2023). Hence edutainment is usually described as having a number of different dimensions. This contradiction has many causes. A central one is the understanding of what edutainment is. Some researchers insist that entertainment is unlikely to be referred to the basis of the curriculum in higher education (Addai et al., 2023; Wang et al., 2007). Considering edutainment as some environment where learners can enjoy what they learn is seen as a complimentary option of the educational process intended to diversify its conservatism (Karmalova, Khankeeva, 2016). It seems to become a radical rethink for students who feel restricted and defined by the limits of the traditional educational system (Rassadina, 2016). D. Buckingham and M. Scanlon argue that technology edutainment is a merger of traditional content and teaching methods in the context of new technologies (Buckingham, Scanlon, 2005). When considered as a digital content the focus is on the combination of programming and training while keeping the audience entertained (Murzo, Chuvileva, 2021; Anikina et al., 2015). In addition, edutainment can be defined as learning focused on a gaming technology, the main motives of which are fun and happiness (Němec, Trna, 2007). The emotions of the user of a computer screen filled with colourful graphics are balanced by educational content in this technique (Okan, 2003; Addis, 2005). Some researchers believe that learning as entertainment is effective because an emotional connection is established between the learner and the subject being studied (Shafait et al., 2021). Some understanding of the edutainment cannot be related to any category as edutainment is seen somewhere between psychological techniques and multimedia products (Boyko, Koltsova, 2023).

In our research edutainment is treated as creative foreign language teaching technology ensuring motivation to learn a foreign language through the grasping content of the material; satisfaction from the independent decision of a task; social interaction with fellow students; progress in learning; materials related to the practical aspects of students' future professional life. When it comes to foreign language teaching both traditional and edutainment models have advantages and disadvantages (Table 1).

**Table 1.** Traditional versus Edutainment model

Model	Goal	Role of teachers and students	Benefits	Challenges
Traditional model	shapes students into moral and educated individuals who can contribute to the working world; focuses on presenting direct information to students; develops foreign language communicative competence	educators are front and center being gatekeepers of knowledge they choose what to teach and how to teach it	its rigid structure provides students with a sense of order; well-known by educators as it has been around for a long time, so it is easier to implement curriculum that has already been established	eliminates individuality; stifles creativity, treats students as machines to be fed by knowledge to get perfect scores on tests
Edutainment model	focuses on what students are passionate about and what critical thinking skills they can develop; helps students understand how	places the student in the center; students can choose topics they are passionate about; attracts students' interest; students develop their love of	includes any topic that can pique the interest of students; keeps students focused and committed to the course; recognises and honours the	poses a risk of misuse of technology; designing computer games, videos is expensive

they can be lifelong learners, constantly engaging with new ideas and solving new problems; develops foreign language communicative competence, innovative potential, and soft skills	learning; students use critical thinking skills outside the university as they evaluate and reevaluate their perspectives on real-world topics and issues	creativity and passions of students; engages students in active hands-on learning through projects, experiments, and collaboration with peers; helps learn faster	and time-consuming; the usage of computers and smart gadgets can have a negative impact on students' health
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Source: compiled by the authors

Thus, a fruitful educational model such as edutainment contributes to the holistic development of an innovative personality and couples the methods of inquiry-based learning, project learning and action-integrated learning.

### Research Design

Our mission was seen as the development of engineering students' English proficiency along with their innovative potential in the mutual and supportive manner. The research steps were as follows: needs of ESP engineering students collecting, research planning, instructional design, developing an edutainment model of teaching foreign languages, testing before and after the experiment, and analysis of test results.

Our goal was to stimulate, encourage, create conditions in which engineering students are eager to become innovative personalities. As students' needs and authentic tasks are paramount in ESP teaching, analysis of learners' habits and preferences serves as a pre-requisite for creating the learning model. So called edutainment technology has a role to play in the development of innovative potential since its dynamic, "squiggly" tasks promoting interest, tailor-made for students' individual needs, talents and ambitions were balanced with traditional academic activities to develop professional and academic expertise.

We would like to state that our model does not make any claims for universality. Its content is learning materials not only for understanding but gaining projective professional experience. The learning model enables the use of different approaches to problem solving or the recognition of different effects of a decision. The path to a right decision is reached via the spiral staircase of error. The course syllabus of the developed model is designed for 36 hours of classroom activities and approximately 36 hours of self-directed learning. The model covers events worldwide and features a set of professional topics spanning major issues such as challenges within the mineral resource sector, increasing productivity, critical thinking, interrelation of language and culture, accelerating progress, country's economic development, technical science breakthroughs, etc. It provides the most appropriate lexis enabling future specialists to read, translate authentic scientific papers, and perform a full-fledged communication.

The learning model is intended specifically for the students having knowledge of English of B1 (the European Framework of Reference for Languages) who aspire to the foreign language proficiency combined with mastering the technical specialty ensuring a balance among scientific, technical areas of expertise and entertainment. The underlying principles within the model are the following:

- working with different types of discourse;
- studying real-world challenges of the mineral resource sector;
- formation of communicative competence in comfortable psychological climate;
- introducing peer discussion as a way of finding solutions to problems facing in the workplace;
- emphasis on the creative development of engineering students, the formation of a personal attitude to what is happening, the accumulation of subjective emotions and individual experience;
- the content of the training material is exclusively practice-oriented;
- facilitating active student participation and dynamism;
- domination of the content that involves audiovisual channels of perception.

The first stage of the research focuses on identifying ESP needs of students. The results received were compared with those given by ESP experts in the methodological and practical literature (Perez Sanchez, Masegosa, 2020; De Vari, 2008). It was then determined that the results from both kinds of questionnaires corresponded in 100 percent of cases (Table 2).

**Table 2.** ESP students' needs

No	Respondents' needs	ESP experts,%	Students,%
1.	to use professional terminology in English	49	51
2.	to find solutions of issues related to the professional domains	67	33
3.	to exchange scientific ideas in the field of the corresponding specialty with international communities	62	38
4.	to get acquainted with new technologies all over the world	31	69
5.	to stay up to date with engineering trends world wide	35	65
6.	average	49	51

Source: compiled by the authors

Based on the most frequently given answers got from the second year engineering students it seems that a relatively large proportion of the responders agreed that the primary focus, the developers of the model of ESP teaching should take into account, was the acquaintance with new technologies (69 %) and future job challenges including technical vocabulary use (51 %). While ESP experts prioritized sharing of scientific ideas and finding an overriding factor of the same pattern repeated by the international community. In general, both respondents' gist remains the same: professional issues should be maximized in teaching a foreign language to engineering students.

After the target students' needs had been identified an ESP learning model was adjusted. On this background, training materials were selected, adopted, and practiced. Those were followed by practical classes devoted to both foreign language competency and innovative potential development guaranteeing transfer from theory into practice. In addition, students were systematically assessed by means of written 3 minute tests in order to make them aware of gaps in knowledge acquisition. The final graduation paper aimed to check if engineering students were able to independently handle a problem in an engineering company.

Amongst the range of different types of discourse video watching is viewed as a way of combining education and entertainment. The idea of the activity is said to be easier for students to grasp from watching short video than from a verbal explanation, and that as they become more familiar with the idea and techniques used (Brame, 2016). As an alternative video may be replaced or supplemented by podcasts, images, audio, animations, etc. enhancing the student learning experience, cultivating students' oral and written communication, critical and analytical reasoning, creative thinking, and problem solving. In this way students were offered to watch videos providing occupational problems meaningful to learners. Videos from streaming sites used as warm-up activities were not arranged in any particular order. Talks having gathered hundreds of thousands of views online served as the base for discussions. They were the following: «The world's English mania» by Jay Walker; «Try something new for 30 days» by Matt Cutts; «Don't insist on English!» by Patricia Ryan; «4 reasons to learn a new language» by John McWhorter; «The secrets of learning a new language» by Lýdia Machová; «Go ahead, make up new words! » by Erin McKean; «How to speak so that people want to listen» by Julian Treasure; «Could your language affect your ability to save money?» by Keith Chen, etc.

These suggested videos make it possible to bridge the traditional educational environment in the classroom with a medium that is part of students' both professional experience. The drive to explore seems to be an essential condition for interest in innovation. The larger the environment under exploration is, the more knowledge one gets, the greater the level of innovation is.

The content structure of the units can be presented as following:

1. Key lexis; students are provided with a list of vocabulary accompanied by pronunciation



and grammar activities.

2. Main text/video/podcast of the unit (adapted, app. 2000 words) While watching the videos students are faced with complicated tasks such as diagnosing the current situation, discussing occupational problems and coming up with possible solutions in order to boost students' interest and engagement.

3. Unit vocabulary exercises (app. 250 words) (Table 3).

**Table 3.** Programme outline

Module/ topic	Content	Hours
Introduction. Academic focus	Reading: Recognising the difference between fact and opinion. Identifying the main and supporting arguments. Stereotypes. Writing: Organising and outlining ideas. Self-editing and correcting. Listening: Confirm predictions about content and structure of a lecture. Note-taking. Speaking: Summarising and building on what the speaker says. Vocabulary: Becoming familiar with academic vocabulary. Grammar: Word order in a sentence and its message. Predicate vs. attribute. Unambiguous Ving forms.	2
Module 1. Systems and order	Reading: Predicting the content of a text from visual information. Is this news? Writing: Adding supporting evidence using reasons and examples. Listening: Abbreviations and symbols. Understanding the main points in a lecture. Recognising and practicing signposting language. Speaking: Recognising language for referring to visual information. Presenting visual information. Evaluating presentation guidelines. Participating in a discussion. Vocabulary: Vocabulary & terminology for technical specialisations. Creating and using classification phrases. Grammar: Passive voice.	6
Module 2. Technologies and processes	Reading: Understanding a description of a process in a text/ Identifying and using signposting language for describing a process. Writing: Analysing written description of processes. Writing a paragraph describing a process. Listening: Taking notes on a description of a process. Speaking: Analysis of the manufacturing process. Referring to the structure of a process. Responding to requests for further details. Giving a short poster presentation. Vocabulary: Vocabulary & terminology for technical specialisations. Building word families through suffixes. Using multiple suffixes to build more complex words. Grammar: Expressing the present and the past.	10
Module 3. Challenges of the mineral resource sector	Reading: Identifying and using signposting language for describing a process. Development of the innovation component of domestic production. Writing: Analysing written description of processes. Writing a paragraph describing a process. Listening: Taking notes on a description of a process. Production dynamics and innovation perspectives. Speaking: Analysing and referring to the structure of a process. Responding to requests for further details. Taking a novel approach to project sustainability. Giving a short poster presentation. Vocabulary: Vocabulary & terminology for technical specialisations. Grammar: Expressing the future. Infinitive. Functions. Infinitive constructions equivalent to clauses. Subjunctive mood. The conditionals.	8
Module 4. Technical science innovations and breakthroughs	Reading: Understanding a description of a process in a text. Exploring technical means, methods and technologies of mining. Technology and equipment for development of mineral resources. Writing: Analysing written description of processes. Innovator's dilemma: How to innovate. Listening: Taking notes on a description of a process. Innovation: definition, classification, stages.	10

	<p>Speaking: Analysing and referring to the structure of a process. Responding to requests for further details. Giving a poster presentation. Breakthrough technologies in engineering.</p> <p>Vocabulary: Vocabulary &amp; terminology for technical specialisations. Building word families. Grammar: Modality as the author's attitude toward what he has to say. Degrees of comparison.</p>	
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Source: compiled by the authors

Variety is crucial in innovative potential development, and a succession of activities in the model proposed is the following:

Briefing phase: warm-up – simulation of chosen aspect of occupational activity input: before watching the video lexical areas are to be covered and tutors are to check that students are familiar with vocabulary. A list of essential vocabulary or actual lexis in the technical field – that the students are likely to find difficult – is provided beforehand. Students are encouraged to deduce meaning of the key phrases where possible, using dictionaries where this fails. Activities can be adapted up or down. There are different types of activities: pair work, small group work, involving groups of threes or fours, and all students circulating freely. The emphasis is on successful communication rather than on the English language correctness. In the preparation phase, students should be given sufficient time to digest the information such as technical terms, specialised terminology, issues of engineering standards, legal framework, handling of hazards and risks, equipment, and their proper use, etc. and ask the tutor for help with anything they do not understand.

Action phase: watching of proper study materials taken from reliable and valid sources representing the current state of engineering is vital. Videos provide a stimulus for natural and meaningful communication: giving both a reason and a motivating context for communication. There are said to be while-watching tasks fostering creative thinking – particularly those involving student-centred, interaction-based, and open-ended elements. Since the foreign language communicative competence needed by would-be engineers is to be related to their professional field, a language learning approach should be based on the activities that are relevant and up-to-date to their specialty acquisition in an international context. It is a multitasking activity – from improving students' foreign language skills of taking notes, debating to raising the level of foreign language proficiency as a whole. The majority of students have high level of computer literacy, that's why they prefer eLearning, hands-on activities, blogs, podcasts, and mobile applications. The tasks reflecting the most current knowledge and skills must be completed position for position. Techniques used include information gap, matching, exchanging, collecting, combining, arranging, puzzles, and simulation. They contribute to the involvement of students in research simulation, creative thinking and their imagination use. Building on the basics of engineering students' soft skills such as teamwork, problem-solving and decision-making are practiced. Acquiring soft skills helps students become better communicators, leaders, and problem solvers in the workplace.

Debriefing phase: evaluation of students' experience. Authors draw on their practical experience of designing learning activities of students' skills integration in the context of simulating professional communication. Student discussion, case study and role plays are claimed to be mutually compatible and complementary and are most effective when applied in a consistent manner. Students are put into controversial situations in order to know how to deal with challenges. Small – and large-scale success during problem solving gives students confidence that they can succeed by relying on their own knowledge, skills and desires. Students talk about their experience to their fellow students, facilitated by the tutor who draws out the main points. All participants should describe how they feel and receive feedback from their group mates and the tutor.

A follow-up written self-assessment may be helpful to identify points that attendees of the short-term programme find confusing. It contains the following:

- a protocol for the student
- how do I see my skills and why?
- what was essential feedback for me; what did I learn?

Areas of difficulty mentioned by students form a basis for subsequent training.

In our model, a creative personality is developed using the following:

- skills to form and articulate an opinion and adjust it to different cultural, economic, professional situations;
- use of innate talents to impulse and act as the originator of one's own actions and words;

- abilities to maintain a core of rules, norms and values, convictions and beliefs.

Classroom management needs to be detailed and precise. Because the tutor's role changing they act as an instruction-giver, materials designer, guide, problem-solver, monitor, evaluator, collaborator, assessor, and a researcher.

## **2. Materials and methods**

The experiment was initiated at the Saint Petersburg Mining University in order to assess the effectiveness of the edutainment model aimed at simultaneous development of both foreign language proficiency and innovative potential. Statistical data processing and graphical representation of the data obtained were performed by means of SPSS 17 (IBM) and Microsoft Office Excel 2017. The randomization method was used in forming experimental and control groups. Numerical values were presented as  $M \pm SD$  where SD is the standard deviation; M being the sample mean. The comparison in the groups was based on the nonparametric methods such as the Mann-Whitney test for independent samples and the Wilcoxon test for dependent (correlated) samples. Differences between the experimental and control groups were considered statistically significant at  $p < 0.05$ , where p is the Type I error probability when testing the null hypothesis. In all cases two-tailed criteria were employed.

The engineering students enrolled in the special short-term ESP programme that addresses gaining additional academic competences were taught via an edutainment model suggested. There were originally 853 students learning General English at the Department of Foreign Languages for two academic semesters (2021–2022 academic year). After taking a placement test enabling them to gauge the level of proficiency in a foreign language the students were randomly assigned to the experimental or control group each consisting of 180 people selected on the basis of a confirmed English proficiency level of B1 (the Common European Framework of Reference for Languages). It should be noted that there was no special selection in the experimental and control groups, except for the English language proficiency level. The control group comprised 180 participants, with 109 male and 71 female students of the average age of 17 to 19, the experimental group included 180 participants, with 100 male and 80 female students of the average age of 17 to 19. The gender and the age of students were not taken into an account either when dividing them into the control and experimental groups, or when making calculations; the gender and age were mentioned for reference only. All participants had been preliminary informed about the study and agreed to participate in it.

Besides it should be noted that chosen edutainment technology is considered to be suitable for our current university students' needs as they belong to generation Z (born between 1995 and 2012) called "digital natives" and characterised by being multi-tasking, creative and productive according to the theory of generations (Eck Duymaer van Twist et al., 2021).

During the educational experiment, students of the control group were taught under a traditional approach, through classical learning and teaching aids; while students of the experimental group were given additional English classes complementary to the main course of study in their second-year university.

At the beginning of the 2nd year each student learning English as a second language in the Saint Petersburg Mining University is to take a placement test enabling them to gauge the level of proficiency in a foreign language. These available data of all 2nd year students' level of foreign language skills were used as input for our experiment.

The study was conducted between September 2022 and March 2023. At the end of the study both groups were tested on their English language skills followed by the 16PF Questionnaire to compare possible differences in the personality of the experimental and control group students. The changes that occurred with students in the control and experimental groups were analysed.

Due to the interpretive nature, the study follows a qualitative method that offers descriptive statistics. The survey relied primarily on structured questionnaire and target group interviews, classroom observation, and analysis of scientific literature to generate a comprehensive understanding of the students' perceptions of the edutainment learning model as well as their interest in, appreciation for, and comfort with their foreign language studies and to analyze their important inner experiences that cannot be uncovered through observation alone. Data were collected on an anonymous basis via online survey application

Questionnaires and interviews were conducted to collect meaningful data about the experience and expectations of the experimental group of students. The questionnaire consisted of 11 positive and negative statements. Accordingly, an interview script was developed, followed by semi-

structured face-to-face interviews that aimed to become acquainted with the learning experience. Open-ended questions were adopted, thus seeking to encourage a vivid interaction. The script acted as a guide, and the order of the questions changed depending on participants' responses. It included questions about the needs within ESP course, the skills that the students developed by employing the edutainment environment. Each interview lasted approximately 15 to 20 min.

Ongoing assessment and final assessment are used to evaluate the knowledge, abilities, and skills a student has acquired. The ongoing assessment is conducted through tests that contain questions on each module throughout the course.

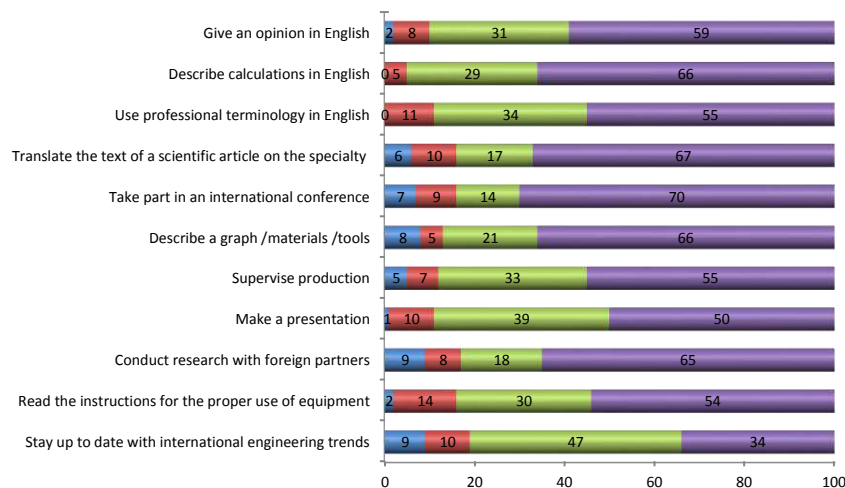
Some fundamental characteristics of human personality or psychological traits were measured employing the factor analysis being a statistical procedure for reducing the redundancy in a set of intercorrelated scores. One major technique of the factor analysis developed by Cattell, the principal-components method, finds the minimum number of common factors that can account for an interrelated set of scores.

### 3. Results

The findings of the study provide useful insights concerning the development of would-be engineers' innovative potential which in its turn would ensure introduction of breakthrough technologies in engineering. Engineering students learning ESP based on proposed edutainment model are expected to have the following professional competences:

- knowledge of the vocabulary & terminology for technical specialisations;
- abilities to resolve critical problems proactively in a sustainable and efficient way; to stay up to date with engineering trends at the enterprises of the sector of mineral resources; to come up with new ideas and technologies that increase productivity and generate greater output and value with the same input;
- skills to articulate an opinion, to make a presentation, to describe graphs/equipment/calculations, to participate in a discussion.

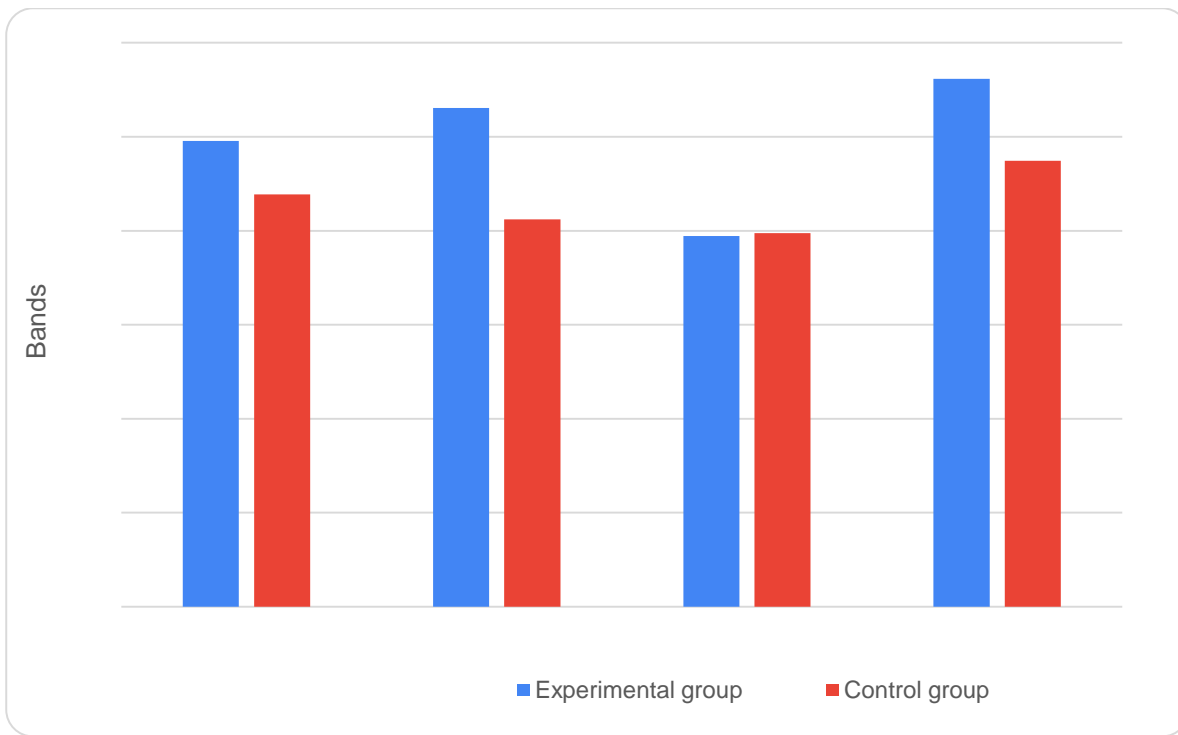
Figure 1 shows that most of the surveyed experimental group students are aware of multiple communicative activities of their future professional life connected to the English language proficiency after completing the programme. Furthermore, most of them find it easy or can perform the activities with some little help of the tutor or the Internet (Figure 1).



I cannot do it.	I find it difficult to do.	I can do it with some help	I know how and can do it by myself.
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**Fig. 1.** The students' self-assessment results related to ESP, %  
Source: compiled by the authors

In addition to the self-assessment, students' English skills were tested as well. The results are given in Figure 2.



**Fig. 2.** Final stage results of the English language proficiency tests  
Source: compiled by the authors

Conscientiousness and openness are considered to be the most valuable global factors concerning innovative potential evaluation among personality traits. For this reason, it is these global factors that were the basis of comparison within our research. After successful completion of the short-term training programme students’ individual psychological characteristics providing capacity for insight, self-esteem, internalisation of standards, openness to change, level of interpersonal trust, quality of attachments, attitude toward authority, scope for core, leadership, and functional skills were assessed using the Sixteen Personality Factor Questionnaire (the 16PF) developed by R.B. Cattell, M. Tatsuoka and H. Eber (Shmelev et al., 1987). After the test has been administered a total score computed from each of the 16 personality characteristics is recorded. These totals have been created in a way to correlate to the sten scale. Scores on the 16PF are presented on a 10-point scale which is bipolar, meaning that each end of the scale has a distinct meaning. The sten scale has a mean of 5.5 and a standard deviation of 2, with scores below 4 considered low and scores above 7 considered high. Below is a table outlining the average course engineering students’ personality traits measured by the 16PF Questionnaire (Table 4).

**Table 4.** Primary factors and descriptors in Cattell's 16 Personality Factor Model of an average student completed an ESP course

Global factors	Primary factors	Descriptors of low range					Descriptors of high range				
		1	2	3	4	5	6	7	8	9	10
Extraversion/ Introversion	A Warmth Reserved/Warm	1	2	3	4	5	6	7	8	9	10
	F Liveliness Serious/Lively	1	2	3	4	5	6	7	8	9	10
	H Social Boldness Shy/Bold	1	2	3	4	5	6	7	8	9	10
	N Privatness (Forthrightness) Private/Forthright	1	2	3	4	5	6	7	8	9	10
	Q 2 Self-Reliance (Affiliative) Self-Reliant/Group-Oriented	1	2	3	4	5	6	7	8	9	10
Receptivity or openness	I Sensitivity Sensitive/Unsentimental	1	2	3	4	5	6	7	8	9	10

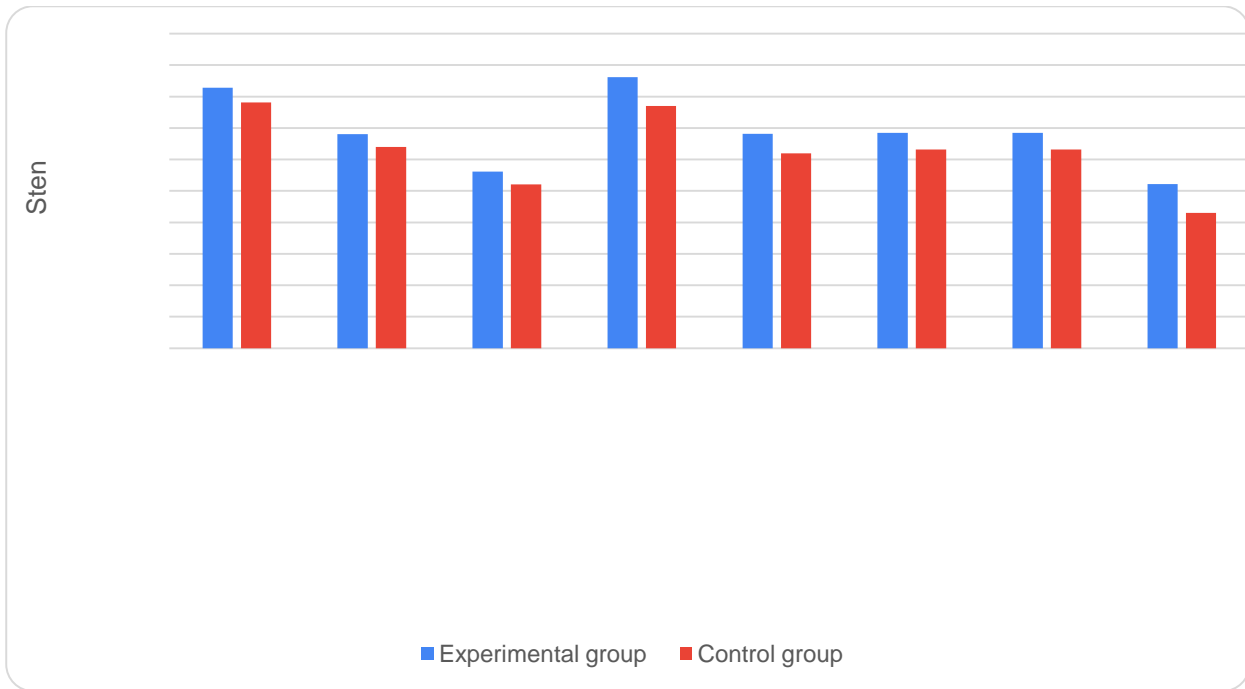
(versus Tough-Mindedness)	M Abstractedness Abstracted/Practical	1	2	3	4	5	6	7	8	9	10
	Q 1 Openness to Change Open-to-Change/Traditional	1	2	3	4	5	6	7	8	9	10
	A Warmth Reserved/Warm	1	2	3	4	5	6	7	8	9	10
Lack of restraint/ Self-control Self-controlled (or conscientious) versus Unrestrained	G Rule-Consciousness Expedient/Rule-Conscious	1	2	3	4	5	6	7	8	9	10
	Q 3 Perfectionism Tolerates disorder/Perfectionistic	1	2	3	4	5	6	7	8	9	10
	F Liveliness (versus Seriousness) Serious/Lively	1	2	3	4	5	6	7	8	9	10
	M Abstractedness Abstracted/Practical	1	2	3	4	5	6	7	8	9	10
	B Reasoning and problem-solving	1	2	3	4	5	6	7	8	9	10
Low Anxiety/ High anxiety Neuroticism	C Emotional Stability Emotionally Stable/Reactive	1	2	3	4	5	6	7	8	9	10
	L Vigilance Trusting/Vigilant	1	2	3	4	5	6	7	8	9	10
	O Apprehension Self-Assured/Apprehensive	1	2	3	4	5	6	7	8	9	10
	Q 4 Tension Relaxed/Tense	1	2	3	4	5	6	7	8	9	10
Accommodation /Independence Agreeableness	E Dominance Deferential/Dominant	1	2	3	4	5	6	7	8	9	10
	H Social Boldness Shy/Bold	1	2	3	4	5	6	7	8	9	10
	L Vigilance Trusting/Vigilant	1	2	3	4	5	6	7	8	9	10
	Q 1 Openness to Change Open-to Change/Traditional	1	2	3	4	5	6	7	8	9	10

Source: compiled by the authors

The individual and psychological characteristics of the average short-term training programme graduate and the control group student were plotted in [Figure 3](#).

The following conclusions can be drawn from the 16PF analysis. Students who successfully completed studies based on the edutainment model had slightly higher indicators of openness and conscientiousness global factors compared with the students from the control group. Students with a high score on the mentioned-above factors are generally seen as bright, open to experience, quick learners who also tend to be more adept at abstract thinking and problem solving. A high score (7 or above) suggests a person who is capable of conceptualising and solving more complex issues. Openness emphasises imagination and insight the most out of all five personality traits. Students are known to be creative, open to trying new things, focused on tackling new challenges. They are also more likely to hold unconventional beliefs, tend to good impulse control, and goal-directed behaviors. These results have indicated the success of the proposed edutainment model.

Statistical data analysis using the Mann-Whitney test showed no statistically significant differences ( $p > 0.05$ ) between the experimental and control groups both on the scale of the Sixteen Personality Factor Questionnaire and in the English language proficiency level (B1) at the placement test ([Table 5](#)).



**Fig. 3.** Final stage results of the 16PF analysis  
Source: compiled by the authors

**Table 5.** Comparative analysis of the placement test results of the experimental and control groups (Compiled by the authors)

Variables	Placement test						
	Experimental group		Control group		Sample mean, %	Mann-Whitney Z-test	p value
	M	SD	M	SD			
The Sixteen Personality Factor Questionnaire							
Factor A Warmth Reserved/Warm	7.75	0.69	7.67	0.62	1.1	1,08	0.278
Factor B Reasoning and problem-solving (cognitive ability)	6.20	1.01	6.19	0.93	0.2	0.52	0.606
Factor F Liveliness (versus Seriousness) Serious/Lively	5.10	0.67	5.10	0.67	0.0	0.00	0.999
Factor G Rule-Consciousness Expedient/Rule-Conscious	7.57	0.74	7.66	0.60	-1.2	-0.86	0.392
Factor I Sensitivity Sensitive/Unsentimental	6.01	0.66	6.01	0.66	0.0	0.00	0.999
Factor M Abstractedness Abstracted/Practical	6.31	0.72	6.24	0.57	1.0	1.40	0.162
Factor Q 1 Openness to Change Open-to-Change/Traditional	6.19	0.87	6.19	0.84	0.0	0.07	0.946
Factor Q 3 Perfectionism Tolerates Disorder/Perfectionistic	4.47	1.01	4.24	0.65	5.5	1.81	0.070
English proficiency band scoring							
Listening	4.00	0.00	4.00	0.00	0.0	0.00	0.999

Reading	4.00	0.00	4.00	0.00	0.0	0.00	0.999
Writing	3.78	0.64	3.95	0.50	-4.5	-0.61	0.542
Speaking	4.17	0.59	4.06	0.61	2.7	1.62	0.104
Overall score	15.84	1.03	16.01	0.70	-1.1	0.43	0.668

Source: compiled by the authors

Statistical data analysis by the Mann-Whitney test revealed statistically significant differences ( $p < 0.05$ ) in a number of factors on the scales of the 16PF questionnaire between the experimental and control groups at the final test.

Thus, the response style indices on the Factor A “Warmth” in the experimental group of students were statistically significantly higher by 6.0% compared with the control group of students ( $p < 0.001$ ).

The cognitive ability scale sten score of the students from the experimental group was statistically significantly higher by 6.4 % than one from the control group students ( $p < 0.001$ ). The liveliness-seriousness scale sten score (Factor F) of the experimental group students was statistically significantly higher by 7.7 % than the control group students’ sten score ( $p < 0.001$ ). The experimental group had 11.9 % improvement in the rule-consciousness scale sten score compared with the control group ( $p < 0.001$ ). The sensitivity scale sten score of the experimental group students was statistically significantly higher by 10.0 % compared with the control group students ( $p < 0.001$ ). The abstractedness scale sten score of the students in the experimental group was statistically significantly higher by 8.2 % than the score of the control group students ( $p < 0.001$ ). The openness-change scale sten score of the experimental group students was statistically significantly higher by 8.4 % than the score of the control group ones ( $p < 0.001$ ). Besides the results showed that the experimental group indicated a statistically significant increase by 21.1 % in the perfectionism scale sten score compared with the control group ( $p < 0.001$ ).

In addition, the edutainment model proposed accelerates students' academic improvement of their listening, speaking, and reading skills. Thus, at the end of the studies the statistically significant improvement in English language proficiency was observed ( $p < 0.05$ ). The listening band of the experimental group students was statistically significantly higher by 12.9 % than that in the control group ( $p < 0.001$ ). The reading band in the experimental group was statistically significantly higher by 28.8 % than that one in the control group ( $p < 0.001$ ). The speaking band of the experimental group students was statistically significantly higher by 18.4 % than one in the control group ( $p < 0.001$ ). The total band in the experimental group was statistically significantly higher by 15.1 % than in the control group ( $p < 0.001$ ). However, no statistically significant changes in writing skills were observed in both groups (Table 6).

According to the statistical analysis of the dynamics of indicators using the Wilcoxon criterion students of the experimental group demonstrated positive dynamics after training based on the edutainment model. The sten scores of all the scales of the 16PF questionnaire increased statistically significantly at the final stage relative to ones at the placement test ( $p < 0.001$ ) in the following way:

- the warmth scale indicator increased by 6.9 %;
- the cognitive ability scale indicator increased by 9.8 %;
- the liveliness scale indicator increased by 10.1 %;
- the rule-consciousness scale indicator increased by 13.8 %;
- the sensitivity scale indicator increased by 13.3 %;
- the abstractedness scale indicator increased by 8.5 %;
- the openness to change scale indicator increased by 10.7 %;
- the perfectionism scale indicator increased by 16.5 %.

Similarly, the English language proficiency bands increased statistically significantly at the final stage relative to the entry test ones ( $p < 0.001$ ). Thus, the listening scale band increased by 23.9 per cent, the reading scale band increased by 32.7 per cent, the writing scale band increased by 4.4 per cent, the speaking scale band increased by 34.8 per cent. As a result, total band increased by 25.2 per cent (Table 7).



**Table 6.** Comparative analysis of the final test results of experimental and control groups

Variables	Final test results						
	Experimental group		Control group		Sample mean, %	Mann-Whitney Z- test	p value
	M	SD	M	SD			
Sixteen Personality Factor Questionnaire							
Factor A Warmth Reserved/Warm	8.28	0.63	7.81	0.49	6.0	6.70	<0.001
Factor B Reasoning and problem-solving (cognitive ability)	6.80	0,98	6.40	0.87	6.4	5.61	<0.001
Factor F Liveliness (versus Seriousness) Serious/Lively	5.61	0.53	5.21	0.68	7.7	5.06	<0.001
Factor G Rule-Consciousness Expedient/Rule-Conscious	8.62	0.96	7.70	0.67	11.9	11.46	<0.001
Factor I Sensitivity Sensitive/Unsentimental	6.81	0.40	6.19	0.53	10.0	9.28	<0.001
Factor M Abstractedness Abstracted/Practical	6.84	0.50	6.32	0.54	8.2	7.95	<0.001
Factor Q 1 Openness to Change Open-to-Change/Traditional	6.85	0.58	6.32	0.71	8.4	7.41	<0.001
Factor Q 3 Perfectionism Tolerates Disorder/Perfectionistic	5.21	0.71	4.31	0.58	21.1	11.39	<0.001
English proficiency band scoring							
Listening	4.95	0.21	4.39	0.34	12.9	13.29	<0.001
Reading	5.31	0.37	4.12	0.46	28.8	15.10	<0.001
Writing	3.94	0.16	3.97	0.19	-0.8	-1.05	0.293
Speaking	5.62	0.69	4.74	0.57	18.4	10.85	<0.001
Overall score	19.82	0.83	17.23	0.83	15.1	15.52	<0.001

Source: compiled by the authors

**Table 7.** Dynamics of indicators in the experimental group

Variables	Experimental group						
	Placement test		Final test		Sample mean, %	Wilcoxon Z- test	p value
	M	SD	M	SD			
the Sixteen Personality Factor Questionnaire							
Factor A Warmth Reserved/Warm	7.75	0.69	8.28	0.63	6.9	7.7	<0.001
Factor B Reasoning and problem-solving (cognitive ability)	6.20	1.01	6.80	0.98	9.8	7.8	<0.001
Factor F Liveliness (versus Seriousness) Serious/Lively	5.10	0.67	5.61	0.53	10.1	7.5	<0.001
Factor G Rule-Consciousness Expedient/Rule-	7.57	0.74	8.62	0.96	13.8	9.3	<0.001

Conscious							
Factor I Sensitivity Sensitive/Unsentimental	6.01	0.66	6.81	0.40	13.3	9.3	<0.001
Factor M Abstractedness Abstracted/Practical	6.31	0.72	6.84	0.50	8.5	7.7	<0.001
Factor Q 1 Openness to Change Open-to-Change/Traditional	6.19	0.87	6.85	0.58	10.7	8.4	<0.001
Factor Q 3 Perfectionism Tolerates Disorder/Perfectionistic	4.47	1.01	5.21	0.71	16.5	9.2	<0.001
English proficiency band scoring							
Listening	4.00	0.00	4.95	0.21	23.9	11.3	<0.001
Reading	4.00	0.00	5.31	0.37	32.7	11.3	<0.001
Writing	3.78	0.64	3.94	0.16	4.4	3.6	<0.001
Speaking	4.17	0.59	5.62	0.69	34.8	10.4	<0.001
Overall score	15.84	1.03	19.82	0.83	25.2	11.5	<0.001

Source: compiled by the authors

Statistical analysis of the dynamics of indicators in the control group by the Wilcoxon criterion showed statistically significant increase in the sten scores of the 16PF questionnaire scales at the final stage relative to the placement test data ( $p < 0.05$ ) in the following way:

- the warmth scale indicator increased by 1.9 % ( $p < 0.001$ );
- the cognitive ability scale indicator increased by 3.4 % ( $p < 0.001$ );
- the liveliness scale indicator increased by 2.2 % ( $p = 0.032$ );
- the sensitivity scale indicator increased by 3.0 % ( $p < 0.001$ );
- the abstractedness scale indicator increased by 1.3 % ( $p = 0.028$ );
- the openness to change scale indicator increased by 2.1 % ( $p = 0.002$ ).

Likewise, the values of a number of the studied scales for English language proficiency bands increased statistically significantly at the final stage relative to the levels of the placement test ( $p < 0.001$ ). Thus, the listening scale band increased by 9.7 % ( $p < 0.001$ ), the reading scale band increased by 3.0 % ( $p = 0.001$ ), the speaking scale band increased by 16.9 % ( $p < 0.001$ ). As a result, total band increased by 7.6 % ( $p < 0.001$ ) (Table 8).

**Table 8.** Dynamics of indicators in the control group

Variables	Control group						
	Placement test		Final test		Sample mean, %	Wilcoxon Z-test	p value
	M	SD	M	SD			
the Sixteen Personality Factor Questionnaire							
Factor A Warmth Reserved/Warm	7.67	0.62	7.81	0.49	1.9	3.6	<0.001
Factor B Reasoning and problem-solving (cognitive ability)	6.19	0.93	6.40	0.87	3.4	4.4	<0.001
Factor F Liveliness (versus Seriousness) Serious/Lively	5.10	0.67	5.21	0.68	2.2	2.1	0.032
Factor G Rule-Consciousness Expedient/Rule-Conscious	7.66	0.60	7.70	0.67	0.5	1.3	0.178
Factor I Sensitivity Sensitive/Unsentimental	6.01	0.66	6.19	0.53	3.0	4.3	<0.001

Factor M Abstractedness Abstracted/Practical	6.24	0.57	6.32	0.54	1.3	2.2	0.028
Factor Q 1 Openness to Change Open-to- Change/Traditional	6.19	0.84	6.32	0.71	2.1	3.2	0.002
Factor Q 3 Perfectionism Tolerates Disorder/Perfectionistic	4.24	0.65	4.31	0.58	1.5	1.9	0.054
English proficiency band scoring							
Listening	4.00	0.00	4.39	0.34	9.7%	9.1	<0.001
Reading	4.00	0.00	4.12	0.46	3.0%	3.3	0.001
Writing	3.95	0.50	3.97	0.19	0.5%	0.3	0.732
Speaking	4.06	0.61	4.74	0.57	16.9%	9.3	<0.001
Overall score	16.01	0.70	17.23	0.83	7.6%	10.6	<0.001

Source: compiled by the authors

It can be seen that the increase of indicators in the experimental group is greater than in the control group. In addition, in the control group there was no statistically significant increase in three global factors such as rule-consciousness, perfectionism and writing skills.

#### 4. Discussion

The person's innovative personality is characterised by the synergistic interaction of the following elements: having competence, values, virtues; acquiring prestige; radiating charisma; earning respect, and gaining authority (Dubakov, Olar, 2019). Employees having innovative potential that is the ability to identify a problem, propose and evaluate possible novel ideas, and provide an innovative and practical solution are essential to the lifeblood of any enterprise of the mineral resource sector (Kazanin et al., 2021; Bazhin, Issa, 2021). Specialists having innovative potential are capable to lead the company out of the dark ages by redesigning something known or implementing completely new products. In the long term, these students' competences result in success for students, both in the university and later at the workplace. They are convinced that they can work and study with great elan after confronting some new and unusual occupational situations within their studies on the basis of the proposed edutainment model. According to some scientists such positive and negative experiences lead to deep reflection and reorientation (Duggal et al., 2021; Makhovikov et al., 2023). Only during such poignant moments does a person feel deep engagement set in, because it takes concern. Concern leads to different consciousness that results in different behaviour (Pestalozzi, 1989).

#### 5. Conclusion

The aim of the research was to suggest the learning model which contributes to the simultaneous development of both the engineering students' foreign language communicative competence and their innovative potential. To reach it, the needs of engineering students were analyzed; different resources, both self-study and in-class were assessed in order to suggest the most suitable activities for the development of the innovative potential. To cultivate the innovative potential of learners the edutainment model based on students' needs was designed. The proposed model results in improvement of the English language proficiency and observable changes in students' behaviour including alterations in personality characteristics related to innovative potential development which may indicate viability of the proposed edutainment model.

#### 6. Limitations

In this study, some limitations are to be mentioned. Firstly, the experiment was conducted only with second-year engineering students. Secondly, there was no special selection of the participants into experimental and control groups apart from their English proficiency level (B1).

### Author contribution

I.G.G. and I.S.O. conceived of the presented idea and designed the research; I.S.O. developed the theory; I.G.G. and I.S.O. carried out the experiment; I.G.G. performed the computations; I.G.G. supervised the project; I.G.G. and I.S.O. wrote the paper.

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### Conflicts of Interest

The authors declare no conflict of interest.

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## Shaping and Financing Educational Practices in Youth Development

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### Abstract

Education, being a formalized continuation of upbringing, is a process aimed at the comprehensive development of an individual. Thus, in addition to comprehending the socially significant experience embodied in knowledge, an individual develops skills for creative activity and learns other forms of spiritual and practical exploration of the world. It is not surprising that over the time, characterized by the expansion of information fields, areas of responsibility and competencies, more attention is brought to discussions on the principles and components of policies that are focused on educating young people within the framework of educational activities at various levels of system education and training. The purpose of the research is to analyze principles and features of educational practices aimed at developing personal and social competencies in young people, as well as the specifics of their development and integration. The factors of social competence education of youth are considered as the objective of the research. The usability of the obtained results is in their potential application for creating a support system for comprehensive development of young people. The findings may have practical implications for developing policies used to create and support opportunities for comprehensive growth of young people. The research is conducted through general and special scientific instruments: dialectical approach, deduction and induction, statistical correlation and regression analysis.

**Keywords:** young people upbringing, educational organizations, young people growth, practical upbringing.

### 1. Introduction

The meaning of the “education of youth” concept can be interpreted in different ways. Thus, based on the context, the development of various competencies in young people can be understood as a process of natural personal development, all practices, methods and existing principles of

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youth education. All definitions have a logical connection, which in turn requires their separate consideration:

Education of youth as a natural process.

Youth development, a traditional and still the most widely used term, refers to natural processes for young people to develop their ability to understand the world around them and act in accordance with its rules, requests and restrictions. In this sense, this concept is identical to child and adolescent development. In other words, development is characterized by the activation of human potential under the influence of challenges and physical and social environment stimuli. It is not surprising that development lasts throughout the whole life (Damon, 2004).

However, when it comes to the level of social competence, it is important to consider the attribute of age, which implies significant differences in a person's preparedness for social life. While the level and the aspects of social competence are clear within the analysis of a formed, completely socialized person, the assessment of personality development for young people cannot always be conducted in accordance with ready-made instructions.

The point is, the state of competence of a youth representative depends on a wide number of factors. In this regard, the process of personal development, achieved due to the expansion of the circle of interests and acquaintances, the acquisition of new communication experience with peers and adults, the development of self-knowledge and self-awareness, is related to the gradual education of socially significant qualities – the ability to sympathize and empathize, to self-identify with a certain person or a group of people and, on the contrary, to separate oneself and one's own interests from the mass of other people's motives, etc. The particular importance at this stage of social development is paid to emotional perceptions, specified by impulsiveness, excitability, rapid mood changes and occurring experiences (Bulatnikov, 2012).

The above mentioned processes constitute the structure of a person's perceptions, where they, based on personal abilities and reasons for self-determination and self-awareness, determine their place in life and choose behavior patterns that are comfortable to adhere to within the framework of regular and work activities. However, in this aspect, an important role is attributed to school that offers experiential acquaintance with various components of social and labor competencies (see Figure 1).

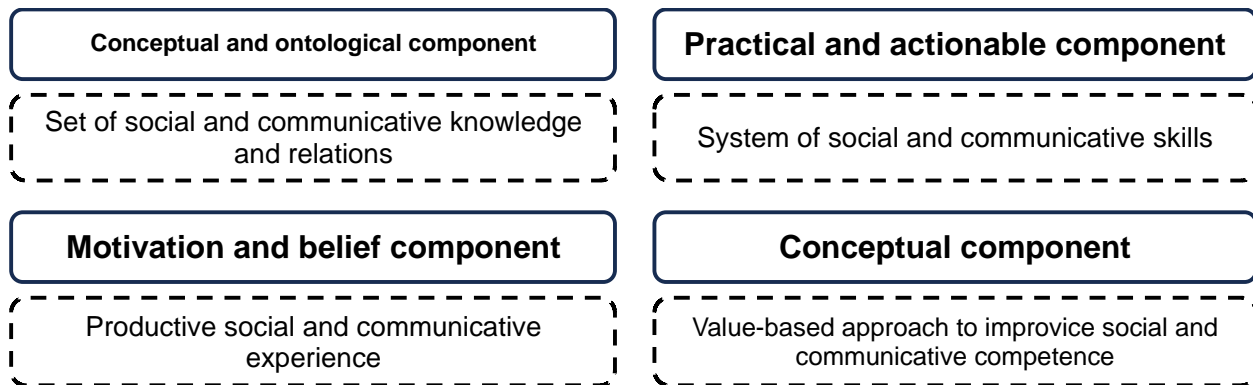


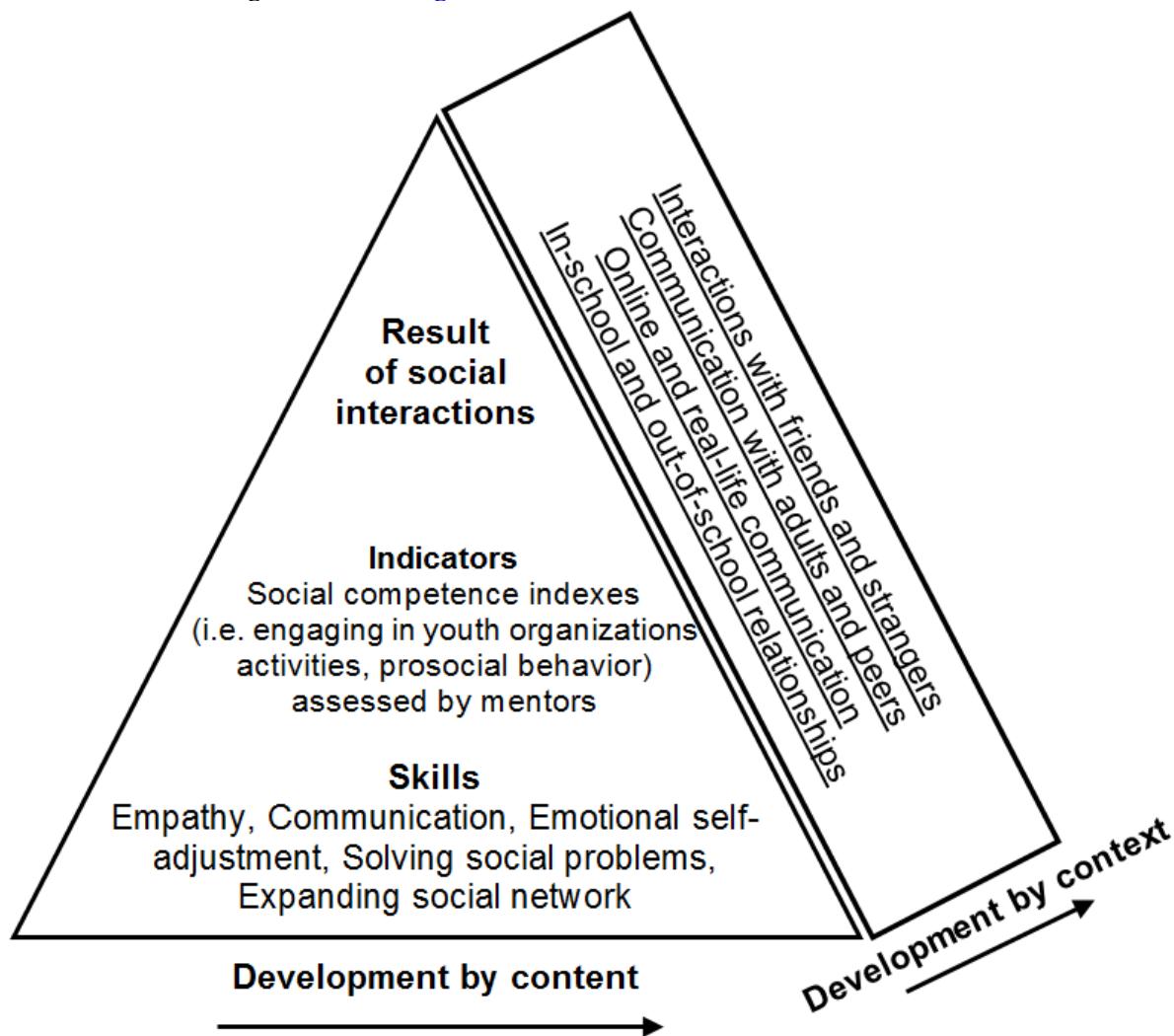
Fig. 1. The components of social competencies (Halberstadt et al., 2001)

As a consequence, the concept of competence of a young person can be defined as an integrative personality attribute that implies the presence of knowledge, experience, abilities and skills, formed as a result of socialization, which allow the person to effectively adapt to society and productively interact with its members. In turn, the content component of competence formation depends on the person's age.

The presence of the above mentioned competencies contributes to personal and professional growth, productive social interaction, increasing level of positive social activity and harmonious social life. A high level of social competence of young people as future professionals who provide value to society guarantees their successful adaptation to dynamically changing living conditions, forms the basis of life, and opens up prospects for effective social and professional fulfillment (Gedviliene et al., 2014).



Of particular note is the prism model of social competence that not only focuses on developing social competence, but describes various elements necessary for establishing good social interactions in general (see [Figure 2](#)).



**Fig. 2.** Rose-Krasnor model of social competence ([Rose-Krasnor, 1997](#))

Various indexes of social competence, as well as multiple skills that support social competence and diverse contexts of social interaction, are relevant measuring methods of social competence that change through the process of development. For example, at the skill level, the authors consider those skills that create key foundations for effective social interaction, such as empathy, and emotional self-adjustment, each of those being a complex construct as is, and may also vary at different developmental stages ([Junge et al., 2020](#)).

#### Fundamental basics

An important role in youth development is assigned to the state, which strives to ensure that the majority of young people get education and necessary competencies in the process of their development and evolvement as professionals. This intention of the state in the development of youth is based on the principles of universality and inclusiveness of education, while the state policy in education covers all the youth of the country, interested in developing and evolving their professional and personal qualities.

The focus on youth development can be seen as a counterbalance to the emphasis on classifying young people according to their weaknesses and attempting to further transform them. The contrast between the approach to youth development and approaches aimed at preventing specific types of problems among groups of young people identified as 'higher risk' is somewhat similar to the contrast between public health and medical treatment ([Roth, Brooks-Gunn, 2023](#)).

#### Essential nature

At the heart of the approach to youth development is the governmental desire to ensure the successful involvement of as many young people as possible. This desire unites two principles – universality and inclusiveness. As a result, the policy should cover all young people and ensure a positive focus of events on the strengths of the youth.

Emphasis on youth development can be seen as a counterweight to programs that classify young people according to their weaknesses and strive for their further transformation. The contrast between the approach focused on youth development and the approach focus on preventing certain types of problems in high-risk youth groups is comparable to the fundamental difference between public health and medicine (Wheeler, 2011).

#### Practical component

The usage of the development of youth term is a priority for describing programs and initiatives. Youth development in this sense means the application of principles to a whole range of planned practices and events that contribute to the process of young people development. The development of personal and social competences occurs in a variety of settings, including family, peer groups, youth and religious organizations, educational institutions, and digital space. The specific methods used by adults to create and maintain these opportunities vary depending on the specific situation, but the principles are generally the same (Roth, Brooks-Gunn, 2003).

## 2. Materials and methods

Within the terminology used in this article, programs, organizations and initiatives represent broader sets of practices. For example, programs may be short-term or long-term, cover a large number of young people or small groups. Programs are often embedded in the value structure of an organization.

Ho, if an organizational policy is long-term and represents a complex structure of several components, its activity covers a larger number of young people and includes them in various programs. Meanwhile, initiatives imply multifaceted cooperation and inclusion of the widest possible range of people and organizations with the aim of making the whole society suitable for youth development, which at the same time is becoming more and more popular as a movement unifying a wide range of actions and measures for the formation of social policy. The latter includes the course of action adopted by competent organizations (usually represented by government authorities). The principles of youth development lie in the basis of policies at all governmental levels (local, regional and national) and in various organizations involved in supporting youth and creating opportunities for their advancement (Christens, Dolan, 2011).

Moreover, creators of youth development programs should remember that the development process as is cannot have a final result, described by a certain qualitative state of a specific group of people. In this regard, it is appropriate to talk about youth development in the context of providing opportunities for further development of personal competences (Benson et al., 2011).

## 3. Results

The set of human qualities to be developed in young people can be determined in various ways. If you present this list in a generalized form, then development leads to the formation of a system of five competencies: willingness, character, commitment, trust, and involvement (care and compassion).

Willingness (competence) includes knowledge and skills that allow people to sense the environment and use its resources for more effective performance of the intended activity. Competence allows a person under favorable external conditions to achieve what they set out to do, and to adapt to the situation in order to achieve as much as possible.

Character describes a penchant of an individual to do what they consider fair and necessary. In turn, commitment is related to a person's social relations with adults, peers, and youth, while self-confidence implies the presence personal qualities that allow a person to achieve goals and act in their own interests, while contribution implies the ability of a person to use the acquired knowledge and skills both for their own benefit and for creating favorable conditions for other people.

The described components, acting as a kind of goals, cannot be limited in their levels and, as a result, be developed enough so that it would be useless for a person to further process the information. For this reason, young people build new connections, develop competence and

character in the process of communicating with other people. In turn, confidence comes from the strength of character and personal principles, while the contribution to the common cause is necessarily connected to the need to apply the acquired skills and demonstrate competence.

These descriptions of key components give a brief idea of youth development goals and are useful as a reasonable checklist used to assess the outcome of young people participating in a particular program, organization or initiative. Of course, each component represents a very broad topic and creates difficulties for the development and evaluation of programs.

Despite the fact that program planning requires a broader and more detailed analysis of development goals, as well as comprehensive illustration of key directions of youth development, it is useful to clarify the personal and social assets terminology (see [Table 1](#)). Thus, social assets are divided into components in the following areas of development:

- physical,
- intellectual,
- psychological and emotional,
- social ([Benson, 2007](#)).

**Table 1.** Personal and social assets that contribute to positive youth development

Area of development	Target results
Physical development	Health-promoting habits
	Health risk managements skills
Intellectual development	Knowledge of basic life skills
	Basic professional skills
	Developing of critical thinking reflexion skills
	Adoption of experience of navigating in various cultural contexts
Psychological and emotional development	Assurance in personal efficiency
	Advanced skills of emotional self-direction
	Sense of personal autonomy/responsibility for actions
	Integral and positive personal and social identity
Social development	Commitment to participate in social life
	Respect to values and norms of various cultures
	High level of connectedness, involving good relationships and confidence with parents and peers
	Loyalty to prosocial institutions (school, church)

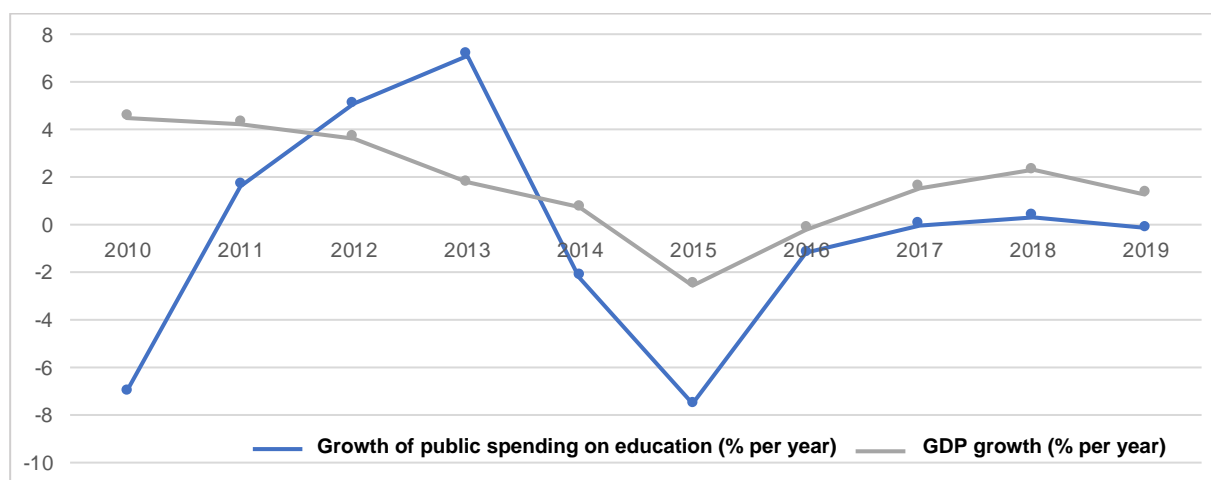
Source: created by authors

An asset is something that has value as is (in a broad sense, similar to money, real estate and property), but is also something useful for obtaining other desired things or effects that can be considered intrinsic assets (for example, purchase of an art piece, use of real estate as a security for a credit) ([Dimitrova, 2021](#)).

When it comes to youth development, it is impossible to focus on developing only one student or one university. It is a long and comprehensive process of creating an integrated complex system based on new types of education with the use of modern, game-changing tools that engage all young people.

Ideally, they create a system built on the principles of inclusiveness, sustainability, connectedness with each other, with a larger macrosystem surrounding them (for example, labor market, media, social and political institutions).

Finally, such system is durable, which implies reduced dependence on grants or subsidized money, which is especially important in the context of changes in the structure of government revenues and therefore a decrease in the amount of funding flow in certain areas, including education. To do so, it is necessary to consider the dynamics of spendings of the consolidated budget and state extra-budgetary funds on education in the Russian Federation (see [Figure 3](#)).



**Fig. 3.** Growth dynamics of GDP and government spending on education in the Russian Federation from 2010 to 2019

The dynamics of changes in expenditures and growth show that since the beginning of the last decade there has been an annual reduction in expenditures on education: if by the beginning of the decade the expenditure to GDP ratio was 4 %, then by the end it was only 3.5 % (see [Table 2](#)).

**Table 2.** Dynamics of consolidated budget spendings and state extra-budgetary funds on education in the Russian Federation (2010–2019)

Year	Budget spendings on education, total (% from GDP)	Growth of budget spendings on education (% per year)	GDP growth (% per year)
<b>2010</b>	4,09	-7,01	4,50
<b>2011</b>	3,99	1,66	4,26
<b>2012</b>	3,75	5,09	3,66
<b>2013</b>	3,95	7,12	1,79
<b>2014</b>	3,83	-2,19	0,74
<b>2015</b>	3,64	-7,52	-2,54
<b>2016</b>	3,60	-1,19	-0,17
<b>2017</b>	3,55	-0,02	1,55
<b>2018</b>	3,53	0,33	2,3
<b>2019</b>	3,49	-0,15	1,3

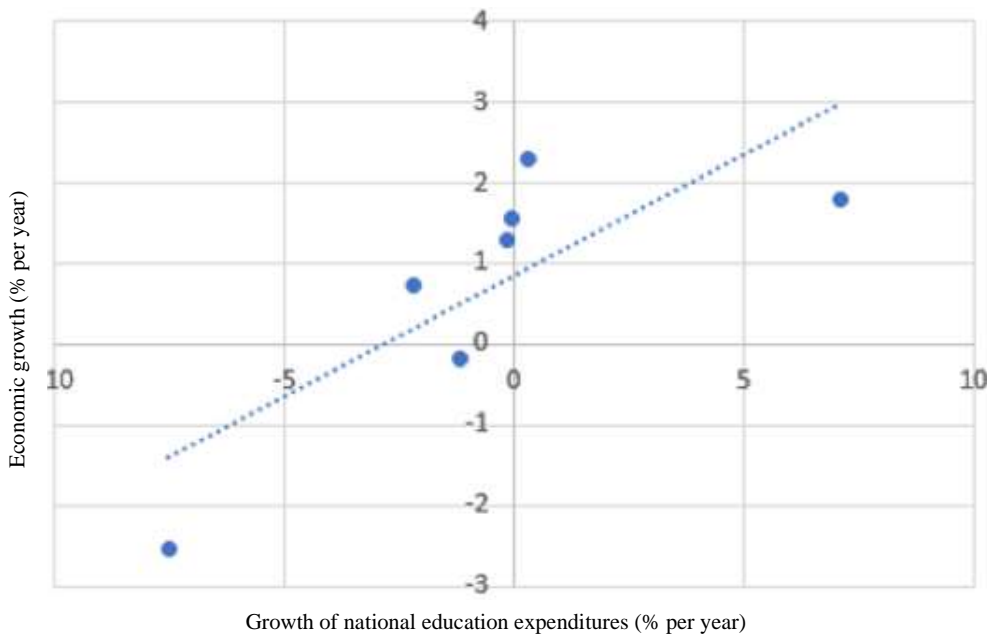
Source: Ministry of Finance of the Russian Federation

Based on the statistical data available for the period 2010–2019, let's build a regression-correlation analysis model. The correlation coefficient is 0.36, a fairly low indicator, that is, in the period from 2010 to 2019, the correlation between growth of spendings on education and economic growth was weak. However, if we take data from 2013 to 2019 as the basis for the correlation and regression analysis, then the linear correlation coefficient is already 0.79. The results obtained indicate a serious dependence of the growth of expenditures on education from the growth of national economy, as indicated by the trend line of the described dependence (see [Figure 4](#)).

The difference between the results for the two periods studied, 2010–2019 and 2013–2019, is that the first covers the post-crisis years, when spending on education and many other social areas of national life has been drastically reduced. We should note the dynamics of changes in budget spendings on education: at the beginning of the decade, the indicator of spendings on education as a percentage of GDP was 4.09 %, then by the end it was reduced to 0.5 %.

Since spendings on education are mostly based on budgetary funds of different levels, it should be noted that budgets take an unequal share in the financing of educational institutions. Secondary schools receive 99 % of funds from the regional budget, while higher educational institutions, on the contrary, rely on federal budget funds (96 %). In some cases, extra-budgetary

funds from business activities, sponsorships and patronage, as well as donations and targeted contributions, are available; however, the volume of those cannot be predicted.



**Fig. 4.** Graphical representation of the correlation between economic growth and education expenditures for the period 2010–2019

Recent trends also indicate a more targeted reduction in costs associated with education and upbringing. Thus, the Development of Extended Education for Children and Implementation of Youth Policy program was funded by 8.5 % less in 2021 and by 15.7 % in 2022 compared to 2020. This program is being implemented under the guidance of the Education Development state project, and the goals of this project include both the development of youth policy and the support for various levels of education, from preschool to vocational.

It should be noted that previous periods show an increase in budget support for youth policy. So, if in 2019 the amount of funding was 32.9 billion rubles, then a year later 45 billion were already spent on education needs. Initially, the Government intended to maintain the upward trend and planned to spend 48.8 billion rubles on the Education Development program in 2021 and 46.6 billion rubles in 2020. However, due to the economic crisis related to the pandemic, many expenditure items were cut, and in 2023 the amount allocated for these purposes is 37.3 billion rubles.

At the same time, more attention is paid to a more comprehensive program of “patriotic, spiritual and moral education of young people”, taken into account for creating the National Goals Plan developed by the Government. Being of strategic importance, these activities involve an increasing coverage of the Internet segment of the youth audience in order to strengthen civic identity and promote spiritual and moral values, as well as promoting creative activities focused on identifying, supporting and developing abilities and talents of children and youth.

In this regard, of particular importance is to take actions targeted on creating an environment that will allow its members to implement the below mentions features of the educational system (see Table 3).

**Table 3.** Features of an effective enriching environment (Perkins, Noam, 2007)

Area	Description	Reverse
Physical and psychological safety	Ecological and health-friendly environment. State policy based on safe interactions	Physical condition and health, threats; fear; insecurity; verbal abuse
Proper organization	Strict limits and rules, consistent stages of control, regulatory compliance and modern predictable standards	Chaotic, unorganized, careless, rough, overcontrolled or autocratic environment

Enabling relationships	Maintaining the atmosphere of responsiveness and community, stimulating good mood and communication.	Atmosphere of excessive control and lack of trust, unresponsiveness to others and rejection of norms and rules
Shared interests	Opportunities for active involvement, regardless of gender, ethnicity and health aspects.	Discrimination, marginalization, limitations, derogation.
Positive social norms	Supporting rules of conduct, values, and moral standards.	Abnormity; anomy; antisocial and immoral norms; consumer attitude; conformism.
Support of activity	Giving young people independence and opportunities for their own influence.	Excessive emphasis on current results that undermines motivation and desire of young people for education.
Opportunities for competence growth	Developing competencies and skills through targeted educational experience, i.e. creating the social and cultural capital of youth.	Conditions that promote unhealthy physical and mental habits, as well as practices that undermine positive attitude to education and upbringing.
Unity of focuses and interests in school, society, family	Synergetic effect, coordinated and targeted actions	Divergence of interests, conflict situations

Source: created by the authors

The “unity of focuses and interests in school, society, family» area is the most difficult matter among those indicated above, and it also creates the need to systematize all educational processes at the specified levels while developing all members of this system. (Silbereisen, Lerner, 2007).

The most corresponding term for this area is “public youth development”, based on initiatives of the whole society (Kharchilava et al., 2021).

As a result, the very mentioning of a policy that includes "youth development" will attract more attention than its full design. To gain widespread support, any principle must be sufficiently comprehensive and include many provisions, from common and typical to field-specific.

#### 4. Discussion

Thus, within the framework of this work, the authors updated and elaborated the concept of youth education, which includes several interpretations that are necessary to differentiate while developing programs and activities for the development of young people. As for the aspect of upbringing of youth as a natural process, special attention was paid to the essence of social competencies, applied within the framework of both regular and professional activities.

Moreso, the authors analyzed the structure of the components of personal growth – personal and social assets that contribute to the positive development of youth. Subsequently, the authors identified the key features of an effective educational system for young people, consisting of inclusivity, connectivity with other systems, programs and initiatives, as well as sustainability, which is especially important in the context of changes in the financing structure applied to educational programs and initiatives.

An efficient educational environment, according to the authors, includes interpersonal communication for young people, as well as compliance with various social norms and created opportunities for self-realization and self-expression, physical development. As a result, it is necessary to develop the concept of «public youth development» that will allow to implement major programs and initiatives aimed at the development of a wider range of young people.

To summarize, it should be noted that modern society has a multifaceted structure, and its participants are required to possess an increasing number of skills and abilities, imperative for a qualitative transformation of life. In addition to professional and innate qualities and talents, people are responsible for building a trajectory of coexistence in social space throughout their whole lives. The instruments used by an individual to achieve results, make choices and overcome

challenges, are competencies: the quality and efficiency of interpersonal interactions depend on the level of their maturity and prominence (Lerner, 2013).

As for the aspect of meeting community requirements among future representatives of youth, the most important issue is the development of social competencies. Among activities aimed at solving this issue are lectures, workshops and trainings, conducted in a more informal environment, as well as general and customized educational programs implemented by public and private organizations.

## 5. Conclusion

Despite the wide choice of channels used for the development of social competencies, organizers and mentors often do not pay enough attention to external circumstances and educational trends, and it results in increased fragmentation of youth development practices that cover only certain aspects of social competence development. Therefore, educational institutions around the world should be aimed at improving approaches to youth development, in particular through updating methodologies of working with young people, the foundation for those methodologies being built by scientific and practical studies.

Public authorities and society challenge universities and other educational institutions to satisfy the need for creating an approach to the development of social and personal competences of young people.

## 6. Limitations

The research was conducted within subject-semantic limitations, while the analysis was carried out on the basis of statistical data, without the use of experimental one. Thus, it is necessary to explore experimental data while analyzing approaches to the assessment of practices applied to the formation and financing of educational practices in youth development.

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## Digital Asceticism: Philosophy Is Back to School

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### Abstract

The article presents the problem of finding a balance between offline and online life in the context of digitalization. The study reports the quantitative results of a pedagogical experiment conducted to test the methodology of digital asceticism. The experiment involved 9th grade students of a secondary school in Chelyabinsk, Russia. In the study we used the textbook designed in the form of a philosophical diary. The diary "Digital Ascetics" is based on the methods of philosophical practice, which include an appeal to the principles of Stoicism, philosophical reflection and keeping a handwritten diary. The journal consists of sections relevant to today's situation: digital footprint, cyberbullying, critical thinking, self-care. The daily tasks are freewriting, slow reading, reflection on philosophical quotations, philosophical questioning, self-reflection. The hypothesis of the study was that philosophical practice can help a high school student find a balance between online and offline life. It can reduce the negative effects of communication and virtualization mediated by technological devices and prevent digital addiction. The results of the experiment showed that the use of a philosophical diary is useful for developing skills in interacting with devices, working with information, digital hygiene and security. Digital asceticism as a pedagogical approach can become a basis for effective and creative educational and extracurricular activities of students. The materials of the study can be used as recommendations for the organization of educational and pedagogical work focused on the formation of digital literacy skills.

**Keywords:** digital anthropology, digital asceticism, philosophical diary, digitalization, pedagogical experiment, digital literacy, digital hygiene.

### 1. Introduction

The modern world has been seriously transformed under the influence of digitalization and therefore it is characterized by a number of features that significantly affect all social processes and

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the everyday life of an individual. Today, modern communication technologies make it possible to receive information in real time, which simultaneously accelerates decision-making and increases the efficiency of performance. However, this constant access to information also exposes a person to stressful information loads. While new forms of communication such as social media, messengers, and other communication tools facilitate quick communication with friends and colleagues anywhere in the world, they also contribute to the pursuit of perfect images that are often broadcast over the Internet.

Digital technology has dramatically changed the way we work in many industries, including commerce, education and healthcare. Since the Covid-19 pandemic, remote work has become commonplace in intellectual fields and has greatly expanded the availability of education. However, it has also blurred the boundaries between employees' work and personal time, leading to the problem of irregular working days that are not governed by labor laws or health and safety regulations. This can lead to burnout, neurotic disorders and other destructive consequences of working in a capitalist race for profit. (Zheleznyak, 2022). E-commerce through online stores, payment systems, and other electronic services offers the opportunity to save time when making purchases without taking time away from your primary job. However, this convenience can lead to incredible overconsumption and online shopaholism, especially when credit purchases are offered, which can create financial hardship for many people. One of the main specifics of the world in the age of digitalization is also the presence of digital threats and challenges. Cybercrimes, cyber espionage, fake news, cyberbullying and other similar phenomena lead to increased tensions between individuals and social groups as well as entire nations (Gálik, 2019; Wang et al., 2019; Ademiluyi et al., 2022).

The labour market has also changed dramatically due to digital technologies. A huge amount of data, known as "Big Data", influences production, economic, political and cultural processes. Processing and analyzing this amount of data requires new tools and digital skills, making digital literacy an important factor for successful work and functioning in today's world. Thus, in the context of digitalization, it becomes crucial to be able to effectively use digital technologies and tools to adjust and perform successfully in the modern world.

The main goal of the Digital Ascetics Diary project is to balance online and offline presence and existence, get out of digital addiction, get to know oneself and determine the path of further self-development with the help of a handwritten diary. The diary, designed in both print and mobile app formats, includes sections that are particularly important at the current stage of society's development: digital footprint, cyberbullying, critical thinking, and self-care. These are the skills that are important to develop in the younger generation.

The purpose of the article is to present the influence of the textbook "Digital Ascetics" on the processes of self-awareness, self-development, and digital addiction on the basis of the results of the pedagogical experiment. Hypothesis of the study is the following: we suppose that methods of philosophical practice based on the principles of Stoicism taking into account the current situation (Dopierala, 2022), philosophical reflection and diary keeping can help schoolchildren to find a balance between online and offline lives. This will reduce the negative effects of mediated communication and virtualization and prevent digital addiction. This approach can become the basis for more effective and creative academic and extracurricular activities of schoolchildren.

## **2. Materials and methods**

Methods employed are the following: pedagogical survey, questionnaires, data analysis.

For the experiment, two classrooms of a general secondary school were selected by prior agreement. A sample of available cases is used, which is fully justified in the experimental conditions. The number of participants of the experiment is equal to the number of students in the classes. According to the design of experiment, experimental group and a control group should be identical. Number of students in classes: class "A" – 14 people and class "B" – 16.

The limitations of using experiments, including pedagogical experiments, are widely described in the scientific literature. First of all, there are problems of an ethical and technical nature. Ethical issues come to the fore when conducting research on human subjects. This point was fully taken into account in the study, since the very essence of the experiment was to teach young people ascetic practices in the digital environment and minimize the threats it poses.

One of the most important technical obstacles when conducting an experiment is the impact of the experimental setup on the object being studied itself and the appearance of removable and

irremovable effects of such impact. Here the experimental methodology encounters a number of specific limitations related to the characteristics of the objects being studied. A typical technical problem is the creation of artifacts in empirical research, which greatly complicates the solution of research problems. It can be solved using statistical processing methods. In our study, statistical data was compared with self-examination based on the results of working with diaries, which was supposed to exclude the appearance of artifacts.

Main concepts of the study are the following.

1. Digital literacy is the ability to use new media with the help of gadgets and to implement fact checking.

2. Digital asceticism is a new format of relationship with digital, in the form of a philosophical practice based on a series of exercises, self-reflection and self-care.

3. Digital addiction is excessive use of gadgets and being on the Internet.

4. Self-reflection is the ability to track your thoughts and understand the reasons behind them.

5. Screen time is the frequency of gadget use.

6. Philosophical practice is a direction of modern philosophy, which uses philosophizing as a tool for posing, analyzing and solving worldview problems. The task is to realize philosophical reflection in order to expand the boundaries of worldview.

7. Social network is an Internet platform for communication, networking and information transfer. Distinctive feature is that the social network contains information about the owner of the page.

8. Messenger is a program for personal or group communication.

The experimental process is the following.

1. Measurement of indicators before the implementation of the experimental factor: self-survey in the forms "A" and "B";

2. Introduction of the experimental factor: diary keeping in the form "B";

3. Final survey at the end of the study on the same program in the experimental and control group: self-survey in the forms "A" and "B".

Analytics.

A) Examining the results of the survey in general for the two groups before and after the diary keeping;

B) comparison of before and after results in control and experimental groups;

C) diary analysis.

The purpose of the surveys was to examine the digital literacy of the students.

The objectives are the following.

1. To identify the frequency of communication media usage before and after the work with the diary:

A) frequency of viewing the news feed, the role of "likes" and the emotions they evoke;

B) writing posts;

C) use of social media and communicators;

D) tracking post ratings ("likes");

E) the presence of blogs.

2. To find out the attitude of students to different content on the Internet and the influence of parents on interaction with information on the Internet.

3. To study the state of health indicators and the level of social interaction of respondents according to the results of self-examination: problems with sleep, nutrition, school performance, the number of friends and conflicts at school.

4. To establish the main interests of schoolchildren besides the Internet.

5. To study the main online interests of adolescents.

6. Find out the attitude to advertisement on the Internet, the use of fact checking.

7. To investigate the use of special health programs, notification tracking and digital hygiene.

Hypotheses:

1. Pupils spend a lot of time using gadgets (browsing social networks news feed more than 3 times a day).

2. Students' social contacts are not developed, they have few friends, and rarely communicate with classmates.

3. Reading information in messengers and social networks is superficial.

4. Health condition and sleep of pupils are satisfactory.

The experiment procedure:

1. Measurement of indicators before the introduction of the experimental factor in the real and control group: self-examination.

2. Introduction of the experimental factor: keeping a diary.

3. Final survey at the end of the study.

A) Comparison of results before and after.

B) Analysis of diaries.

Results:

1) Students began to spend less time browsing social networks; screen time decreased.

2) Social contacts increased (level of social interaction increased).

3) Students paid less attention to evaluating their own posts.

4) Attentive reading of posts increased.

5) Self-assessment of health status improved.

### **3. Results**

The study is a controlled pedagogical experiment. Students of the 9th form of a secondary comprehensive school in Chelyabinsk were chosen as the object of the study. Two forms "A" and "B" were chosen. First, students of both forms participated in a continuous sociological survey on the topic of interaction with the Internet space: the use of gadgets, the use of messengers, social networks and games, topics of interest, as well as the level of social interactions and well-being (according to the results of self-examination). Then form "A" was offered to work with the diary "Digital Ascetics", which involved not only working with textual information, but also practical exercises. After a month of work with the diary in the experimental (form "A") and control (form "B") groups were measured using the same program and tools that were used before the introduction of the experimental factor (diary). Socio-demographic portrait of students: boys and girls aged 15-16.

Survey results before the introduction of the experimental factor in two forms.

The survey found that 50 % of respondents use smartphones very often, rating the frequency as 5 points on a 5-point scale, and a further third reported a frequency of 4 points. When asked how they interact with a smartphone, the most popular answer is 'I communicate on social networks and messengers', followed by 'I use it to listen to music' and 'I browse social network feeds'. Around 60 % of respondents do not have a tablet, and those who do use it very rarely (1 point). For tablet users, reading e-books was the most important aspect of their use. Those who have a laptop or PC use it moderately – 3 points – and very often – 5 points. Laptops and PCs are mainly used for studying, watching films and playing computer games. Some 77 % of respondents said that their parents did not monitor their use of the devices. One of the questionnaires had a note next to the "No" option: "I am already an adult". Respondents were divided on the issue of restricting access to Internet content. About a third of respondents are sure that it is necessary, while 55 % are sure that it should not be done. Pupils are sure that they should not publish online material that demonstrates and propagates violence (41.9 %), incites inter-ethnic and inter-racial discord (29 %) and about 23 % chose the option "all of the above". More than 50 % of respondents use special screen settings to reduce the strain on their eyesight, a third use the pedometer application and 29% have applications with training and exercise complexes.

The top three social networks (in descending order) are "VKontakte", "TikTok", "YouTube". A third of respondents chose the option "Other", where they indicated the popular messengers "Telegram", "WhatsApp". This indicates a lack of understanding of the differences between these means of communication. Approximately 45 % of respondents do not maintain a personal blog and those who do fill it with content at least once every two weeks. Next, a block was developed for those who maintain a personal blog on any online platform. A third of the respondents share personal photos with their subscribers, 25.8 % post short texts under their photos or videos, another 12.9 % make short clips for social networks such as "TikTok", "Yappy", "Likee". Most of the students who blog use special programmes for photo and video editing. However, around a third of respondents (32.3 %) note that likes and reposts do not mean anything to them and do not affect their self-esteem. 35.5 % of respondents check their social network news feed more than 3 times a day and 25.8 % (almost a third) – 1 time a day. When looking at the feed, they feel interest (48.4 %) and indifference (22.6 %). Students mainly only like posts from their friends or favourite communities (58.1 %). The respondents' favourite communities on social networks are related to

music and favourite artists. This is followed by 3 options with the same percentage (22.6 %): famous person, anime and cartoons, class/school group.

The most popular messenger among students is Telegram, in line with all-Russian indicators. WhatsApp and Discord come next. The success of the latter is explained by its popularity among gamers and programmers, as well as the possibility of working with neural networks. Favourite channels in messengers coincide with groups in social networks: channels of favourite music bands/artists, anime and cartoons, class/school group. It is worth noting the presence of private communities with friends (19.4 %), subscribing to a famous person's channel (19.4 %) and groups about animals (16.1 %). The majority of respondents (64.5 %) offer the possibility to follow information about their online presence, all statuses are disabled for 22.6 % of respondents. All notifications are enabled for 38.7% of respondents. These are mainly calls – 38.7 %, messengers – 35.5 %, social networks – 32.3%. Respondents most often follow notifications about news, posts from friends and family (61.3 %), 25.8 % follow posts from interesting communities.

With the active use of gadgets and social networks, the issue of personal data becomes very important. They do not leave their personal phone number and email address – 51.6 %, regularly clear their browser history – 48.4 %, delete unnecessary files and have special devices to store necessary information – 32.3 %. The most unpopular answer was using anonymizers, "incognito" mode in the browser – 9.7 %, deleting accounts in unnecessary social networks and deleting their data on other people's computers – 12.9 % of respondents.

At the current stage of development of new media, virtual communication is significantly replacing real communication. More than 50 % of respondents said they had several close friends and no conflicts with others. 25.8 % found it difficult to answer whether they had conflicts with others. About a third of respondents (32.2 %) tend to agree with others and more than half of them said they were independent of other people's opinions. Respondents check information that they distrust (35.5 % strongly agree and 29 % somewhat agree). Almost all respondents do not trust advertising – 77.4 % completely distrust it, 19.4% partially distrust it. In this section, the ability to clearly express and defend one's personal opinion is important. A third of respondents found it difficult to answer that they were always and in everything right (29 %), and also a third tended to agree with this statement (32.3 %).

35.5 % of respondents have C's in several subjects, but they mostly study with '4' and '5'. 25.8 % of the respondents study at '4' and '5', while 22.6 % of the respondents study at '3' and '2'. The following reasons were given for not studying: not interested in studying – 38.7 %, classmates hindering studying – 25.8 %, not liking school – 22.6 %. The option 'other' received 25.8 % of the votes; the students themselves had to write a suitable option in the blank line. The most popular answer in this case was 'laziness'. Active use of gadgets makes respondents think about health problems. More than half of respondents said they had no health problems. The question about the quality of sleep divided the respondents into 3 groups – one third of the respondents reported a satisfactory quality of sleep, another third – an unsatisfactory quality of sleep and 25.8 % – a good quality of sleep. 58.4 % of respondents eat what they want, when they want, i.e. they do not follow any dietary rules. Hobbies (in descending order): sports (41.9 %), computer games (29%), drawing and listening to music (both 25.8 %), computer programs (22.6 %). The other option scored 9.7 % – the most common answer is 'manicure'. Computer games by popularity (in descending order) Roblox (38.5 %), Dota 2 and 'other' – 29 % (other – World of Warcraft), Counter-Strike: Global Offensive – 25.8 %. When it comes to planning their day, the students were divided into 2 groups: making plans for the day – 38.7 %, not planning at all – 41.9 %. The most unpopular answer was making a plan for the week at 6.5 %.

Results of the study on control (form "B") and experimental (form "A") groups

The frequency of smartphone use one month after using the diary decreased slightly in the experimental group from 5 to 4 points (from 33.3 % to 29.6 % to 3.7 %). However, there was also a decrease of 1.5 % in the control group. The reasons for using a smartphone changed: the percentage using marketplaces almost halved (from 32.3 % to 17.2 %), as did the percentage using services to listen to music (from 41.9 % to 24.1 %). In addition, the percentage of playing games also decreased (11.6 % difference).

Social networking remained the same, while calls to family and friends increased by 22.7 %. In the control group, almost all indicators remained the same, except for one – the use of smartphones for studying increased more than threefold (from 6.5 % to 20.7 %). The results for tablet use remained the same – 1 point. However, the percentage of the experimental group

increased – from 24.1 % to 31.3 % (7.2 % difference). Before the experiment, students used the tablet for messenger communication and for reading books (especially in form "B"). After the interaction with the diary in form "A" the situation changed: students started to use the tablet for browsing social networks, for entertainment and for watching films (this is the most popular answer – 37.5 %).

Interaction with the laptop/PC gadget in the experimental group decreased from 3 points (22.6 %) to 1-2 points (23.8 % total). The reasons for use remained almost unchanged. There was a slight decrease in the percentage using the PC for studying, while watching films increased. It is interesting to note that students are less likely to play games on a laptop or PC (a decrease from 32 % to 18.2 %), but more likely to play games on a tablet (an increase from 0 to 50 %). This can be explained by the greater mobility of the device. In addition, modern game developers take into account the possibility of realizing the game on different platforms.

The use of social networks remained within the general trends in the changing conditions of the new media market – "VKontakte", "YouTube", "TikTok". In the experimental form, the frequency of viewing the feed decreased. About a third of the participants said that they did it twice a day, and 17.2 % – once a day. The situation did not change in the control group. The feelings when watching the tape also changed insignificantly – the leading factor was still the "interest". The most popular answer to the question "How often do you give likes?" in both forms was "I only give likes to posts from my friends/favorite communities". In the experimental group, 13.3 % also chose the answer "I don't give likes to anyone". Liking other people's posts is a rather controversial topic. On the one hand, we can talk about a lack of desire to support the author, to express one's approval. On the other hand, such behaviour can be seen as a more thoughtful and deeper engagement with the material. In this case, likes can be given to really interesting and important topics. I would like to believe that the participants of the experiment do not give "unnecessary" likes and thus clean up their electronic footprint, as many social networks show page owners who have rated and viewed the material.

After working with the digital asceticism diary, the percentage of those who tracked the number of likes and reposts in order to improve their social media page/blog decreased (from 18.2 % to 7.2 %). However, there was a slight increase in the indicators 'I blog for myself' (from 18.2 % to 33.3 %) and 'Likes mean nothing to me and my self-esteem' (from 13.6 % to 22.2 %).

The most popular messengers maintained their positions: "Telegram", "WhatsApp". At the same time, the percentage of users of "Discord", "Snapchat" decreased in the experimental form. These data are confirmed by the fact that students started to play games on PCs and laptops less often, where perhaps the use of this messenger "Discord" is more convenient. The percentage of students using the "Viber" messenger has increased (from 6.9 % to 13.3 %). Most students follow notifications about messages and posts from friends and relatives. In form A, this percentage even increased slightly. Notifications on mobile devices also include (in descending order) social networks, calls and messengers. Around 20 % of respondents have all notifications on gadgets.

One of the tasks of the digital asceticism diary was to teach children to keep track of their personal data. After working with the diary in the experimental form, the pupils began to clear their browser history more often (6.7 % increase). Other indicators remained the same: students do not leave their personal data; they regularly clear the cache on their devices. Modern gadget-based communication has a significant impact on the health of the younger generation – not only physically, but also mentally. About a third of the respondents in the experimental form said they had health problems. It should be noted that after working with the diary, when asked about the quality of sleep, the children more often chose the answer "good" (an increase from 16.7 to 20.0 %) and "satisfactory" (from 16.7 % to 23.3 %). At the same time, the most popular answer before the experiment was "unsatisfactory sleep" (26.7 %). Pupils mostly do not follow the principles of a healthy diet. However, after the experiment in the form "A", there was an increase in those who tried to follow a healthy diet (from 6.5 % to 16.7 %).

In order to reduce the strain on the eyes, the students use special settings of the screens of the gadgets, and the most popular programme for maintaining their health is "Pedometer". Students' interest in computer games in general has been maintained. In form "A" the interest in the game "Roblox" decreased, but more than a third of the respondents started to play other games.

The students' social contacts were measured in a special block. Most pupils have several close friends. The children try not to fight with anyone, and this percentage increased slightly after the experiment (from 42 % to 48 %). Pupils try to agree with others, the percentages before and after

the experiment did not change. This may be an indicator of low levels of conflict as well as an inability or fear to express their opinions. Both before and after the experiment, students in both forms found it difficult to answer the question whether they were always right. Taking into account the dynamics of the answers to the previous question, the growth of self-reflection is possible.

According to the results of the experiment, the students began to doubt that they really check facts (the percentage decreased from 50 % to 43 %). The percentage of mistrust in advertising remained high. The evaluation of their own performance is interesting. After working with the diary in the experimental form, the students evaluated their academic performance differently. The most popular answer was still "There are 3's in some subjects, mostly 4's and 5's", but the percentage increased from 29 % to 50 %. At the same time, the percentage for the answer 'I have problems with my studies' fell from 12.9 % to 3.3 %. The main reason for school failure remained the same – "I am not interested in studying" (up to 27.6 %, compared to 26.7 % in the experimental form), but a new one appeared – "I have no time to study, I work part-time" (23.3 %). In fact, at the end of the school year, most young people try to find a part-time job for the summer.

Respondents started to plan their time less. In form "A", the percentage of such students increased by 17 %. This can be explained by the fact that the survey was conducted at the end of the school year, before the holidays. Among the hobbies, sport is the most popular. In the experimental form "A", hobby options such as "embroidery" (26.7 %) and "other" (26.7 %) scored a high percentage – in this section, the children mainly mentioned manicure.

#### **4. Discussion**

Philosophy at school is not only an academic discipline, but is also designed to help students understand their values, beliefs and worldviews, and how these aspects influence their behavior and decisions. This forms the basis for a more conscious and effective management of individual life trajectory both during the period of study and in the subsequent professional activity and life.

A modern person who is computer literate and able to effectively use technology and techniques for his/her professional activity faces certain problems. Constant online presence has a negative impact on his offline life. The virtual world, with its screens, chat rooms and voice messengers, replaces real human communication, which leads to serious problems and prevents the realization of his full potential and capabilities. The digitalization of society has increased the amount of time spent online, which often leads to isolation from the real world (Skivko et al., 2020). People face problems in personal relationships, lack of face-to-face communication and difficulty in making quality connections with others. The constant fascination with social media and digital devices can distract from real tasks and goals, which reduces productivity and affects quality of life. In addition, uncontrolled use of online technology can lead to mental health issues such as internet addiction, social isolation and other psychological disorders (Vlachopoulou, 2018).

It is important to emphasize that digitalization has its undeniable benefits and greatly improves the availability of information and opportunities for professional growth. However, being aware of and balancing online and offline life is critical to successfully fulfilling all potentials and achieving personal well-being. The education sector should also focus on developing skills in digital management, critical thinking (Ennis, 2018) and conscious use of online resources to help people effectively cope with the challenges and opportunities presented by the digital world. Only by doing so can a balance between the online and offline spheres of life be achieved, and the full realization of each individual's potential be attained (Shaev, 2015).

For the diary design we implemented the philosophy of the Stoics as a basis (Aurelius, Seneca, Epictetus), including modern practices of Stoicism (Becker, Becker, 2017; Irvine, 2009; Pigliucci, 2017; Robertson, 2019; Farnsworth, 2018; Holiday, Hanselman, 2016). In case we do not aim at radical transformations in lifestyle, excluding secular pleasures in favor of ascetic principles, it seems reasonable to pay attention to an alternative scientific-philosophical approach. In this context, Stoicism stands out as a philosophical doctrine that provides a methodology for a dignified and balanced lifestyle by re-evaluation material wealth, aesthetic appeal, and physical health. The central premise of Stoicism is to propose a rational aspiration in the world that prevents extreme imbalances. The underlying idea is to allow the possession of preferred objects with moderation and harmony (Guerin, 2022). Following the concept of Stoicism is characterized by its adherence to the middle path, striking a balance between avoiding excessive constraints that can oppress personal freedom and avoiding the destructive consumerist pursuit of material goods (González Estrada, 2019). This concept is analogous to the position of a surfer who skillfully holds

his balance at the top of the wave, ensuring optimal performance in the realities of life (Vrečko, 2021). As a result of a strict adaptation of stoic principles, the individual gains the desired increase in productivity and a harmonised state of spiritual well-being.

Digital asceticism is a lifestyle characterized by the conscious use of modern means of communication and the prudent allocation of attention in a world of digital technology and media. The methodology of digital asceticism becomes an important tool for achieving harmony between online and offline life of an individual. It helps one to realize how digital technology affects his life as a whole. Digital asceticism includes a number of practices aimed at controlling information consumption and the use of digital technologies. For example, this could be setting limits on time spent on social media or using apps to track screen time. Also, digital asceticism may involve not using certain digital devices or services at all, in order to reduce dependence on them and lessen the impact on real life.

The Department of Philosophy (South Ural State University) has published a series of manuals "Digital Ascetics" by Gulevataya i dr., 2023; Grednovskaya i dr., 2023). Also a mobile application "Digital Ascetics" was created, which is a diary available on the user's phone. The manuals are available upon request (in Russian).

The diary is a daily planner designed for four weeks of work and covers current issues in human life in the online and offline realms: digital footprint, cyberbullying, critical thinking, and self-care. Designed for students in forms 9-11 and university students, the manual can be used both for independent work and to support educational and training activities aimed at preventing digital addiction and developing digital literacy skills. This diary presents a number of exercises and assignments aimed at developing critical thinking skills, digital hygiene, self-reflection and other important aspects. The main methods of work with the diary include philosophical practice, which consists of reflective thinking about a philosophical quote and its application in everyday life, as well as freewriting as a free and creative reflection on a proposed problem topic. Each week begins with a problem statement, which should be analysed and comprehended, and ends with a reflective "Letter to Self", where it is proposed to summarise the results, give advice and determine directions for further development. It is designed to help students develop critical thinking, learn to use digital technologies effectively, and develop self-reflection and self-organisation skills. The methods presented in the workbook encourage a more informed and productive approach to everyday tasks and problems.

Limitations of the study. The statistical data obtained did not allow for in-depth analyses due to the descriptive nature of the study.

## **5. Conclusion**

In general, the performed experiment has shown that the use of the diary on digital asceticism is possible for the development of such useful skills as the skills of working with information on the Internet, maintaining personal boundaries of one's online presence. The tasks developed within the framework of the philosophical practice of digital asceticism give an opportunity to understand the importance of the virtual world in one's life and try to find a balance with the real world.

In order to enhance the results, it is necessary to work with students and pedagogical staff in an integrated way and for a longer period of time (for example, during the school year). Mentoring by the class teacher is possible. Working with teaching staff to improve information literacy could also be useful, since only in this way is it possible to build proper interaction with students on issues of digital literacy. It is necessary to take into account the specifics of the object itself: secondary school students in adolescence, when the transition to the adult model of behavior is in progress. During this period it is possible to meet the rejection of certain norms of behavior. This fact raises the question of the possibility of conducting this experiment in an earlier period (7th-8th grade) or with university students. It is also necessary to make adjustments to the toolkit: to elaborate on the block of social interactions with relatives, friends, teachers; interests outside of the school. Perhaps understanding the gaps in real communication will help explain the immersion in virtual communications.

The further development of digital asceticism in research and pedagogy, especially in the context of Digital Anthropology, aims to make better use of technology to achieve a balance between online and offline lifestyles. This research has significant pedagogical and humanistic



potential, providing important tools to address the issues and challenges of global digitalization. The Diary Digital Asceticism has been digitized and is freely available.

In 2023–2024 it is planned to conduct the experiment in a large-scale version at the regional level. The project will include more than five hundred schools in the Chelyabinsk region (Russia, South Ural). We invite colleagues (teachers, psychologists, sociologists) to conduct their own experiments using the presented diary and compare the results.

We hope that one of the key areas of digital asceticism will be the development of more advanced tools and technologies that will help people control their use of gadgets and digital devices. These could include mobile apps that can track screen time, as well as intelligent systems that provide guidance and tips for digital management. Such tools will help people to use digital resources consciously and effectively, which contributes to better time management and quality of life in the digital age. This approach is an important step in achieving a balance between the digital world and real-world interactions, promoting more conscious use of technology to enrich lives and personal development.

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## Self-Regulation of Emotions in Relation to Students' Attitudes Towards School Life

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### Abstract

The paper focuses on assessing, how the use of emotional regulation strategies and perceived position in formal and informal school life processes are related. The paper also aims to identify, which of the assessed school life processes are involved in the use of emotional regulation strategies, i.e. the use of adaptive emotional regulation strategies and non-adaptive emotional regulation strategies, or in the suppression of emotional manifestations. The research was carried out on a sample of 1,133 upper-primary school students using Cognitive Regulation of Emotion and Students' Attitudes to School Life questionnaires. The results imply that the degree of use of adaptive strategies is affected by a combination of predominantly strengthening stimuli in the school environment, i.e. the perception of success and opportunity, and social inclusion in peer groups. On the contrary, high-risk environmental attributes connected with a feeling of negative experience at school play a larger part in the use of non-adaptive emotional regulation strategies. A combination of two opposing stimuli, i.e. a negative experience of school life and a positive approach by the teacher towards the pupils, contributes to the suppression of emotional manifestations. The perception of position in formal and informal school life processes as an important prerequisite for the use of students' self-regulating mechanisms in the school environment.

**Keywords:** self-regulation of emotions, attitudes towards school life, upper-primary school children.

### 1. Introduction

Emotional regulation represents a key multidimensional self-regulation component (Gross, 2015; Erber, Erber, 2000; Larsen, 2000), which can be an important factor in children's social behaviour (Hrbackova, Balaban Cakirpaloglu, 2020). The systemic concept of self-regulation shows that, during its examination, one must deal with not only cognitive regulation, but also emotional regulation. Research into children's school preparedness (Blair, Diamond, 2008) showed that

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preparedness for school attendance is affected by children's cognitive emotional state. Self-regulation develops more in children whose emotional and cognitive personality components are in balance and "collaborating", than in children in whom the ratio between these two components is unbalanced. Children who are able to regulate their emotions at an early stage maintain better attention and can collaborate better with the teacher and other students (peers) (Rubin et al., 2005). Some research points to strong evidence that children enlist emotional regulation skills to accomplish complex social and personal goals (Thompson et al., 2008). Regardless of where these skills are acquired, children who perceive and express emotion in acceptable ways are likely to have more positive relationships than others (Saarni et al., 1998).

It is the very focus on the examination of children's regulatory processes in the context of the social environment (cf. Criss et al., 2021) that we perceive as fundamental for understanding the causes and consequences of their behaviour. In this context, the paper focused on examining the relationship between emotional regulation and the school's social climate, as this is an important socialisation environment. The research is based on the assumption that students' attitudes towards school life are related to their use of emotion regulation strategies.

### **Theoretical Framework**

In general, emotional regulation can be understood as the use of specific strategies to influence what emotions we have, when we have them, how we experience them and how we manifest ourselves (Gross, 2015). These strategies are used to intensify, reduce or maintain emotions, whether positive or negative (Gross, 2014). The objective of emotional regulation is to influence the dynamics of the emotion in such a way that adaptive reactions to the given situation take place (not to eliminate maladaptive emotions) (cf. Oschner, Gross, 2005). If optimal emotional regulation does not occur, it can lead to behaviour which is not very adaptive in the given situation (Garber, Dodge, 1991).

Emotional regulation can take place on both a conscious and unconscious level; at the same time, it can be automatic, and it can influence the course of emotion formation (Gross, Thompson, 2007; Braunstein et al., 2017).

Individual emotional regulation strategies can be divided into so-called antecedent-focused and response-focused. Antecedent-focused strategies activate before or very shortly after the activation of the full emotional response; therefore, they are "input strategies". These strategies are focused on the prevention or stimulation of the origin, stopping or starting of the emotional process (cognitive strategy). On the contrary, a response-focused strategy (so-called "output strategy") appears at the end of the emotional development process, or when the emotion itself activates some tendency to react (behavioural strategy) (Gross, Cassidy, 2019).

Emotional regulation can be described using a process model which contains four phases (Koole et al., 2011). In the first phase, the people are exposed to a situation which can (has the potential to) cause an emotional reaction. It means choosing a situation involving behaviour which leads to coming closer to, or avoiding, certain people, places or things. In the second phase, Gross (1998) talks about the so-called modification of a situation where the individual can change the situation's emotional impact with their behaviour. One emotional regulation option is the use of focus of attention. The third phase involves a so-called cognitive change; i.e., on the basis of cognitive processes, the individual assesses the situation which causes the emotional reaction. The last phase involves the modulation of a response, where the individual expresses their emotions by their behaviour. Each of these phases can be the subject of regulation.

The relationship between cognitive control and self-regulation can be specified on the basis of two main approaches: 1. Reciprocal relationship (i.e. when one is active, the other is less active); 2. Equal relationship (i.e. should lead to a balance between emotions and cognitive control) (cf. Blair, Diamond, 2008).

Emotional regulation is mostly connected with emotions which cause negative reactions in the individual or the people around them. Hofmann and Kashdan (2010) divide individual emotion regulation strategies into three broad categories (1) strategies that aim to suppress the emotion; (2) strategies that aim to change the emotion; and (3) strategies that aim to tolerate the emotion. A manifestation of emotional regulation is the effort to prevent situations which the individual expects to arouse a negative (undesirable) emotional reaction in them. Gross (2014) describes two basic forms of emotional regulation, i.e. the suppression of emotional manifestations (a behaviourally oriented form of emotional regulation), within whose scope the individual reduces or prevents manifestations of experienced emotions, and the cognitive reappraisal of emotions

(a cognitively oriented form of emotional regulation), where the individual tries to think of the situation in a manner which leads to a change of emotional reaction (cf. [Webb et al., 2012](#)). Garnefski et al. (2002) differentiate among the following nine (conscious) cognitive emotion regulation strategies: self-blame; acceptance; rumination; positive refocusing; planning, or thinking about what to do to cope with the situation; positive reappraisal (e.g. ascribing positive meaning); putting into perspective (e.g. downplaying the severity); catastrophizing; other-blame (blaming the situation on others) (cf. [Garnefski, Kraaij, 2007](#)).

The repeated use of cognitive reappraisal is usually connected with healthier social and emotional adaptation and experience, compared to the suppression of emotional manifestations, which is usually connected with cognitive and physiological losses and negative experience ([Ehring et al., 2010](#); [Hofmann et al., 2009](#)).

Emotional regulation strategy can be divided into adaptive, whose use is effective and beneficial for us, and, on the contrary, non-adaptive. Adaptive emotional regulation strategies require 1. awareness of one's own emotions in a specific context; 2. awareness of the goal one wants to achieve; 3. selection of a strategy towards that goal ([Gross, Jazaieri, 2014](#)). In addition to the context mentioned (and specified below), the intensity of individual emotions at a given time may play an important role in emotion regulation. Lennarz et al. (2019), in their study examining the daily lives of adolescents, found that it is the intensity of negative emotions that is positively related to the number of strategies used. It was also found that the likelihood of using strategies such as distraction, rumination, avoidance, problem solving suppression, and social support increased with increasing intensity of emotion. In contrast, the strategy of acceptance was more likely to be used in response to less intense negative events ([Lennarz et al., 2019](#)).

For example, non-adaptive strategies include rumination, catastrophizing and self-blame, while on the contrary Garnefski et al. (2002) refer to the so-called “protective” strategies, being positive reappraisal and positive refocusing (cf. [Gross, 2014](#)). From a long-term perspective, adaptive regulation should contribute to a more positive emotional experience, while non-adaptive regulation should contribute to a more negative emotional experience.

In their analysis, Marroquín et al. (2017) point to the results of research on coping, emotion regulation, and personal well-being and divide emotion regulation strategies into avoidant strategies, which are more maladaptive (non-adaptive) in nature, and approach-oriented strategies, which appear to be adaptive. Among the so-called maladaptive emotion regulation strategies, the authors include suppression of external displays of emotions and thoughts, cognitive and behavioural avoidance, denial, rumination and worry. On the other hand, according to the authors, adaptive strategies of emotion regulation in a certain context include problem solving, seeking social support, cognitive reappraisal or positive reframing of the situation, active acceptance of the situation, as well as awareness and expression of experienced emotions (cf. [Moreno et al., 2021](#)).

Parallel with the afore-mentioned emotional regulation strategies, one must always perceive these processes within the scope of the specific social context in which they take place. The social environment in which the individual operates can lead to the activation of the development of self-regulation abilities or, on the contrary, to stagnation and the inability to develop self-regulation. ([Hiekkaranta et al., 2021](#); [Criss et al., 2021](#)) Social context (or the quality of interpersonal relationships) may influence the choice of emotion regulation strategy ([Marroquín, Nolen-Hoeksema, 2015](#); [Marroquín et al., 2017](#); [Zaki, Williams, 2013](#)). Reciprocally, emotion regulation strategies also influence interpersonal relationships (e.g., reappraisal may reduce emotional experience and lead to improved social functioning; conversely, expressive suppression may have negative social consequences) ([Goldin et al., 2008](#); [Butler et al., 2003](#)). In a positive, supportive and stimulating social environment, it can be expected that the individual will be able to develop their self-regulation to a greater degree ([Blair, Diamond, 2008](#)).

The school's social climate, as a micro-social environment, can be specified as the stabilized processes of the perception, experience, reaction to and evaluation of what took place, or is taking place right now, in the school environment. These are the opinions and perceptions of the given social reality of all the participants in the school environment ([Adams et al., 2016](#)). The school's social climate can influence students' behaviour and their optimal development (including their motivation to learn, creativity, resilience etc.), effectiveness of teaching, students' results (cf. [Adams et al., 2016](#)), and children's satisfaction in school, but also the occurrence of high-risk behaviour (cf. [Kauffman, 2005](#); [Vojtova, 2010](#)). A positive social climate within the scope of formal and informal processes offers children the opportunity to experience success and joy, which

supports their optimal development and positive self-perception (Burns, Hoagwood, 2002). Similarly, experiencing good collaboration and acceptance in social relationships affects the development of social competencies important for functional conduct and behaviour in the given environment. Therefore, the social relationships within the scope of the given environment can significantly influence the self-regulation process, in both a positive and a negative direction (Adams et al., 2016; Finkel, Fitzsimons, 2011). It can be assumed that the school environment's social climate can significantly influence the process of emotional regulation of children for whom this environment is an important socialisation factor.

The research focuses on the findings what emotion regulation strategies students use depending on their attitude towards school life. The main aim of the research is to clarify the relationship between the extent to which emotion regulation strategies are used and perceived position in the formal and informal processes of school life. Another aim is to determine which of the school life processes assessed play a role in the use of emotion regulation strategies, i.e., the use of adaptive emotion regulation strategies and non-adaptive emotion regulation strategies, or the suppression of emotional expressions.

## **2. Methods**

The research sample comprised 1,133 students from 11 primary school in the Czech Republic (students in grades 6-9) consisting of 596 boys and 537 girls aged 11 to 16 years ( $M = 13.29$ ,  $SD = 1.293$ ).

Primary schools were randomly selected (random number generator) from all primary schools in the Czech Republic.<sup>1</sup>

Students' emotion self-regulation was measured using the Cognitive Emotion Regulation Questionnaire. This questionnaire was adapted from the CERQ (Garnefski, Kraaij, 2006) and the ERQ (Gross, John, 2003). This questionnaire focuses on the methods or strategies of regulating one's own emotions (emotion regulation strategies) that students use when dealing with a stressful or unpleasant situation.

Factor analysis identified 5 factors explaining 51.65% of the variance. These are strategies of Rumination (F1), Acceptance and Positive Reappraisal (F2), Positive Refocusing (F3) and Blame (F4). We also identified a factor relating to the suppression of emotional manifestations (F5).

In terms of the effectiveness of emotional regulation strategies, the strategies Acceptance and Positive Reappraisal (F2) and Positive Refocusing (F3) are described as adaptive strategies. Rumination (F1) and Blame (F4) are considered as non-adaptive/maladaptive strategies.

Based on low factor scores (below 0.40), a total of 2 items were excluded; the final version of the questionnaire included a total of 18 items. Students evaluate each statement with one choice on a five-point scale expressing frequency of occurrence from 1 (almost never) to 5 (almost always). In the case of individual strategies, we work with the arithmetic mean of all of the items appertaining to it. A higher score represents a greater degree of use of the specific strategy.

Factor 1, Rumination, explains 18.69 % of the variance and includes 4 items with a factor weight of .64 to .79. This factor expresses the effort to manage negative emotions by returning to the description and analysis of negative experiences, constant rumination over the problem, and exaggeration of the given situation.

Factor 2, Acceptance and Positive Reappraisal, expresses the purposeful search for the positive aspects of the given situation, and viewing the problem as an opportunity for personal growth. At the same time, there is an evident effort to accept the given situation, and to see the given situation with an overview. This factor includes 5 items with a factor weight of .49 to .62, and explains 12.91 % of the variance.

Factor 3, Positive Refocusing, is connected with a change in the focus of attention, i.e. purposeful focus on positive experience. At the same time, there is an evident effort to think of more pleasant things, or an effort to manage the given situation as well as possible. This factor includes 3 items with a factor weight of .59 to .78, and explains 7.41 % of the variance.

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<sup>1</sup> Ministry of Education, Youth and Sport of the Czech Republic register of school and school facilities, situation as on 26/ 04/ 2017 (incomplete, mixed-grade, special and practical schools were eliminated from the list).

Factor 4, Blame, contains 4 items with a factor weight of .52 to .72, and explains 6.96 % of the variance. This factor is connected with the effort to deal with negative emotions by blaming other people, or situational and contextual variables.

Factor 5, Expressive Suppression, includes 2 items with factor weights of .83 and .85, and explains 5.68 % of the variance. This factor expresses the effort to inhibit the manifestation of the given emotion, where the individual prevents or reduces visible manifestations of experienced emotions.

The internal consistency of all 18 items in the questionnaire, measured using Cronbach's coefficient, attains a value of  $\alpha = .74$ , which represents an acceptable degree of reliability.

Perceptions of their own position in formal and informal processes of school life were measured using the Students' Attitudes to School Life questionnaire (Vojtova, 2009). This questionnaire measures students' attitudes to school life, and defines the areas of school life which are supportive for their learning, and those which are high-risk. The original instrument contains 38 items and is based on The Quality of School Life Scale – School Life Quality Questionnaire (Williams, Batten, 1981) and on the theory of the authorial collective of Binkley et al. (1996). Factor analysis identified 5 factors explaining 48.04% of the variance. This includes factors related to success and opportunity (F1), as well as the factors of social inclusion in peer groups (F2), negative experience (F3), teacher's approach to students (F4) and school status (F5). Based on low factor scores (below 0.40) and significant saturation of more than one factor, a total of 5 items were discarded, with the final version of the questionnaire containing a total of 33 items. The students evaluate each statement with one choice on a four-point scale expressing the degree of agreement or disagreement. In individual dimensions of school life, we work with the arithmetic mean of all of the items appertaining to it. A higher score represents a more positive attitude to school life.

Factor 1, Success and Opportunity, explains 28.17 % of the variance, and includes 10 items with a factor weight from .54 to .75. This factor reflects the students' opinion of their own position in learning processes, and of the opportunities which they receive in them. The positive results in all the items show that the schooling and learning correspond to their expectations. They regard school as a place which positively stimulates them to learn, and where they perceive their ability to achieve good results in school work.

Factor 2, Social Inclusion in Peer Groups, expresses how students perceive their involvement in informal activities and student groups in school life. Positive results in this dimension indicate students' good feelings from their own involvement in informal social peer networks (relationships among students). This factor includes 6 items with a factor weight of .62 to .75, and explains 7.28 % of the variance.

Factor 3, Negative Experience of school life, is connected with negative feelings such as loneliness and worry. The items in this factor are inverted, and are renumbered in order to ascertain the overall attitude to school life. Factor 3 includes a total of 5 items with a factor weight of .53 to .66, and explains 4.95% of the variance.

Factor 4, Teacher Approach, contains 9 items with a factor weight of .52 to .75, and explains 4.6 % of the variance. If the results of this evaluation reach the positive parts of the spectrum, then they perceive the teacher as a person who provides them with interest, support and assistance, who is fair, on whom they can rely, and who respects the students' needs.

Factor 5, School Status, includes 3 items with a factor weight of .43 to .58, and explains 3.03 % of the variance. This factor expresses how the students perceive their position in school life processes, with an awareness of their own value and importance. The positive results indicate that others (both fellow students and teachers) value their person and regard them as important. They can therefore regard school as a safe social space in which they are firmly anchored, and which provides them with support in case of need.

The internal consistency of all 33 items in the questionnaire, measured using Cronbach's coefficient, attains a value of  $\alpha = .91$ , which represents a sufficient degree of reliability.

The overall evaluation of school life is expressed by the mean of the evaluation of all the items and the items in the individual dimensions. At the same time, we also worked with the distribution of the students into subgroups according to the character of the prevailing nominations (students with a prevailing positive evaluation of school life, students with ambivalent attitudes and students

with negative attitudes). We defined these subgroups within a range of  $\pm 1$  of a determinant deviation (standard deviation) from the mean<sup>1</sup>.

The data was collected from students during classes using the paper-pencil form. Questionnaires were filled out by students on the basis of teacher's instructions. In order to find out what emotion regulation strategies students use depending on their attitude towards school life, the one-way ANOVA was proposed. Before applying the analysis, it was verified that there were no extreme outliers, and then the assumption of normality was evaluated for the distribution of each variable according to comparable groups. For this, the Kolmogorov-Smirnov test with Lilliefors coding was used. Subsequently, the assumption of homogeneity of variance was evaluated; Levene's test was used for this purpose. Pearson's correlation coefficient and multiple linear regression were used to clarify the relationship between the degree of use of emotion regulation strategies and perceived position in the formal and informal processes of school life. The mixed stepwise method was used to test the fit of the models; normality of residuals was evaluated with the Kolmogorov-Smirnov test with the Lilliefors modification; then the homoscedasticity of the residuals and multicollinearity were evaluated. The data was processed using the IBM SPSS software vers. 24.

### 3. Results

From the results of the analysis, it follows (Table 1) that, for regulating their own emotions, students utilise a positive refocusing ( $M = 3.41$ ,  $SD = 1.03$ ) to the greatest degree (on a scale of 1-5), which means that they purposefully focus on positive experience. Of the non-adaptive strategies, students utilise rumination ( $M = 3.10$ ,  $SD = 1.04$ ) to the greatest degree, which means that they return to descriptions and analyses of negative experiences, or they exaggerate the experienced situation. At the same time, it is evident that students also suppress manifestations of their own emotions ( $M = 3.28$ ,  $SD = 1.17$ ), which indicates that they prevent or reduce visible manifestations of experienced emotions.

It was found that adaptive emotional regulation strategies are dependent on students' attitudes to school life, whereas students utilise non-adaptive strategies to a similar degree regardless of their attitude to school life.

Students with a predominantly positive attitude to school life utilise a positive refocusing to a greater degree ( $M = 3.66$ ,  $SD = .97$ ) than students with a predominantly ambivalent attitude ( $M = 3.42$ ,  $SD = 1.00$ ) and students with a negative attitude to school life ( $M = 3.03$ ,  $SD = 1.12$ ). Acceptance and positive reappraisal is utilised by students with a positive attitude to school life to a greater degree ( $M = 3.40$ ,  $SD = .70$ ) than students with an ambivalent attitude ( $M = 3.16$ ,  $SD = .71$ ) and students with a negative attitude to school life ( $M = 2.86$ ,  $SD = .76$ ).

**Table 1.** Differences in students' use of emotional regulation strategies depending on their attitude towards school life

	Positive		Ambivalent		Negative		Total		<i>F</i>	<i>p</i>
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		
Rumination	3.03	1.10	3.14	1.01	3.03	1.10	3.10	1.04	1.273	.280
Acceptance and positive reappraisal	3.40	.70	3.16	.71	2.86	.76	3.16	.73	25.099	< .001
Positive refocusing	3.66	.97	3.42	1.00	3.03	1.12	3.41	1.03	17.915	< .001
Blame	2.94	.73	2.94	.78	3.03	.83	2.96	.78	.916	.400
Expressive suppression	3.39	1.17	3.24	1.15	3.33	1.25	3.28	1.17	1.434	.239

<sup>1</sup> A range of  $\pm 1$  of a determinant deviation from the mean is defined as from 2.4 to 3.3 of a point ( $M = 2.8$ ,  $SD = .44$ ). Students with negative attitudes fall under a value of 2.4 points, while students with a prevailing positive evaluation of school life fall above a value of 3.3 points.



The results of the correlation analysis show which of the assessed areas of school life are related to the use of sub-strategies of emotion regulation (Table 2).

The use of the strategy of acceptance and positive reappraisal is connected with the perception of success and opportunity ( $r = .188, p < .001$ ), with social inclusion in peer groups ( $r = .184, p < .001$ ), with the teacher's approach to students ( $r = .177, p < .001$ ) and with school status ( $r = .131, p < .001$ ). Similarly, a positive refocusing is connected with the perception of success and opportunity ( $r = .180, p < .001$ ), with social inclusion in peer groups ( $r = .241, p < .001$ ), with the teacher's approach to students ( $r = .151, p < .001$ ) and with school status ( $r = .136, p < .001$ ). It means that students who utilise the strategies of acceptance and positive reappraisal or positive refocusing to a greater degree during emotional regulation regard school as a place which positively stimulates them to learn and where they experience success, where they have a good feeling from their own inclusion in informal peer groups, where they perceive the teacher as a person who provides them with positive support, assistance and interest, and at the same time regard school as a place where they are aware of their own value and importance.

From this it follows that the greater the degree of use of adaptive emotional regulation strategies, the stronger (more positive) the perceived position in formal and informal school life processes (and vice versa).

The degree of use of adaptive strategies is not connected with a negative experience of school life ( $p > .05$ ).

On the contrary, non-adaptive emotional regulation strategies, i.e. rumination, strongly correlate with a negative experience of school life ( $r = .152, p < .001$ ) and with school status ( $r = -.097, p = .001$ ). Similarly, expressive suppression is significantly connected with a negative experience of school life ( $r = .110, p < .001$ ). This means that students who experience feelings of loneliness and worry at school return more frequently to the negative situation which they experienced, think about it constantly or exaggerate it, or end up suppressing the manifestations of their emotions. At the same time, it is evident that students who think about the situation they experienced to a greater degree, and analyse and exaggerate it, experience a far lesser degree of awareness of their own value and importance at school.

From the results of the research, it also follows that whether students deal with negative emotions by blaming other people (or situational and contextual variables) is not connected with their perceived position in formal and informal school life processes, i.e. their attitude toward school life ( $p > .05$ ).

**Table 2.** The relationship between the degree of use of emotion regulation strategies and students' attitudes towards school life

	Correlations (r)				
	Success	Social inclusion	Negative experience	Teacher approach	School status
Rumination	.055	.005	.152**	.044	-.097*
Acceptance and positive reappraisal	.188**	.184**	-.036	.177**	.131**
Positive refocusing	.180**	.241**	-.030	.151**	.136**
Blame	-.050	-.017	-.032	-.005	.044
Expressive suppression	.021	.001	.110**	.056	-.053

N = 1,133; \*\*p < .001

To ascertain which of the assessed school life processes plays a part in the use of emotional regulation strategies, i.e. the use of adaptive emotional regulation strategies, non-adaptive emotional regulation strategies or suppression of emotional manifestations, we looked for the model which would best explain the degree of variability of the dependent variable, i.e. the degree of use of emotional regulation strategies (Table 3).

**Table 3.** Effect of students' attitudes towards school life in the use of emotion regulation strategies

		<b>B</b>	<b>SE<sub>B</sub></b>	<b>β</b>	<b>Sig.</b>
Adaptive	Social inclusion	.227	.039	.184	.001
	Success and opportunity	.199	.039	.162	.001
Non-adaptive	School status	-.068	.035	-.072	.049
	Negative experience	.123	.031	.127	.001
Suppression	Negative experience	.238	.066	.114	.001
	Teacher approach	.185	.077	.098	.017

From the regression analysis it follows that, when explaining the degree of use of adaptive emotional regulation strategies, the relevant variables are social inclusion in peer groups ( $p < .001$ ) and perception of success and opportunity ( $p < .001$ ). The created model, with two independent variables, explains 8.5 % of the variability of the dependent variable, i.e. adaptive emotional regulation strategies ( $R \text{ Square} = .085$ ,  $p < .001$ ). In connection with the perceived position in formal and informal school life processes, it is primarily strengthening stimuli connected with the perception of school as a place where students experience feelings of success and opportunity to learn, and where they feel they are included in social peer networks, which play a part in the degree of use of adaptive emotional regulation strategies. The more school corresponds to students' expectations (they enjoy learning, like going to school and experience success there), and the more students are included in informal activities and students' groups, the greater the degree of their use of adaptive emotional regulation strategies.

When explaining the degree of use of non-adaptive emotional regulation strategies, the relevant variables are school status ( $p < .049$ ) and negative experience of school life ( $p < .001$ ). The created model, with two independent variables, explains 1.6 % of the variability of the dependent variable, i.e. non-adaptive emotional regulation strategies ( $R \text{ Square} = .016$ ,  $p < .001$ ). It can be said that high-risk environmental attributes connected with a feeling of negative experience play a greater part in the use of non-adaptive emotional regulation strategies. The more students experience feelings of loneliness and worry at school, and the lower their awareness of their own value and importance, the greater the degree of use of non-adaptive emotional regulation strategies.

The factors contributing to the greater degree to the suppression of emotional manifestations are negative experience of school life ( $p < .001$ ) and teacher's approach to students ( $p = .017$ ). The created model, with two independent variables, explains 2.2 % of the variability of the dependent variable, i.e. expressive suppression ( $R \text{ Square} = .022$ ,  $p = .006$ ). A feeling of negative experience of school life, but also the perceived approach of the teacher to the students, plays a bigger part in the effort to inhibit manifestations of own emotions than other environmental factors. It means that the more students experience feelings of loneliness and worry at school, and simultaneously perceive the teacher as a person who is supportive and understanding, the more they prevent or reduce visible manifestations of experienced emotions. It is possible that the perception of a positive approach by the teacher, combined with the negative experience of feelings of loneliness and worry, strengthens the student's effort to manage negative emotions by suppressing emotional manifestations, i.e. not manifesting them outwardly.

We can state that a combination of predominantly strengthening stimuli in the school environment plays a part in the degree of use of adaptive strategies. It means that if the student perceives school as a place where they experience a feeling of success, and see it as an opportunity to learn, and at the same time feel they are included in social peer networks, then there is a greater probability that they utilise adaptive emotional regulation strategies. On the contrary, the degree of use of non-adaptive strategies or suppression of emotions is affected by a combination of predominantly high-risk stimuli in the school environment. It means that if the student perceives school as a place where they tend to experience negative emotions such as feelings of loneliness or worry, then there is a greater probability that they will tend to utilise non-adaptive emotional regulation strategies.

#### **4. Discussion**

From the results of the research, it follows that second-class primary school students utilise both adaptive and non-adaptive emotional regulation strategies. On the one hand, it is a good thing that students utilise a positive refocusing to a relatively large degree, i.e. that they manage to purposefully focus on positive experience, and in the effort to manage negative emotions they do not find it a problem to think of more pleasant things or about how to best manage the given situation. On the other hand, however, it is surprising that students suppress emotional manifestations to a relatively large degree, i.e. that they try to prevent or reduce visible manifestations of experienced emotions.

We regard as key the discovery that the degree of use of adaptive strategies is dependent on students' attitude to school life. This means that students with a predominantly positive attitude to school life utilise adaptive emotional regulation strategies to a greater degree than students with a predominantly ambivalent or negative attitude. These students express an effort to manage negative situations by accepting them and trying to see them with an overview; they perceive the problem as an opportunity for personal growth. At the same time, they express an effort to think of more pleasant things, and to change their attention in a more positive direction. It is evident that adaptive emotional regulation strategies correlate with strengthening stimuli in the school environment, i.e. the positive perception of own position in formal and informal school life processes. The use of adaptive emotional regulation strategies is connected with a feeling of success, opportunity to learn, a feeling of inclusion in the class collective, perceived support from the teacher, and the awareness of own value and importance which students experience in school.

In our research, we did not ascertain the type of negative situations encountered by students who, as a consequence of their position in formal and informal school life processes, experience predominantly positive feelings at school. If they experienced the same situations as students who experience negative emotions at school, the question would arise whether the emotional regulation mechanisms would manifest themselves in the same way, and whether the students would remain resilient against negative situations.

We discovered that non-adaptive emotional regulation strategies correlate with predominantly high-risk stimuli in the school environment, i.e. they are significantly connected with a negative experience of school life. Students who do not experience an awareness of their own value and importance at school (which is connected with their school status), and on the contrary experience feelings of loneliness and worry, utilise non-adaptive emotional regulation strategies to a greater degree. In their effort to manage negative emotions, these students tend to return to descriptions and analyses of the negative experiences connected with this situation, they think about them constantly or they exaggerate the given situation, or they end up suppressing their emotional manifestations.

The connection between emotional regulation strategies and the perceived position in formal and informal school life processes indicates that this social environment plays an important role in the use of emotional regulation strategies. Nevertheless, we do not know how this connection takes place. Whether it is the social environment which affects the degree or use of emotional regulation strategies (i.e. whether a positive environment strengthens students' efforts to utilise adaptive emotional regulation strategies and, on the contrary, a negative environment encourages non-adaptive emotional regulation strategies) or if it is self-regulation mechanisms (patterns of emotional reactions and responses) which influence students' attitude/approach to managing various situation which occur in a social environment.

It is possible that the environment acts as a stimulator for the use of self-regulation mechanisms, in this case emotional regulation strategies. According to the strength model (Murtagh, Todd, 2004), self-regulation might operate like a muscle that fatigues after use and then requires a rest. We believe that the social environment acts as an inhibitor or catalyst of self-regulation mechanisms, which subsequently influence students' behaviour in this environment and their perception. Research shows that, as a consequence of social rejection, which is accompanied by the experience of so-called social pain, mechanisms which support the individual's effort to reintegrate into the group are not activated and, paradoxically, the opposite tendency occurs, i.e. a rise of selfish a self-defeating behaviour (Baumeister et al., 2005; Wood et al., 2002; Blackhart et al., 2006).

From our analysis it follows that, in connection with the perceived position in formal and informal school life processes, the degree of use of adaptive strategies is affected by predominantly strengthening stimuli connected with the perception of school as a place where students experience

feelings of success and opportunity to learn, and where they feel they are included in peer groups. The more school corresponds to students' expectations, the more they experience success there, enjoy attending school and are included in informal activities and students' groups, the higher the degree of their use of adaptive emotional regulation strategies.

On the contrary, high-risk environmental attributes connected with a feeling of negative experience play a greater part in the use of non-adaptive emotional regulation strategies. The more students experience feelings of loneliness and worry at school, and the lower their awareness of their own value and importance, the greater the degree of their use of non-adaptive emotional regulation strategies.

It is interesting that a combination of two relatively opposing stimuli contributes to the suppression of emotional manifestations. One of them is the feeling of negative experience, and the other is the teacher's approach to the students. The perception of a positive approach by the teacher, combined with the negative experience of loneliness and worry, strengthens the student's efforts to manage their emotions by suppressing emotional manifestations, and not expressing them outwardly. This means that the expressive suppression occurs to a greater degree in the case of students who experience feelings of loneliness and worry at school, but simultaneously perceive the teacher as a person who is supportive, understanding and fair, and respects the students' needs. It is possible that negative experiences at school, combined with the perception of a positive approach by the teacher, can actually intensify the student's feeling of helplessness, and lead to them suppressing their emotions.

The question arises of what causes students' negative experiences at school. If the student perceives that the surrounding environment (teacher) appears positive outwardly, it does not necessarily have to mean that this impression is positive in relation to them (the positive perception of external factors will not affect the internal feeling of negative experience). Although the findings are promising, they should be interpreted in light of certain limitations. First, the research results are based on children's self-reported information on their emotion regulation strategies and attitudes to towards school life. In this case, one must also take into account possible biases due to the current state of individuals and their susceptibility to social desirability. Secondly, the measurement of attitudes towards the school environment was carried out with one research tool and focused very specifically on areas of school life that are supportive of their learning and those that are risky. Finally, it should be emphasised that although this study was based on a large research sample, the results may or may not prove suitable for generalisation beyond the Czech context. In subsequent research, it would be interesting to focus on what are the causes of the students' negative experiences at school, and to what extent they are related to the intensity of the negative experience.

## **5. Conclusion**

We can regard as an important finding the fact that a positive perception of position in formal and informal school life processes, specifically success and opportunity, and social inclusion in peer groups, strengthens the degree of use of adaptive emotional regulation strategies. It can be said that a supportive environment plays an important role in the emotional regulation. On the contrary, negative experience plays a greater part in the use of non-adaptive emotional regulation strategies, or the suppression of emotional manifestations.

How the students themselves perceive this environment is important. If they perceive learning as an opportunity, and experience success and good feelings from their inclusion in informal peer groups at school, then they are also able to regulate their emotions to a greater degree in this environment.

We can regard the perception of own position in formal and informal school life processes as an important prerequisite for the use/non-use of students' self-regulation mechanisms. We believe the perception of social environment can cause the strengthening or suppression of self-regulation mechanisms, i.e. also the use of emotional regulation strategies, which are key for managing stressful situations, maintaining positive relationships with others, and achieving social and personal goals.

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### **7. Conflict of interest**

The author declared no potential conflicts of interests with respect to the authorship and/or publication of this paper.

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## The Role of Technology and Education in Improving Students' Learning Outcomes

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### Abstract

Our study examined the effects of educational reform on improving academic performance in primary and lower secondary schools in Kosovo. We focused on the Critical Thinking training program, which aims to implement educational reform and improve students' academic results. This program has significantly reformed our education system by improving various aspects of teaching, and we collected and analyzed the opinions of students and teachers to evaluate its effectiveness. We began by discussing the theoretical basis of educational reform and its implementation in schools through a progressive approach and active teaching methods. This contemporary teaching philosophy considers the student an active subject engaged in acquiring knowledge and positive school experiences. When the student is engaged in acquiring knowledge and learning experiences, he participates in learning discussions and debates, contributing directly to the treatment of learning topics. This mastery of learning is a high form of learning by engaging the thinking process in school learning. To conduct comprehensive research, we collected and analyzed the opinions of 255 students from schools that apply interactive teaching methods and 262 that still use traditional teaching practices. We also obtained the opinions of 121 trained teachers who work according to contemporary teaching methodology, and 113 teachers who have not yet been trained in teaching approaches and strategies according to this program.

**Keywords:** critical thinking, contemporary teaching, interactive teaching, productive school, academic results.

### 1. Introduction

To enhance student performance, various public policies have been implemented over the last three decades. (Fisher, 2011). To make a student a good critical thinker, we need to teach them how to analyze and evaluate data and persuasive arguments (Maynes, 2013).

In the field of education, there is a new program that takes a constructivist approach to student learning. This means that students are seen as active participants and contributors to their

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education and development. To implement this program, teachers use interactive teaching strategies that encourage research and constructive debate among students on specific educational topics. The goal is to reform the educational approach towards students, encouraging dialogical forms of learning where people collectively make meaning and learn from each other. Educational reform is a continuous process that aims to improve teaching practices to keep up with the changing socio-economic and technological landscape. To achieve this, national curricula, texts, and teaching standards must be updated regularly.

The term "traditional schools" refers to educational institutions where the teacher dominates the class through lectures and other forms of influence. In such schools, learning is often mechanical and formal, with an overload of information that fails to develop students' initiative or innate potential. This conservative mindset views students as passive listeners, tied to their desks and focused solely on the teacher, without the opportunity to collaborate with their peers. However, learning is heavily influenced by relationships, knowledge, environment, and what is important to the individuals involved (Bishop, 2020).

In traditional schools, students are taught without collaboration, are expected to accept the teacher's words blindly, and are compelled to learn outdated and impractical theoretical concepts that do not align with their interests and abilities. This outdated educational approach results in poor academic performance and fails to prepare students for lifelong learning (Basso et al., 2023).

The rapid advancements in technology and the economy have created a need for reforming outdated educational practices that do not promote the intellectual and technical skills of students. The findings of psycho-educational disciplines and market demands for education with critical and creative qualities have further emphasized the need for educational system reform. Modernizing teaching strategies and approaches is a set of innovations that can improve teaching and student performance in classes. Schools that implement active teaching methodologies and involve students in interactive learning are considered contemporary schools.

## **2. Literature review**

The goal of educational reform is to modernize the entire educational process in our schools. The focus of teacher training is to implement contemporary teaching methodologies and progressive educational practices. To improve learning objectives and reform the educational practices of our schools, we need to scientifically analyze both our educational goals and global trends in the field of education. We should then harmonize contemporary trends and innovations in education with our positive educational traditions, opportunities, and objectives. This should be done for future generations with democratic views and competitive abilities. The reformation of our schools is closely related to the level of social development, demands of the labor market, and rapid technological changes. In the last two decades, many reform projects have been launched and tested in the schools of our country. However, many of these projects have not undergone a thorough analysis and planning process for the reformation of our education system (Kokaj et al., 2021).

The absence of competent leadership and thorough planning for educational reform has resulted in multiple challenges and uncertainties among those involved. This suggests that the authorities in charge of education in our nation have not adopted a well-informed strategy for devising and executing reforms in our education system (Kokaj et al., 2021).

The lack of proper planning and professional leadership in educational reform has caused significant difficulties and obstacles in modernizing our educational practices. According to educator Michael Fullan, the primary reason for the failure of this process is the inadequate planning for the reformation of educational institutions.

Schools that have teachers trained in implementing active teaching methods are working towards improving the teaching and learning experience in their school environments. These significant progressive changes in schools have been well-received by students, parents, and the school community. Scientific terms related to the reformation of educational practices and learning environments have become a part of the daily communication between teachers and school governing bodies. In reformed schools, students feel happy and willingly participate in learning tasks and debates. The improvement of learning environments has also relaxed and democratized the relationships between students and their teachers.

The partnership requires agents to, use sound reasoning and strategies to objectify research findings (Taysum, Arar, 2020).

Our research has identified several schools that have made significant progress in their efforts to reform. These schools have successfully established a culture of success and serve as positive examples for other schools that are struggling to reform. They are highly respected in their communities, as well as by education directorates, for their commitment to providing quality education and fulfilling their mission. However, it's important to note that the majority of schools we researched are still lagging in their efforts to reform their school environments.

During our research, we observed that many principals and teachers lack sufficient knowledge about contemporary teaching methodologies and strategies. They seem to have doubts and uncertainties about professional innovations and positive changes. We found teachers who do not understand the essence of educational reform and the benefits of modern approaches to children's education. In some schools, principals who lack professional competence have become an obstacle to improving the quality of teaching and education. These school leaders and teachers, without proper training and preparation, tend to be traditional and conservative in their educational practices. Therefore, school leaders should analyze and plan the implementation of specific professional innovations to improve the quality of education in their schools (Knapp, 2020). The relationships between the principals and teachers in these schools are formal and bureaucratic, leading to a lack of cooperation among the teachers. This lack of cooperation results in ineffective teaching methods, which force students to memorize irrelevant material. Furthermore, since teachers are uninformed about each other's teaching experiences, this hinders the students' motivation to learn and acquire new knowledge. In contrast, when learners believe in their ability to complete a task, their motivation to do so increases (Makkonen et al., 2021). In some schools, some teachers are progressive in their approach to education, even though they may be in the minority and lack the authority to bring about changes in their schools. This is because many traditional and conservative teachers resist introducing new teaching methods. However, such schools are becoming less common, and it is now more important to assess the implementation of modern teaching strategies. We believe that our educational system is already on a path of positive change and that educational institutions should support special schools in reforming their teaching environments.

### **3. Methodology**

In this research, we want to analyze the effects of the educational reform in improving the student's learning outcomes. As research objectives we have:

- To compare the philosophical approach of critical thinking implemented in many schools with the traditional approach of schools that have not yet reformed their pedagogical practices.
- Through the research, we aim to emphasize the importance of implementing this program in other schools as a suitable alternative for reforming their practices.

The research questions for this study are:

- Does the educational approach and contemporary teaching methodology help improve student performance in our schools?
- What are the concrete contributions of this program in improving students' academic results and increasing schools' productivity?

In this research, we utilized the quantitative method to obtain opinions from students and teachers of contemporary and traditional schools. We gathered these opinions through a survey and present them in this paper as research findings, which we compare as numbers and percentages. Our research included 851 subjects, comprising 121 teachers trained for contemporary teaching and 113 teachers not trained for new teaching strategies. We also surveyed 255 students from contemporary and interactive teaching schools and 262 students from traditional and formal mechanical learning schools. Furthermore, we evaluated the impact of educational reform on enhancing academic outcomes through pedagogical documentation. To achieve this, we analyzed the academic results of 10 contemporary schools and 10 traditional schools, specifically focusing on the National Achievement Test of lower high school students. We analyzed the academic success of a total of 1172 students.

**Table 1.** Questionnaire for students

<b>Students in class take</b>		Every two consecutive months	Only one Time	Out of the 7 days	One time per every class
1	Taking Notes	1-1	2-2	3-3	4-4
2	Fully Focused in Class	1-1	2-2	3-3	4-4
3	Individual Debate	1-1	2-2	3-3	4-4
4	Class discussion	1-1	2-2	3-3	4-4
5	Subgroup discussion	1-1	2-2	3-3	4-4
6	Conducting a group test	1-1	2-2	3-3	4-4
7	Individual meditation and reading	1-1	2-2	3-3	4-4
8	Reading with a loud voice	1-1	2-2	3-3	4-4
9	Writing an essay	1-1	2-2	3-3	4-4
10	PowerPoint Presentations	1-1	2-2	3-3	4-4
11	Completing the tasks in class	1-1	2-2	3-3	4-4
12	Writing out an essay on the work that was done	1-1	2-2	3-3	4-4
13	Completing classwork	1-1	2-2	3-3	4-4
15	Future Tasks being completed	1-1	2-2	3-3	4-4
16	Problem analyses	1-1	2-2	3-3	4-4
17	Teleconference	1-1	2-2	3-3	4-4
18	Performing questions at task	1-1	2-2	3-3	4-4
19	Modelling the analysis	1-1	2-2	3-3	4-4

**Table 2.** Questionnaire for teachers

<b>Outcome Results</b>		0 % Approve	33.33 % Approve	66.6 % Approve	100 % Approve
1	How much is education valued?	1-1	2-2	3-3	4-4
2	How much do we have a basic education	1-1	2-2	3-3	4-4
3	Did we meet the objectives that were given to us?	1-1	2-2	3-3	4-4
4	What is the quality of teaching?	1-1	2-2	3-3	4-4
5	Feedback on our success	1-1	2-2	3-3	4-4
6	Personel assesment of work	1-1	2-2	3-3	4-4

**4. Results**

The changes that have been made in schools have had a positive impact on the performance of students. Our research has confirmed that the use of contemporary teaching strategies in reformed schools has resulted in an improvement in the quality of learning. We have observed differences in opinions between students and teachers in the two school environments, particularly in certain aspects of educational practices. We recognize that these differences in opinions are a normal part of the educational landscape. The schools that have successfully applied progressive teaching philosophies have yielded better learning outcomes when compared to their counterparts who have not yet implemented educational reforms. We conducted a survey in which both sets of

students were asked about their satisfaction levels with their learning outcomes, and the results are presented in [Table 3](#).

[Table 3](#) displays the satisfaction level of students from both reformed and traditional schools about their learning outcomes. The "Never" category has a total of 35 students, with 2.1 % from reformed schools and 4.6 % from traditional schools. The table also represents the percentage of students content with their results in various learning categories, including writing reports, giving presentations, carrying out work reports, completing in-class assignments, working on independent projects, solving different tasks, participating in debates, and answering questionnaires.

We also conducted a questionnaire for teachers, which is shown in [Table 2](#). The questionnaire focuses on five aspects: teachers' evaluation of the quality of education, the background of students about their work, objectives that students obtained concerning their work, the quality of teaching, and teachers' communication regarding student success. Teachers were asked to rate these aspects on a scale ranging from "Never" to "Always." The results show a wide range of responses in each category.

**Table 3.** How much is the satisfaction of the outcome results

LEVEL	Pupils in Reformed institutions	Pupils in Traditional institutions	Total
	N (%)	N (%)	N (%)
0	(1.1%)	(14.6%)	(10.8%)
1	(1.8%)	(4.1%)	(1.7%)
2	(1.11%)	(1.4%)	(2.02%)
3	(10.4%)	(4.6%)	(59.5%)
4	(3.9%)	(9.8%)	(1.6%)
Total	(18.31%)	(34.5%)	(75.62%)

- Pupils in Reformed Institutions: Pupils were surveyed from institutions that apply the standard methodology.

- Pupils in Traditional Institutions: Pupils were surveyed from institutions that apply the traditional methodology.

**Table 4.** The output P values for Table 3

		Reformed Institutions	Traditional Institutions
Reformed Institutions	Pearson Correlation Sig. (2-tailed)	1	0.998**
	N	6	6
Traditional Institutions	Pearson Correlation Sig.(2-tailed)	0.998**	1
	N	6	6

Note: \*\*.Correlation is significant at the 0.01 level (2-tailed).

The table above shows the differences of opinion between students from reformed schools and those from traditional schools. This shows that the educational results of students from schools with reformed educational practices are slightly higher compared to the educational results of students from traditional schools. The most positive opinions about their teaching performance are evidence of contemporary teaching and stimulating learning environments for learning achievement. The next question for teachers of contemporary and traditional schools was how much the students make presentations in front of the class. Presentations of students' works in front of the class are important activities that are followed by discussions and constructive learning debates.

**Table 5.** Student Presentations

The Level of time	Teachers in Reformed institutions	Teachers in Traditional institutions	Total
Every two consecutive months	N (%)	N (%)	N (%)
	(7.9 %)	(18.7 %)	(19.0 %)
Only one Time	(23.7 %)	(3.1 %)	(1.8 %)
Out of the 7 days	(0.2 %)	(1.9 %)	(3.1 %)
One time per every class	(31.6 %)	(2.0 %)	(16.9 %)
N/A	(9 %)	(1.3 %)	(18.8 %)
Total	(72.4 %)	(27 %)	(59.6 %)

- Reformed Institutions: Teachers were surveyed from institutions that apply the standard methodology.

- Traditional Institutions: Teachers were surveyed from institutions that apply the traditional methodology.

**Table 6.** The output P values for Table 5

		Reformed Institutions	Traditional Institutions
Reformed Institutions	Pearson Correlation	1	0.991**
	Sig. (2-tailed)		0.000
	N	6	6
Traditional Institutions	Pearson Correlation	0.991**	1
	Sig.(2-tailed)	0.000	
	N	6	6

Notes: \*\*.Correlation is important at the value 0.01 level (2-tailed)

The percentages of teachers' opinions from the two school environments that are the object of analysis and comparison are distributed in four variants. There are differences between the teachers of these two school environments in terms of the frequency of students' appearance in front of the class. Teachers of critical thinking schools have stated that their students present their work and assignments more often in front of the class. Unlike critical-thinking teachers, those in traditional schools are less likely to organize presentations in front of their students, which means they also find group work and collaboration less applicable.

### Statistical Analysis

For this paper, we analyzed the learning results of 1172 students who were divided into two groups. In these schools, teachers are taking on the role of both instructors and fellow travelers on their students' intellectual growth journey. In contrast, traditional schools tend to have more formal and less cooperative teacher-student relationships, which may hinder students' preparation for independent learning and lifelong education. For this paper, we analyzed the learning outcomes of 1172 students who were divided into two groups. The first group of learning outcomes that were analyzed consisted of 648 students from 10 schools with teachers trained in contemporary teaching. While in the second group, the learning achievements of 524 students from 10 schools with teachers not trained in contemporary teaching were analyzed. The educational results of these 20 schools achieved in the Achievement Test and presented as an average percentage are as follows:

**Table 7.** The output Test Results for Reformed and Traditional groups

Number of Institutions	Reformed %	Traditional %
1.1	81	30
2.1	80.04	40
3.1	70	30
4.1	60	40
5.1	30	60
6.1	50	50
7.1	40	20
8.1	20	20
9.1	10	20
10.1	60	30
<b>Average</b>	<b>50.104</b>	<b>34</b>

**Table 8.** The output P values of Table 7

		Reformed	Traditional
Reformed	Pearson Correlation	1	1.000
	Sig. (2-tailed)		
	N	2	2
Traditional	Pearson Correlation	1.000	1
	Sig.(2-tailed)	2	2
	N		

The table above shows the average percentages of general learning results achieved in the Achievement Test. Students were tested in 9 subjects, and we presented the overall averages of contemporary and traditional schools. As seen from the data, there are significant differences in averages expressed as percentages between these two school environments. Students from schools that implement active teaching methodologies have achieved better results in the official test for the 9th grade. The differences in the percentages of averages, 50.104 % and 34 %, are pronounced. The higher educational results of students from reformed schools demonstrate the importance of applying contemporary teaching philosophies to create relaxing and motivating learning environments that encourage active and interactive learning. The average percentages for the special subjects achieved in this test are:

**Table 9.** The Test results of each course

Course	Reformed %	Traditional %
Albanian	60	57
English	80	80
History	70	50
Geography	60	50
Maths	60	60
IT	70	70
Physics	60	47
Chemistry	58	50
Biology	60	60
<b>Average</b>	<b>64.22</b>	<b>58.22</b>

The success of students in different subjects is a clear indication that schools that have adopted new educational practices are of better quality. Even within specific subjects, there are noticeable differences in the percentages of the averages, which demonstrate that schools that have been slow to adopt new educational practices have lower learning outcomes. Higher educational achievements reflect positive changes in the approach to students and the educational process in general. These improvements lead to better learning outcomes and prepare students more effectively for work and lifelong learning. It is worth noting that the educational results compared in [Tables 7](#) and [9](#) are from schools where we conducted the survey.

**Table 10.** The output P values of Table 9

		Reformed	Traditional
Reformed	Pearson Correlation	1	0.922
	Sig. (2-tailed)		0.000
	N	9	9
Traditional	Pearson Correlation	0.922	1
	Sig.(2-tailed)	0.000	
	N	9	9

## 5. Discussion

In discussions, a progressive view dominates the necessity of implementing innovative instructional strategies and innovations that prepare generations for an increasingly qualified workforce. In contemporary society, to be objective and competitive in society, people must verify information from reliable and contradictory sources ([Tarchi, Villalón, 2021](#)). On the other hand, in some school environments, we still find conservative opinions of teachers who oppose changes in education for some non-scientific reasons. These teachers are usually older have not fully understood the active teaching methods, and have professional doubts and uncertainties in their implementation. Interesting and fruitful discussions also take place among teachers for the effective implementation of critical thinking techniques and instructional strategies. These instructional techniques and strategies help to achieve active and interactive learning and form a research culture among students. In the context of improving the performance of students in lessons, debates are also held in schools to improve the specific competencies of students. This type of competency includes abilities and skills related to autonomous learning, the development of creativity, and the capacity to adapt to new situations ([Amor, Serrano Rodríguez, 2019](#)). Most teachers prioritize the comprehensive development of their students. Apart from providing theoretical knowledge, teachers aim to instill progressive attitudes, open-mindedness, creativity, and problem-solving skills in their students. Creative thinking enhances problem-solving abilities, which can have far-reaching benefits in both personal and professional domains ([Fazal et al., 2023](#)). Teachers have expressed serious concerns about the lack of laboratories and teaching technology in schools. According to them, the absence of laboratories and various workshops in schools makes it difficult to cultivate students' work habits and develop their talents and interests.

### Further research

It is crucial to conduct further research to reform education and enhance students' academic performance. The effectiveness of schools and the success of students in their studies are influenced by various factors. Therefore, it is essential to study the role of these factors in improving our educational system. The research should focus on examining the impact of educational reform in different social contexts. Additionally, it is important to investigate the implementation of modern teaching strategies that promote active and interactive learning.

## 6. Conclusion

Based on the results of this study, we can conclude that schools that adopt the philosophical approach of critical thinking have improved the academic performance of their students by engaging them in active learning. By using active teaching methods, students are presented with instructional tasks that require their intellectual involvement to search for and discover solutions. Problem-solving activities encourage students to think critically and find the most appropriate solution ([Kadrija et al., 2022](#)).

Seeking alternatives and finding solutions to tasks can help cultivate children's interest in new knowledge and motivate them to actively pursue academic success. In other words, when learners expect to succeed and experience intrinsic or extrinsic value in innovation, they are more likely to try innovating on their own (Soleas, Bolden, 2020). During learning, students are the center of attention, and responsible for their intellectual and human development. Schools that promote critical thinking and interactive teaching methods play a crucial role in developing a sense of community and democratic attitudes among their students. Through active and collaborative learning, children not only gain knowledge but also share their experiences and opinions on social and environmental issues discussed in class. This helps them learn to argue and reach consensus, which contributes to the development of creative and democratic personalities. To ensure fairness in education, teachers must acknowledge that students' life circumstances can affect their learning. Therefore, it is essential to create a stimulating learning environment that caters to students with different abilities and interests (Schenker et al., 2019).

Teachers need to be aware of their student's cognitive abilities and emotions during lessons to create positive learning experiences and foster a progressive attitude toward education. Interactive learning in reformed schools is of higher quality than in traditional schools because students are encouraged to conduct experiments, collect data, and analyze scientific theories. Theories not only aid in the understanding of practice but also help to formulate goals (Ali et al., 2019).

Many students are taught scientific theories through mechanical instruction without enough practice and application. This type of learning is quickly forgotten and does not help students develop their creative and inventive abilities to find solutions in everyday situations. However, students in reformed schools are more motivated to achieve high academic results because they are constantly informed and appreciated for their successes. They have established partnerships with their teachers in various instructional trials and projects and in setting standards for assessment and behavior in the classroom. The implementation of the strategies of this program has democratized the relationships between teachers and their students and created an appropriate and stimulating environment for learning. The teacher must recognize the cognitive possibilities and emotions of the students during the lesson to create positive learning experiences and progressive attitudes toward education (Lujan et al., 2021).

It is not possible to make generalizations at the national level based on the research conducted, as the number of teachers and students involved is too small. Additionally, the terms "contemporary school" and "traditional school" are relative concepts, as the differences in the use of active learning strategies between them are not very distinct. This is because the entire educational system in our country is undergoing reformation, and the difference lies in the level of progress each school has made in this journey. While some schools have made significant progress and are familiar with the new teaching methodology, others are either at the early stages of this journey or have not yet started the reform process.

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## Value Self-Determination of University Students on the Basis of Multilingual Culture

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### Abstract

The purpose of the study is to analyze the university students' value self-determination on the basis of multilingual culture. The authors report the results of a survey of students from two universities, Orenburg State University (Russia) and Zhangir khan West Kazakhstan Agrarian and technical University (Kazakhstan). The survey sample includes 303 students studying in the full-time and 49 university teachers.

The article also presents a structural and processing model of value self-determination of university students on the basis of multilingual culture. The model is presented in the form of highlighted blocks: target, structural-contenting, procedural, evaluation and effective blocks. The model determines the orientation, structure, content and pedagogical conditions of the value self-determination of the university students on the basis of multilingual culture.

Within the framework of research the authors conducted students' scientific and practical conferences, round tables, trainings, debates, festivals of national holidays, intellectual games and literary contests.

It was established that the developed and tested scientific and methodological support of the process of formation of the university students' value self-determination on the basis of multilingual culture acts as a program and technological basis for the improvement of multilingual education.

**Keywords:** youth values, self-determination, multilingualism, multilingual culture, multilingual education, learning foreign languages, cross-cultural communication.

### 1. Introduction

In the global space of multiculturalism and multilingualism, the problem of adaptation of a modern person to constantly changing conditions, its integration into the globalizing world, and at the same time, maintaining integrity, balance, and national identity is especially acute. In this context an important place is occupied by the value self-determination of the personality, ready for

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life and activity in a multinational, multicultural environment with the developed sense of understanding and respect for other peoples and cultures.

In the process of mastering the cultures of the countries of the studied languages a person develops his moral, spiritual and creative resources. It is a foreign language that contributes to cultural growth, an increase in the spiritual wealth of a person, a deeper understanding of the wealth and beauty of the native language.

The value potential of multilingual education actualizes the process of aspiration to civilizational, national and personality-oriented values, the formation of readiness for conducting cultural dialogue, taking into account the specifics of native and foreign languages as reflecting the system of cultural values, cultural and conditioned behavior on the basis of mutual respect, tolerance and mutual understanding.

The subject of the study is the value self-determination of university students.

The purpose of the study is to substantiate and check experimentally the pedagogical conditions of the value self-determination of university students on the basis of multilingual culture.

Research tasks:

1. To clarify the essence of the concepts of “value self-determination of students”, “multilingual culture”;
2. To develop a model of value self-determination of university students on the basis of multilingual culture;
3. To develop and test in experimental work the educational and methodological support of the value self-determination of university students on the basis of multilingual culture.

**Experimental research base.** Experiments were conducted at Zhangir Khan West Kazakhstan Agrarian and technical University (Kazakhstan) and Orenburg State University (Russia). In total, 303 students and 49 lecturers took part in the study.

## **2. Theoretical aspects of the study**

At present the educational situation is characterized by the modern integration processes, the opening of borders between states, the formation of multilingual spaces dominated by the role of the English language, the need to preserve both linguistic and cultural diversity, conducting intercultural dialogues based on the construction of tolerant intercultural, interethnic, interpersonal relations.

The systematization of knowledge about self-determination made it possible to conclude that it is impossible to specify what types of self-determination became the subject of individual sciences, since, for example, life self-determination is the subject of study in psychology and pedagogy. This, in our opinion, is due to the fact that self-determination is a complex and multi-stage process of personality development in which different types are formed at the same time constantly interacting with each other.

According to the axiological approach, self-determination reflects the process of a person's aspiration to values and the result expressed by the ability to develop a life-based perspective, and make responsible choices of goals and values (Mosienko, 2011; Povzun, 2003).

In the works of Russian researchers self-determination is associated with the awareness of the meaning of life and personal responsibility (Rubinstein, 2007), with self-esteem, self-realization and cognition of other people (Zhuravlev et al., 2007), professional activity (Safin, 2004).

The interpretation of the concept of “self-determination” was developed in the works of A.N. Leontiev, who focused on the active position of the individual in the process of self-determination. This process has two sides: external and internal, that is, a person, acting on the outside world, changing it, changes himself. According to A.N. Leontiev, the success of the process depends on historical conditions, on belonging to the social environment and the choice of subject activity (Leontiev, 2005).

According to L.I. Bozhovich, need for self-determination is associated with the formation of a semantic personality system, with the search for the meaning of his existence, which is especially relevant for each particular age. So, in adolescence, when a young man is facing a life and professional choice, self-determination involves aspiration for the future, the choice of the future path. At an older age, self-determination becomes a systemic neoplasm associated with the formation of an internal position of an adult (Bozhovich, 2001).

The social environment and specific social groups are important in the process of self-determination of personality. The choice of the subject of one or another method of activity in

constantly changing conditions largely depends on changes in the social environment, the development of reference groups, and the vector of self-determination of the personality itself.

According to A.L. Zhuravlev there are two main factors affecting the development of personality and his adaptation to the social environment: 1) social, representing a socio-cultural context that reflects the historical, cultural and ethnic specifics; 2) individual-personal, which is determined by the individual psychological properties of the individual, the peculiarity of his life path. Therefore, in the interpretation of A.L. Zhuravlev, self-determination is the search by the subject of his own way of life, system of life meanings, principles, values, capabilities and abilities (Zhuravlev et al., 2007).

In the interpretation of A.V. Kiryakova “value self-determination includes a valuable attitude towards the world, which is expressed in the awareness, experience and assignment of universal values, values of the modern world, values of the profession”. (Kiryakova et al., 2016).

According to L.P. Razbegaeva value self-determination is the formation of a system of value relations of a person, involving awareness, understanding, acceptance of values, and is a process and the result of determining the personality of his place in the modern cultural and historical space (Razbegaeva, 2009).

An analysis of the works of foreign scientists showed that the concept of “self-determination” is revealed through the concept of lifestyle (Adler, 2002) and a model of human development (Erickson, 2006).

A. Adler considers self-determination as the goal of any person – to become a significant, valuable person representing a unique whole with his own understanding of the world, capable of setting goals and realizing them. According to A. Adler, the personality is part of the social system that strives for superiority, developing his own lifestyle and making efforts to realize it.

The idea of M.R. Ginzburg about the relationship of personal self-determination with values is very important for our study. In his interpretation, self-determination becomes value-semantic, acting as the basis of personal development, setting a personally significant orientation to achieve a certain level in the system of social relations, which, in turn, determines the requirements for a specific professional field (Ginzburg, 1998).

When determining the concept of “multilingual culture”, we considered the works of N.E. Bulankina, B.A. Zhetpisbaeva, L.A. Malikov and others.

According to N.E. Bulankina, a multilingual culture is a “special integrative sphere of sociocultural reality, which is formed in the process of human development, in its national self-awareness, and characterised as a set of interacting components: a way of preserving national and universal values. The main characteristic of a multilingual culture is multifunctionality due to the variety of functions of the language itself (Bulankina, 2002).

On a global scale, “multilingual culture” means a set of indicators that reflect the level of “prevalence of languages” in the educational space, as well as the level of mastering the native and foreign languages in the space of a particular society (Zhetpisbaeva, 2008).

According to L.A. Malikov, in the development of a multicultural person the formation of knowledge about the phenomenon of culture, its types and varieties, the most common cultural traditions considered as the most valuable indicators in the educational space of the university. In addition, the general awareness of students about the cultural diversity of the world, modern trends in globalization, the phenomenon of multiculturalism, principles, methods, techniques of cross-cultural interaction are one of the most important criteria. Mastering a multilingual culture, a student expands the capabilities of opportunities, becomes open to dialogue, gets acquainted with the history and prospects of a certain ethnic group (Malikov, 2016).

Multilingual culture is a characteristic of a multilingual personality, an individual with a certain level of linguistic knowledge, and with a valuable attitude to the studied languages and cultures, capable of effective communication in several languages.

Thus, as a result of the analysis of basic concepts, we determined the main definitions for the categories of “value self-determination”, “multilingual culture” and revealed the pedagogical capabilities of the multilingual culture in the value self-determination of university students.

### **3. Materials and methods**

To diagnose the levels of the formation of value self-determination of university students on the basis of multilingual culture at all stages of experiment, we have used the methods of observation, survey and analysis of creative works.

In order to prepare teachers and students to participate in experimental work at the university, the Center for the Development of Multilingual Education was created (hereinafter referred to as the Center). The structure of the center is represented by language departments: “Kazakh and Russian languages”, “Foreign languages” (Appendix 1).

The implementation of cultural and social practices in integral multilingual education is aimed at introducing global, universal, professional and personal values to the students on the basis of the formation of students' attitude to the multicultural reality, the ability to adapt in a wide range of situations through native and foreign languages.

Mastery of three or more languages becomes necessary in the current situation of multilingualism and multiculturalism. Consequently, it is necessary to develop the students' multilingual culture which is associated with such professions as translators, writers, teachers and others.

The stages of the formation of value self-determination of university students on the basis of multilingual culture are as follows:

- *Adaptation*. In the process of adaptation, students of different levels of training are adapted to new conditions and a new team, undergo testing to determine the level of knowledge of the languages and are distributed into groups in accordance with the level of knowledge.

- *Specialization*. At this stage the students work on a professional thesis and develop the ability to work with professionally oriented text, with its lexical, grammatical features; to analyze professional-oriented texts; to comment on the information of foreign language sources in the native language.

- *Personalization* is a stage when a student feels freely when choosing an activity, communication style, means and ways to achieve the goals of communication in several languages, has a developed multilingual culture, i.e. he speaks several foreign languages. Conventionally, we call this student a specialist-designer, since he is able to design independently situations of professional communication in a multilingual environment.

### **Characteristics of a structural and processing model of the value self-determination of university students on the basis of multilingual culture**

This paragraph describes a model of value self-determination of university students on the basis of multilingual culture. The model is presented in the form of highlighted blocks: target, structural-content, procedural, evaluative and productive. The model determines the orientation, structure, content and pedagogical conditions of the value self-determination of the university students on the basis of multilingual culture (Figure 1).

The goal determines the structure and functions of the system and its individual components, since it is the goal that directs and regulates the activity. The target bloc reflects the social order of modern society – the education and upbringing of students capable of creative activity in the modern multicultural and multilingual environment, preserving their socio-cultural identity, striving to understand other cultures and ethnic communities, races and beliefs.

The orientation of modern education to the multilingual and multicultural values involves education and upbringing in a multicultural and multi-ethnic environment, recognizing the uniqueness, value of the people, their culture and language. It contributes to students' awareness of their own national-cultural identity, acquaintance with other cultures, peoples, their achievements, educating tolerance and respect for other nations.

The students' value self-determination forming processes are determined by the cultural, dialogical, integral and mobility principles.

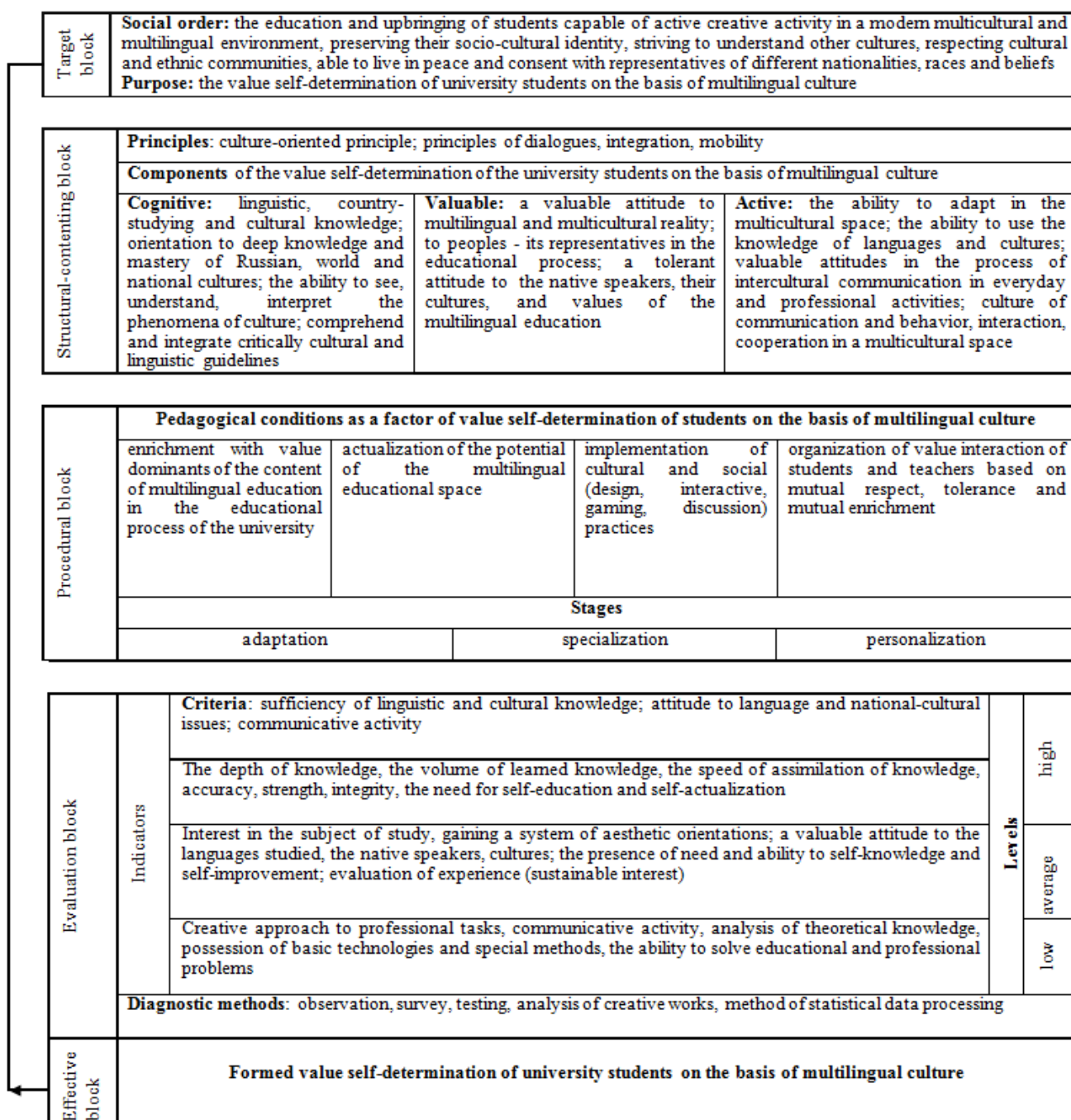
The cultural principle determines the selection and organization of cultural content, taking into account the definition of the value and cultural significance of materials, actualizing the significant interdisciplinary concepts of “cultural heritage”, “multiculturalism”, “cultural self-determination”, “multilingualism”.

The dialogical principle, on the one hand, approves dialogue interaction, on the other hand, ensures the development of person's culture, organizes human thinking, and promotes communication.

The principle of integration stimulates interdisciplinary relations of a philosophical, cultural and linguistic nature; creates the conditions for the integration of elements of national cultures into the world one.

The principle of mobility is one of the modern indicators of the university life under the sign of the Bologna process. Mobility in conditions of multiculturalism and multilingualism implies not

only physical movements, but also the ability to adapt quickly to the constantly changing conditions of the multi-cultural world.



**Fig. 1.** Structural and processing model of value self-determination of university students on the basis of multilingual culture

The substantial components of the value self-determination of the university students based on the multilingual culture reflect the cognitive, value and activity components.

The cognitive component includes linguistic, cultural and regional knowledge; orientation to deep possession of the world and national cultures; the ability to see, understand, interpret the phenomena of culture, models of speech behavior, the ability to comprehend and integrate cultural-linguistic guidelines into their own vision of the world.

The valuable component determines valuable attitude towards the multilingual and multicultural reality; a tolerant attitude to peoples - native speakers, their cultures, to the system of values of the multilingual education.

The active component includes the ability to adapt in the multicultural space, the culture of communication and behavior, culture of interaction, cooperation in the multicultural space; to conduct cultural activities using native and foreign languages in the process of intercultural communication (verbal and non-verbal) in everyday and professional activity.

The third block – procedural – reflects the pedagogical conditions of the value self-determination of university students on the basis of multilingual culture:

- enrichment with value dominants of the content of multilingual education in the educational process of the university;
- actualization of the potential of the multilingual educational space;
- implementation of cultural and social practices: projects, interactive discussion.

Thus, the developed model is a system of interconnected elements that determines the orientation, structure, content and pedagogical conditions of the value self-determination of the university students on the basis of multilingual culture. The model shows the stages, criteria, indicators and levels of the formation of the value self-determination of the university students on the basis of multilingual culture.

For the most complete study of the effectiveness of experimental work on the value self-determination of a student on the basis of multilingual culture, we used the “chi-square” test, the statistical purpose of which made it possible to identify the difference between the quantitative results of the experimental group at the ascertaining and verification stages of the experiment.

To obtain equal empirical data, the results of tests, surveys, conversations, diagnostic methods were converted into scores for each level: 0-30 – low, 31-70 – medium, 71-100 – high.

The formula for the chi-square test is as follows:

$$\chi^2 = \sum_{i=1}^r \sum_{j=1}^s \frac{(n_{ij}^{\text{э}} - n_{ij}^{\text{т}})^2}{n_{ij}^{\text{т}}}, \quad (1)$$

$n_{ij}^{\text{э}}$  – observed (empirical) frequency in the  $i$ -th row and  $j$ -th column of the table,  $i = \overline{1, r}$ ,  $j = \overline{1, s}$ ;

$n_{ij}^{\text{т}}$  – theoretical frequency in the  $i$ -th row and  $j$ -th column of the table, which would be observed if the two empirical distributions coincided.

The mathematical calculation of the criterion was carried out in the Microsoft Office Excel program for each indicator.

The hypothesis that there is no difference between the two empirical distributions is rejected if the observed value of the statistic  $\chi_{\text{набл}}^2$ , calculated by formula (1) will be greater than the critical  $\chi_{\text{кр}}^2(\alpha, \nu)$ , found from the table of critical points of the "chi-square" distribution depending on the level of significance  $\alpha$  and number of degrees of freedom  $\nu = (r - 1) \cdot (s - 1)$ .

Let us present the results of experimental work for each criterion after the implementation of the process model of a student's value self-determination on the basis of multilingual culture. The verification stage also made it possible to notice the qualitative dynamics of the process under study.

In the framework of the experiment it was noted that after the implementation of the developed model, students achieved high communicative tolerance (82 %): they accept and understand the individuality of a representative of a foreign culture (69 %), use images of representatives of the culture of peoples as a standard (72 %), have flexibility and breadth of outlook in the world of values of a multicultural society (86 %), realize the ability to adapt in a multicultural society (79 %).

At this stage of the experiment, students showed themselves capable of acting, respecting the rights, norms, values and traditions of a multicultural society, but at the same time remaining subjects of this society with their own individuality. Students assess themselves objectively (81 %), master the methods of assertive behavior in a multicultural society from the standpoint of value orientations (73 %), feel confident in the conditions of multilingualism and cross-cultural communication (75 %).



It is worth noting the high knowledge of students about the values and culture of their native country and other peoples. The participants of the experiment showed a positive attitude towards such values as: "Motherland", "Citizenship", "Patriotism", "Culture". Among the respondents, 89 % are proud of their country, they want to connect their professional future with their country. Students value natural resources of their country (94 %), speech and culture of communication (75 %), political and economic structure (68 %). All students have advanced knowledge about the official symbols of their own and other countries, about the main traditions and customs, and the history of the state. Students continuously follow international news and significant events, hold informational meetings to exchange news at the university. The experiment made it possible to determine the high level of psychological culture of the student's personality expressed in the ability to perform self-knowledge (74 %), constructive communication (83 %), sufficient self-regulation of one's emotions, actions, thoughts (79 %).

Measurement of the dynamics of indicators was carried out on the basis of the results of regular tests with the help of AINTS (Automated Interactive Network Testing System) developed at Orenburg State University. AINTS is an Internet version of an instrumental training and control system with advanced capabilities for monitoring students' knowledge, creating and setting up subject material and successfully used to test knowledge of students in various disciplines. Testing with the help of this system made it possible to change the complexity and number of questions depending on the level of requirements of the educational program. In the process of experimental training, we used different tests in English, French, Russian, Kazakh of different levels.

Based on the measurements we established the dynamics of the results of assessing the knowledge of students participating in the experiment. At the beginning of the experiment, a high level of knowledge was noted in 22 % of students, an average level in 49 %, a low level in 29 %, by the end of the experiment a high level was noted in 29 % (+7) students, an average level in 60 % (+11), low – in 11% (-18).

To identify the dynamics of quantitative data for each indicator of the cognitive criterion of a student's value self-determination on the basis of a multilingual culture, generalized data were taken (Tables 2, 3) and the "chi-square" criterion was calculated.

**Table 2.** Dynamics of a student's value self-determination based on a multilingual culture (according to a cognitive criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high
1	2	3	4
Cognitive criterion indicator: Knowledge about oneself as a representative of a multicultural society			
Ascertaining	28,3	50,2	21,5
Verification	5,2	30,3	64,5

Theoretical frequencies for each level of formation of the student's value self-determination in terms of "knowledge about oneself as a representative of a multicultural society" amounted to: 16,75 (low), 40,25 (average), 43 (high). In accordance with the data obtained, the calculation  $\chi^2$  observed showed that there is a positive dynamics of the student's value self-determination for this indicator: high level growth ( $\chi^2$  observ. = 10,75), low level reduction ( $\chi^2$  observ. = 7,964328358). In general, the indicator shows the dynamics of the value self-determination of the student, which confirms the following  $\chi^2$  observ. = 21,1740178.

According to the indicator of the "Ideas about the national traditions of their country and other peoples of the world", a statistical analysis made it possible to determine that positive dynamics was confirmed by all levels of the formation of the phenomenon under study. So, theoretical frequencies were: 21 at a low level, 35.45 at an average level and 43.55 - at high.

Bringing data under the  $\chi^2$  Pierson criterion made it possible to determine the dynamics of empirical data by the high level of this indicator of the formation of the student's value self-determination by the cognitive criterion ( $\chi^2$  observ. = 14,40878301). In addition, a lower level decrease was revealed by this indicator ( $\chi^2$  observ. = 8,171904762). Thus, the criterion  $\chi^2$  is equal to 26,60896704.

**Table 3.** Dynamics of a student's value self-determination based on a multilingual culture (according to a cognitive criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high
1	2	3	4
The indicator of the cognitive criterion: Ideas about the national traditions of their country and other peoples of the world			
Ascertaining	34,1	47,4	18,5
Verification	7,9	23,5	68,6

Statistical analysis of the generalized data by the cognitive criterion of the student's value self-determination based on the "chi-square" criterion allows us to conclude that observed  $\chi^2$  for each indicator is higher than the critical value of the statistics of "chi-square" (5.99), which confirms the  $H_1$  hypothesis that the implementation of the process model of the student's value self-determination positively affects the dynamics of the studied phenomenon.

Based on the results of the diagnosis of this criterion, it was determined that students have formed a stable positive attitude towards the world and other people (85 %), respectful attitude to people of another race and ethnic group (77 %), readiness for constructive and productive intercultural interaction (69 %), a valuable attitude to their own ethnic group (92 %), social attitudes are predetermined by the values of cross-cultural and interethnic interaction (74 %). As a result of the interpretation of students' answers, it was determined that respondents are emotionally assigned to representatives of other cultures (72 %), perceive the diversity of various socio-cultural groups (81 %).

Within the framework of the experimental work, students showed significant personal qualities that have determined value self-determination based on the multilingual culture: friendliness (78 %), adaptability (83 %), self-confidence (69 %), responsiveness (84 %), selflessness (87 %). Students are able to carry out cross-cultural interaction due to delicacy, sociability, friendliness, respect, gratitude to the interlocutor – the representative of his native or other culture. A positive point in assessing the motivational criterion of the student's value self-determination on the basis of multilingual culture was the identification of the collegial style of the interpersonal interaction of all participants of the experimental work.

The cultural and value orientations of students at the ascertaining stage of the experiment shifted towards a dynamically developing culture. At the beginning of the experiment, 29 % of the students involved in the experiment were focused on a dynamically developing culture, 41 % on modern culture and 30 % on traditional culture, by the time the experiment is completed, respectively: 58 % (+29), 25 % (-6) and 17 % (-13).

Most respondents focus on achieving results in the future, being successful and able to solve the problem in a timely manner. It was determined that students are cultivated by individuality (79 %), identity (83 %), independence of decision-making (92 %). In the process of cross-cultural communication, 78 % of respondents show revelation, spontaneity, orientation to the equality of role-playing relationships. A socially recognized value for respondents is the provision of equal opportunities in a multicultural society for the development of each subject. With the help of the survey of cultural and value orientations, it was determined that the expansion of the cultural range leads to significant shifts in the cultural and value orientations of the student.

At the same time, the orientation of the future among students is reinforced by the presence of tactical and strategic planning and goal-setting skills (76 %). Participants of the experiment showed such significant qualities as purposefulness (84 %) and perseverance (91 %) that reveal their orientation to the search for ways to design the path of personal and professional development. In general, students determined the ability to structure their behavioral activity and complete the work begun.

#### 4. Discussion

Having determined the components of the value self-determination of university students on the basis of multilingual culture, we set the task to develop criteria, indicators, levels of formation

of value self-determination, and find out under what conditions the components of the value self-determination were formed.

As a result of the analysis, we identified the following criteria. The initial one is a criterion for the sufficiency of the linguistic, country-study and cultural knowledge. The sufficiency of the above knowledge is characterized by a number of indicators.

As a result of the study, we established the levels of sufficiency of the linguistic, country-study and cultural knowledge: high, average, low, each of which was considered by such signs as depth, breadth and volume.

The second criterion for the development of the value self-determination of the university students on the basis of multilingual culture is the attitude to the language and national-cultural problems. It is characterized by a tolerant attitude to people and native speakers, their cultures, a system of values of a civilizational character; values of a national character; the values of a personality-oriented character.

The third criterion is the communicative activity, characterized by the ability to adapt in the multicultural space, and is determined by the culture of communication and behavior, the culture of interaction, cooperation and creativity in the multicultural space. We identify the same levels as in the characterization of the sufficiency of knowledge: high, average, low.

The development of value self-determination of university students on the basis of multilingual culture was carried out in compliance with the pedagogical conditions: enrichment with value dominants of the content of multilingual education in the educational process of the university; updating the potential of the multilingual educational space; implementation of cultural and social practices: projects, interactive discussion, gaming; organization of value interaction of students and teachers based on the relations of trust, mutual respect, mutual enrichment and tolerance.

We have analyzed a huge number of works devoted to the problem under discussion, and published in Russian, Kazakhstani and foreign scientific journals. The analysis of the works made it possible to determine the relevance of the comparative analysis of the value orientations of students of Russia and Kazakhstan, choose adequate research methods, formulate pedagogical problems and organize the process of forming value orientations in an effective way. In analyzed works, value orientations are a factor in the formation of interests, a socio-active position, the activation of educational and cognitive activity, the formation of a future specialist.

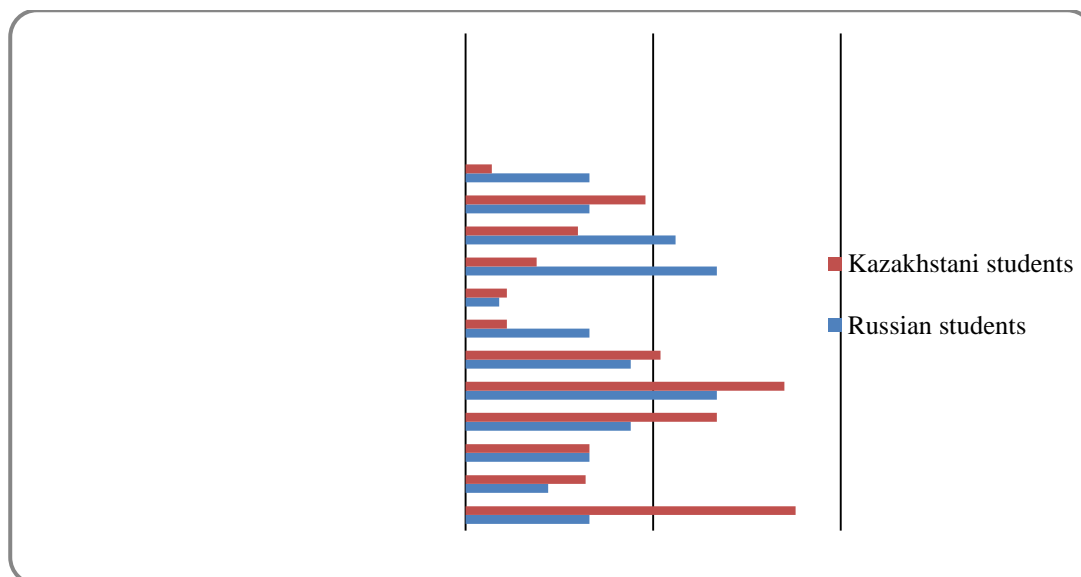
The subjects of the process of forming value orientations are mostly specialists (7 %), high school students, teenagers (34 %), students (32 %). The work presents the characteristic of the value orientations of youth, carries out the analysis of factors influencing the value orientations of youth as well as considers the role of higher school in the formation of students' value orientations.

Having analyzed the available works on the problem, we came to the conclusion that insufficient attention was paid to the study of national values and value orientations (Faizullin, 2012). A comparative analysis of the value preferences of representatives of different countries, primarily, youth, e.g. Russia and Kazakhstan, Russia and the USA, Kazakhstan and Great Britain, represents only certain aspects, as the formation of value orientations in the context of the ethnic socialization of the individual (Andreeva, 2001). However, it is this comparison that gives grounds and makes it possible to determine common and general features in the value consciousness of youth from different countries, and to identify the problematic aspects of the educational process, one of the tasks of which is the formation of value orientations of youth, to determine the effective results of this process, and to reveal the pedagogical conditions for their formation.

In order to study the value orientations of Russian and Kazakhstani students, a survey consisting of 37 questions was compiled and conducted. Its purpose was to identify students' value preferences in life, study, pastimes, plans for the future, and assessment of human personal qualities. For comparisons, separate aspects were identified that had value characteristics common to representatives of both peoples. A special emphasis was placed on differences in value preferences of students of the two countries. Carrying out similar axiological parallels, we managed to conduct content analysis of the essential characteristics of students' value orientations.

Determining the value orientations of students, the establishment of a hierarchy of youth values on the example of Russia and Kazakhstan, allows to consider the problem more in detail.

As a result of the survey, we identified key values that students consider to be the most important (Figure 2).



**Fig. 2.** Diagram of the value preferences of students in Russia and Kazakhstan

*Education as a value.* The system of students' value orientations is dominated by their attitude to education as basic social value. Education is considered, first of all, as a way of acquiring knowledge, then as a means of promising a competitive position in the labor market ("studying will allow me to build a career in the future"). This opinion is shared by both Kazakhstani and Russian students. Individual were the answers in which students connected their studies with professional experience and the opportunity to "learn how to build relationships in a team."

*Work as a value.* Material wealth and ways of obtaining it remain dominant in life values and behavioral priorities. Students are sure that they will get interesting job (42.9 %), which will allow them to earn well (37, 3 %), give them the opportunity to build a good career (21.7 %) and promote self-development (39.4 %). It should be noted that students connect the real embodiment of moral values in everyday life with material conditions. 73 % of the respondents are convinced that a person's financial situation depends, first of all, on himself; they plan to achieve a lot in life by their own efforts.

*Friendship, love, communication as value.* The process of the formation of value orientations is accompanied by the attempts to understand one's purpose and by the search for the meaning of life and happiness.

According to the survey, students of both countries do not imagine life without family, loved ones, and friends. It is important to note that 99 % of respondents to the question: "Where do you find new friends?" answered that they were getting acquainted in the virtual space. In fact, chat became one of the forms of socialization of young people, which makes it possible to get acquainted with the virtual world, and then in reality, both in Russia and abroad. The students surveyed are in an extensive network of friendly and family contacts and do not imagine life without support of friends and without communicating with them: 86 % of young people state that they are ready to contact their friends, acquaintances or colleagues if necessary and get real assistance from them in solving various problems.

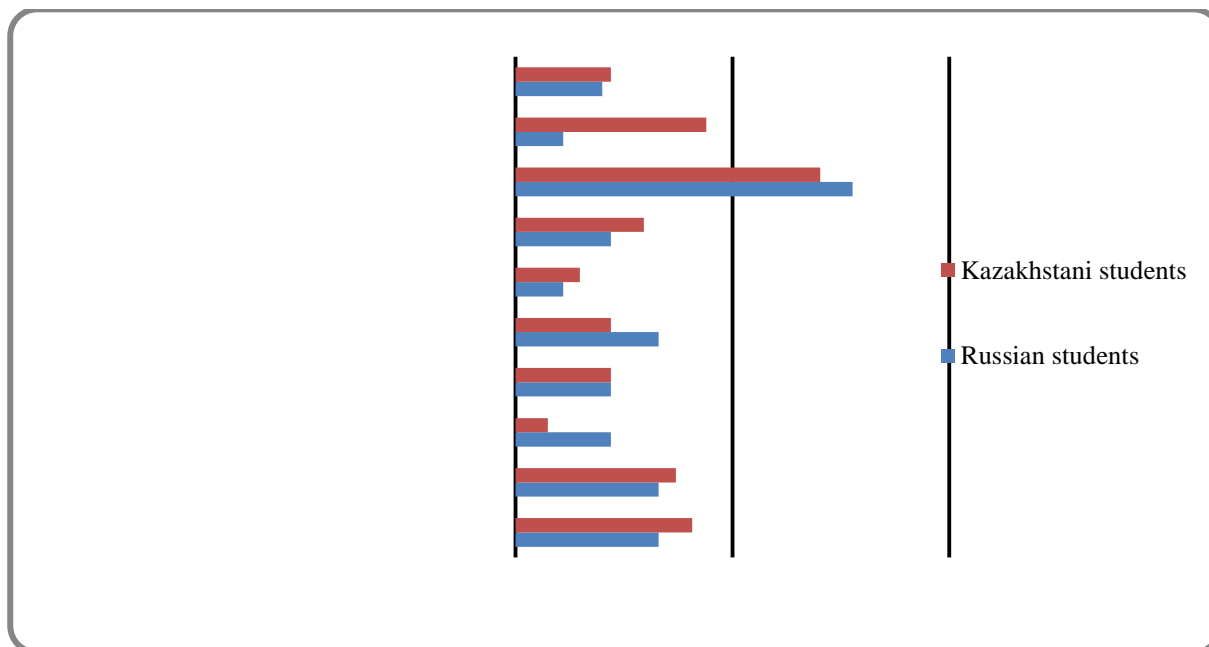
*Family as a value.* Family values occupy strong leading positions in the structure of life orientations of the majority of young people in Kazakhstan (85 %) and in Russia (67 %). In the course of the study, it was important for us to identify young people's understanding of a "strong, healthy family" as well as to define the conditions necessary for creating a family and the values of raising children.

*Leisure as a value.* Particular attention should be paid to the leisure time of student youth, its differences from the traditionally established, generally accepted type of leisure time, related to the expansion of its parameters due to broader social relations, leisure preferences, lifestyle, entry into various associations, organizations, subcultures, the variety of leisure activities offered by mass culture.

The current situation provokes the "inventory" of moral values and leads to a rethinking of the youth's view of universal human values. The notions of a morally perfect person are sufficiently

informative. For 80% of respondents, the leading place in personality characterization is taken by kindness and love, decency, generosity, compassion, empathy, responsiveness, justice (Figure 3).

If in most cases, based on the survey results, we observe differences in the value preferences of students in Russia and Kazakhstan, but when evaluating personal qualities, almost all opinions are identical. Such human qualities as kindness, responsiveness, honesty, as well as the desire for self-development, the ability to communicate with people are especially valued. The desire to create and have diversified interests is more characteristic of Russian students, while the respect for the elders characterizes the culture of the countries of Asia and the East.



**Fig. 3.** Results of evaluation of personal qualities

Overall, the study showed that 62 % of graduates plan to work in their specialty, although it is very difficult to find a suitable job (40 %) or almost impossible, in the opinion of 30 % of students. 16 % of students find it difficult to answer, while only 5 % are sure that they can find a job quite easily, and 9 % – with little efforts. 20 % of the respondents believe that they will probably work in their specialty, 11 % – do not plan to work in their specialty, and 5 % have not yet decided. A fairly large percentage of students have not decided yet on their professional plans for the future.

In addition, young people (60 %) are sure that to stand out from others and be a bright personality is better than living like everyone else. At the same time, it should be noted that the orientation of young people towards the modern values of individualism, achievements, independence and competitiveness is intensifying. They appreciate material prosperity, work and strive to rely on themselves in everything.

Thus, the actualization of such significant concepts as “cultural property”, “cultural and linguistic diversity”, “cultural and ethnic self-determination”, “cross-cultural communication”, “multilingual personality”, “patriotism” was carried out through the study of such topics as “The Property of the native country and the countries of the studied languages”, “National symbolism”, “The Role of the national language and its interaction with other languages”.

Attitude of value of languages and national-cultural issues was evidenced by the discussion of such themes as “Education as a value in the native country and abroad”, “Family as a value in different cultures”, “Work as a value”. Classes on the topics “National holidays, traditions and customs”, “Features of national behavior” were conducted with the greatest communicative activity of students.

In the process of teaching native and foreign languages students get acquainted with the history of languages, terminology of the studied disciplines, proverbs and sayings reflecting definite areas of knowledge. The study of languages supports the following tasks: participation in professionally oriented situations, leading business communication, speaking with reports at meetings, participation in round tables and conferences, writing abstracts, annotations, articles in the studied languages.

Work with information was carried out in accordance with the following algorithm: search for information → evaluation → choice → acceptance.

At the first stage the tasks were cognitive and aimed at finding information, identifying key information, conceptual supports, the formation of linguistic and cultural-oriented guesses, mastering the rules of speech etiquette:

- compilation of a vocabulary on a given topic in the form of a thematically connected lexical chain in three or more languages;
- compilation of a dictionary of aphorisms, proverbs and sayings on certain topics in three or more languages;
- compilation of a review of information sources on a given topic in three or more languages;
- conducting the analysis of sites in three or more languages for the availability of articles on a given topic with the aim of compiling a portrait of a national hero, determining national stereotypes, etc.;
- conducting an analysis of the modern issues of dissertation research, master's work in the field of multilingualism and multiculturalism.

At the second stage the significance of information was evaluated by identifying the value meanings of its linguistic and cultural aspects.

At this stage cognitive assignments were focused on identifying general and specific features in languages and cultures:

- analysis of the influence of images, facts and events on the appearance of national symbols;
- making analogies between individual phenomena in different languages (for example, give similar comparisons in Russian, Kazakh, English);
- definition/selection of phenomena of socio-cultural, cultural and historical significance (language stereotypes in different languages);
- contrasting analysis of linguistic and cultural phenomena in different languages;
- perception, understanding and comparison of texts in different languages.

The third stage was characterized by the activation of knowledge and the development of skills in choosing the necessary information for multilingual communication and multicultural interaction.

Communicative-oriented tasks were aimed at mastering the skills of cross-cultural interaction:

- comparison of facts, phenomena, information of native and foreign languages and cultures;
- commenting on the phenomena of native and foreign languages and cultures;
- comparison of the methods of transmitting information from the perspective of different cultures in different languages;
- forecasting situations of multilingual and multicultural communication;
- modeling and explanation of situations of communication in different languages from the perspective of different cultures.

The fourth stage of acceptance was characterized by the incorporation of knowledge and experience in the everyday and professional situations of multilingual communication.

The units of information consist of texts assigned to improve practical knowledge of three and more languages as a means of communication, to expand their linguistic and cultural horizons, to learn how to extract information of cultural, professional topics and use it in inter-linguistic and cross-cultural communication.

Within the framework of research we conducted the student scientific and practical conference on the topic: "Multilingualism as a factor of formation of a highly qualified specialist". The purpose of the conference was to enable students of all faculties of the University to participate in scientific and research conferences and improve knowledge of English. Students in their first and second years of study took part in the conference, and all reports and their discussions were held in English

Readiness for multilingual and multicultural communication was encouraged through the process of the festival of national holidays "Holidays as a national tradition" organized by us, the festival "Friendship of Peoples", the creative marathon "The culture of my country in poems, songs, arts, humor", and role-playing games on the topics "National behavior: facial expressions and gestures", "National features of the rules of speech behavior and stable formulas of polite communication", literary contests, for example, contest "He was not of an age, but for all times",

dedicated to the poetry of William Shakespeare (based on the materials of the Russian, English and Kazakh languages); the intellectual game “Polyglot”.

One of the most important research tasks was the preparation of teachers for implementation of a program of value self-determination of university students on the basis of multilingual culture. To realize the abovementioned task the administration of Zhangir Khan West Kazakhstan Agrarian and technical University organized advanced training courses, round tables, conferences, seminars on the topics “Active and interactive technologies for learning foreign languages at the university”, “Cultural values of Great Britain and Kazakhstan”, “Problems of teaching specialized disciplines in English at a non-linguistic university”, “Multilingualism in Kazakhstan: problems and future trends” for professors and teaching staff of the university.

Senior students were proposed themes for research work to identify their value orientations and preferences (Appendix 2).

In addition, in the framework of the training of teachers, the Center organized advanced training courses, seminars on the problems of teaching special, professional-oriented disciplines in English with the participation of university teachers (seminar “Interactive teaching methods as a means of value self-determination of students”, training course on the topic “Academic English and its teaching in the multilingual educational space of the university”, master class on the topic “Features of teaching a professional-oriented language in high schools”, coaching session for multilingual teachers on the topic: “Innovative teaching approaches in the conditions of multilingualism”).

For the development and deepening of a valuable attitude to the languages and cultures of their native and other countries, teachers were sent to language courses and internships to leading universities in the country and abroad, and were also able to increase their linguistic and cultural and professional levels at foreign universities (Czech Republic, France, Great Britain, UK, Spain).

Within the framework of the research teachers have organized contests of masters of artistic reading and knowledge of the works of famous poets and writers; writing essays; contests of translators, debates, round tables dedicated to the problems of multilingual education; meetings with scientists and teachers of foreign universities; literary and musical evenings among students. Language departments held various events aimed at developing and improving the linguistic training of students. Particularly interesting for students were events dedicated to the Day of Languages of the people of Kazakhstan and the contests of readers “Abay readings”, “Pushkin readings”, “Shakespeare readings” (based on the materials of Russian, Kazakh and English).

Further, the teachers of our university implemented the “My World” Universal program, including value-oriented substantial blocks (“Myself”, “My Activity”, “Me and Others”, “Culture and Me”), reflecting the implementation of the diversity of cultural practice (practices of multilingual communication, practice of cultural identification, practice of freedom of choice, practice of expanding student resources)

The main goal of the universal program “My World” was the disclosure of the characteristics of the national values of the Russian, Kazakh, French and English peoples, the knowledge of which contributes to the formation of a valuable attitude to the studied cultures and languages, a deeper understanding of their own national affiliation. The developed program reflects the pedagogical vector - an axiological orientation; organizational and methodological characteristics i.e. elements of cross-cultural communication; the norms and models of behavior, hobbies and cultural preferences of these countries. The program was universal, as it implied the implementation of a whole set of tasks, covered future specialists of various specialties, was used in audit and extracurricular activities, in language and integrated classes.

The implementation of the universal program took place according to four value-oriented content blocks. The tasks were aimed at reproducing and understanding the material read, the development of linguistic interpretation and discussion of axiological information, the formation of the skills of expressing reasoned judgments, and upholding their own point of view.

The “Myself” block is aimed at expanding the sphere of self-knowledge, the student’s self-identification, deepening knowledge about himself as a representative of a multicultural society, assigning students to socially developed values based on axiological ideas and values of education. Within the framework of this block, the construction of the “Road map” of targeted guidelines, the development of the collage “Linguistic Picture of the World”, a complex of metacognitive exercises that prepare students for independent study of languages, the training “Successful self-presentation of the multilingual personality” were used.

The tasks of the “Myself” block were aimed at the independent search for information, the identification of key information, conceptual supports, the formation of linguistic and cultural-oriented guesses, mastering the rules of speech etiquette. So, for example, students:

-determined the theme of films, reports on constructing models of future life and activity, revealed cultural and personality-oriented problems of texts;

- made up the vocabulary in the form of a thematically connected lexical chain in three or more languages (for example: “Unification of cultural values”, “Internationalization of higher education within the framework of the international educational space”, “National stereotypes”, “Equality of priority in learning languages”);

- developed a glossary on different topics in three or more languages (for example: “Education as a value”, “Work, professional activity as a value”, “Family as a value”, “Love, friendship, communication as a value”, “Leisure as a value”);

- made an overview of information sources in three or more languages (for example: “Competent specialist of the international level: substantive characteristics”, “Globalization of peace and multilingualism”, “Professions of the future”.

- analyzed sites in three or more languages for the presence of articles on the following topics in order to compile a portrait of a national hero, determine national stereotypes (for example: “National stereotypes”, “National character”, “Outstanding personalities as a national treasure”, “Features of national behavior and communication”);

- analyzed the current issues of dissertation research, Master's work in the field of multilingualism and multiculturalism.

The “Me and Others” block contributes to the formation of constructive speech interaction in the multilingual educational space of the university in the process of symmetrical communication with representatives of a foreign culture.

During the implementation of the “Me and Others” block the skills of choosing the necessary information for the multilingual communication, multicultural interaction were developed, and special situations of choice were created within the framework of the multilingual and multicultural topics; activities were organized to compare and analyze the national values; creative-master’s “Interference of contacting languages”, “Speech melodies of Kazakh, Russian, English and French languages”, “Obstacles of the multicultural worldview” were carried out. The communicative and oriented tasks of this program were aimed at mastering students the skills of cross-cultural interaction.

So, students:

- compared biblical phraseological units originated in Russian, French, Kazakh, English cultures, found similarities and differences; commented on the use of Proper Nouns with support on different-language contexts, determined their symbolic meaning;

- compared the methods of transmitting information from the perspective of different cultures in different languages, gave examples; stereotypical formulas that were used by carriers of different linguistic cultures; lexical behavior regulators;

- worked with proverbs, identifying the following elements in them: proverbial translation, interpretation, i.e. a brief description of the situation simulated in this saying; etymological characteristics of the proverbs, etc.

The “Culture and Me” block is dedicated to the expansion of a value-semantic sphere of the student, the disclosure of his resources in the application of the assimilated values in the cultural world, their distribution and transfer to other subjects in the framework of the integration of cultures and cultural values, the prediction of models of future life and activity in multicultural and a multilingual society.

For example, students:

- determined the cultural and historical meanings of words and expressions, explained the mechanism of their formation; analyzed the influence of images, facts and events on the appearance of national symbols (students were given some tasks, for example: Tell us what do you know about the following names representing the national treasure of countries? Comment on the events that are discussed in the proposed contexts, symbols)

- discussed the cultural cases of a biographical, historical, creative, sociological, political character; carried out master classes on the topics “National stereotypes”, “Unification of cultural values”, “Dialogue or conflict of cultures”;



- pointed out differences between individual phenomena in different languages (Russian, French, Kazakh, English) making a selection of phenomena of socio-cultural, cultural and historical significance (language stereotypes in different languages);
- implemented a contrasting analysis of linguistic and cultural phenomena in different languages (e.g. expressions of speech etiquette);
- carried out a comparative analysis of texts in different languages in order to determine phraseological units that arose in certain historical situations.

The “My Activity” block develops the ability to act in various multicultural situations, which contributes to the consolidation of assimilated knowledge, values, understanding and interpretation of them in a multicultural and multilingual society, the transformation of the subject within the boundaries of socially developed values and educational regulators. Teachers of English conducted round tables, press conferences, discussions, debates, integrated classes on certain topics, multilingual projects on the topics “Higher education and language practice”, “Language and cultural portfolio”, “Multilingualism is the basis of a competitive person”.

The textual speech situations involved the implementation of the student’s speech activity at the reproductive level: work with text blanks, analysis of media texts expressing the attitude to different points of view on the same multilingual phenomenon, compilation of the dictionary of aphorisms, phraseological units, proverbs and sayings on certain topics in three or more languages. These situations oriented the student on speech interaction, enriched his communicative skills, allowed to form the necessary and sufficient language base for the student’s value self-determination.

In the process of cross-cultural communication, facts, phenomena, and events were analyzed, compared, and results were summed up. It is important to note that in the process of implementing these tasks, students tried not only to use their native and foreign languages to indicate their position, argumentation, belief, but, based on the analyzed materials, spoke from the position of native speakers, responding to such questions as: 1) How would you determine the concept of national idea? Why do people attach particular importance to it, especially in the modern era of globalization? What is a Russian national idea? 2) The national treasure is ... citizens of the country? Economic benefits? Language and historical monuments? History of the country and geography? or something different? The discussion process was characterized by a high degree of intensity of communication between participants, the exchange of opinions, a change and a variety of techniques, logical conclusions.

At the same time, University teachers organized such forms of work as drawing up the tables “I know. I want to know. I can”, “Language is ...”; watching and discussing the films “Koshpendi” (“Nomad”, a joint Kazakh-French film), “Kyz Zhibek”; analysis of books dedicated to famous people; the blitz-survey “My ideal”; a philosophical cafe (some participants set out their thoughts both in their native language and in English, Russian, French, others played the role of translators); a round table; the methods of “Association” and “Complete the phrase”; creation of presentations: “My value creativity”, “Hierarchy of personal values”, “Hobbies of youth of different countries”, etc.

For the successful implementation of international activities, teachers underwent advanced training and internships in foreign partner universities, developed new courses, programs and educational materials with them, open joint programs, participate in seminars, conferences, gave lectures and conducted seminars.

For five years, foreign languages in the relevant areas of training at the University have been taught by foreign specialists – native speakers. In the framework of international activities schools of language and culture, tent camps, expeditions, forums, diplomacy schools, conferences and other forms of cooperation were organized for students.

The focus of the university to strengthen its own reputation and internationalization of education occurs due to interaction with the world scientific community. The university actively promotes higher national education, strengthen the positions of the national language and culture through the active development of international cooperation in the educational and scientific fields, and also creates the conditions for the effective study of foreign languages with representatives of another culture, which determine the success of the student’s integration into the world community and the optimality of the achievement of life and professional goals.

The teachers of the university conducted diagnostic procedures (methodology “Psychological culture of the individual” (O.I. Motkov); “Survey of Multilingualism”; questionnaire of communicative tolerance (V.V. Boyko); test “I am a citizen”; test “What is your nationality?”),

aimed at identifying a conscious idea of oneself as a representative of a multicultural society and knowledge about the national traditions of his country and other peoples of the world.

To conduct the experiment Survey of Multilingualism was carried out, which includes 19 issues related to multilingualism. It was determined that students study their native language from birth, the first foreign language from school, and the second foreign language from the university. It is worth noting that not all respondents speak the second foreign language, which was most often found in specialties not related to the relevant study of foreign languages.

A foreign language was pointed out as an obligatory discipline by 63 % of respondents; 87 % of students would choose English as their first foreign language. The most common answers were also "German" (68 %), "French" (48 %), "Spanish" (24 %), Arabic (12 %). The students preferred less common languages as a second foreign language: "Chinese" (74 %), "Japanese" (63 %), as well as Armenian, Tatar, Bashkir, Belarusian and others.

When answering the question "What is a foreign language for you?", students' opinions were: "just an academic discipline" – 38 %, "one of the interesting disciplines" – 41 %, "hobby" – 10 %, "the possibility of expanding the circle of communication" – 10 %, "professional future" – 1 %. Students see the main goal of learning foreign languages in obtaining a diploma of higher education (73 %) and communication while traveling abroad (62 %). If learning a foreign language was optional, then 72% of respondents would not learn it. Only 21 % of the experiment participants took part in multilingual educational projects with peers of different nationalities.

Not all students were able to assess their level of knowledge of a foreign language: 28 % of students speak the first language at a high level, 42 % – at an average level, 30 % of students – at a low level; not all participants in the experiment speak the second language, but their knowledge was rated as medium – 39 %, and low – 61 % of respondents. The number of foreign language lessons per week varies from 1 to 3 times. In most cases, they study foreign languages 1 (69 %) and 2 (21 %) times a week. Students are not ready to set aside a lot of time for learning a foreign language: 47 % of respondents consider 45 minutes sufficient, and only 12 % chose 1.5 hours. Among the difficulties in learning foreign languages, students noted the language barrier (64 %), insufficient knowledge (48 %), lack of real language practice (38 %).

By mastering foreign languages, students set several goals (presented in ranked order). According to the respondents, knowledge of foreign languages is a necessary criteria for participation in multilingual educational projects.

In students' opinion multilingual education as a learning process associated with mastering several languages, as well as interacting with foreigners in their specialty. The participants of the experiment consider the values of multilingual education as science, knowledge, language, culture of the country, cross-cultural communication, multilingual personality.

The general level of communicative tolerance of students, revealed during the implementation of the questionnaire of communicative tolerance (V.V. Boyko), is close to the average, but in most answers a low level was revealed (in 39 % of respondents). It was determined that students do not want to accept the individual characteristics of representatives of other cultures in different situations of communication – 31 %; use themselves as a standard of a multicultural society – 19 % of respondents; are pessimistic in assessing themselves as a representative of their native culture – 36 %; insufficient level of flexibility of communicative and cultural outlook was revealed in 39% of respondents.

The characteristics of a student as a social and communicative personality were composed of the following qualities: openness to communication (64 %), seriousness (38 %), cheerfulness (72 %), sensitivity (39 %), rationality (58 %), desire to work in a team (47 %), independence (59 %), self-control (41 %), impulsiveness (29 %), logical thinking (56 %), emotional stability (37 %). Students master the strategy of speech behavior, are able to present themselves in situations familiar to them; perceive the general content of a foreign culture; are able to play the role of a mediator and implement the strategy of speech cooperation in a multicultural society; not ready for intercultural dialogue in an unfamiliar situation of verbal communication.

One of the significant indicators of a student's self-development in the aspect of a multicultural society is the readiness to plan life and realize their own destiny. Thus, students are not quite organized, time planning is a difficulty for most of them (64 %). When solving situations for planning their time in the present or with a future perspective, 78 % of respondents encountered difficulty (difficulty in choosing, lack of vision of prospects, subjective assessment of opportunities or underestimation of them).

In particular, when performing an important task, students do not have a reserve of time for urgent matters. One of the tasks for the students was to develop a form of planning their affairs for the week, month, year. 39% of the respondents were able to cope with the task, the rest faced difficulties in long-term planning, which confirms the lack of rational use of time resources by the participants in the experiment. In the context of planning, in general, students showed the following qualities: they prefer to shift the matter to someone else – 55 %; indecisive in making a decision – 49%; unable to rely on their experience – 62 %; ignore the advice of others – 73 %. Of those surveyed, 63 % are unable to plan successfully their life activities due to the expectation of criticism or praise.

In order to determine the value of the information being studied, we conducted classes using the “Interview” method on the problems: “Do I need to get a higher education?”, “Educational system of Great Britain”, “Youth of different countries about higher education”, “Youth of different countries about higher education”. Students composed a language portfolio of self-development and self-actualization, a cultural portfolio “My family is my castle”, as well as carried out scientific projects in different languages on the topics “Love in culture and language”, “Friendship in culture and language”, “Love in French linguistic culture”, “Friendship in French culture and French language”.

When teaching a foreign language to students of Kazakhstan, it is recommended to use elements of English, Russian, Kazakh culture, for example, to introduce folk holidays, traditions, customs in a foreign language. When performing project work, the student gradually selects a topic from the proposed list, then collects information, makes a presentation, comments, explains, and, if possible, dramatizes. For example, the national holiday Nauryz. The student chose this topic, studied the history of the issue and the existing various versions (Table 1). The teacher has developed the assessment criteria for this type of work:

**Table 1.** Evaluation criterion for students' project activities

Stages of project activity	Types of activity	Score up to 100 points
Preparatory	Selecting a topic from the proposed list: Muslim and Slavonic holidays (Maslenitsa, Nauryz, Halloween, Kurban ait, Tatyana's Day, etc.)	-
Search	Search for information in the literature; vocabulary work	30
Analytical	Explanation of the meaning of the holiday; a recipe for preparing national dishes	30
Practical	Preparation of Kazakh national dishes (beshbarmak, nauryz kozhe, bauyrsak, kazy-karta, etc., holding national games (kokpar, kyz kuu, altybakan, etc.), accompaniment with poems and songs	30
Presentational	Video film about the Nauryz holiday	10
Control and evaluation	Author's speech, students' comments, lecturer's conclusion	-

The project method allows the teacher to interest students and helps to achieve a high level of involvement, it interests students not only at the informational but also at the organizational level. It can be implemented both in a group format and individually. In both cases, the student performs a large amount of independent work, during which the studied material is fixed and systematized; the accumulated information from other areas of knowledge and the student's inner potential is revealed; his organizational and leadership qualities are manifested.

The complex of speech situations was used at the lessons (“Values of the peoples of the world”, “Cultural originality and identity”, “The world of a multicultural society”, “Countries, languages, cultures”, “In the country of national values”, etc.), and their scenarios were developed with taking into account the level of language training of students, their value orientations in a multicultural society, as well as the experience of international interaction. An example of one of these activities was the interactive game “Polyglot” conducted by the teachers of English.

The “Week of the English Language” contributed to the expansion of the experience of speech interaction in the native and foreign languages. The program included: the contest of translators “The best translators”, the Brain Ring “Do you know...”, the intellectual game “Language learning Quiz”, the contest of readers based on the works of W. Shakespeare “Shakespeare's readings”, as well as the musical evening “My music - my soul”. Most of the competitions were held in three languages, promoting the policy of trinity of languages.

To organize speech interaction in a multilingual educational space, we organized a students’ scientific conference “Value self-determination of a student in a multicultural society”. The purpose of the conference was to provide an opportunity for students to participate in scientific events, improve their knowledge of a foreign language, and form the need for the study of foreign languages. Discussion of the reports at the sections made it possible to organize cross-cultural communication between the participants of the conference, verbal interaction with representatives of different cultures, as well as to build a strategy for international cooperation based on a valuable attitude to the culture of the peoples of the world.

As part of the experiment we conducted the festival “Days of culture of ethnic groups”. The Festival was attended by students, teachers, invited guests (representatives of the ethnic groups), as well as those wishing to get acquainted with the values and cultures of other nationalities. The opening of the Festival was marked as “Language is the soul of the nation”, which was held in the form of a literary and musical contest among representatives of different nationalities. In this contest aimed at promoting the unity of the peoples of Kazakhstan, students of different nationalities showed their talents.

During the ceremony of holidays dedicated to a particular culture, exhibitions of decorative and applied arts were organized at the university. Thus, the “Day of Armenian Culture” allowed the participants to get acquainted with the works of Armenian artisans, the exposition of which was complemented by stands and materials telling about Armenian writing, architecture, folk art, folklore, and music.

Within the framework of the Festival, we organized creative competitions among students, literary and musical evenings, book exhibitions, exhibitions of national clothes, national dishes, meetings of representatives of ethno-cultural associations with students. An important component of the Festival was the exhibition “Kazakh Tanu”, aimed at getting acquainted with the culture, traditions and customs of the Kazakh people.

Particular attention was paid to work with representatives of the Assembly of the Peoples of Kazakhstan, meetings were held on an ongoing basis with the members of ethno-cultural associations of the region. Such meetings were aimed at the formation of a tolerant consciousness among students and the development of cross-cultural communication, strengthening the sense of unity and harmony.

In order to identify the assimilated values, the Republican Multilingual Olympiad was organized on the value perception of the cultures of the Russian, Kazakh and English languages. The main goal of the Olympiad was to support the idea of multilingualism, increase motivation for learning foreign languages, expand the sociocultural, linguistic and communicative competencies of students.

The Olympiad was held in 3 rounds:

- the first round consisted of three parts and was focused on revealing knowledge of the language: a) listening – in 30 minutes the participants of the Olympiad had to listen to authentic texts in a foreign language and complete tasks following them; b) lexical and grammar test – participants had to complete test tasks in three languages (Kazakh, Russian and English) to determine the level of formation of their linguistic competence; c) speaking - the participants had to speak on the proposed topic in three languages: spontaneous speech was assessed in three languages;

- the second round included a presentation of the participants of the Olympiad of the culture of a certain people in three languages with a description of their traditions, customs, lifestyle features, values, etc.;

- the third round immersed students in real situations of cross-cultural communication, in which they had to show respect for the culture of a certain representative of a multicultural society, communicate with him, discuss a certain topic.

Based on the results of the Olympiad, we can say with confidence that the students showed a sufficient level of knowledge of Kazakh, Russian and English, a meaningful value perception of the cultures of the peoples of the world, as well as the ability to identify themselves as a subject of a multicultural society.

As a result of the experimental work, positive changes were observed in the student's value self-determination on the basis of a multilingual culture, which contributed to the competent identification of students; in-depth analysis and comparison of the facts of foreign and native cultures; fast and flexible orientation in the conditions of cross-cultural and inter-lingual communication; recognition and understanding of vocabulary with a national-cultural component; organization of their speech behavior in accordance with the situational norms.

To identify the dynamics of quantitative data for each indicator of the motivational criterion of the student's value self-determination on the basis of multilingual culture, generalized data were taken and the chi-square test was calculated (Tables 4, 5, 6).

**Table 4.** The dynamics of the student's value self-determination on the basis of multilingual culture (according to the motivational criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high
1	2	3	4
An indicator of the motivational criterion: An emotional-valuable attitude to the perception of the cultural and linguistic diversity of the world			
Ascertaining	29,7	62,2	8,1
Verification	6,1	18,6	75,3

According to this indicator of the motivational criterion of the student's value self-determination, theoretical frequencies in terms of the level of formation of the studied phenomenon were: 17,9 (low), 40,4 (average), 41,7 (high). Level dynamics is observed at all levels: at a low level  $\chi^2$  observ. = 7,77877095, at an average level – 11,76336634, at a high level – 27,07338129, taking into account the fact that the critical meaning of the criterion  $\chi^2 = 5,99$ , the differences in frequencies can be considered reliable, since the obtained empirical values are higher than the critical. Meaning of  $\chi^2$  observ. = 46,61551858 confirms the dynamics of the level of formation of the student's value self-determination in terms of “An emotional-valuable attitude to the perception of the cultural and linguistic diversity of the world”.

Comparing the empirical data for this indicator of the student's value self-determination according to the motivational criterion, it was revealed that theoretical frequencies were: 13,1 (low), 50,15 (average), 36,75 (high). Criterion  $\chi^2$  observ. for each level allowed us to conclude that the criterion values are higher than critical one for the average level ( $\chi^2$  observ. = 8,016001994) and of high level ( $\chi^2$  observ. = 21,87). The meaning of the criterion  $\chi^2$  observ. = 35,14478062, which confirms the positive dynamics of the student's value self-determination on the basis of multilingual culture.

**Table 5.** The dynamics of the student's value self-determination on the basis of multilingual culture (according to the motivational criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high

1	2	3	4
The indicator of the motivational criterion: Focus on the implementation of productive cross-cultural interaction			
Ascertaining	21,4	70,2	8,4
Verification	4,8	30,1	65,1

This indicator of the student's value self-determination by the motivational criterion has also changed positively according to the results of statistical analysis. Theoretical frequencies at the levels of this indicator were: 12,45 (low), 40,3 (average), 47,25 (high).

Calculation of criterion  $\chi^2$  made it possible to see statistical confirmation of the positive dynamics of each level, but to a greater extent it is noticeable by average ( $\chi^2$  observ. = 19,31538462) and high ( $\chi^2$  observ. = 24,53761905) levels. General meaning of  $\chi^2$  in terms of "Orientation on the search for ways to design a trajectory of personal and professional development" was equal to 46,89095547.

**Table 6.** The dynamics of the student's value self-determination on the basis of multilingual culture (according to the motivational criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high
1	2	3	4
Motivation criterion: Orientation on the search for ways to design trajectory of personal and professional development			
Ascertaining	18,6	68,2	13,2
Verification	6,3	12,4	81,3

Thus, the dynamics of the level of formation of the student's value self-determination on the basis of multilingual culture confirms the hypothesis of the success of the implementation of the designed process model on the problem under study.

It is worth noting that after the implementation of the developed model, students perceive cultural diversity as the norm of coexistence of cultures in their country and in the world, and realize their place and role in a multicultural society. In the process of cross-cultural interaction, students do not allow speech statements of a negative character regarding representatives of other national or cultural groups, and try to substantiate the fallacy of these statements. In general, the level of socio-cultural competence of students can be assessed as high.

Based on measurements, we established the dynamics of the results of the experience of foreign language communication. At the beginning of the experiment, a high level of experience of foreign language communication was recorded by 28 % of the students, the average level was 45 %, low is 27 %, by the time the experiment was completed, a high level was noted by 55 % (+27) of students, and average by 28 % (-21), low by 17 % (-10) students.

To identify the dynamics of quantitative data for each indicator of the activity criterion of the student's value self-determination on the basis of multilingual culture, generalized data were taken (Tables 7, 8) and the "chi-square" criterion was calculated.

According to this indicator of the student's value self-determination on the activity criterion, statistical analysis made it possible to determine that the positive dynamics was confirmed for all levels of formation of the studied phenomenon. So, the theoretical frequencies were: 17,5 – at a low level, 37,65 – at the middle level, 44,85 – at a high level. Bringing data under the criterion  $\chi^2$  Pierson made it possible to determine the dynamics of empirical data:  $\chi^2$  observ. = 40,73145589.

In addition, a decrease in the average level for this indicator was revealed, ( $\chi^2$  observ. = 15,87788845) and high-level enhancement ( $\chi^2$  observ. = 22,05356745).

**Table 7.** The dynamics of the student's value self-determination on the basis of multilingual culture (according to the activity criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high
1	2	3	4
Indicator of the activity criterion: Socio-cultural competence			
Ascertaining	24,5	62,1	13,4
Verification	10,5	13,2	76,3

The results of calculations for this indicator of the studied phenomenon made it possible to determine that the theoretical frequencies for each level were: 10,85 (low), 38,45 (average), 50,7 (high). According to the received data, calculation of  $\chi^2$  showed that the positive dynamics of the student's value self-determination for this indicator occurs due to the growth of a high level ( $\chi^2$  observ. = 12,72504931) and decrease in the average level ( $\chi^2$  observ. = 10,35117035). In general, according to the indicator "readiness to choose and build a promising life activity", the dynamics was confirmed ( $\chi^2$  observ. = 25,81377726).

**Table 8.** Dynamics of value self-determination of a student on the basis of multilingual culture (according to the activity criterion)

Stages of experimental work	Levels of value self-determination of a student		
	low	average	high
1	2	3	4
Activity criterion indicator: Readiness to choose and build a promising life activity			
Ascertaining	16,3	58,4	25,3
Verification	5,4	18,5	76,1

A comparative analysis of the data obtained at the ascertaining and verification stages of the experimental work clearly demonstrates the stability of positive results and successful dynamics in all indicators of the student's value self-determination on the basis of multilingual culture, presented by generalized empirical data for each level (Table 9).

## 5. Results

The analysis of the presented generalized data indicates an increase in the number of students with a high level of value self-determination, which characterizes this group as self-determined subjects with a high level of knowledge about themselves as a representative of a multicultural society with a stable idea of the national traditions of their country and other peoples, the orientation and productivity of cross-cultural interaction, high socio-cultural competence. A high level of value self-determination of a student on the basis of multilingual culture indicates a decrease in the number of participants in experimental work with a passive attitude to the perception of the cultural and linguistic diversity of the world, a lack of readiness to design a personal and professional development trajectory.

**Table 9.** Dynamics of student's value self-determination on the basis of multilingual culture, in %

Criterion	Indicator	Ascertaining stage			Verification stage		
		low	average	high	low	average	high
1	2	3	4	5	6	7	8
motivational	emotional-value attitude to the perception of the cultural and linguistic diversity of the world	29,7	62,2	8,1	6,1	18,6	75,3
	focus on the implementation of productive cross-cultural interaction	21,4	70,2	8,4	4,8	30,1	65,1
	Orientation on the search for ways to design a trajectory of personal and professional development	18,6	68,2	13,2	6,3	12,4	81,3
cognitive	knowledge about oneself as a representative of a multicultural society	28,3	50,2	21,5	5,2	30,3	64,5
	ideas about the national traditions of their country and other peoples of the world	34,1	47,4	18,5	7,9	23,5	68,6
activity-oriented	socio-cultural competence	24,5	62,1	13,4	10,5	13,2	76,3
	readiness to choose and build a promising life activity	16,3	58,4	25,3	5,4	18,5	76,1

The qualitative dynamics of the levels of formation of the value self-determination of the student was observed through a conversation with the participants in the experiment. Students were asked questions, the answers to which revealed their value orientations as subjects of a multicultural society.

General results of the implementation of the process model of a student's value self-determination on the basis of multilingual culture are as follows:

- the level of students' knowledge about the peculiarities of national culture, about the value bases of the life of individual and peoples, about cultural values and traditions has increased;
- there is an increase in students' interest in various forms of cross-cultural interaction, the need for verbal communication in native and foreign languages, the emotional atmosphere of communication;
- a certain system of values, ways of communication that correspond to a certain culture has been formed, and the range of skills for regulating relations in a multicultural society has also expanded;
- there is an increase in reflective, analytical and prognostic skills in the aspect of building prospects for further personal and professional development of a student in a multicultural society.

In the context of the phenomenon under study, we saw a positive trend in the growth of the level of value self-determination of a student on the basis of multilingual culture for each criterion and indicator. The most significant result of the diagnostics was an increase in the number of respondents who speak their native language and two foreign languages. Most of the participants in the experiment actively entered into communication with representatives of a different socio-cultural communities, showed a valuable attitude to the phenomena of other cultures.



Thus, the results of the implementation of the process model of a student's value self-determination on the basis of multilingual culture showed a positive dynamics in the phenomenon under study. The experimental work and its main conclusions made it possible to establish the need to stimulate students' interest in identifying themselves in a multicultural society, accepting and manifesting the value orientations of a culturally diverse society, and planning their future in the aspect of a multilingual world community.

## **6. Conclusion**

The experiment demonstrated that the multilingual culture becomes a factor of the university students' value self-determination on the basis of multiculturalism, subject to the following pedagogical conditions:

- enrichment with valuable dominants of the content of multilingual education;
- actualization of the potential of the multilingual educational space;
- implementation of cultural and social practices;
- organization of valuable interaction of students and teachers based on the relations of trust, mutual respect, mutual enrichment and tolerance.

The effectiveness of experimental work on the value self-determination of university students on the basis of multilingual culture was confirmed by the data of the formative experiment. A comparative analysis of all stages of the experiment indicates the positive dynamics of the level of formation of the university students' value self-determination on the basis of multilingual culture in accordance with the developed criteria.

The results of the formative experiment prove the efficiency of the highlighted pedagogical conditions that allow to forecast the effectiveness of the process of formation of the university students' value self-determination on the basis of multilingual culture, the effectiveness of the scientific and methodological support of the university students' value self-determination on the basis of multilingual personality in the context of multilingualism and multiculturalism through the actualization of significant concepts in the process of comparing the national-cultural specifics of the studied languages and cultures, determining the significance of the values of the multilingual education, the formation of readiness for multilingual communication and interaction taking into account personal communicative needs and capabilities of university students.

The experiment developed a structural and processing model of value self-determination of university students on the basis of multilingual culture.

The problem of value self-determination of university students on the basis of multilingual culture inevitably gives rise to a problem closely related to it - how to ensure the necessary conditions, determine the effectiveness and real result of research. As a result of the theoretical analysis, we have put forward a hypothesis about the pedagogical conditions of the university students' value self-determination on the basis of multilingual culture, one of which is the formation of a multilingual educational space.

It was concluded that the developed and tested scientific and methodological support of the process of formation of the university students' value self-determination on the basis of multilingual culture acts as a program and technological basis for the improvement of multilingual education.

The study can serve as a promising direction of scientific search related to the development of a cultural approach to the study of the multilingual culture, the study of the axiological potential of the multilingual education, its content, methods and technologies.

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## Appendix 1

### Information about the Center for the Development of Multilingual Education

The structure of the Center is represented by language departments: “Kazakh and Russian languages”, “Foreign languages”.

The purpose of the Center is to organize, regulate and control the process of forming a student value self-determination in the expense of functioning and improvement of the educational process on multilingual education at Zhangir khan West Kazakhstan Agrarian and Technical University.

The main tasks of the Center are:

- improvement of skills of mastering the Kazakh, Russian and English to develop the ability for cross-cultural communication;

- assistance in the preparation of a functionally competent person as a carrier of certain positive value assets capable to develop independently methods for achieving the set targeted guidelines and designing ways to gain value meanings of professional, social and personal being in a multicultural and multilingual society that determine the quality of life and future productive work of the university graduate in transforming world community;

- strengthening the regulatory, material, technical, scientific, educational and methodological support of the multilingual educational space of the university for the effective training of multilingual specialists who have mastered Kazakh, Russian and foreign languages (English).

The main functions of the Center:

- management and control of educational and methodological activities of the "Kazakh and Russian languages" and "Foreign languages" departments;
- participation in the formation of multilingual academic groups, the organization of the educational process in the framework of the value self-determination of students and the control of its quality;
- organization and control of the process of preparing textbooks and educational literature for students of multilingual groups;
- organization of language courses at the University (Kazakh, Russian, English) for students and future multilingual teachers, as well as training seminars, advanced training courses for the teaching staff;
- attracting foreign scientists, specialists, teachers, as well as representatives of foreign companies working in the region, to give lectures and conduct practical classes in the multilingual groups.

## **Appendix 2.**

### **Topics for students' research work**

1. National values
2. Life values and guidelines of modern youth
3. Values and their influence on the formation of personality
4. Features of national culture
5. Outstanding personalities as a national treasure
6. Universal values: concept and essence
7. The value of bread as an important component of human life
8. The quality of life and values of a person
9. Research of values in modern pedagogy
10. The system of national values in Russia
11. The system of national values in Kazakhstan
12. Education as a value
13. Study of the values of modern Kazakhstanis in the context of inter-generation relations
14. Human values as its meaning
15. Moral values of a modern teenager
16. The study of life meanings and value orientations of the elderly
17. Theoretical aspects of the study of value
18. The place and role of values in the life of the individual and society
19. Spiritual and moral values and their influence on the formation of a modern personality
20. The norms and values of modern society
21. In the world of spiritual values
22. The system of family values of Kazakhstan society in modern conditions
23. The problem of values in human life and society
24. Kazakh national traditions and customs
25. Cultural values of America and Kazakhstan



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## **An Adaptation of Parent Involvement Scale to the Kosovo Culture: Validity and Reliability Studies**

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### **Abstract**

The present study aimed to adapt the Parent Involvement Scale developed by Şaban (2011) to Kosovo culture to measure parental involvement in schools in Kosovo. The original scale is graded on a 4-point scale where 4 = Always, 3 = Mostly, 2 = Rarely, and 1 = Never. There are 48 items on the scale. There are six factors in the scale. These factors and the number of items in each comprise 10 Parenting items, 11 Communicating items, 9 Learning at Home items, 5 Volunteering items, 9 Decision Making items, and 4 Cooperating with Society items. For the validity and reliability of the scale, a sample of parents of Turkish and Albanian ethnic students was collected. Multi Group Confirmatory Factor Analysis (Brown, 2006) was implemented for the participants in the sample. In the multi-group analysis, the model was analyzed in each group. Then the equal form (unconstrained model) was analyzed. Equality of factor loading and equality of structural covariances and measurement errors were tested subsequently. The Convergent and discriminant convergent validity of the scale was also examined. In terms of reliability, Cronbach's Alpha, item-total correlations, and item discriminations of the scale were examined. In the study, the factor structures of the scale, which has 6-factor structures consisting of 38 items, were found to have very high fit indices for the data obtained from the Turkish and Albanian samples in the Kosovo Turkish and Albanian samples. It can be said that the 6-factor structure of the scale developed in the Turkish sample produced acceptable results in Kosovo, Turkish and Albanian samples. As a result, it can be argued that the structures of the scales are preserved as in the original and are applicable in determining parental involvement.

**Keywords:** parent involvement, culture, adaptation.

### **1. Introduction**

Involving families or parents in education is recognized as an essential strategy to improve education quality. It is a systematic approach that includes parental involvement, supporting

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families, enhancing children's educational and academic experiences, and enriching educational programs with the participation and contribution of families is one of the main goals. Parent involvement is a process designed to enable parents to play a more effective role in the education of their students through collaboration between school management, teachers, and parents. This process is carried out in various ways to involve parents in their children's school life and actively participate in their educational journey. Joyce Epstein's model of engagement, known for their extensive research on the school, family, and community partnership, focuses on how schools and teachers can work to engage parents, the challenges they may face, and how to improve teachers' and schools' understanding of parent engagement. Also, the model provides a comprehensive structure that describes the outcomes of any involvement of students and the consequences for teachers and parents (Epstein, 1995; Epstein, 2001).

Scale adaptation/development studies in Kosovo based on Epstein's parental involvement model are limited. The present study examined the factor structures of the Parent Involvement Scale developed by Şaban (2011), considering Epstein's six types of parental involvement in Turkish and Albanian in the context of adaptation to Kosovo culture. As stated by Epstein (2001), the purpose of adapting this scale is to make parents, students, and schools aware of the sharing of responsibility to support student achievement. The purpose of parent involvement is to enable students to succeed in school. Research has revealed that parent involvement is essential in improving students' school achievement. Parents can contribute to students' educational journey in various ways, such as keeping track of students' homework, participating in activities outside the classroom, and communicating regularly with teachers at school (Epstein et al., 1993).

Studies on the impact of family involvement on children's success in school date back to the 1960s. Buchanan, Hansen, and Quilling (1969) conducted one of the first studies to examine the relationship between family involvement and student achievement in the late 1960s. Quantitative research on the effects of family involvement on student achievement generally began in the late 1960s. Buchanan, Hansen, and Quilling (1969) examined the relationship between the frequency of communication between students' home and school environments and their mathematics performance. Using an experimental group design, their study was the first to examine the relationship between family involvement and academic performance. These studies have been followed by many others examining family factors. The factors and benefits of family involvement have been researched for over sixty years, and multiple meta-analyses have been conducted to synthesize the data (Fan, Chen, 2001; Jeynes, 2005; Jeynes, 2007; Jeynes, 2012; Mattingly et al., 2002). These studies provide a solid basis for concluding that family involvement can have a positive impact on school children's achievement, including grades, school adjustment, social-emotional functioning, standardized test scores, school attendance, and high school graduation rates (Fan, Chen, 2001; Hill, Taylor, 2004; Jeynes, 2005; Barger et al., 2019; Kim, 2020; Smith et al., 2020).

Parent involvement plays a vital role in children's education. Research revealed that parental involvement increases students' academic achievement, reduces school absenteeism rates, and positively affects students' behavior. When parents are actively involved in their children's education, children's motivation increases, they receive more support in their learning process, develop a more positive attitude towards learning, and gain better self-confidence (Epstein, 2001; Epstein et al., 2002; Epstein, 2018). Parent involvement also enables parents to collaborate with the school and teachers as part of the school community. This collaboration helps to support students' academic, social, and emotional development. Parents can contribute to the school's curriculum, participate in school activities, and participate in decision-making processes by collaborating with school administration (Epstein, 1995; Fan, Chen, 2001; Epstein, 2011). Many studies suggest that parental involvement is particularly important in the early years when children recognize their role as learners and adapt to the educational system (Hill, Taylor, 2004; Li et al., 2008). A relationship was found between parental involvement in providing a learning environment at home and preschool children's cognitive development (Sylva, Evans, 1999). A strong positive relationship exists between socioeconomic status variables and parental involvement in later schooling (Ice, Hoover-Dempsey, 2011; Tan et al., 2020).

When developing or adapting a scale to assess parental involvement, it is necessary to define the conceptual framework clearly. There is a clear and agreed definition of parental involvement. It has been defined and measured differently in different studies, depending on the research objectives. Nevertheless, researchers generally agree that parental involvement is multifaceted and encompasses many parenting practices (Lau et al., 2011). Epstein (1995, 2001) conceptualizes

parental involvement in terms of the collaborative relationship between home and school. Epstein's model has been widely used in the field and comprises six dimensions: (1) Parenting: schools provide resources to help create a positive home environment to promote children's development; (2) Home-school communication: communication between home and school concerning children's development; (3) Learning at Home: parental involvement in the various learning activities that take place at home; (4) Volunteering: parents assisting in facilitating the functioning of the school; (5) Decision-making: parents' cooperation with the school in school management decisions; and (6) Cooperation with the community: parents identify and use available community resources to support children's learning and development (Epstein, 1995; Epstein, 2001). This model emphasizes how schools and teachers can engage parents, the challenges they may face in doing so, and the development of teachers' and schools' understanding of family involvement. The model is also a comprehensive structure that considers the possible consequences of the type of involvement for students, teachers, and parents (Ahioğlu et al., 2016).

### **Purpose**

Many studies have indicated that parental involvement is a critical factor. Since there is no parental involvement scale to measure parental involvement in Kosovo, it was aimed to adapt the parental involvement scale developed by Şaban (2011) to Kosovo culture. It is thought that the scale will be a source for studies conducted in Kosovo on parental involvement. Remarkably, because parental involvement decreases as the school level increases, studies on parental involvement will be increased thanks to this scale. In this context, it will contribute to eliminating this deficiency in the literature. Within the scope of the validity and reliability studies of the Parent Involvement scale, data will be collected, and statistical analyzes will be conducted to determine the reliability and validity of the tool. The scale's internal consistency will be tested, and it will be measured whether the current factor structure is compatible with Kosovo culture.

## **2. Method**

### **Participants**

The present study developed adapted the scale developed in Turkey to Kosovo. Considering the multicultural structure of Kosovo, it is possible to observe that different languages are used together in daily life. Since this study aimed to determine whether the scale developed in Turkey in Turkish has similar factor structures in Turkish and Albanian languages in Kosovo, the study was applied to parents in Turkish and Albanian mother tongues. Parents whose children were attending primary education were included in the study. The data were collected from parents of Turkish and Albanian ethnic students who volunteered to participate in the study and were in the same grade school. To ensure the representativeness of the sample, parents of both Turkish and Albanian students were contacted from each city and school. In one school, both Turkish and Albanian student parents were sampled. In this way, representation of Turkish and Albanian parents whose children are studying in each school was ensured. Accordingly, 365 parents participated in the study, 165 (44.1 %) of Turkish ethnicity and 200 (53.5 %) of Albanian ethnicity. Of the parents of Turkish ethnicity, 132 (80 %) were female, and 33 (20 %) were male. Among the parents of Albanian ethnicity, 162 (76 %) were female, and 48 (24 %) were male. The age of the parents ranged between 20 and 60 years. The average age of the participants is 36 years. Of the parents, 46 (12.2 %), 178 (47.6 %) were high school graduates, and 150 (40.2 %) were university graduates. Among the university graduates, 25 (6.7 %) stated they had graduate-level education. Among the parents, 29 (7.8 %) had one child, 196 (52.4 %) had 2 children, and 114 (30.5 %) had 3 children. The rest stated that they had four or more children. Those in the middle age group (31-40 years old) had more children ( $f=235$ ).

### **2.2. Measurement Tool**

The scale adapted to Kosovo culture in this study was developed by Şaban (2011). The scale is graded on a 4-point scale where 4 = Always, 3 = Mostly, 2 = Rarely, and 1 = Never. There are 48 items on the scale. There are six factors in the scale. These factors and the number of items in each comprise 10 Parenting items, 11 Communicating items, 9 Learning at Home items, 5 Volunteering items, 9 Decision Making items, and 4 Cooperating with Society items. All items on the scale are positive. The scale Şaban (2011) developed is based on Epstein's (2001) parent-parent involvement model theory. In theory, the parent involvement model has the same name as the factors in this scale. Şaban (2011) first examined the factor structures (multidimensionality) with



Exploratory Factor Analysis in the scale development process. Then, Confirmatory Factor Analysis was used to test the accuracy of the model based on the 6-factor structure determined in the exploratory factor analysis. It was determined that the scale explained 43.64 % of the variance with 6-factor structures, and the highest and lowest factor loadings ranged between 0.791 and 0.317. It was determined that excellent fit indices were obtained in the CFA analysis. It was observed that the scale's lowest Cronbach Alpha reliability coefficient was 0.602 in the Cooperation with the Community dimension, and the highest was 0.812 in the Decision Making dimension. The overall reliability of the scale was 0.925. In the correlation analysis of the 6-factor structure of the scale, the lowest correlation was between Parenting and Volunteering, with 0.398, and the highest correlation was between Volunteering and Decision Making, with 0.716.

**2.3. Data Collection and Analysis**

The researcher implemented the scale for parents whose children were studying at the school. The data was collected through face-to-face home visits or by contacting the family. The student and the scale were sent to the family, and the scales were collected the next day by visiting the schools. It was specifically stated that volunteer parents could fill in the scales. In the face-to-face application, it was similarly applied to volunteers. The scale was originally developed in Turkish. It has been used in Turkey to determine parental involvement in schools. Therefore, it was used in its original form for the application to Turkish teachers. For Albanian native speakers, the scale was translated into Albanian. The translation was carried out from the source to the target language and back again.

Although the study was conducted in Kosovo, since the participants in the sample had different mother tongues, Multi Group Confirmatory Factor Analysis (Brown, 2006) was applied. Accordingly, the separate group, combined group, and multilevel CFA analysis were applied (Harrington, 2009). In the multi-group analysis, the model was analyzed in each group. Then the equal form (unconstrained model) was analyzed. Equality of factor loading, and fourth, equality of structural covariances and measurement errors were tested (Brown, 2006; Kline, 2005). Also, the convergent and discriminant validity of the scale were examined. In terms of reliability, Cronbach's Alpha, item-total correlations, and item discriminations of the scale were examined. SPSS 26.0 and Lisrel 8.7 programs were used to analyze the data.

**3. Results**

**3.1. Results of the Translation Process**

The scale was developed in Turkish. Kosovo is a country where different mother tongues are used together. Therefore, to apply the Albanian translation of the scale to the parents whose mother tongue is Albanian, an expert in the Turkish Language whose mother tongue is Albanian was utilized for the translation from Turkish to Albanian. To re-check the translated scale linguistically, three experts in the field of the Turkish Language who are native Albanian speakers checked the translation. No editing or changes were made during this control process. Secondly, the scale translated into Albanian was compared with the scale translated into Turkish one month later using the same expert translators. In the comparison made at the end of the reverse translation process, it was observed that the scale items translated from Albanian to Turkish were the same as the original. Thirdly, the scales in both languages were administered face-to-face to a total of 13 parents (6 parents whose mother tongue is Turkish but who also speak and write in Albanian, and seven parents whose mother tongue is Albanian but who also speak and write in Turkish) at 20-day intervals. As a result of the application, the correlation between both versions was found to be 0.96. During the face-to-face application, the scale items were read aloud and checked whether the parents understood them. The feedback from the translation process led to the conclusion that the expressions of the scale in both languages were the same in terms of meaning and content.

**3.2. Descriptive Analysis**

The answers of Turkish and Albanian parents regarding the scale of participation in education were analyzed descriptively separately. The results of the analysis are presented in Table 1.

	Turkish Parents				Albanian Parents				Overall			
	M	SD	Skewness	Kurtosis	M	SD	Skewness	Kurtosis	M	SD	Skewness	Kurtosis
GO1	2.64	1.17	-.188	-1453	2.56	1.16	-.079	-1464	2.59	1.16	-.127	-1460

GO2	2.74	1.08	-.346	-1166	2.69	1.12	-.250	-1248	2.71	1.10	-.292	-1213
GO3	2.69	1.08	-.169	-1281	2.92	1.09	-.449	-1143	2.81	1.09	-.314	-1237
GO4	2.63	1.10	-.170	-1289	2.67	1.06	-.151	-1137	2.65	1.07	-.161	-1205
GO5	2.48	1.07	.010	-1249	2.48	1.13	.009	-1331	2.48	1.10	.009	-1292
EO1	2.68	1.05	-.090	-1263	3.61	.70	-1623	1826	3.19	.99	-.817	-.631
EO2	2.73	.94	-.207	-.883	2.90	.93	-.060	-1056	2.82	.94	-.127	-.940
EO3	2.71	1.01	-.191	-1082	3.25	.83	-.563	-.448	3.01	.95	-.456	-.742
EO4	2.54	1.01	-.019	-1095	2.87	.99	-.238	-.955	2.72	1.01	-.139	-1036
EO5	2.60	1.06	-.022	-1264	3.55	.71	-1265	1078	3.12	1.00	-.711	-.689
EO6	2.69	1.09	-.173	-1293	3.52	.74	-1278	1046	3.15	1.00	-.777	-.587
EO7	2.72	1.10	-.234	-1306	3.56	.74	-1428	1390	3.18	1.01	-.855	-.506
EO8	2.78	1.08	-.261	-1283	3.54	.73	-1402	1731	3.20	.98	-.862	-.403
EO9	2.87	1.06	-.385	-1172	3.61	.74	-1782	1764	3.27	.97	-1011	-.180
KV1	2.68	1.00	-.099	-1113	2.73	.98	-.276	-.943	2.71	.99	-.194	-1032
KV2	3.43	1.08	.137	-1254	3.24	.90	-.834	-.491	3.34	1.06	-.398	-1167
KV3	2.26	1.05	.350	-1089	2.46	1.08	.032	-1275	2.37	1.07	.173	-1229
KV4	2.76	1.01	-.230	-1110	2.85	1.07	-.415	-1141	2.81	1.04	-.330	-1139
KV5	2.41	1.04	.139	-1145	2.57	1.03	-.024	-1158	2.50	1.03	.048	-1164
KV6	2.43	1.02	.087	-1113	2.47	1.04	.080	-1172	2.45	1.03	.084	-1146
KV7	2.56	1.03	-.055	-1138	2.78	1.03	-.279	-1116	2.68	1.03	-.174	-1149
KV8	3.50	1.14	-.139	-1408	2.43	1.12	.037	-1376	2.97	1.13	-.041	-1399
KV9	2.70	1.09	-.250	-1251	3.15	.95	-.768	-.582	2.95	1.04	-.534	-.981
EB1	2.55	1.10	-.091	-1308	3.53	.74	-1144	1120	3.08	1.04	-.718	-.601
EB2	2.63	1.03	-.171	-1125	3.34	.87	-.813	.364	3.01	1.01	-.534	-.620
EB3	3.47	1.01	-.012	-1096	3.51	.77	-1254	1434	3.49	1.03	-.624	-.683
EB4	2.85	1.07	.012	-1274	3.65	.73	-1620	1090	3.25	1.05	-.747	-.621
EB5	2.59	1.11	-.106	-1342	3.47	.80	-1055	.594	3.07	1.04	-.664	-.723
EB6	3.52	1.10	-.027	-1331	3.55	.76	-1307	1851	3.54	1.06	-.706	-.653
EB7	2.44	1.10	.118	-1302	3.59	.76	-1533	1985	3.07	1.09	-.671	-.850
EB8	2.48	1.10	.108	-1313	3.66	.70	-1783	1459	3.13	1.07	-.752	-.745
EB9	2.58	1.09	-.114	-1285	3.40	.87	-1011	.465	3.03	1.06	-.593	-.782
EB10	2.58	1.07	-.067	-1259	3.51	.80	-1184	1114	3.09	1.04	-.657	-.695
IK1	3.00	1.03	-.473	-.961	3.40	.98	-1186	.351	3.20	1.03	-.799	-.541
IK2	2.40	.98	.068	-1001	2.45	1.15	.276	-1002	2.43	1.08	.221	-.935
IK3	2.83	.97	-.256	-1029	3.16	1.02	-.609	-.562	3.01	1.01	-.420	-.843
IK4	3.60	1.07	-.581	-1056	3.56	.89	-1735	1248	3.58	1.01	-1092	-.048
IK5	2.91	1.07	-.479	-1118	3.57	.89	-1736	1102	3.27	1.03	-1020	-.246
IK6	2.98	1.06	-.542	-1075	3.45	.98	-1372	.883	3.24	1.04	-.929	-.392
IK7	3.40	1.04	-.399	-1051	3.20	1.03	-.728	-.630	3.30	1.05	-.555	-.884
IK8	2.70	1.07	-.164	-1259	3.22	1.05	-.817	-.331	2.98	1.09	-.484	-.964
IK9	2.61	1.06	-.113	-1215	3.44	.94	-1165	.519	3.06	1.07	-.599	-.853
IK10	2.31	1.01	.179	-1087	2.48	1.22	.201	-1243	2.40	1.13	.234	-1110
IK11	2.36	1.12	.254	-1312	2.54	1.23	.173	-1361	2.46	1.18	.222	-1317
TIY1	2.49	1.03	.159	-1141	2.54	.98	.129	-.758	2.52	1.00	.140	-.950
TIY2	2.58	1.05	-.013	-1216	2.64	1.12	-.035	-1269	2.61	1.09	-.020	-1240
TIY3	2.68	1.04	-.290	-1072	2.96	1.00	-.465	-.745	2.83	1.02	-.385	-.908
TIY4	2.61	1.09	-.236	-1246	2.71	1.09	-.081	-1118	2.66	1.09	-.151	-1159

As a result of the descriptive analysis, the lowest mean ( $M=2.26$ ,  $SD=1.05$ ) in the Turkish sample was observed in item KV3 in the Decide dimension. The highest mean ( $M=3.60$ ,  $SD=1.07$ ) was observed in the IK4 item in the Communicating dimension. In the Albanian sample, the lowest mean ( $M=2.43$ ,  $SD=1.12$ ) was observed in item KV3 in the Decide dimension. The highest mean ( $M=3.66$ ,  $SD=.70$ ) was observed in item EB8. In all items, kurtosis and skewness values were between  $\pm 2$ .

### Separate Group Analysis

The Turkish version of the scale developed in Turkey was applied to Turkish and Albanian parents in Kosovo. Firstly, CFA analysis was applied separately for each group. The fit indices obtained as a result of CFA are given in [Table 2](#).

**Table 2.** CFA Fit Indices for Kosovo Turkish and Albanian Samples

	$X^2$	SD	$X^2/sd$	NFI	NNFI	CFI	IFI	RFI	SRMR	AGFI	RMSEA
Turkish	1764.59	1057	1.66	.90	.95	.95	.95	.95	.07	.85	.064
Albanian	1505.94	1054	1.42	.91	.97	.97	.97	.90	.06	.86	.048

As a result of the analysis of the Turkish sample in Kosovo, it was observed that  $X^2/sd=1.66$  ( $p<.05$ ). Other fit indices NFI=0.90. NNFI=0.95. CFI=0.95. IFI=.95. IFI=0.95 at good level AGFI=0.85. SRMR=0.07 and RMSEA=0.064 were at acceptable levels. NNFI=0.97 obtained from Bosniak sample  $X^2/sd=1.42$  ( $p<.05$ ). CFI=0.97. IFI=0.97. Excellent NFI=0.91 with RMSEA=0.48 indices. RFI=0.90. SRMR=0.06 and AGFI=0.86 indices were found to have acceptable fit values (Bagozzi and Yi. 1988; Tabachnick and Fidell. 2007). The lowest factor loading value belongs to item 3 in the Volunteering dimension. ( $\lambda=.72$ .  $t=10.31$ ). The lowest factor loading value belongs to item 9 in the Learning at Home sub-dimension ( $\lambda=.49$  .  $t=6.46$ ). The lowest factors were Item 2 in the decision-making dimension ( $\lambda=.35$  .  $t=4.34$ ), Item 5 in the parenting dimension ( $\lambda=.66$  .  $t=9.33$ ), Item 11 in the communication dimension ( $\lambda=.48$ .  $T=6.33$ ), and Item 2 in Cooperation with Society dimension ( $\lambda=.69$ .  $t=9.46$ ). The highest factor loadings belong to item 4 in the Volunteering dimension ( $\lambda=.88$ .  $t=14.05$ ), Item 8 in the Learning at Home sub-dimension ( $\lambda=.89$ .  $t=14.61$ ), Item 6 in the decision-making dimension ( $\lambda=.74$ .  $t=10.52$ ) Item 8 in the parenting dimension ( $\lambda=.86$ .  $t=13.75$ ), Item 9 in the communication dimension, ( $\lambda=.79$ .  $T=11.76$ ), and Item 1 in the Cooperation with Society dimension ( $\lambda=.81$ .  $t=11.84$ ). The correlations between the independent variables in the Turkish sample are given in [Table 2](#).

As a result of the analysis of the Albanian sample in Kosovo, it was observed that  $X^2/sd=1.42$  ( $p<.05$ ). Other fit indices were found to be close to perfect (Bagozzi and Yi. 1988). The lowest factor loading in the Volunteering dimension belonged to item 5 ( $\lambda=.57$ .  $t=7.13$ ). In the Learning at Home sub-dimension, the lowest factor loadings belonged to item 4 ( $\lambda=.49$ .  $t=8.84$ ), Item 8 in the decision-making dimension ( $\lambda=.46$ .  $t=5.92$ ), Item 5 in the parenting dimension ( $\lambda=.72$ .  $t=11.59$ ), Item 10 in the communication dimension, ( $\lambda=.44$ .  $T=5.83$ ), and Item 1 in the Cooperation with Society dimension ( $\lambda=.56$ .  $t=6.86$ ). The highest factor loads belonged to item 4 in the Volunteering dimension ( $\lambda=.71$ .  $t=9.40$ ). Item 7 in the Learning at Home sub-dimension ( $\lambda=.90$ .  $t=12.86$ ), Item 1 in the decision-making dimension ( $\lambda=.77$ .  $t=11.34$ ), Item 8 in the parenting dimension ( $\lambda=.86$ .  $t=12.34$ ), Item 7 in the communication dimension, ( $\lambda=.86$ .  $t=13.74$ ) and 4. ( $\lambda=.74$ .  $t=9.54$ ). The correlations between the independent variables of the Turkish Albanian and both samples are given in [Table 3](#).

**Table 3.** Correlation of Latent Variables for Turkish and Albanian Parents

Latent Variables	Volunteering	Learning at Home	Decide	Parenthood	Communicatin g
	Turkish; Albanian	Turkish; Albanian	Turkish; Albanian	Turkish; Albanian	Turkish; Albanian
Learning at Home	0.20 <sup>a</sup> ; 0.30 <sup>a</sup> (.08) <sup>b</sup> (.08) <sup>b</sup> 2.53 <sup>c</sup> ; 3.53 <sup>c</sup>	1.00			
Decide	0.48; 0.53 (.07) (.07)	0.43; 0.19 (.07) (.08)	1.00		
Parenthood	6.70; 7.33 0.21; 0.18 (.08) (.09)	5.93; 2.36 0.43; 0.17 (.07) (.08)	0.36; 0.34 (.08) (.08)	1.00	
Communicating	2.71; 2.07 0.40; 0.37 (.07) (.08)	6.33; 2.17 0.39; 0.43 (.07) (.07)	4.62; 4.42 0.36; 0.45 (.08) (.07)	0.29; 0.42 (.08) (.07)	1.00

	5.46; 4.53	5.31; 6.28	4.63; 6.55	3.79; 6.13	
Collaborating With the Community	0.30; 0.47 (.08) (.09)	0.34; 0.30 (.08) (.09)	0.72; 0.56 (.06) (.07)	0.47; 0.33 (.07) (.08)	0.44; 0.38 (.07) (.08)
	3.70; 5.50	4.28; 3.44	13.00; 7.76	6.72; 3.85	5.99; 4.68

Notes: a= correlation, b= Standard Error, c= t value

As a result of the CFA analysis for the Turkish and Albanian samples, the correlations between the latent variables were significant at the 0.05 level. In the Turkish sample, the highest correlation is between Decide and Collaborating With the Community latent variables with 0.72, and the lowest correlation is between Volunteering and Learning at Home latent variables with 0.20. In the Albanian Sample, the highest correlation among the latent variables is between Decide and Collaborating With the Community, with 0.56, and the lowest is between Parenthood and Learning at Home, with 0.17.

#### Combined (Single) CFA

CFA analysis was applied to all the data obtained from Turkish and Albanian teachers. The fit indices obtained from the analysis are given in [Table 4](#).

**Table 4.** Combined Group (Single) DFA Uyum İndeksleri

	$\chi^2$	SD	$\chi^2$ /sd	NFI	NNFI	CFI	IFI	RFI	SRMR	GFI	RMSEA
Combined	3308.68	1041	3.17	.92	.95	.94	.94	.93	.07	.78	.071
Combined 4 Modification	2738.06	1038	2.64	.94	.96	.96	.96	.94	.06	.80	.067
Cross Validation	4634.39	2193	2.11	.89	.93	.93	.93	.90	.09	.76	.078

Although satisfactory fit indices were obtained in the first analysis of the combined group (Turkish and Albanian samples) data, the modification based on error variances between EO4 and EO2 in the Learning at Home dimension, between EB3 and EB10 in the Parenthood dimension, between IK2 and IK11 in the Communicating dimension and between KV3 and KV4 in the Decide dimension resulted in  $\chi^2/sd= 3.17$ . RMSEA decreased from 0.071 to 0.067, the SRMR index decreased from 0.07 to 0.06, and a relative improvement was achieved in the indices. In addition, the NNFI index increased from 92 to 94. The RFI index increased from 0.93 to 0.94, and the AGFI index increased from 0.76 to 0.78, and a relative improvement was observed in these indices. As with other indices, NFI = 0.92 to 0.94, and CFI = 0.94 to 0.96. IFI=0.94 to 0.96. Both modification and post-modification indices were acceptable ([Tabachnick, Fidell, 2007: 607](#)). As a result of the Cross Validation analysis, although the fit indices were not as high as the Combined group, they were at an acceptable level. The values  $\chi^2/sd= 2.11$ , NNFI=.93, CFI=.93, IFI=.93 ve RMSEA= .078 were at acceptable levels. However, NFI=.89 GFI= relatively low and SRMR=.09 values are relatively high. The path analysis diagram for the combined data is given in [Figure 1](#).

#### Convergence and Discriminant Validity

Although CFA is used to determine the construct validity of a measurement tool, Campbell and Fiske (1959) also suggested examining convergent and discriminant validity. Convergence validity is the degree of confidence of a trait well measured by its indicators, whereas discriminant validity is the degree to which different unrelated traits are measured. The Fornell-Larcker (1981) criterion is widely used in CFA to assess the degree of common variance shared among the latent variables of the model. According to this criterion, the convergent validity of the measurement model. The convergent validity of the measurement model can be evaluated with Average Variance Extracted (AVE) and Composite Reliability (CR). Construct validity, regarding whether the scale measures the construct it is intended to measure, was tried to be determined by using a) convergent validity and b) discriminant validity, which is another version of divergent validity. AVE and CR values are presented in [Table 5](#).

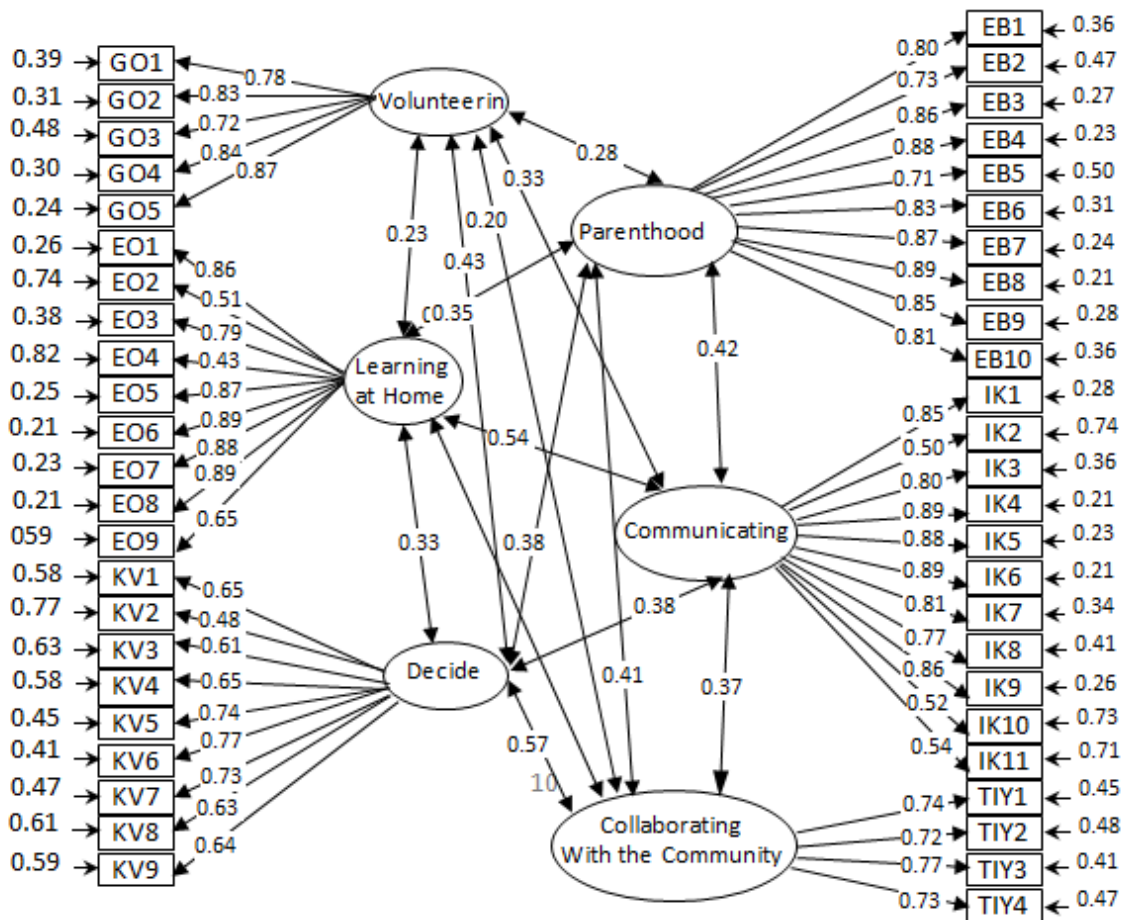


Fig. 1. Combined group path diagram

Table 5. CR, AVE and Correlations between Dimensions

	CR	AVE	1	2	3	4	5	6
1- Volunteering	.905	.656	<b>(.80)</b>					
2- Learning at Home	.926	.594	.19	<b>(.77)</b>				
3- Decide	.873	.437	.44	.42	<b>(.66)</b>			
4- Parenthood	.955	.681	.21	.43	.36	<b>(.82)</b>		
5- Communicating	.939	.593	.38	.42	.35	.27	<b>(.77)</b>	
6- Collaborating With the Community	.829	.548	.29	.32	.70	.46	.44	<b>(.74)</b>

Notes: Square roots of average variances extracted are shown on a diagonal.

Hair et al. (1997) suggested that the Composite Reliability value should be 0.70 and above. It has been stated that AVE (Average Variance Extracted) should be .50 and above when the composite reliability value is above 0.70. As a result of the analysis, the Composite reliability of each dimension was above .80. The highest was 0.955 for Parenthood and the lowest was 0.827 for Collaborating With the Community. The AVE value was below 0.50 in the Communicating dimension with 0.477. It was above 0.50 in other dimensions. It has been stated that when the composite reliability is above 0.70, the AVE value can be at 0.40 and below (Hair et al., 1997; Peterson, 2000). The results can be said to support the convergent validity of the scale. Discriminant validity is ensured by the square root of the AVE value of each dimension (expressed by the latent variable) being above the correlation coefficients between the dimensions in each row-column (Chin, 1998; Fornell, Larcker, 1981). Accordingly, the correlation coefficients between each

latent variable (construct) are below the square root of the AVE value. Therefore, each construct supports discriminant validity and measures a separate characteristic (Hair et al., 1997).

**Item and Reliability Analysis**

In addition to determining the reliability of the scale and item-total correlations, the discriminations of the items were examined. Item total correlations and Cronbach's Alpha values are given in Table 6.

**Table 6.** Item Total Correlation and Reliability Analysis

		Turkish Sample		Bosnak Sample		Combined Group	
		Corrected Item-Total Correlation	Cronbach's Alpha	Corrected Item-Total Correlation	Cronbach's Alpha	Corrected Item-Total Correlation	Cronbach's Alpha
Volunteering	GO1	.300	.67	.540	.80	.632	.86
	GO2	.472		.589		.693	
	GO3	.401		.659		.655	
	GO4	.525		.614		.717	
	GO5	.442		.575		.693	
Learning at Home	EO1	.562	.81	.814	.95	.841	.94
	EO2	.371		.805		.607	
	EO3	.600		.838		.824	
	EO4	.292		.629		.561	
	EO5	.611		.868		.876	
	EO6	.639		.851		.866	
	EO7	.704		.853		.872	
	EO8	.642		.843		.870	
	EO9	.540		.749		.754	
Decide	KV1	.542	.84	.748	.91	.659	.97
	KV2	.403		.654		.552	
	KV3	.520		.708		.608	
	KV4	.557		.763		.664	
	KV5	.654		.728		.681	
	KV6	.624		.672		.653	
	KV7	.640		.746		.704	
	KV8	.511		.593		.519	
	KV9	.523		.707		.642	
Parenthood	EB1	.682	.91	.873	.96	.879	.97
	EB2	.617		.787		.785	
	EB3	.733		.876		.892	
	EB4	.700		.865		.891	
	EB5	.524		.851		.823	
	EB6	.716		.857		.880	
	EB7	.793		.829		.875	
	EB8	.746		.853		.890	
	EB9	.729		.828		.843	
	EB10	.605		.865		.866	
Collaborating With the Community	IK1	.572	.83	.756	.93	.753	.92
	IK2	.361		.618		.506	
	IK3	.529		.776		.764	
	IK4	.490		.852		.827	
	IK5	.543		.815		.797	
				1342			

	IK6	.479		.828		.808	
	IK7	.625		.822		.791	
	IK8	.570		.735		.744	
	IK9	.491		.645		.706	
	IK10	.416		.513		.484	
	IK11	.394		.597		.527	
Communi cating	TIY1	.518	.65	.524	.77	.601	.72
	TIY2	.455		.566		.594	
	TIY3	.406		.560		.595	
	TIY4	.346		.642		.616	

According to the reliability analysis results, the highest Cronbach's Alpha in the Turkish sample was observed in the Parenthood dimension with 0.91 and the lowest in the Communicating dimension with 0.65. In the Albanian sample, the highest reliability coefficient was observed in the Parenthood dimension at 0.96 and the lowest in the Communicating dimension at 0.77. The reliability of the overall scale was highest in Decide and Parenthood dimensions with 0.97 and lowest in Communicating dimension. Examining the item-total correlations, the lowest was 0.300 in the GO1 item in the Volunteering dimension in the Turkish sample. The highest was 0.876 in item EB3 in the Parenthood dimension in the Albanian sample. In the overall scale data, the lowest item-total correlation was 0.519, the highest was 0.892, and the item-total correlations of the other items were also between these values. Determining the discrimination of the scale items, it was observed that all items were discriminative ( $p < .05$ ) as a result of the analysis performed with the upper group lower group 27 % technique: the lowest  $t = 6.125$  and the highest  $t = 22.129$ .

#### 4. Discussion

In this study, a scale developed in Turkey and used to determine the participation of families in education and training processes was adapted to Kosovo culture. Kosovo is rich and diverse in terms of Language, religion, ethnicity, and social and cultural structure. Besides Turkish, languages such as Albanian, Bosnian, and Serbian are also used in Kosovo. The present study aimed to examine the adaptation of the scale developed to determine the educational participation tendencies of Turkish and Albanian families to Kosovo Turkish and Albanian families. In this concept, since the original scale was in Turkish, it was first translated into Albanian. In the translation process, cultural elements were considered in the linguistic context.

In the second step of the study, Confirmatory Factor Analysis was applied to each group separately based on the Maximum Likelihood method to determine whether the factor structures of the scale, which has 6-factor structures consisting of 38 items, are supported in the Kosovo Turkish and Albanian samples. As a result of the analysis, the data obtained from the Turkish and Albanian samples in the Kosovo sample had fit indices that can be regarded as very high. Good results were also observed in the Confirmatory Factor Analysis applied by combining the data obtained from the Turkish and Albanian samples in the second step. However, four modifications provided better results. Cross Validation was examined since adaptation to linguistically different samples was examined in the study. In this examination, lower fit indices were obtained. However, the 6-factor structure of the scale developed in the Turkish sample produced acceptable results in the Kosovo Turkish and Albanian samples.

The results of the study's divergence and discriminant validity analyses showed that each factor measured a separate feature. It was evaluated that each factor measured an independent character, and the scale indicators had a good level of measurement. Reliability and item-total correlation analyses also showed that the scale was reliable. It was shown that the scale developed to determine the involvement of families in the educational process in the Turkish sample can also be used to determine the involvement of families with Kosovo Turkish and Albanian mother tongues and ethnicity in the educational process.

Scale adaptation or adaptation contributes to the universality of the scale (Dilekli, Tezci, 2019). When developed in different environments, languages, and cultures at different times, its direct use leads to developing prejudices about the research (Herdman et al., 1998). Also, scales adapted to different cultures have the potential to contribute to time-saving (Çapık et al., 2018), cross-cultural comparison (Borsa et al., 2012), and generalization of data (Nilsson et al., 2016). However, in cross-cultural comparisons, the translation process of the scale items and the

reflection of the characteristics of the target language's culture when translating from the source language to the target language are also critical. Beaton et al. (2000) pointed out the translation process and its problems in scale adaptation studies. The researchers pointed out that a successful translation process will contribute to the validity and reliability of the scale and that many adaptation problems arise from linguistic and cultural differences. Van Widenfelt et al. (2005) also emphasized the importance of the translation process in scale adaptation studies. The researchers emphasized the importance of translation and retranslation. Therefore, in the present study, the target and source languages were mastered and retranslated from the target language to the source language to reflect linguistic and cultural understanding. This translation process was done with experts living in the culture in question. The translation process was completed with experts who received academic education and training in both languages.

The involvement of families in the educational process can be shaped according to their expectations, backgrounds, cultures, family structure, and economic status (Davis-Kean, 2005; Kourea, Owens, 2016; Li, Xie, 2020; Phillipson, Phillipson, 2006). Therefore, since there are differences in the participation of families in educational processes in studies to be conducted in different cultural structures, adapting the scales to the culture in which the research is conducted is an essential factor instead of direct use. Geisinger (1994) pointed out the problems in scale adaptation and adaptation processes due to cultural and linguistic differences. Some studies (Chen, Stevenson, 1995; Dandy, Nettelbeck, 2002; Salili et al., 2001) show that cultural differences are essential to family behaviors, perceptions, attitudes, and expectations. Hong and Ho (2005) pointed out that ethnic diversity is essential in families' education and training. Salend and Taylor (1993) discussed the factors in the participation of students and families' behaviors in education and training processes, pointing out the importance of several cultural factors. Therefore, it can be argued that it is crucial to consider this situation, which is influential on the behaviors of the individual, in studies involving societies, individuals, and countries with cultural, ethnic, linguistic, etc. differences. In some scale studies conducted in different cultures (Gjersing et al., 2010; Kornor et al., 2007; Meyer, Eley, 2006; Sandhu et al., 1996; Schellhase, 2009), it was observed that different results were determined due to cultural differences. However, as in the present study, some studies conducted in different cultures (Lopez-Fernandez, 2017; Kervan, Tezci, 2018; Kervan et al., 2021; Uysal-Bozkir et al., 2013) also produced results showing that similar factor structures were supported.

## 5. Conclusion

Scale adaptation studies for different cultures may produce different results depending on the linguistic, cultural, and environmental factors of scale adaptation. In particular, factors such as when the scale to be adapted was developed, the structure of the scale items, and whether the scale is well structured may cause the scale to produce different results in different cultures. The present study showed that the scale developed to determine the family's tendency to participate in education could be used to determine the tendencies of families of different ethnic origins in Kosovo culture. However, there are different ethnic groups other than Turkish and Albanian in Kosovo. The fact that not all families could take part in this study is an important limitation. Therefore, it is helpful to examine the adaptation of the scale by doing translations that include all ethnic and linguistic differences in Kosovo.

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## **Formation of Critical Thinking of Future Teachers While Designing Quest Rooms for Didactic Purposes**

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### **Abstract**

The actual problem of higher education is the search for effective forms of education. Such forms have didactic potential for intellectual development (systemic, critical and foresight thinking) along with creativity, teamwork in the training of future specialists. This study aims to explore how engaging next-generation teachers in the creation of inquiry spaces influences the formation of their critical thinking abilities.

An analysis of scientific papers on the problem of learning gamification, the use of digital resources for the formation of critical thinking was used to obtain theoretical generalizations. The escape room is designed using interactive technologies.

Research results. The manifestation of critical thinking perception becomes apparent in the context of equipping specialists for the digital economy. Quest rooms is described as a tool with large educational potential for the formation of critical thinking. In their work, the authors provide a clear definition as well as a comprehensive overview of the principles and mentor guidance for students actively participating in designing quest rooms to achieve didactic outcomes.

In conclusion, student participation in the development of educational escape rooms will enhance the opportunities for fostering critical thinking skills as a universal competence in the preparing specialists in demand by the digital economy.

**Keywords:** quest technology, digital school mentor, university challenges, information and analytical activities, educational space, digital resource.

### **1. Introduction**

1. As part of the UNESCO World Conference 2022, an official report on science was presented. It is published every five years. Its motto is "The Race Against Time for Smarter Development". It reflects the vector of global transformations identified by the UN in

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17 sustainable development goals until 2030. A roadmap, which describes the principles, goals and objectives of higher education around the world, was also adopted. According to the roadmap, universities have a certain social duty. The authors formulated six principles for the higher education system. They are: inclusiveness, equality and diversity; academic freedom and participation of all stakeholders; development of critical thinking and creativity, etc. Like any other, the technology for developing critical thinking has its own principles of construction, which are based on specific types of human mental activity (Vzglyad YUNESKO na..., 2023).

The reports, devoted to the need to develop critical thinking so that the user can understand the information flow from the Internet; could protect himself from fake news, were also made at the XXV St. Petersburg International Economic Forum (Itogi Peterburgskogo..., 2022). So, on the one hand, critical thinking is becoming a very important learning outcome for university students.

2. A.V. Dmitrieva, A.N. Malakhov point out that the project of an educational program must begin with an in-depth study of the labor market. Designing educational programs in higher education is a complex process that requires compliance with certain standards (Dmitrieva, Malakhov, 2017). But in this process, there is always a place for creativity: communication with experts in different fields, creating individual trajectories that not only make the student sought after in the labor market, but also cultivate an interesting, harmonious personality.

According to those interviewed by E.V. Moskalenko, for the introduction of new educational standards, for the formation of a truly new school, a future teacher preparation can be greatly enhanced by implementing a competency-based approach, leading to high effectiveness. (Moskalenko, 2022).

We can conclude that an integral factor in the development of the formation of a digital society is the widespread introduction of information technologies.

3. An educational quest is a pedagogical technology that includes a set of problem tasks with elements of a role-playing game (Isupova, Suvorova, 2018).

According to E.M. Bonsignore, the problem of preserving and developing the educational motivation of schoolchildren is now the most pressing. Nowadays, it is difficult for teachers to find the right approach to children, because “nothing will surprise them,” and it is difficult to interest and motivate them. This problem is solved to some extent by the use of “web quest” technology, which takes into account the active use of computer technologies by schoolchildren in everyday life (Bonsignore, 2016).

The mentor of a modern school is supposed to be a responsible and active member of society. Therefore, he is expected to achieve personal values through certain professional practices. These practices also include the use of interactive services and digital applications. Further, the teacher, when building a professional career, will be able to imitate those teaching technologies that he “tested on himself”. According to E.V. Soboleva et al., the acting mentors need (Soboleva et al., 2022):

- game forms and teaching methods;
- e-learning resources that will enable them to develop scientifically based objectives, content and tools for digital learning assessment;
- information interaction services, in the space of which you can prepare highly qualified professionals, who will also be full citizens in a complex and interconnected world;
- the means of defining objectives, designing their own educational trajectory and jointly solving complex problems that can be used by students.

However, as N.N. Vekua, A.A. Lubsky, M.S. Perevozchikova, Yu.N. Folgerova persuasively show, the main problem for the design and implementation of a didactic quest room is changing the usual stereotypes of lesson organization. Thanks to the use of technology, students have the opportunity to independently select and structure material, analyze the information received, and learn to make independent decisions in choosing topics and presenting them for discussion in class. In the space of a quest lesson, students comprehend the elements of scientific and practical work (Vekua et al., 2020). At the same time, students, in the process of working on such a quest project, comprehend real processes and experience specific situations.

So, on the one hand, higher education teachers tend to actively use web quests as a game form of learning to form students' professional competencies.

At the same time, students of pedagogical specialties need additional experience in developing didactic quests to work in a digital school. Experience in additional research activities is

required to enable them to learn to filter information, focusing on the material necessary to find the right solution, and discarding irrelevant details.

The hypothesis of the study is that the design of quest rooms for didactic purposes will help to increase the level of critical thinking among future teachers if the principles of the “quest” technology and the specifics of the work of graduates are taken into account.

## **1.2. Purpose and objectives of the study**

The purpose of the work is determined by the need to study the influence of the participation of future teachers in the design of quest rooms on the level of formation of their critical thinking.

Research objectives:

- to specify the features of designing educational “quest rooms” for the acquisition of in-demand advanced professional skills by future teachers;
- to expand the range of requirements for the development of critical thinking of graduates in the field of preparation “Pedagogical Education”, taking into account the highlighted features;
- propose content for the stages of work of future teachers in designing a quest room;
- check the effectiveness of the proposed option for additional work during the experiment.

## **2. Relevance**

### **2.1. Literature review**

#### **2.1.1. Analysis of Russian scientific and pedagogical literature**

According to S. N. Mironenko, L. P. Tikhonova, N. P. Sirotina, a low level of critical thinking can lead to unpredictable and even tragic consequences associated with harm to health, financial well-being, and impact on relationships (Mironenko i dr., 2020). In the summer of 2022, a Decree of the Government of the Russian Federation was signed on the launch of a unified information portal “My School”. It will contain information about students, their parents and teachers of all Russian educational institutions (Federal'naya gosudarstvennaya..., 2023).

To implement technologies as smoothly as possible and to avoid general panic, it is necessary to be prepared for changes at the state level. E. Ya. Varshavskaya, E. S. Kotyrlo consider the main employment trends of the future, comparing them with the current situation in the labor market and suggesting the necessary adjustments (Varshavskaya, Kotyrlo, 2019).

A.D. Korol, Yu.I. Vorotnitsky note that new methods and mechanisms for the formation of spirituality, ethics, morality, morality in a network society, the center of which is a person who is capable of limitlessly expanding knowledge, a set of connections, directions and methods of interaction, are acquiring fundamental importance (Korol, Vorotnitsky, 2022).

E.V. Soboleva, N.L. Karavaev, N.V. Shalaginova, M.S. Perevozchikova (Soboleva et al., 2018) indicate that, based on the presented skills of the future, the demand for university graduates as professionals largely depends on success in the areas of communications and interaction. Trends in recent years show that the expected future comes earlier, so today it is necessary to build self-development and development system in the digital society, focusing on key competencies.

I.A. Shcheglova, Yu.N. Koreshnikova, O.A. Parshina substantiate that students' involvement in class work, participation in scientific projects and extracurricular activities are positively related to the development of critical thinking skills (Shcheglova i dr., 2019).

The competency orientation of the educational process is highlighted by D. A. Aleksandrov, V.A. Ivanyushina, D.L. Simanovsky (Aleksandrov dr., 2017) along with its informatization and individualization aspects; they also underscore the need for diversified forms, methods, and technologies in teaching. This led to the accumulation of a large number of new didactic facts that have not yet received full scientific understanding.

The scientific realm is actively engaged in conducting diverse studies on how gamification tools can be utilized effectively in modern education, encompassing the establishment of a detailed model for gradually incorporating these tools into educational settings and pinpointing key aspects associated with the implementation of quests.

For example, K.V. Tarasova, E.A. Orel note that gamified learning, a multiplicative approach, and active use of the media space actively contribute to the development of people of generations Y and Z (Tarasova, Orel, 2022).

A. G. Sidenko exposes that the use of gamification technologies in the process of teaching high school students the specific topics in the school computer science course has not been sufficiently studied. At the same time, the use of this technology, as well as technologies associated

with the use and application of various gaming environments, can significantly increase the effectiveness of teaching computer science (Sidenko, 2020).

N.N. Askhadullina, I.A. Talysheva prove that the use of active teaching methods in educational processes presupposes a personal focus of interaction between subjects of the educational environment on the development of soft skills (Askhadullina, Talysheva, 2022). The design of the educational process of professional training of a future teacher must be built in accordance with the special principles noted above for the use of active teaching methods. The organization of pedagogical interaction based on these principles will in some cases be ensured by the use of game teaching methods. The advantage of using the “quest” method in teaching is the involvement of students in the educational process based on competition and passion. Students’ participation in quizzes helps them develop skills in collective search for the right solution and cognitive activity in the process of communication between team members and the development of leadership qualities.

N.I. Isupova, T.N. Suvorova demonstrated how some Internet gaming services can be used for research purposes (Isupova, Suvorova, 2018). The authors note that you need to start developing a quest by creating an interesting storyline – a story that will captivate users as they get to know it. E-learning should feel like an exciting journey. For example, you can imagine vocational training as a path to preventing a global catastrophe or solving a problem. Add characters to this story so that the person can improve their avatar.

Yu.N. Koreshnikova notes that if a teacher plans to develop critical thinking skills in students, then he should treat students not as recipients of information, but as active users (Koreshnikova, 2019). A learning environment in which students are actively involved in seeking information and applying what they have learned will help develop students’ critical thinking skills. One of the ways to organize such an environment, in her opinion, is project-based learning.

M.A. Tishina explores the didactic potential of mobile technologies for the development of the following skills: problem presentation; reframing complex problems through reduction and transformation; problem abstraction and decomposition; heuristic reasoning; planning (Tishina, 2020). She emphasizes such didactic properties of mobile technologies as interactivity, informativeness and metainformativeness, which allow using them to create problematic tasks that involve cooperation between students in their thinking.

N.N. Vekua, A.A. Lubsky, M.S. Perevozchikova, Yu.N. Folgerova observe that a crucial aspect of fostering critical thinking skills via a web-quest entails promoting the formation of thematic and interdisciplinary associations, enabling students to effectively construct and apply their knowledge across various contexts. To achieve this, the teacher provides links to Internet resources from different and sometimes opposing contexts (Vekua et al., 2020).

K.A. Kuzoro, M.M. Zhukova note that the quest may include tasks of various types: indicative, informational, creative, intellectual (Kuzoro, Zhukova, 2021). The choice of genre, materials and theme depends on the author of the quest, who thinks through what he wants to show and tell future players, what tasks and technologies he can use. According to the authors’ conclusions, web quests are gaining popularity. The most popular of them involve targeted search activities using Internet information resources to complete tasks and quest excursions – walking with elements of an adventure game.

### **2.1.2. Analysis of foreign studies**

As stated above, the problem of developing critical thinking skills is at the center of UNESCO’s attention. At the 1996 symposium in Bern, the Council of Europe defined five key competencies that modern school and university graduates should possess (Hutmacher, 1997). Among them are competencies due to the “increase in the informatization of society”, which presuppose the ability of students to think critically. D. Beer, M. Matthee indicate that in connection with the spread of false information through digital media platforms, it is extremely important for all people to have developed critical thinking skills (de Beer, Matthee, 2021). The authors perform a systematic review of the literature, highlighting the main approaches to identifying fake news; and how these approaches can be used in different situations. Some approaches are illustrated with an example as well as problems.

Trying to highlight the main features of critical thinking, Sh. Bailin et al. reach a conclusion that critical thinking is used so that a person can decide for himself what to believe or what to do (Bailin et al., 2010).

Ju. Surjanti, A. F. Prakoso, R. Y. Kurniawan et al. substantiate that modern education, the vector of development of which is established taking into account the direction of development of Russian society, has begun to experience the need for the formation of critical thinking in both students and teachers (Surjanti et al., 2022). The expansion of almost all areas of production and the introduction of increasingly innovative forms and methods requires the educational process to constantly develop and introduce the most effective techniques and approaches to training future specialists.

Critical thinking, according to the conclusions of M. Kubiato, K. Balatova, E. Sustekova et al., is necessary for future specialists to understand the content of academic disciplines and for effective professional activity (Kubiato et al., 2022). The purpose of their study is to identify the dependence of the development of critical thinking among university students on a set of factors. These factors include: gender, age, media use, media need, current information, current professional information, and online health information. As you can see, the effectiveness of using critical thinking skills depends not only on the level of their formation, but, presumably, is determined by subjective factors, namely, the development of multi-level properties of a person's individuality, which act as a necessary and sufficient condition that ensures the formation of universal competence – the ability to think critically.

M. Kubiato, K. Balatova, E. Sustekova et al. determine the factors for the critical thinking development. They are: gender, age, media use, need for media, up-to-date information, current professional information, and online health information.

M-T. Nagel et al. study the information activity of students in the Internet space (Nagel et al., 2020). For example, the duration and frequency of visits to individual web pages. The authors propose to further study in detail on which sections of the visited web pages the students lingered most of all, what actions they performed (for example, read the text or watched the photo/video).

In their research, O.L. Liu, L. Frankel, K. Roohr identify a set of skills that characterize critical thinking and contribute to the construction of independent judgments: analysis, evaluation, interpretation, explanation, logical conclusion, self-regulation. Thus, scientists are confident that to achieve a goal, critical thinking skills will help select methods for effectively working with information depending on the situation. Using the necessary skills will lead to truthful judgments and productive solutions to life or professional problems (Liu, Frankel, Roohr, 2014).

S. Woodcock and co-authors note that in modern conditions, in order to meet the constantly changing requirements for professionalism, teachers need to constantly improve their level of skill, engage in self-education, and look for new teaching methods (Woodcock et al., 2023). In order to meet modern requirements, teachers need to constantly improve their level of professional competence, engage in self-education, and look for new teaching methods.

U. Khan focus lies in examining how a person-centered approach affects the advancement of critical thinking (Khan, 2020). The author points out that with this approach teaching is required to think analytically, because appropriate thinking involves the use of facts and information. Every professional needs to develop critical thinking in order to:

- objectively evaluate the information received;
- determine what information is important and what is not;
- identify problems and determine opportunities to resolve them;
- consider situations and events from different points of view in order to formulate alternative goals;
- use reasoned arguments when making decisions.

According to A. Rubin-Vaughan et al., the actual way to attain the objectives of modern education is to use the “quest” technology (Rubin-Vaughan et al., 2011). The popularity of technology is growing every day. Since in the space of quests, participants learn to consider fundamentally, solve complex problems, weigh alternative opinions, make thoughtful decisions on their own, and take charge for their implementation in a form of a game.

The Canadian school CanadaZoom.School has launched an online project to increase digital competence and develop the creative potential of teachers and students (Canada Zoom School, 2023). As part of the project, teachers, methodologists, and employees of educational organizations can take part in the international quest competition “Web-Quest”.

M. Chang and his colleagues specify an educational quest as a complex task, this necessitates the development of various standards for its assessment. The emphasis is placed on the specific type of task problem and the form of the result presentation. The teacher uses the same criteria (Chang et al., 2019).



S. Jarmak, and co-authors indicate that quests contain an element of competition, as well as the effect of surprise (unexpected meeting, mystery, atmosphere, scenery) (Jarmak et al., 2020).

L. Amali, N. Kadir, M. Latief list selections for designing quests: using the project method, competitions (Amali et al., 2019). The plot of the quest helps students decide how they can learn techniques for relieving psycho-emotional stress, self-regulation, increasing self-esteem, and coping with this or that life situation. A quest is a game situation in which not only erudition is involved, but also ingenuity, creativity and innovative thinking, the development of a sense of responsibility, trust in a partner, and the promotion of life-affirming principles.

Z. Zainuddin and co-authors mark that the most popular are interactive forms that can exist as separate elements, or can be combined with each other (Zainuddin et al., 2020).

The described situation in educational practice, of course, does not satisfy the challenges of the digital society and the didactic resources of web-quests.

### **3. Materials and methods**

#### **3.1. Theoretical and empirical methods**

Software options for learning gamification and specific applications for creating quests were analyzed: Quest-maker, Urban Quest, PowerPoint, Joyteka.com, Surprise me, Genially, QuizWhizzer, Seppo, audio tours, etc. Materials of the All-Russian Quest Competition "In Search of Knowledge" and the Canadian schools CanadaZoom.School.

The basis of the educational quest is a problem task with elements of a role-playing game.

Criteria for comparing digital resources for developing web-quests:

- how the learning process using this product works, starting from the moment of user registration and beyond;

- what you need to start using this product;

- what technical requirements do these solutions impose;

- what is missing in this resource so that it can fully ensure the learning process in the quest format;

- cost of the solution.

To develop critical thinking among students, the efficacy of involving them in the design of quest rooms was examined through empirical methods like observation, testing, analysis of gaming applications, and evaluation of their performance.

In order to assess the extent of critical thinking skills, the authors' test materials were utilized. Questions for measurement before the experiment, as in the case after, were designed taking into account Bloom's classification (Bloom, 1956). At each level, certain algorithms of operations of mental activity are mastered: operations of comparison, analysis, synthesis, concretization and abstraction, formation of concepts, construction of judgments and conclusions, classification, generalization, systematization. Based on this provision, 5 types of questions were formulated (each type was incorporated twice for enhanced control accuracy): to search for the main information (task 1); to work with sets of objects (task 2); to evaluate information (task 3); to eliminate redundant information (task 4); to modify the object (task 5).

To fulfill the rules of probabilistic selection of subjects, the same teacher used digital technology to design quest rooms during the experiment.

Activities for designing quest rooms were carried out using the interactive capabilities of the Power Point presentation development tool. Since the development program is only a tool for gamification, it was decided not to use a complex technical solution. Any quest can be presented with high quality even in a simple Power Point presentation. The main thing is to choose a beautiful and eye-catching template.

Other advantages of this component of the Microsoft office application suite: wide functionality, versatility and widespread use. One can place virtually any type of digital object on each slide of the project. At the same time, creating them directly in the program or importing them from other software. Special attention is paid to such tools as animation, audio and video effects, triggers, and hyperlinks.

The study involved 54 students of the Vyatka State University of the training program 44.03.01 Pedagogical education (bachelor's degree level). The mean age for the respondents was calculated at 18 years old, with slightly more than half being girls (52 %) and almost half being boys (48 %).

Applications for creating quest rooms for didactic purposes are studied in the sections of the disciplines “Modern information technologies”, “Technologies of social and professional interaction”, and are used in the course of introductory educational practice.

In order to analyze the modifications within the pedagogical system, the Pearsons chi-square coefficient –  $\chi^2$  is applied during the stage of statistical processing.

### **3.2. The base of research**

The experiments central focus revolved around examining whether involving students in the design process of didactic quest rooms enhances their development of critical thinking, a crucial skill for well-trained instructors.

54 students of the Vyatka State University were involved in the direction of Pedagogical Education (bachelor's degree level). All respondents are first-year students.

In the “Modern Information Technologies” classes, there was a practical use of a digital service for designing a quest room for didactic purposes.

Before and after the experiment, a measurement of the level of formation of critical thinking of students of pedagogical specialties was carried out, according to the ideas described in p.p. 4.3.1.

The content definitions for the test assignments and questions were made by the authors according to the norms of the current standards of higher education.

### **3.3. Stages of research**

At the first stage of the study the problematic issues of gamification, the complexity of using quest technology for studying at a university, were revised. In addition, 20 questions for the control testing of the work were compiled. The examples are presented in p.p. 4.3.1.

A set of 10 tasks was presented in both versions of the test, each task being assigned a value of 2 points. The key to processing and interpreting the results: high level – if a student of a pedagogical specialty scored more than 18 points; average level – if a future teacher scores from 9 to 17 points (inclusive); low level – if a participant scores less than 8 points.

Thus, it was possible to collect data on 54 students of the pedagogical specialty. They create both experimental and control groups. Each has 27 people. The sample was not random. The proportion of females in the experimental group was 52 %, while males accounted for 48 %.

The second stage of the experiment was devoted to determining the structure of the course. As part of the stage, the interactive capabilities of the digital application are explored. The base for the development of quest rooms for didactic purposes in this study is the concept of triggers.

At the third stage, the positive aspects of using quest rooms for the critical thinking growth of teachers are highlighted (for example, to gain experience in formulating a problem taking into account the uncertainty of the future, students analyze the educational space of the school, determine the development of the plot for different conditions, etc.). Options for putting into practice of the research results are proposed.

## **4. Results**

### **4.1. Key concepts of designing didactic games**

The game mechanic in the quest room is a set of rules and procedures that guide the actions of the characters. For example, the “Random event” mechanic: the characters start to act, and the events in the quest occur when a particular door opens, a window or a book on a shelf opens.

The game mechanics in the proposed study assume that the student is active and independent in cognition. In addition, the game characters appear according to the development of the plot.

The number of characters, their character, and didactic purpose are determined by the future teacher based on the needs of the quest space.

For example, after turning the key, a door may open to a new room, to a new dimension, or it may turn out to be a “false” move.

Critical thinking assumes that the student, when designing, will be able not only to make a “selection” of characters and their characteristics, but also to distribute their occurrence throughout the quest.

Analysis of the result at each level of the quest room can contribute to: gaining skills in working with redundant or missing information (available at that particular moment); gaining

experience in modeling based on two or three tests; developing the practice of independence in planning activities for an uncertain future.

A quest room can be interdisciplinary in nature or highly specialized. Designing a quest room using Power Point, on the one hand, does not require any special technical characteristics of the educational space. On the other hand, apparent simplicity determines high requirements for filling the levels of the quest room: introduction, problem statement, plot development, evaluation of the result and one's own activities.

The search for a "key," "artifact," or level in a quest room depends on the level of academic performance of the student, on the competence of the game teacher (game/quest master), on the theme and plot. However, we should not forget about the need to prepare the future teacher for the challenges of Industry 4.0: developing his readiness to use artificial intelligence to solve professional problems, choosing the appropriate tools for implementation. In this regard, triggers, the creation of control buttons, and links to relevant Internet resources can help.

It was determined that in order to achieve the goals of international and state policy, it is useful for higher educational institutions to include in the training programs:

- interactivity features, innovations from the field of science and technology. For example, to involve teachers and future teachers in active educational and cognitive activities with training programs on gaming platforms. In this case, you can use such methods and tools as AR/VR, three-dimensional graphics, etc.

- information interaction, which involves participants in the didactic process. However, the following characteristics should not be lost:

- a. Reliability, scientific character, and connection with the reality of the reported knowledge;
- b. Availability of knowledge depending on the psychophysical characteristics and abilities of students.

In the process of developing the skills that make up the essence of critical thinking of future teachers, the following factors must be taken into account:

- the student knows the essence of the critical thinking of the individual and its pedagogical understanding;
- the student knows the criteria for the level of formation of critical thinking and can determine it by indicators;
- the student can apply forms of cognitive activity that contribute to the most effective form of critical thinking;
- the student owns both traditional methods and techniques for organizing educational activities, as well as those developed by him;
- the student can evaluate the actions carried out by both their peers and themselves built on Bloom's taxonomy;
- the diligent student endeavors to establish a knowledge-driven learning environment under the obstacles of society and time;
- the student himself is a critically thinking person.

PowerPoint functionality was used to design quest rooms for didactic purposes. PowerPoint is a versatile tool for preparing visual digital presentations that has become widespread in various industries. The service has many design templates that are easy to edit. You can quite easily give the presentation personality (replace the background, and splash screen, apply different fonts, add effects and animation).

The main PowerPoint tool used for designing escape rooms is triggers.

With this animation tool, you have the ability to set an action or time condition for any chosen element. The animated sequence initiates upon a single click.

Using a trigger, you can set an action for any object in the quest room. Moreover, we can choose the sequence of these actions depending on the desire and situation. You can open the task as it is completed. Clicking the left mouse button on an object animates it, causing it to perform a predefined action. Incorporating triggers into the presentation greatly amplifies its interactive nature.

Each new problematic task is a new level in the game. Increasing the level is not necessarily an increase in difficulty in solving the task. A new level means a new character, the use of a new element of the interior, the application of new theoretical knowledge.

#### **4.2. The system of practical classes for the design of quest-rooms of didactic purposes by students of pedagogical specialties**

Design stages:

I. Correlating the requirements of employers, UNESCO priorities, planned educational results with the possibilities of digital services.

This activity was carried out by the participants in the classroom and during extracurricular work in the course :Technologies of social and professional interaction.:

At the first stage, the mentor of the digital school faces the tasks of the international format. Future educators must have practical knowledge of digital technologies, various information sources; experience in formulating and solving professional problems; collaboration skills; formed skills in terms of time management (for example, to plan their professional and career prospects, engage in self-education and self-development).

II. The students study a digital resource, its functionality. Correlating them with the labor functions of a teacher, the capabilities of educational institutions and the needs of students.

Let's describe a variant of studying the use of triggers within the course lesson.

1. Open PowerPoint. Create an empty presentation.

2. The title page of the presentation will open in front of us. Remove all text fields from it.

3. Find a picture, which, for example, will depict a computer. Let's try to create a game in which we will need to find the means of input.

4. Insert the found picture on the slide.

5. Now you need to create a "button", when pressed, the information "Correct" will be displayed.

6. Create such an action for pressing the keyboard. To do this, do "Insert-Shapes-Rectangle". Draw a rectangle so that it covers the entire surface of the keyboard.

7. Now set the parameters of the figure. Right-click on the shape and select Format Shape.

8. Next, select the "Fill" item and make the transparency 100 %. In the line item, select "No lines".

9. Now add a sign that will appear when you press the keyboard. For example, "That's right, it's an input." To do this, we do "Insert – Text". Enter a sign in the field that opens.

10. Now comes the creation of the trigger itself. To do this, add the animation "Occurrence" to the inscription. Then the trigger "On click" – "Rectangle".

Check the trigger.

Then, in a similar way, you can add the required number of triggers so that the task is completed.

III. Further in the classes, students studied the principles of quest room design and used digital services to implement it.

Let us describe the main ones that they adhered to:

The story of the quest room should be short and memorable. Long quests with a twisting plot with many sudden turns in the narrative can be confusing even if you dive into it for fun. In the learning process, you shouldn't even get close to this. This can mislead the player and discourage them from delving into the essence of what is happening.

You need to tell the plot of an adventure game in an informal, accessible language. No matter how valued complex words and their various derivatives and phrases are among the scientific community, they can only scare students away.

Trust in the quest room leader. This is the foundation of any dialogue. Without trust, there is no proper understanding of the quest plot, as well as the establishment of strong connections between the facts presented and their reliability.

The plot shouldn't be boring. The story of the quest should capture the imagination and keep you on your toes.

It is important to "put completeness." The story of the quest, after its completion, cannot be allowed to raise questions such as: "What was that? What was the quest all about? What did the author mean? What next?"

IV. Technological map of the quest room.

Consider the student results in the two previous stages. Let's describe a variant of the designed "quest room" – "Computer World".

Plot. One day, Mary, a college student, receives a message from an Unknown to check her mailbox. Going to the mailbox, Mary receives an interesting letter: “Can you go back (?)”, and an unsigned CD.

Without thinking twice, the girl decides to see what this incomprehensible disk keeps in herself. The game is loading. On the screen appears the sign: “Start the game?” and a single “Yes” button.

Mary presses the button. The heroine does not have time to look back, as she begins to be drawn into some space that is already outside the monitor. Unable to cope with this force, she moves to another dimension.

Mary now faces an unknown blue room – a long corridor, on the walls of which are sequences of binary codes. And there is a small door in front of her. To open it, you need to enter a code with numbers only “0” and “1”. Carefully examining the door, you can find three numbers: 123, 35, 87. Only binary numbers can be entered into the combination lock. Therefore, the Heroine decides to translate all these numbers into a binary number system. However, only one number is the correct key. There is a development of the rules for transferring numbers from one positional number system to another.

Methodical recommendation. The inclusion of such a task will contribute to the creation of additional conditions for the development of logical and spatial thinking; for the formation of skills to analyze, compare, generalize.

If the Heroine receives  $1111011_2 = 123_{10}$  or  $1010111_2 = 87_{10}$ , then the door will not open. If she enters the code  $100011_2 = 35_{10}$ , then the girl will receive a message: “Feed the rabbit.” This is a task of the first level of difficulty.

At the next level, the girl finds herself in a petting zoo. Around the paddocks with rabbits, puppies, kittens. Remembering that the clue was about a rabbit, the Heroine approaches him. The rabbit enclosure is made in the form of a labyrinth. There is a bundle on his back. This is a task of the second level of difficulty. But in order for the rabbit to get closer to Mary, he must go through the maze. To stimulate the rabbit, you need to find a carrot and beckon the animal with it. The heroine opens an enlarged plan of the labyrinth and, using the arrows “←”, “↑”, “→”, “↓”, she completes this task.

Methodical recommendation. Completing the task, participants develop visual perception, learn the ability to analyze, draw logical conclusions.

When the rabbit comes closer, Mary removes the bundle from his back. She finds a task of the third level of difficulty.

Task: The performer Rabbit has two commands, which are assigned numbers: 1. Add 2; 2. Divide by b (b is an unknown natural number;  $b \geq 2$ ).

By executing the first one, Rabbit increases the number on the screen by 2. By executing the second one, Rabbit divides the number by b. The program for the Rabbit executor is a sequence of command numbers. For example, program “12111” is known to translate the number 54 into the number 20. The heroine needs to determine the value of “b”.

Methodical recommendation. When completing a task, participants get the opportunity to consider the variety of approaches to solving the problem as a whole through an assessment of their effectiveness. Everyone has the opportunity to comprehend the information received from the point of view of its usefulness.

Mary finds a solution and gets the value “4”. Then she returns to the familiar corridor. Paintings with numbers from “1” to “6” now hang on his walls. Sequentially sorting through them, the girl finds a picture with the right number. On the back of the painting, she sees a hidden cipher “@??@??@” and a note with the decryption. This is a task of the fourth level of difficulty.

With the help of this hint, the Heroine must unravel the encrypted word “Poppy”.

Methodical recommendation. Completing the task, participants learn to work with information, train logical and non-standard thinking.

Fifth level of difficulty. There are bedside tables with vases in the corridor near the doors to the rooms. In some cases, for example, daisies, poppies, roses, etc. Having received the answer “Poppy” in the previous task, the Heroine assumes that she needs to approach the vase with poppies. Under the vase, she finds the key to the door.

Mary opens the door to the room. The strong wind is picking up again. And the girl returns to her room, to the computer.

After completing the quest, you need to organize a reflection. For example, you can create a survey in advance, send a link to computers/gadgets to students. Further, their answers are summarized in a single table. Such work will provide everyone with the opportunity to express (argue) their opinion. It is important for the teacher not only to evaluate each participant, but also to comment on the received answer.

It is useful to provide questions in the survey so that students can list comments, wishes, emotions, impressions, etc. It is important in terms of determining the effectiveness of critical thinking resources of quest technology to include the following questions:

- evaluate (on a scale) what caused you the greatest difficulties;
- rank (arrange in order of importance for yourself) the levels of the quest room that were completed in the gaming environment. Justify the significance of each level in one or two words.

As an encouragement, awards can be:

1. Letter of congratulations. For example, the Heroine receives a letter that just now she tested a new computer game with real immersion. And according to the results of the tests, Mary receives the title of “Best Cyber Sportsman”.

2. New opportunities for Mary's information educational and cognitive activity. For example, during online classes, she can use the hint in the chat.

3. Invitation for an interview.

V. Presentation and presentation of the project. Its application in the course of educational introductory practice.

Within this stage, specific criteria to evaluate the quest room project, focusing on its adaptability in different academic subjects: persuasiveness of the reflection of the idea with the help of digital resource tools; the realism of the proposed development.

So, the students organized a photo quest “Theatrical Trouble” among 6-7 grades of school No. 16 named after. A. Likhanov in Kirov. The purpose of this quest is to learn interesting and useful information about different types of theaters through the gameplay and informal communication with the characters. The tasks of the students are to get acquainted with the characters of the theater and try to help them, get the necessary things for them. To cope with the tasks, participants need to get to know the heroes of the quest, solve puzzles and pass interesting tests. According to the results, they received a theatrical guide containing information about the regional actors' fate and concert teams during the Great Patriotic War.

VI. Generalization of the results obtained.

For example, it was determined that a quest room held in an educational institution must follow the rules:

- task, question or problem statement. In this part of the escape room, a problem or problem is presented for solution. The format and details of the final product that the participants will present are also specified here. At the end, participants must provide a photo report of their experience in the quest room and present their project;

- process. This part of the quest room contains step-by-step instructions to help participants complete the task. Each step should be described in detail;

- assessment. It is worth describing in detail the requirements by which the work will be assessed. An assessment model is used, with given criteria, scores and verbal description. In this way, the assessment becomes transparent and participants have a clear understanding of how it will be carried out;

- conclusion contains a summary of the results of completing the quest room: the knowledge that the participants will receive, ideas for continuing work on this topic, feedback/reflection;

- report forms on the implementation of quests can be different: a series of photographs, drawings, a video, a virtual excursion, a photo album, a library entry, etc.

### **4.3. Experimental assessment**

#### **4.3.1. The ascertaining stage of the experiment**

To assess the input conditions (the level of formation of critical thinking), author's testing was developed. The testing phase involves a set of 10 tasks, including memorization, understanding, application, analysis, evaluation and creation.

Task 1. To search for the main information. Point out the answer selections that properly convey the main content found within the text. Write down the numbers of these sentences.

Or another option. Using a text editor, find out how many times, not including footnotes, the word “measures” or “Measures” appears in the text of the Convention on the Rights of the Child.

Task 2. To work with sets of objects. Given a logical expression that depends on  $N$  logical variables. How many different sets of variable values are there for which the expression is true?

Or another option. What objects can be considered as systems? (a person, a tree, a house, a system of education at a university or school, the solar system, a book, a table ...).

Task 3. To evaluate information.

In order to attract the attention of the “digital generation” the text should:

- a) have a clear structure with division into small paragraphs;
- b) include visual elements (drawings, photographs, diagrams, infographics);
- c) be interactive (with the possibility of feedback);
- d) all options are correct.

Task 4. To eliminate redundant information. 30 bags of cement, 50 kg each, were brought to the school for repairs. Immediately, 20 bags were taken for work, and the remaining 10 bags were taken to the warehouse. How many kg of cement was taken to the warehouse? Can this problem be solved using the following expression “ $50 \cdot 30 - 50 \cdot 20$ ”?

Is there redundant data in this difficulty?

What data from the condition of this issue should be used so that the solution consists of one action?

Task 5. To modify the object. Participants are offered a program in an algorithmic language. It is required to modify the program in such a way that when solving a problem on a computer, if necessary, checking the input data for admissibility – compliance with the domain of definition. For example, given sides  $A$  and  $B$  of a rectangle, determine its area.

Another option is to adapt the resulting algorithm so it can be used to determine which side of the rectangle more.

Correct completion of each task – 2 points.

To interpret the results we describe the following levels.

The high level: the student knows how to offer his ideas on the formulation of the proposed problem situation in the quest space and develop various options for its solution. Justify, prove the correctness of your ideas in resolving a problematic quest situation, and also independently formulate problems. They should no longer work with “ready-made” information, but offer their own ideas on the proposed quest topic. These skills begin to develop at the ideological-problem level, since when working with information, namely when putting forward your ideas on a proposed topic, you need to be able to formulate a problem, look for a solution to the proposed problem, and summarize the available information.

The average level: the student knows how to work with information that needs to be supplemented, changed, and most importantly, be able to justify his point of view when answering a question posed in the space of an quest room. This is exactly what students at this level should be able to do with information, since the next step in working with information after analyzing the “given” information is its modification and addition. In addition to justifying his own point of view, the student must establish cause-and-effect relationships in the plot of the game situation. In addition, when working with information, you need to be able to find relationships between data in order to supplement and change the proposed information in the desired direction for the development of the quest.

The low level: the student must be able to evaluate and analyze incoming information to design an escape room. Demonstrates the following skills: analysis of the information under consideration from different points of view, assessment of each point of view of information based on comparison on the same grounds. These skills were chosen as basic, since the first thing a student should be able to do with information is to learn how to evaluate it comprehensively based on analysis and comparison, and then carry out further actions with it in the quest space. In addition, these skills are needed by a person in future everyday life, since every day a fairly large amount of information is received, which is often unverified. Therefore, before doing anything with the incoming information, it is necessary to select valid information. These are mainly tasks for choosing the correct answer according to the outline of the plot, which satisfies the conditions of the task. As well as tasks in which you need to find and indicate an error. Thus, at this level the student must demonstrate the ability to work with “given” information.

Thus, based on the results of the processing of materials, it was possible to collect data on 54 students of pedagogical specialties. They formed experimental and control groups.

#### 4.3.2. Forming stage of the experiment

The students developed the following types of resources: social quest (to support and strengthen the musculoskeletal system – “Health Path”), educational quest (learning the rules of netiquette), lesson-quest (built on the works of A.S. Pushkin), a computer quest (a video game constructed on the story by L. Carroll).

During the design of quest rooms, participants must:

- 1) justified the relevance, purpose, and objectives of the quest;
- 2) formulated the idea and concept;
- 3) determine the target group (for whom the quest is designed).
- 4) described the mechanisms for the implementation of the quest and chose the tools of the digital service for their implementation;
- 5) searched for information and developed a series of problems, tasks, and questions;
- 6) assumed what could be the expected results (social and educational effect) from the implementation of the quest room.

The control group students successfully acquired expertise in the materials covered in the courses “Modern Information Technologies”, “Technologies of Social and Professional Interaction”, underwent an introductory educational practice. But they were not involved in the activities organized according to the described stages and the design of didactic quest rooms.

#### 4.3.3. Control stage of the experiment

At the control stage of the work, testing was also carried out in accordance with the tasks indicated in p.p. 4.3.1. Information is presented in [Table 1](#).

**Table 1.** Assessment of the critical thinking formation level

Level	Groups			
	Before the experiment		After the experiment	
	Control group (27 students)	Experimental group (27 students)	Control group (27 students)	Experimental group (27 students)
Low	11 (40.7 %)	10 (37.0 %)	8 (29.6 %)	3 (11.1 %)
Average	14 (51.9 %)	15 (55.6 %)	16 (59.3 %)	14 (51.9 %)
High	2 (7.4 %)	2 (7.4 %)	3 (11.1 %)	10 (37.0 %)

The accepted statistical hypotheses are as follows:

H<sub>0</sub> – the level of critical thinking development among students of the experimental group is statistically equal to the level of the control group;

H<sub>1</sub> – the level in the experimental group is higher than the level of the control group. For  $\alpha = 0.05$   $\chi^2_{crit}$  is equal to 5.991. Thus:  $\chi^2_{observ.1} < \chi^2_{crit}$  ( $0.082 < 5.991$ ), and  $\chi^2_{observ.2} > \chi^2_{crit}$  ( $6.175 > 5.991$ ). Consequently, the shift towards an increase in the level of formation of the skills that form the basis of critical thinking can be considered non-random.

#### 5. Limitations

Let us dedicate our attention to the potential constraints for this study:

1. Because the students in the sample were not accidental, it is impossible to generalize the entire student population using experimental data. Therefore, it would be more correct to use the term “quasi-experiment”.

To guarantee that both the control and quasi-experimental groups possess identical knowledge, skills, and abilities essential for critical thinking, the questions formulated for authors testing aim to establish equivalency.

2. An essential requirement is that throughout the quasi-experiment the same teacher:
  - explained a digital platform tools for design;
  - supervised the design of didactic quest rooms;



- helped future teachers with the formulation of the plot, when working with information sources;
- organized educational introductory practice.

The development of a didactic quest room took place in the same classrooms. The game design tool in the virtual educational environment has not changed either.

## 6. Discussion

Performing a quantitative analysis of the obtained data, we can conclude that after completing the course, the level of “High” among students in the experimental group increased from 7.4 % to 37.0 %.

The positive shift, of course, was recorded for the “Low” level: from 37.0 % to 11.1 % of future teachers. The fluctuations in the average level are not particularly significant.

Note the changes in the control group. For example, the level of “High” increased from 7.4 % to 11.1 %. Shifts in the “Average” level were also recorded: from 51.9 % to 59.3 %.

The curator of the course noted that if you do not constantly devote time to the development of critical thinking, then no fundamentally qualitative shift will occur.

In the process of designing a quest room, future teachers not only performed independent educational and cognitive tasks, but also acquired skills:

- explanation of data, opinions, situations, rules;
- information investigation and consistency of sources;
- discovery and confirming facts;
- assessment of the plausibility of statements and the logic of arguments;
- formulation and substantiation of reasoning;
- checking, making the necessary adjustments to their own reasoning;
- formulation of conclusions.

The skills growth formed the basis of critical thinking, which was facilitated by the following factors: high creative activity, participation in discussions, selection of sources and search for information, analysis of one’s actions (opinions, decisions), individual and group work on a series of quest problems-rooms. The students of the experimental group were involved in the search for missing and redundant information, made and evaluated logical inferences, evaluated the sequence of inferences, etc.

The research materials correspond to the provisions, principles, goals and objectives of the road map adopted by UNESCO ([Vzglyad YUNESKO..., 2023](#)). The findings can be used in the work of the unified digital platform of the FSIS “My School” ([Federal'naya gosudarstvennaya..., 2023](#)). The author's results on the didactic potential of quest rooms for the development of students' thinking are consistent with the conclusions of M. Chang and his colleagues ([Chang et al., 2019](#)). In addition, the presented work supplements the system of principles formulated by N.N. Vekua, A.A. Lubsky, M.S. Perevozchikova, Yu.N. Folgerova for designing a quest environment ([Vekua et al., 2020](#)).

The following areas are currently being considered as research prospects:

- 1) expansion – transfer of the ideas of the proposed methodology to network educational programs, adapting them to professionally oriented network courses. The resulting training modules will be posted on the Moodle platform for the relevant areas of training;
- 2) and, conversely, a narrower specialization – involving students in the practice of developing quests in the puzzle format (for example, the Questodel service).

## 7. Conclusion

During the study, the conditions were determined under which the involvement of students in the design of educational quest rooms will donate to the formation of the critical thinking as:

- The potential transfer of experience gained from modeling the interaction of virtual characters and objects in the quest room to the real educational space is being explored;
- Self-education and self-development can be achieved through recognizing the value of independently studying necessary languages and ways to interact with ones environment (remote) people and events);
- Assessment and self-assessment of the formulated tasks (organization of discussions, argumentation);
- Collaboration (work on the plot, practical implementation of the quest room).

The effectiveness of involving future teachers in the design of educational quest rooms for the development of skills that form the basis of critical thinking depends on many factors, among which the most significant is the ability to provide information interaction between students within a group, between students and a digital service, students and a game teacher.

Equally important is the quality of information materials (sources) for self-study.

The quasi-experiment participants also emphasized the difficulties of the suggested novelty. The imaginative character of the activities to develop the subject matter and content of the playground, the dependence on software, the technical glitches of the equipment and the long process of building a team of like-minded people to design and implement the task. Another aspect worth noting is the accentuation on the obstacles associated with implementing technology in the education of forthcoming educators. Digital school leaders must be aware of a variety of conceptual tools and games with pedagogical content when making technology decisions, as well as gain expertise in designing, developing, and assessing creative projects.

The fact that gamification elements can foster essential 21st century skills in future professionals illustrates the practical significance of these research findings.

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## 6-Week Intervention Program and Posture Changes in Music Students

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### Abstract

**Introduction:** Developing the musculoskeletal complaints in music students are common because of practice over an instrument. Little is known about the effectiveness of interventions; therefore, more research is necessary to better understand and manage the issues; therefore, the present study was aimed at evaluating the impact of 6-week intervention program on posture in music students.

**Materials and Methods:** 6-week intervention program was carried out six weeks, aiming for 30 female music students: (i) Experimental group (n = 15) (58.50 kg, 168.50 cm, 20.40 years); (ii) Control group (n = 15) (60.20 kg, 170.20 cm, 20.80 kg), attending the bachelor's degree in Performing Arts. Standardized measure to evaluate the posture was carried out; in particular, pre- (31-10, Week 1) and post-testing (9-12, Week 6). Evaluating the impact of 6-week intervention program was by Wilcoxon Signed-Rank Test, Wilcoxon Rank-Sum Test (rejection of normality of data distribution), Pearson's r (normality of data distribution).

**Results.** Significant differences (.01, .05) between the experimental and control group were in: (i) Pre-testing – (i-i) Head and neck; (i-ii) Curvature of spine; (ii) Post-testing – (ii-i) Head and neck; (ii-ii) Abdomen and pelvis; (ii-iii) Curvature of spine; (ii-iiii) Shoulders and scapulas. 6-week intervention program, targeting the posture in music students is important because of its impact on musculoskeletal health.

**Discussions:** 6-week intervention program in music students was effective at improving their postures; and therefore, implementing intervention program (at least 6 weeks) in music students and guidance on prevention of musculoskeletal complaints may influence, in a positive way, their quality of life and career.

**Keywords:** 6-week intervention, performing arts, posture, university students.

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## **1. Introduction**

Musculoskeletal complaints in music students are common because of intense practice over an instrument, i.e., spending long hours of practicing may cause muscular imbalance, tension, and awkward posture (Cruder et al., 2021). Repetitive nature of practicing in music students may cause overuse and muscle fatigue, increasing the risk of acute pain of neck, arms, and shoulders (Cruder et al., 2018; Davies, 2020), affecting quality of life and performance (Ackermann et al., 2012; Rickert et al., 2014).  $\pm 85$  % of music students (1<sup>st</sup> year) at university experience acute pain and  $\pm 34$  % of them experience musculoskeletal complaints before the 1<sup>st</sup> year of bachelor's degree and/or earlier in education (Spahn et al., 2004; Dommerholt, 2010; Stanek et al., 2017). The 1<sup>st</sup> year of bachelor's degree at university is demanding because of transition, requiring intense practice over an instrument (Hildebrandt et al., 2012; Cruder et al., 2021); musculoskeletal complaints increase to 42 % in year 2, after which decline to 36 % in year 3 (Spahn et al., 2017). Decline by 6 % in year 3 is because of combination of factors; in particular, improving technique, increasing awareness of injury prevention, and developing self-care over time (Strenáčíková, 2020).

Promotion of health (e.g., musculoskeletal) at educational institutions (e.g., music school) may influence, in a positive way, health attitudes of music students (Árnason et al., 2018; Matei et al., 2018), reduce the incidence of musculoskeletal complaints (Chan et al., 2014; Davies, 2020), and support them during the demanding year 1 of bachelor's degree (Cruder et al., 2021).

Quality of posture in music students while performing (e.g., playing an instrument, singing) may affect the musculoskeletal health and quality of performance. Incorrect posture in music students is common ( $\pm 58$  %), more in females (Ohlendorf et al., 2017; Gembris et al., 2018; Rousseau et al., 2021). Whether sitting and/or standing, music students should be aware of positioning, aligning the spine, and relaxing manner of shoulders (Blanco-Piñero et al., 2015). Maintaining correct posture is of utmost importance in promoting the well-being of music students, allowing to engage in music-making with greater comfort and ease; however, prevention of posture is not common in music students (Akbari-Chehrehbargh, Tavafian, 2022).

Responsibility of health (e.g., musculoskeletal) in music students is low; therefore, creating awareness and providing specific guidance on prevention of musculoskeletal complaints (e.g., discomfort, pain) during study may influence, in a positive way, careers of music students (Kreutz et al., 2009; Stanhope, Weinstein, 2021).

Educational institutions (e.g., music school) are in charge of teaching music students how to take care of musculoskeletal health; however, that teaching is absent (absence of data). Addressing that absence, educational institutions may incorporate musculoskeletal health education into curriculum by offering classes, practices, and/or seminars of various topics; in particular, music students' health, injury prevention, and self-care. Because many gaps remain in literature, in terms of Slovak scale (to the best of authors' knowledge), the present study was aimed at evaluating the impact of 6-week intervention program on posture in music students.

## **2. Materials and methods**

### **Procedure Sample and Participant Selection**

In accordance with study aim, the target population consisted of 30 (100 %,  $n = 30$ ) female music students: (i) Experimental group (50 %,  $n = 15$ ) ( $20.40 \pm .50$  years,  $58.50 \pm 4.50$  kg,  $168.50 \pm 2.50$  cm); (ii) Control group (50 %,  $n = 15$ ) ( $20.80 \pm .40$  years,  $60.20 \pm 4.20$  kg,  $170.20 \pm 3.40$  cm) (Table 1, 2), attending the Bachelor's Degree (1<sup>st</sup> and 2<sup>nd</sup> year) in Performing Arts (Faculty of Performing Arts, Academy of Arts in Banská Bystrica, Slovakia). Target population (100 %,  $n = 30$ ) consisted of convenience sample – music students (female), recruited through the subject – “Prevention of Musculoskeletal System 1 – 2” (Experimental group; 50 %,  $n = 15$ ) and institutional e-mails (Control group; 50 %,  $n = 15$ ) (Adamčák et al., 2022). 6-week intervention program was carried out six weeks (31-10 – 9-12-2023), 2x (Mon, Tue)/week/45 minutes, aiming for intentional sampling; regarding age, gender, and degree/year of study.

Evaluating the impact of 6-week intervention program in music students was carried out in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments and/or comparable ethical standards. All subjects provided written informed consent (Harriss et al., 2019).

**Table 1.** Anthropometric data of experimental (50 %, n = 15) and control (50 %, n = 15) group

	<b>Experimental group</b>	<b>Control group</b>
<b>Age (years)</b>	20.40 ± .50	20.80 ± .40
<b>Body weight (kg)</b>	58.50 ± 4.50	60.20 ± 4.20
<b>Body height (cm)</b>	168.50 ± 2.50	170.20 ± 3.40
<b>Body mass index (i)</b>	20.50 ± .60	20.80 ± .90

**Table 2.** Playing instruments of experimental (50 %, n = 15) and control (50 %, n = 15) group

	<b>Experimental group</b>	<b>Control group</b>
<b>Wind</b>	5 (33.33 %)	5 (33.33 %)
<b>String</b>	5 (33.33 %)	5 (33.33 %)
<b>Keyboard</b>	5 (33.33 %)	5 (33.33 %)

### Assessments, Measures and Procedures

Evaluating the impact of 6-week intervention program in music students (female) (experimental vs. control group) was carried out six weeks (31-10 – 9-12-2023), 2x (Mon, Tue)/week/45 minutes (True experimental design) consisting of random assignment (2 groups of music students (female), manipulation (6-week intervention program in experimental group (50 %, n = 15), and control (comparing with control group (50 %, n = 15). Experimental group (50 %, n = 15) size was 15 music students (female)/ lecturer (Prevention of Musculoskeletal System 1 – 2). Besides demonstrating (supervising) 6-week intervention program, the lecturer was informing the experimental group (50 %, n = 15) of purpose and principles of 6-week intervention program. 6-week intervention program was chosen because of supporting musculature of spine, neck, abdomen, and shoulders (Chan et al., 2014), allowing the experimental group (50, n = 15) to exercise with low-load activation of supporting musculature (early stage), advancing to more challenging (changing positioning) and movement patterns with resistance (Chan et al., 2013). 6-week intervention program consisted of warm-up, intervention (3 sets of 12 reps and/or 3 sets of 6 reps – 30/40 sec.), and cool-down. Experimental group (50 %, n = 15) was documenting the progress of 6-week intervention program (e.g., number of sets/reps, possible problems) and notifying the lecturer in case of musculoskeletal discomfort and/or pain who was monitoring the signs of fatigue (i.e., shaking, loss of control) (Kim et al., 2015).

Standardized measure (Klein and Thomas/ Mayer) to evaluate the posture in music students (n = 30) was carried out six weeks; in particular pre- (31-10, Week 1) and post-testing (9-12, Week 6). Standardized measure evaluates (visual) 5 segments (area) of body: (i) Head and neck; (ii) Shape of chest; (iii) Abdomen and pelvis; (iiii) Curvature of spine; (iiiii) Shoulders and scapulas. Positions of segments are given numerical values (1 – 4) in terms of quality and posture is expressed by postural score: (i) Correct posture, 5 points; (ii) Good posture, 6 – 10 points; (iii) Bad posture, 11 – 15 points; (iiii) Incorrect posture, 16 – 20 points (Marko, Bendíková, 2020).

### Data Processing

Evaluating the impact of 6-week intervention program in music students (female) (experimental vs. control group) was by Wilcoxon Rank-Sum Test, Wilcoxon Signed-Rank Test (in case of rejection of normality of data distribution), Pearson's r (normality of data distribution is not rejected), and descriptive statistics (Ibm Spss Modeler). Significant difference (.01, .05) between the experimental (50 %, n = 15) and control (50 %, n = 15) group was evaluated by Wilcoxon Rank-Sum Test, of which the significance level ( $\alpha$ ) was .01 and .05 (Nahm, 2016). Significant difference (.01, .05) between the pre- (31-10, Week 1) and post-testing (9-12, Week 6) was evaluated by Wilcoxon Signed-Rank Test, of which the significance level ( $\alpha$ ) was .01 and .05 (Kim, 2014). Measuring of linear correlation between two sets of data (e.g., covariance and standard deviation) was evaluated by Pearson's r (Schober et al., 2018). Descriptive statistics (e.g., arithmetic mean, percentage frequency) described the basic features of music students (Adamčák et al., 2022).

### 3. Results

In accordance with study aim, Table 3 illustrates the differences (.01, .05) of posture in experimental (50 %, n = 15) and control (50 %, n = 15) group. Average values (1 – 4) in terms of

quality of posture (position of segments – i, ii, iii, iiiii, iiiii) in experimental (50 %, n = 15) group were as follows: (i) Pre-; 1/ Post-; 6 – (i-i) Head and neck –  $2.12 \pm .64/1.34 \pm .48$ ; (i-ii) Shape of chest –  $1.72 \pm .70/1.34 \pm .48$ ; (i-iii) Abdomen and pelvis –  $2.20 \pm .68/1.40 \pm .50$ . Average values in terms of quality of posture in control (50 %, n = 15) group were as follows: (ii) Pre-; 1/ Post-; 6 (no change) – (ii-i) Head and neck –  $2.80 \pm .68$ ; (ii-ii) Shape of chest –  $1.50 \pm .64$ ; (i-iii) Abdomen and pelvis –  $2.20 \pm .68$ ; (i-iiii) Curvature of spine –  $2.40 \pm .52$ ; (i-iii) Shoulders and scapulas –  $2.14 \pm .64$ . In accordance with results of repeated measures analysis of changes in quality of posture in experimental group (50 %, n = 15), significant (.01, .05) changes were in head and neck ( $Z = 3.46$ ,  $p < .01$ ,  $r = .64$ ), shape of chest ( $Z = 2.44$ ,  $p < .05$ ,  $r = .44^*$ ), abdomen and pelvis ( $Z = 3.46$ ,  $p < .01$ ,  $r = .64$ ), curvature of spine ( $Z = 3.32$ ,  $p < .01$ ,  $r = .60$ ), and shoulders and scapulas ( $Z = 3.16$ ,  $p < .01$ ,  $r = .58$ ). In addition, there was significant (.01) decrease in measured values at week 6 (post-testing) as compared with baseline by post hoc analysis in experimental group (50 %, n = 15), which confirmed the decrease by  $3.44 \pm .60$  in postural score (posture) in experimental group (50 %, n = 15) after the intervention of 6-week program ( $Z = 3.60$ ,  $p < .01$ ,  $r = .64$ ). Repeated measures analysis of changes in quality of posture in control group (50 %, n = 15) were not statistically ( $p > .05$ ) different (n/a); therefore, there was no significant (.01, .05) decrease in measured values at week 6 (post-testing) as compared with baseline (Pre-; 1) by post hoc analysis in control group (50 %, n = 15) after the intervention of 6-week program (n/a).

**Table 3.** Differences (.01, .05) of posture in experimental (50 %, n = 15) and control (50 %, n = 15) group

Testing; Week	Experimental group		Wilcoxon S-R Test
	Pre-; 1	Post-; 6	
Head and neck	$2.12 \pm .64$	$1.34 \pm .48$	$Z = 3.46$ , $p < .01$ , $r = .64^{**}$
Shape of chest	$1.72 \pm .70$	$1.34 \pm .48$	$Z = 2.44$ , $p < .05$ , $r = .44^*$
Abdomen and pelvis	$2.20 \pm .68$	$1.40 \pm .50$	$Z = 3.46$ , $p < .01$ , $r = .64^{**}$
Curvature of spine	$1.86 \pm .35$	$1.12 \pm .35$	$Z = 3.32$ , $p < .01$ , $r = .60^{**}$
Shoulders and scapulas	$1.66 \pm .48$	$1.02 \pm .02$	$Z = 3.16$ , $p < .01$ , $r = .58^{**}$
Postural score	$9.94 \pm 2.22$	$6.50 \pm 1.62$	$Z = 3.60$ , $p < .01$ , $r = .64^{**}$
Testing; Week	Control group		Wilcoxon S-R Test
	Pre-; 1	Post-; 6	
Head and neck	$2.80 \pm .68$	$2.80 \pm .68$	n/a
Shape of chest	$1.50 \pm .64$	$1.50 \pm .64$	n/a
Abdomen and pelvis	$2.20 \pm .68$	$2.20 \pm .68$	n/a
Curvature of spine	$2.40 \pm .52$	$2.40 \pm .52$	n/a
Shoulders and scapulas	$2.14 \pm .64$	$2.14 \pm .64$	n/a
Postural score	$11.24 \pm 2.20$	$11.24 \pm 2.20$	n/a

Notes: n/a – Not available; \* – Significance ( $\alpha$ ) = .05; \*\* – Significance ( $\alpha$ ) = .01.

Differences (.01, .05) of posture in pre- (week 1) and post- (week 6) testing illustrates [Table 4](#). According to repeated measures analysis of changes in quality of posture in pre- (week 1) testing of experimental (50 %, n = 15) and control (50 %, n = 15) group, significant (.01, .05) changes were in head and neck ( $Z = 2.44$ ,  $p < .05$ ,  $r = .44$ ) and curvature of spine ( $Z = 3.12$ ,  $p < .01$ ,  $r = .58$ ); however not in shape of chest ( $Z = .80$ ,  $p > .05$ ,  $r = .14$ ), abdomen and pelvis (n/a), and shoulder and scapulas ( $Z = 1.86$ ,  $p > .05$ ,  $r = .34$ ). In addition, there was significant (.05) difference in measured values at week 1 (pre-) as comparing, by post hoc analysis, experimental (50 %, n = 15) and control (50 %, n = 15) group, which confirmed the difference of  $2.30 \pm .02$  in postural score, in favor of experimental (50 %, n = 15) group ( $Z = 1.96$ ,  $p < .05$ ,  $r = .36$ ). According to repeated



measures analysis of changes in quality of posture in post- (week 6) testing of experimental (50 %, n = 15) and control (50 %, n = 15) group, significant (.01) changes were in head and neck ( $Z = 4.36$ ,  $p < .01$ ,  $r = .80$ ), abdomen and pelvis ( $Z = 3.04$ ,  $p < .01$ ,  $r = .56$ ), curvature of spine ( $Z = 4.64$ ,  $p < .01$ ,  $r = .84$ ), and shoulders and scapulas ( $Z = 4.26$ ,  $p < .01$ ,  $r = .68$ ); however, not in shape of chest ( $Z = .84$ ,  $p > .05$ ,  $r = .16$ ) (Table 4). In addition, there was significant (.01) difference in measured values at week 6 (post-) as comparing, by post hoc analysis, experimental (50 %, n = 15) and control (50 %, n = 15) group, which confirmed the difference of  $4.74 \pm .58$  in postural score, in favor of experimental (50 %, n = 15) after the intervention of 6-week program ( $Z = 4.60$ ,  $p < .01$ ,  $r = .84$ ).

**Table 4.** Differences (.01, .05) of posture in pre- (week 1) and post- (week 6) testing

Testing; Week	Experimental group	Pre-testing; Week 1	
		Control group	Wilcoxon R-S Test
Head and neck	2.12 ± .64	2.80 ± .68	$Z = 2.44$ , $p < .05$ , $r = .44^*$
Shape of chest	1.72 ± .70	1.50 ± .64	$Z = .80$ , $p > .05$ , $r = .14$
Abdomen and pelvis	2.20 ± .68	2.20 ± .68	n/a
Curvature of spine	1.86 ± .35	2.40 ± .52	$Z = 3.12$ , $p < .01$ , $r = .58^{**}$
Shoulders and scapulas	1.66 ± .48	2.14 ± .64	$Z = 1.86$ , $p > .05$ , $r = .34$
Postural (total) score	9.94 ± 2.22	11.24 ± 2.20	$Z = 1.96$ , $p < .05$ , $r = .36^*$
Testing; Week	Experimental group	Post-testing; Week 6	
		Control group	Wilcoxon S-R Test
Head and neck	1.34 ± .48	2.80 ± .68	$Z = 4.36$ , $p < .01$ , $r = .80^{**}$
Shape of chest	1.34 ± .48	1.50 ± .64	$Z = .84$ , $p > .05$ , $r = .16$
Abdomen and pelvis	1.40 ± .50	2.20 ± .68	$Z = 3.04$ , $p < .01$ , $r = .56^{**}$
Curvature of spine	1.12 ± .35	2.40 ± .52	$Z = 4.64$ , $p < .01$ , $r = .84^{**}$
Shoulders and scapulas	1.02 ± .02	2.14 ± .64	$Z = 4.26$ , $p < .01$ , $r = .68^{**}$
Postural (total) score	6.50 ± 1.62	11.24 ± 2.20	$Z = 4.60$ , $p < .01$ , $r = .84^{**}$

Note: n/a – Not available; \* – Significance ( $\alpha$ ) = .05; \*\* – Significance ( $\alpha$ ) = .01.

#### 4. Discussion

When it comes to impact of intervention program (6-week) on posture in music students, the incidence rate is low (Blanco-Piñeiro et al., 2016) and because many gaps remain in the literature, in terms of Slovak scale (to the best of authors' knowledge), the present study was aimed at evaluating the impact of 6-week intervention program on posture in music students. 6-week intervention program targeting posture in music students is important because of significant impact it has on musculoskeletal health and performance (Chan et al., 2014). Research carried out by numerous authors underlines the prevalence of musculoskeletal complaints in music students and detrimental effects of poor posture (Steinmetz et al., 2012; Ackermann et al., 2012; Blanco-Piñeiro et al., 2015; Kok et al., 2016; Stanek et al., 2017; Cruder et al., 2020; Rotter et al., 2020). For instance, Ackermann et al. (2012) found that 84 % of music students surveyed musculoskeletal complaints, with the most affected areas being the neck, back, and upper limbs. According to repeated measures analysis of changes in quality of posture in pre- (week 1) testing of experimental (50 %, n = 15) and control (50 %, n = 15) group, significant (.01, .05) changes were in head and neck ( $Z = 2.44$ ,  $p < .05$ ,  $r = .44$ ) and curvature of spine ( $Z = 3.12$ ,  $p < .01$ ,  $r = .58$ ) (Table 3).

Prevalence of musculoskeletal complaints in music students may differ, depending on various factors, including the type of instrument, intensity of practice and performance, individual's technique and posture, and level of awareness and preventive measures taken. In terms of numbers, it ranges from 43 % to 63 %, sometimes in more than 80 % of professional musicians (Steinmetz et al., 2010; Paarup et al., 2011). Prevalence of musculoskeletal complaints related to music performance ranges from 80 % to 98 % among professional orchestral musicians, affecting at least one area of their body for at least one day (Leaver et al., 2011; Paarup et al., 2011; Spahn, Blum, 2011). Female music students have higher risk (significantly) for reporting the musculoskeletal complaints compared to males, while effects of these complaints last for more days. In a study conducted by Sousa et al., (2016), it was revealed that 94 % of orchestral musicians in North Portugal, who were part of research, expressed concerns regarding the musculoskeletal complaints. When involving 441 musicians from six Danish symphony orchestras, Paarup et al (2011) found that woodwind players had lower risks of musculoskeletal complaints compared to musicians who played other instruments.

6-week intervention program targeting posture may provide music students with knowledge necessary to maintain the correct body alignment during practice over an instrument and performance. Researchers like Mahmud et al. (2011) stressed the importance of ergonomics and optimal posture of reducing the possibility of musculoskeletal complaints. By educating music students about correct alignment and instrument-specific ergonomics, and teaching exercises and stretches to improve muscle flexibility and strength, 6-week intervention program may address, in a positive way, frequent demands placed on music students (Ackermann et al., 2002; Lee et al., 2012). Music students who receive individualized assessments and/ or guidance from qualified professional demonstrate improved postural awareness and were less likely to experience musculoskeletal complaints (Chan, Ackermann, 2014). This highlights the significant role of personalized guidance in promoting correct posture in music students; however, there is almost no research on implementing (evaluating) programs aimed at preventing correct posture in music students (Blanco-Piñero et al., 2015), as some deal with musicians' pain. As an illustration, Wolff et al. (2021) conducted the recent randomized controlled pilot study to assess the effectiveness of musicians' pain prevention workshop involving 57 music students. The results revealed that, at the 8-week follow-up, the intervention group experienced 32 % reduction in their pain scores, whereas the control group saw an 8 % increase in pain ( $p < 0.01$ ). Davies (2020) was examining the impact of Alexander Technique classes on musicians' pain among music students and reported significant reductions in pain. In terms of 6-week intervention program, there was significant (.01) difference in measured values at week 6 (post-) as comparing by post hoc analysis experimental (50 %,  $n = 15$ ) and control (50 %,  $n = 15$ ) group, which confirmed the difference of  $4.74 \pm .58$  in postural (total) score, in favor of experimental (50 %,  $n = 15$ ) after the intervention of 6-week program ( $Z = 4.60$ ,  $p < .01$ ,  $r = .84$ ) (Table 4).

Researchers like Ohlendorf et al. (2017) demonstrated the positive correlation between correct posture and technical skills in music students. Correct alignment allows efficient muscle coordination and better control over an instrument, resulting in improved accuracy and precision during performance. Staes et al. (2010) found that music students with correct posture exhibited better sound production and tonal quality. This indicates that optimal body alignment facilitates proper breath control and enables musicians to produce the full, resonant sounds; therefore, 6-week intervention program that focuses on posture may enhance performance in music students. Scientific research supports the necessary of 6-week intervention program on posture in music students ( $p < .01$ ,  $.05$ ). It is obvious that incorrect posture contributes to musculoskeletal complaints and affects performance in music students (Blanco-Piñero et al., 2016; Ohlendorf et al., 2017). By implementing the comprehensive intervention program (at least 6 weeks) that includes education, personalized assessments, and guidance, music students may develop optimal posture habits. The integration of ergonomics and posture exercises into music curricula is essential for equipping music students with the necessary tools to maintain correct posture during their musical careers.

## 5. Conclusion

Musculoskeletal complaints in music students are common (see Introduction); and little is known about the effective prevention; therefore, the present study was aimed at evaluating the impact of 6-week intervention program on body posture (change) in music students. Using

evidence (available) of intervention program in cooperation with medical experience and current best practice (Bendíková et al., 2018; Kliziene et al., 2018), 6-week intervention program was effective at improving body posture (e.g., neck, abdomen, shoulders) in music students. Participation in such a program and/or any program is beneficial in music students if retaining for longer duration. Preventive education (i.e., Prevention of Musculoskeletal System 1 – 2) in music students influences attitudes towards musculoskeletal health; therefore, the intervention (preventive) programs, which target body postures (correct) with an adequate duration (at least 6 weeks) should be implemented.

Recommendation for future research: (i) Experimental groups (samples) should be larger, with control of variables, such as age, musical instrument; (ii) More research in music students and intervention (preventive) programs, with follow-up.

According to results of 6-week intervention program, we may recommend it for practical use of static load compensation system and prevention of functional disorders of musculoskeletal system; however, it is important to carry out 6-week intervention program on long-term and regular basis.

Conclusions of any experimental study require additional formulation in the light of existing limitations, therefore, we consider the inability to generalize the findings to the entire population, since non-probability sampling methods do not ensure the sample (representative), the results may not be applicable beyond the sample (experimental) group. While the 6-week intervention program may bring short-term improvements, sustaining these changes over the long term can be challenging. Music students may revert to their previous posture habits once the intervention ends, leading to a loss of benefits.

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## 7. Conflicts of interest

The author(s) declare that the research was carried out in the absence of any commercial, and/or financial relationships that could be construed as a potential conflict of interest.

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## **Modern Model of University Education: Innovative Approach in Practical Implementation**

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### **Abstract**

In the educational process of high school, the absolute priorities today should remain such activities, which are aimed at teaching and upbringing, as inseparable and complementary elements of a single whole. Today there is a course for personal-oriented vocational education, where the free personality is promoted. Modern trends in the formation of a conceptual approach to the university educational process are based on taking into account the characteristics of the individual trajectory and an individual-personal approach. It is important to combine tradition and innovation as the basis for creating and applying a modern model of university upbringing activities, including various forms of nurturing, because vocational training should not be limited to the acquisition of certain competencies by students. A university must also implement an upbringing system that promotes the vocational training and personal development of young generation. Therefore, in this paper authors proposing their concept of the organization of upbringing work in a university, which should allow to effectively solve problems of upbringing students and focusing on a development of a socially significant and socially useful personality.

**Keywords:** concept, organization of upbringing work, university, model, nurturing.

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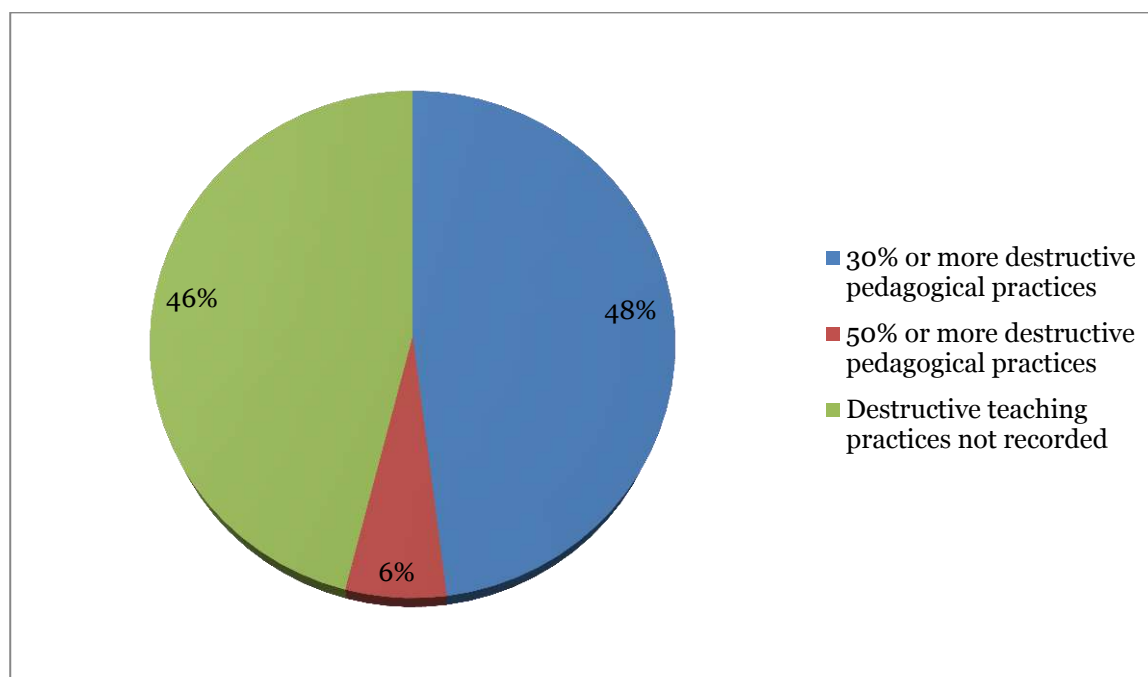
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### 1. Introduction

The current political and economic situation in the Russian Federation puts new demands on future highly professional specialists who receive higher education. New imperatives are being placed in front of the educational system, as it must train specialists who are not only knowledgeable in a profession concerned but also capable of assuming, when necessary, civic responsibility by means of their own initiative, tolerance, autonomy. Graduates should be self-developing and self-improving individuals, easily socialized in society. However, the development and improvement of these qualities in students takes place in the context of a search for new landmarks, which were identified after disintegration of educational policy and ideological values of past.

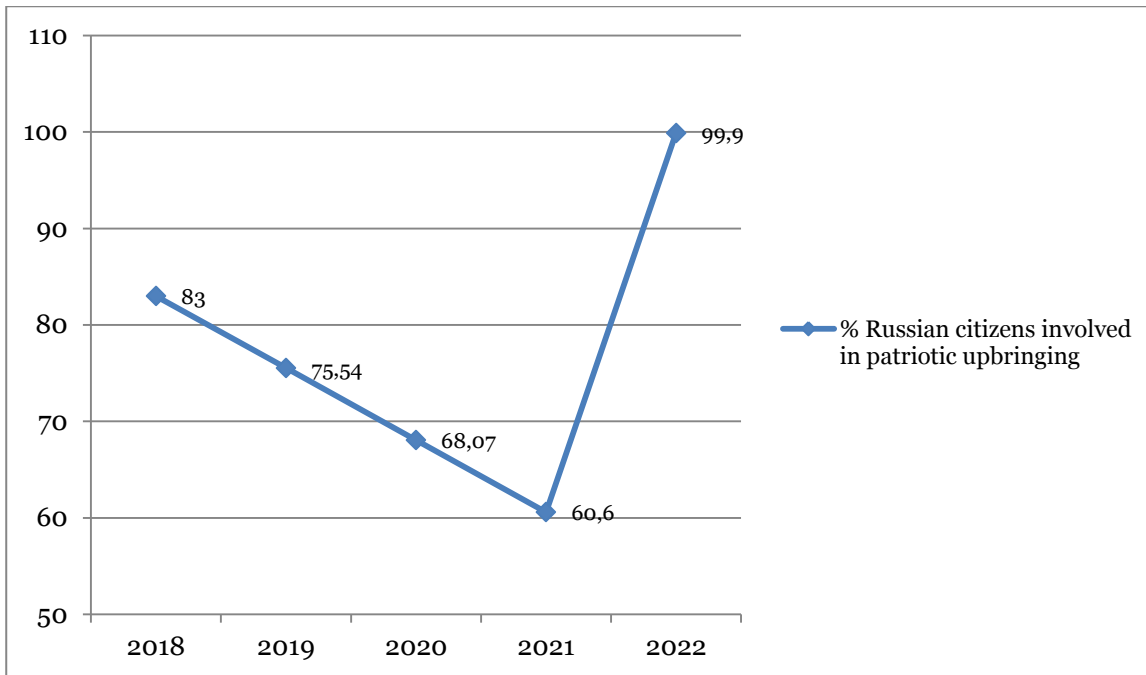
Today, the issue of the prevention of destructive phenomena among young people is of particular concern. According to Rosobrnadzor experts, the Federal Institute of Educational Quality Assessment (FIOKO) almost “half (48 %) of schools have a high level of destructive pedagogical practices – 30 % and more” (FIOKO, 2021), in addition, in “6 % of schools the value of this index is more than 50 %” (FIOKO, 2021) (Figure 1).



**Fig. 1.** Destructive phenomena index among youth

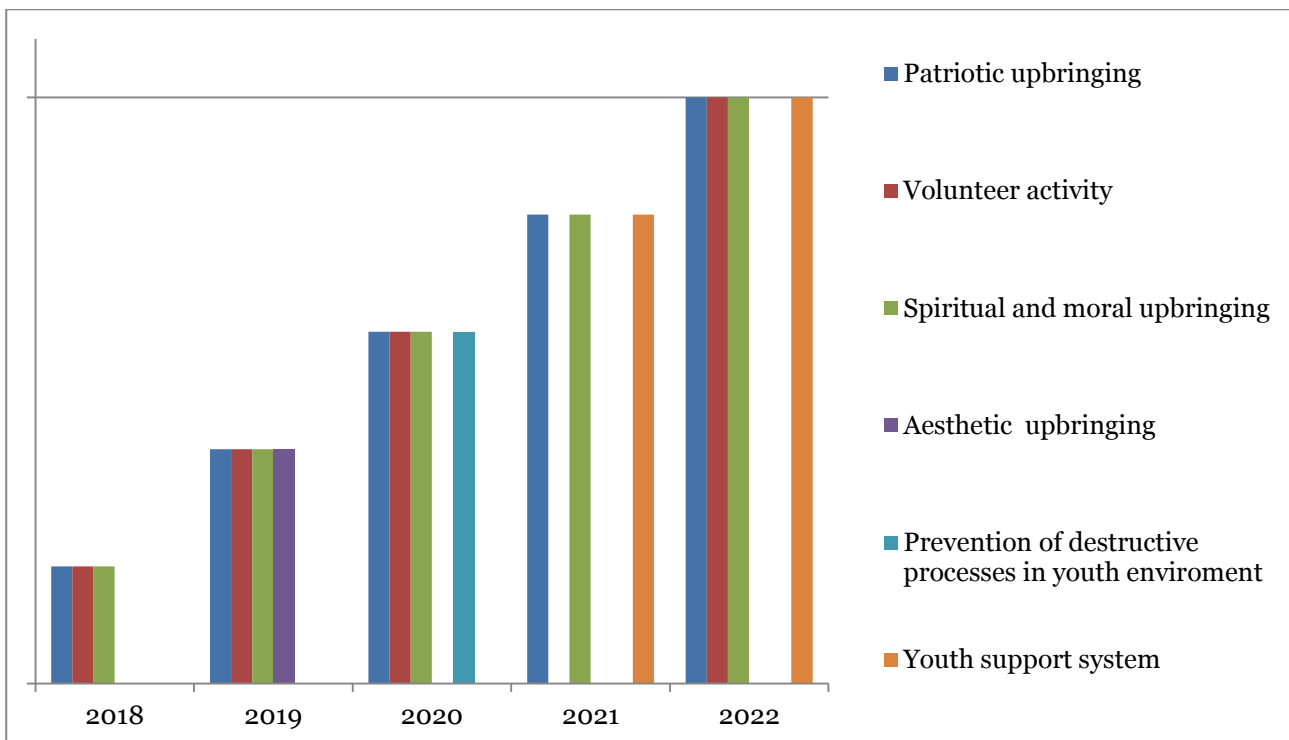
Of course, such facts raise many questions about organization of the upbringing process at school level.

At the state level, however, considerable attention is now being paid to various types of upbringing activities. For example, if we take the sphere of patriotic nurturing of Russian citizens, the involvement of Russians in the implementation of these measures over the past five years is gradually increasing (with the exception of two COVID years 2019–2020) (Itogovyj otchet..., 2019; Doklad, 2020). In 2018, 83 % of young Russians were involved in patriotic nurturing in Russia (Itogovyj otchet..., 2018). In 2021, after the gradual abolition of quarantine restrictions, it was already 60.6 % of Russian youth (Itogovyj otchet..., 2021). This trend was raised to 99.9 % in 2022 (Doklad Pravitel'stva RF, 2022) (Figure 2).



**Fig. 2.** Patriotic upbringing of Russian Citizens

It is necessary to note the quantitative increase in various types of educational events organized in the modern education system in Russia. (Figure 3). Patriotic, spiritual and moral upbringing is carried out throughout the period under study. However, if the prevailing value from 2018 to 2020 (Itogovyj otchet..., 2018; Itogovyj otchet..., 2019; Doklad..., 2020), and also in 2022 had volunteer activity, so since 2020 attention is paid to prevention of destructive processes in youth environment, and since 2021 (Itogovyj otchet..., 2021) to 2022 (Doklad Pravitel'stva RF, 2022) a support system for young people is being implemented.



**Fig. 3.** Types of educational activities



When studying the opinion of the first-year law students of MIREA, it should be noted that a significant number support the idea of implementing patriotic education. The percentage of students (P) supporting patriotic education among university students can be obtained by dividing the number of patriotic-minded students N by the total number of first-year students surveyed S and multiplying by 100.

Thus, 95 students study in three groups. 82 students support the idea of patriotic education, which is 86,31 % of students.

$$P = \frac{N}{S} * 100$$
$$P = 82:95 * 100 = 86,31 \%$$

In the educational process of higher education, the absolute priorities today should remain such activities, which are aimed at teaching and upbringing, as inseparable and complementary elements of a single whole. However, the question of a reality of the realization of upbringing activities, in relation to young, practically formed individuals, was repeatedly discussed in the scientific literature, but never received a clear answer. Opponents of the educational process note that students in universities are adults and sufficiently formed individuals who do not need upbringing, and the most important goal of the university is, first of all, professional, not nurturing training. Therefore, the dominance of such an opinion in the nineties of the last century led to optimization (reduction) of educational work with students (Selivanova, 2013: 5, Kiselev, Kiseleva, 2014: 29).

However, practice has shown that it is quite important to develop and carry out upbringing activities not only at a pre-university level of education, but also in higher education, and within the entire Russian State, not limited to one or more federal entities. There was a need to update an upbringing process, combining historically traditional forms of nurturing activity and modern, innovative approaches. One should not forget the forms of upbringing activity that have developed in the past, even in Soviet practice, where the main goal was to continue harmonious and all-round human development, contributing to the formation of his active life and professional position within the Komsomol structure (for example, organization of problem discussions, military-patriotic games, actions in support of various ideological and political events in the country, video shows and discussion of films, etc.). In addition to the Komsomol, higher education institutions have used forms of work carried out with help of creative extracurricular activities, including various competitions for creative youth, the organization of amateur clubs, etc.

In the transition period of 1990s after the state-political changes “in the country there was a complete and often unjustified renunciation of the legacy of Soviet period, including a whole system of upbringing in higher education” (Akopova, Baranova, 2010: 112). Due to the socio-economic crisis, the difficult material situation of educational institutions, including higher education, many universities have a vacuum in upbringing effectiveness. There was a general decline of moral foundations in the society, in a youth environment intensified: loss of interest in traditional values and moral foundations, “group egoism, complex of social inferiority” (Akopova, Baranova, 2010: 112) and etc. The Russian “de-ideologized society” could not fill the ideological void. Their roles were often performed by random ideals that could not form the basis for serious upbringing work within educational process. Russia did not receive a new educational concept of similar social significance during the transition period of the 1990s, instead of the destroyed communist upbringing system.

The change in political paradigms and ideological guidelines in the 90s of the last century led to a transformation of the social and everyday principles that existed among the youth of Russia. The real threat to the future of the Russian state was the selfish, and sometimes consumerist, “predatory” attitude towards society and public life among the rising young generation of Russians, with whom highly ideological educational work was practically not carried out. In addition, the life values and guidelines have changed not only among young people, but also among the entire Russian society, since the creation of a “consumer society” entailed a change in authoritative and respected heroes, changed moral principles, and deepened intergenerational contradictions.

Today among young people there are often such disturbing factors as a morbid addiction to various computer games, “going into the virtual world”, the reluctance of young people to participate in the public life of not only their educational institution, but also the city, village, town in which they live

The resumption of educational forms of work in Russian educational institutions today is a necessity dictated by the times. However, modern Russian universities are faced with problems of different understanding of the purpose of educational activities, its tasks, methods and forms of its implementation. In addition, in a number of cases, universities, when implementing the educational function, have difficulties with the system of organization outside of academic work. Therefore, there was a need to eliminate these gaps by developing unified approaches, creating not only a methodological, but also a scientific basis for the implementation of educational activities in universities, enriching pedagogical science.

According to N.N. Kiselev, E.V. Kiseleva, in the Soviet upbringing model, a mass character of educational activities had not only a positive effect, but also suffered damage to the “individual trajectory of personal development” (Kiselev, Kiseleva, 2014: 29). The modern student possesses a different way of thinking and a different system of values, as well as world views in contrast to students of the Soviet period. Today in the educational activities of universities some achievements of the Soviet educational model are applied, including the conduct of KVN, the organization of student trade unions, competitions, games, etc. Such events stand “apart” from educational process, as an extracurricular component, and modern students are more entertained rather than nurtured.

The Russian legislator realized the strategic importance of not only the development, but the implementation of an innovative and modern concept that lays the organizational foundations for educational activities in higher educational institutions.

Thus, in 1999, a similar program was approved, highlighting the emerging trends in the educational process as a whole in the country, which was intended to last for three years (Programma razvitiya..., 1999).

Every educational organization needed to implement an upbringing system as a part (element, component) of educational process. The most important point of this program is “the rejection of the doctrine of upbringing work. It clearly states the principle of the variability of nurturing systems, organizations, forms and methods” (Akopova, Baranova, 2010: 113). Thus, according to M.A. Akopova, T.A. Baranova, the main difference of this program from the Soviet upbringing program is: “de-ideologization of nurturing, in particular liberation from political doctrine” (Akopova, Baranova, 2010: 113). It laid down the imperative of personal orientation in upbringing, i.e. goals, objectives, content, methods of upbringing were determined on the basis of needs and interests of a student as a person, and not on the basis of interests of the State as a whole.

However, for many reasons of a human, financial and economic nature, in practice it was not always possible to create adequate conditions for development of an upbringing system.

The Russian legislator in the 2000's years developed strategic documents that formulated theoretical and empirical provisions on a most important tasks, conditions and process of upbringing in our country. These include the following:

- “National Doctrine of Education in the Russian Federation”, published by Decree of the Government of the Russian Federation N 751, was a fundamental act that determined not only the goal of education as part of the educational process, but also the ways and means of its implementation. This doctrine determined such a strategy until 2025 (Postanovlenie Pravitel'stva RF ot 04.10.2000, 2000);

- “The Concept of Modernization of Russian Education for the Period until 2010”, contained the principles of Russian educational policy, which developed the most important principles of Russian educational policy, reflected in the Federal Law “On Education in the Russian Federation”, the Federal Law “On Higher and Postgraduate Professional Education” and the above-mentioned “National Doctrine” (Kontseptsiya..., 2002);

- The program for the development of education, operating at the federal level for five years starting in 2000, and laying the organizational foundations for the entire state educational policy (Federal'nyj zakon ot 10.04.2000, 2000).

In addition, a number of programs were adopted that define a system of ideas, a set of state policy trends for their implementation in the field of education (Postanovlenie Pravitel'stva RF ot 27.12.2000, 2000; Postanovlenie Pravitel'stva RF ot 16.02.2001..., 2001; Osnovnye napravleniya..., 2002).

In 2017, a new priority state educational program begins to be implemented (Postanovlenie Pravitel'stva RF ot 26.12.2017, 2017).

It reveals one of the most important elements of the educational system for young people – a volunteer activity (para. 4), which already has state support. In addition, the program obliged all

educational institutions and organizations realizing General Education Programs, Secondary Vocational Education Programs and Higher Education Programs to implement work programs of upbringing, as well as upbringing work schedules. In 10 pilot regions from 2021, according to the program will be organized in general education organizations different types of work for director's advisers in the field of upbringing (Section III).

Today Russian "society is in the process of radical changes" (Rechkalov i dr., 2023: 72). The legislator pays considerable attention to the sphere of patriotic upbringing of youth.

In this regard, a federal project is already in place, which operates from 2021 to 2024 (Federal'nyj proekt, 2021). In addition, conditions are being created for the self-realization of youth, which are regulated by the federal project "Youth of Russia" (Federal'nyj proekt, 2019), which has been in force since 2018. until 2030. The project is aimed not only at creating conditions for self-realization of modern youth, but also at developing infrastructure.

However, the modern approach to the organization of the upbringing process should take into account the specifics of the Russian student of the XXI century, individual and psychological features, as the student should be at the center of the learning process. Only in this case "the main goal is realized – that is the nurturing of the personality" (Bondarevskaya i dr., 1997).

Instead of traditional upbringing, today the course is taken on a personal-oriented vocational education, where the free personality is promoted. In the implementation of this approach, the interaction of the subjects of the educational process is possible in the context of the development of students' ability to self-education and self-realization in the domestic and professional spheres (Akopova, 2003: 5), developing a high level of self-consciousness, dignity, discipline. Such a subject of upbringing process should respect the opinion of other people, be able to make a competent decision, have a high level of legal culture, spirituality and morality.

Modern educational trends are based on taking into account personal trajectory and an individual approach to the individual. Upbringing is no exception. This is evidenced by the significant research carried out by Russian scientists whose works are the basis of this article. Among them it is necessary to mention the following: O.A. Kalimullina, focusing on the problem of improving the "social well-being" of students, as well as offering options for creating a socio-cultural environment at the university, bringing up the personality in accordance with modern trends, existing in the Russian higher education system (Kalimullina, 2017); V.P. Zeleeva, who assigns a significant place in the upbringing process to the curator in the student group, characterizing his activities from the standpoint of the conditions of the organization of his work at the university, by disclosing the issues of functional responsibilities, types of curators, the main elements that make up the system of curatorship (Zeleeva, 2011); E.I. Luneva, analyzing the role and functions of the curator in the process of organizing upbringing activities in a student group during the change of the axiological component of the personality itself (Luneva, 2016); G.F. Tereshchenko, putting forward the idea of rethinking modern methods and methods of educational activities among students, through the use, among other things, of the most common technologies in the educational work of universities, including web quests, various PR technologies, volunteer activities, debates and flash mobs, etc. (Tereshchenko, 2017); L.I. Yakobyuk, representing upbringing as a process of constant and systematic, as well as purposeful influence on the spiritual and physical development of an individual in order to prepare him for professional activity, develop value orientations that contribute to the formation of a highly moral personality that also realizes itself in the social and cultural spheres (Yakobyuk, 2014).

It is important to combine tradition and innovation as the basis for creating and applying a modern model of university upbringing activities, including various forms of nurturing, because vocational training should not be limited to the acquisition of certain competencies by students. A university must also implement an upbringing system that promotes the vocational training and personal development of the young generation. There was a need to develop the author's concept of the organization of upbringing work at a university, which should be understood as a systematic statement "ideas, theoretical grounds, principles that allow to form a holistic picture of the process (system) of upbringing and to outline the ways of their development and (or) transformation" (Borytko, 2001: 159).

Therefore, the aim of this study is the conceptualization of the modern model of university upbringing, allowing to use ontological representations about its structure, functions, mechanism of implementation in practice. The proposed concept of a modern model of university upbringing allows effectively solve the problems of nurturing at the university and it is focused on the

development of a socially significant and socially useful personality as a strategy goal of upbringing work in the university of the XXI century.

## **2. Materials and methods**

This scientific study used the regulatory legal acts of the Russian Federation regulating the educational, training and development activities of universities.

Excerpts are provided as explanatory material to help ensure the objectivity of comparative analysis. For comparison of different scientific positions in the work judgments of scientists are given. The use of a wide range of scientific materials and normative empirical basis has made it possible to ensure objectivity in assessing the facts presented in scientific research.

This paper uses such methodological principles underlying the analysis of empirical data as: the principle of consistency and the principle of self-organization. The first allows the received data to be brought into the system by structuring them. The application of the principle of self-organization will allow synergetic ordering of the data obtained.

The present study is based on the application of a comparative method that allows not only to identify the content features of key definitions and concepts, but also to compare them as the most important initial categories. The application of the comparative method is based on the process of systematization and structuring of the obtained data.

In the course of this work, empirical methods were applied, which made it possible to compare the Soviet, post-Soviet and modern model of university upbringing, by comparative analysis and “structural analysis” (Perova i dr., 2023: 39) the features of modern upbringing work at the university were revealed, the essential characteristics of the model of upbringing and developed the bases of its formation.

The modern model of university upbringing was developed due to the application of the observation method as well.

Methods of analysis, generalization, and synthesis were also used. They made it possible to reveal the process of organizing educational activities at the university, its content and structure. This certainly contributes to the understanding of its value and essence by the subjects of the educational process. Therefore, in the present work:

- substantiated the details and features of the organization of upbringing activities in the university, which allows you to apply individual and personal approach in the course of the educational process;
- developed a modern model of upbringing activity in the university, which can serve as a fundamental theoretical basis for the organization of this process;
- the technology of implementation of the model of upbringing activity in the university, which contributes to the development of relevant competencies, has been proposed.

## **3. Results**

The model of upbringing can be called a unique pattern (standard, sample, matrix) of upbringing, realized in real established practice. The components of such a template are not only the subjects, objects of the upbringing process, but also the purpose, the conceptual basis of the process, as well as the structure, functions and mechanisms of upbringing work.

When forming the model of upbringing it is necessary to systematize (encode) “old knowledge”, as well as to unify the widely distributed modern information. It is important to understand the basics of systematization of structural components of the modern model of university upbringing, as without them the model will be only a set of individual details, and not a complete, well-functioning mechanism. Therefore, it is necessary to study not only the essential characteristics of upbringing model, but also the basis of its formation.

The modern process of organization of university upbringing activity often faces many problems and difficulties. Among them:

- the problem of contradictory moral and value ideals;
- socio-economic uncertainty of the development of young generation;
- ineffectiveness (or low efficiency) of the educational process because of its treatment as a “minor or secondary” case or because of the unevenness in the levels of implementation of upbringing activities in various structural units (institutes, faculties) of university, etc.

It is necessary to find mechanisms to stimulate all participants in upbringing activities and to monitor the implementation of such activities, highlighting both positive and negative aspects of this process.

As one of the most important components of the activities of universities, upbringing work has its own characteristics. So, the student today – a person who can carry out self-upbringing, using their own potential to solve the most important social problems and tasks. Such a person can interact in the process of upbringing with various social and administrative structures within university (for example, participation in a student-teaching community) and outside it (for example, an organization and participation in outings, trips).

Of course, today there is a practical need to implement a system of educational measures in the context of the introduction of the Federal State Educational Standard. In Art. 2 of the Federal Law “On Education in the Russian Federation” dated December 29, 2012. N 273-FZ, education is understood as purposeful activity that promotes personal development, as well as the creation of “conditions for self-determination and socialization of students” (Federal'nyj zakon ot 29.12.2012, 2012) based on the application of “sociocultural, spiritual and moral values and rules and norms of behavior accepted in Russian society” (Federal'nyj zakon ot 29.12.2012, 2012), and not only in interests of the individual, family, but also of the whole society and even the state, as well as the formation in students of a sense of patriotism, citizenship, respect for the memory of the defenders of the Fatherland and the exploits of the Heroes of the Fatherland, law and order, working people and the older generation, mutual respect, respect for cultural heritage and traditions of the multinational people of the Russian Federation, nature and the environment” (Federal'nyj zakon ot 29.12.2012, 2012). On the basis of this definition, the Russian legislator has clearly enshrined not only the goal, but also the tasks for the full implementation of upbringing work in educational institutions at all levels, including universities.

Experts of Rosobrnadzor, Federal Institute of Education Quality Assessment (FIOKO) rightly note that clearly formulated targets allow “to measure the used methods of upbringing and achieved results” (FIOKO, 2021). Developing this idea, it is necessary to modernize the organization of upbringing work (including extracurricular work at the university). Therefore, a variant of the authors' generated model of the organization of upbringing work in the university, allowing to form the required federal state educational standards of competence in students, has been proposed. This model is characterized by system connections, within which there are features that distinguish the “system” from other similar phenomena. (Table 1).

**Table 1.** Structure of upbringing process model

Model of organization of upbringing process						
conceptual framework of the upbringing process	upbringing process structure	mechanisms of realization of upbringing work	subjects	objects	upbringing purpose	upbringing function

The scope of this article does not allow a detailed consideration of all elements of the model of upbringing. However, it is important to disclose, first of all, not only the conceptual basis of the upbringing process, but also its structure and practical mechanisms for the implementation of upbringing work at a university. (In the subsequent study, the authors touch upon the consideration of such elements of the model of upbringing as: subjects, objects of the upbringing process and features of their interaction, as well as the purpose and function of upbringing work).

The conceptual framework of the upbringing process or the original values, guidelines provided in the model of upbringing should include various approaches that contribute to the creation of a university conditions for personal growth and development of a student, for his professional development.

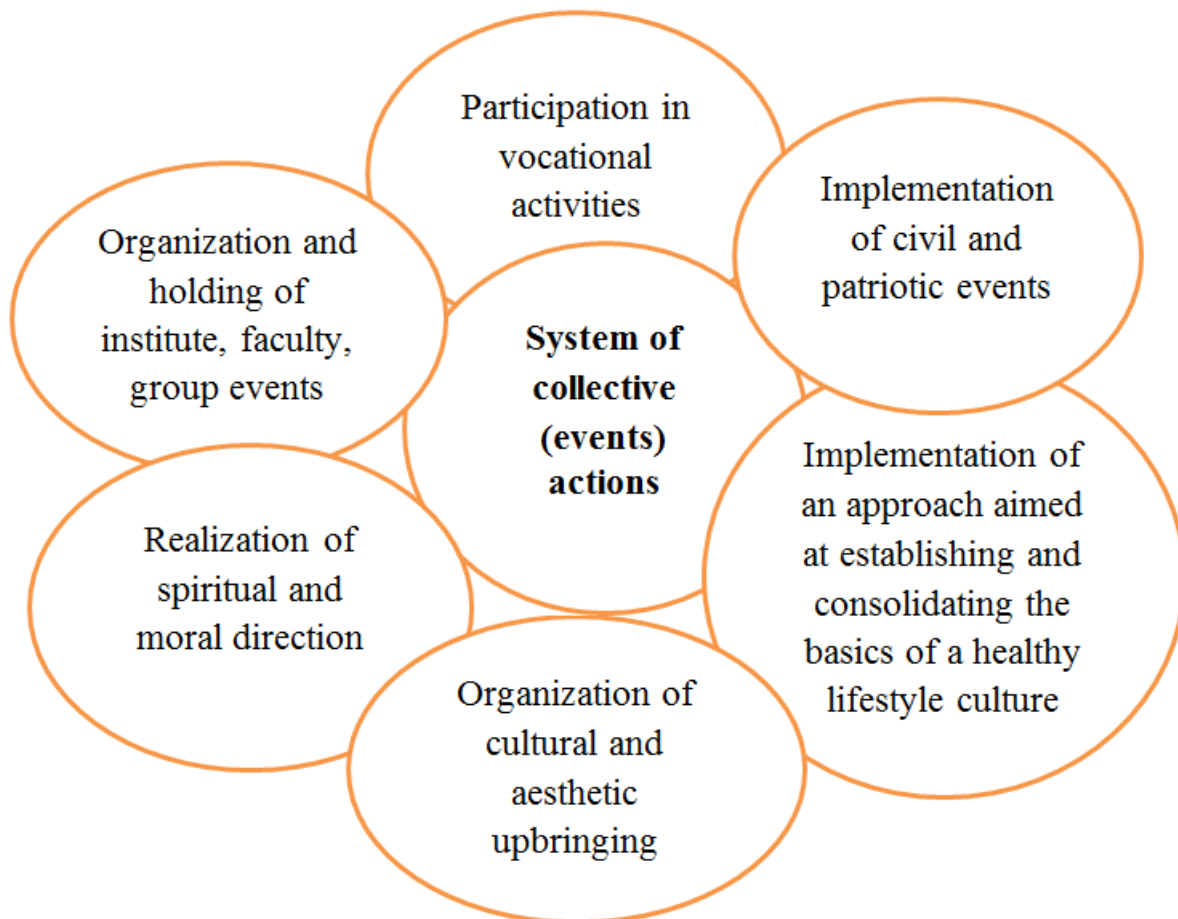
In foreign countries, a similar educational system is used. It is “understood as personality-oriented, capable of adequately orienting graduates to the specifics of modern corporate society” (Belyaev, 2013: 44). In foreign education systems, “three educational practices are practiced” (Belyaev, 2013: 44).

We are talking about three main models of "multicultural upbringing: incorporating, integrative and multicultural" (Belyaev, 2013: 44). In the modern Russian concept of upbringing activity, it is necessary to take into account foreign experience and combine these models of multicultural upbringing.

We cannot exclude also the systemic approach, in the implementation of which all elements of the upbringing process are not only interrelated and interdependent, but also mutually integrated, providing a systemic upbringing impact on the formation of future professionals. Action and value-orientation approaches also are very unimportant. The first of them allows to implement an upbringing process at a university through certain activities, including significant types that exert influence on students. The latter approach allows student to interiorize the most important and significant values characteristic for the future professional.

The structure of the upbringing process organization at a university can be presented in a form of a collective events system, which will be a system-forming type of a teacher's and student's community activity (Figure 4). Moreover, all the measures and directions envisaged should be fully implemented.

The collective events system, including various activities (actions, events, approaches) is aimed at achieving the respective goal and objectives. And each block of activities solves only certain tasks.



**Fig. 4.** Structure of the upbringing process at the university

Setting themselves a goal of upbringing work at a university – creation of a developing and active youth environment in a student community, organizers should determine the objectives that will allow to achieve a certain goal.

Thus, the participation of students in professional and practical activities develops their readiness for integration and involvement in the student environment, as well as help to “learn to learn”. Organization and holding of institute, faculty, group events allows to form a cohesive, unified goal of student collective; to create an active initiative group of students; to develop social,

national, religious tolerance; to inform not only of the university's possibilities but also of other cultural and educational institutions.

Carrying out spiritual and moral events promotes tolerance and the formation of humane values in the student community. The organization of cultural and aesthetic direction in upbringing work will contribute to the creation of corporate university (institute, faculty) culture. The implementation of civil and patriotic affairs makes it possible to raise a patriotic person who is responsible to his homeland, as well as to involve in active university (institute, faculty) life. Implementation of the approach aimed at formation and consolidation of the basis of the culture of healthy lifestyle will not only involve students in active university life, but will also bring a positive attitude to sports and healthy "dress code" (Table 2).

**Table 2.** System of collective upbringing activities and tasks permitted by them

<b>Activities</b>		<b>Tasks to be undertaken</b>
I.	Professional and practical activities	- develop readiness for integration; - "learning to learn"
II.	Institute, faculty, group activities	- form a cohesive team; - create an active initiative group of students; - develop tolerance; - inform about the possibilities of the university, cultural and educational institutions
III.	Spiritual and moral direction	- raise morality and shape values
IV.	Cultural and aesthetic direction	- promote corporate university culture
V.	Civil-patriotic complex of activities	- allow to raise patriotic person; - to engage in active university life.
VI.	Building and consolidating a healthy lifestyle culture	- inculcate a positive attitude towards sports and healthy lifestyle.

Thus, in the implementation of the system of collective upbringing measures presented, a goal and tasks that contribute to effective organization of the model of upbringing work in the university will be achieved.

#### 4. Discussion

Today in science there are many concepts of upbringing, developed by the most authoritative scientists. So, the concept of personal-oriented nurturing (its author E.V. Bondarevskaya) (Bondarevskaya i dr., 1997), includes a value-sense direction in the field of education, in which the student, as a person is at the center of the educational process, in which one of the most important objectives is the upbringing of the personality. In addition, the concept developed by a group of psychologists led by I.A. Zimnyaya (Zimnyaya i dr., 1998; Zimnyaya, 2006; Zimnyaya, 2006a), they consider education to be a certain process of shaping the attitude of a particular individual to the world around him. Based on the positioning of an individual, the concept of M.I. Rozhkov is formed (Rozhkov, Bajborodova, 2023).

The author's concept presented by I.M. Il'inskii (Il'inskij i dr., 1995), P.I. Babochkin (Babochkin, 2000), is aimed at the formation of a viable, active generation through their activities.

The analysis of the outlined concepts showed that the educational process is perceived by most of the authors as a process occurring in society, contributing to the determination of trends in the management of personality development through the upbringing environment, the motivation of students, and through the identity of the teacher.

In addition, many researchers discover the theoretical and empirical basis of upbringing in students of various specialties (Pocius, Malinauskas, 2022), offer ways to improve the legal culture of students (Ashirova et al., 2022), study the psychological and pedagogical conditions for the organization of upbringing activities within the framework of students' independent work (Kosshyugulova et al., 2022), develop an exemplary programme of upbringing, first of all, of a

socially active person (Kagerman'yan, 2003), answer questions of organization of educational space of the university (Selivanova, 2013: 5, Kiselev, Kiseleva, 2014: 29), etc.

However, a lot of questions about practical implementation of the concept of modern model of upbringing in the high school require considerable development.

## 5. Conclusion

Thus, there is no doubt that today there is a need to revise the established attitude to the upbringing process and its organization in a university. The considerable experience gained in previous decades should be used as it will enrich the modern upbringing model. In the current process of the ongoing reform of the entire system of Russian education, it is important to maintain a personal approach in the system of upbringing. Efficiency in the implementation of real nurturing work at the university is possible if the requirements for the development of the upbringing system are increased both by the educational institution and by the State, as well as with active State support.

Applying the concept of the modern model of university education at a university proposed by the authors, we can:

- create conditions for creativity;
- harmoniously and comprehensively develop and socialize the individual as a citizen of the Russian Federation;
- to achieve the formation of an individuality that is humanistically oriented towards society;
- to reveal the creative and spiritual potential of students.

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## Class Management Focussing on Family-School Collaboration – Research Findings

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### Abstract

The authors present partial research results monitoring the educational needs of class teachers at the secondary level (ISCED 2; ISCED 3) of education in Slovakia. Research aims to develop tools to improve the readiness of future lower secondary and upper secondary school teachers for their complex work as class teachers. The research sub-objective is to find out whether there are differences in the educational needs of the class teachers in the area of collaboration with the student's family. Since no standardised research instrument had been developed that specified the needs of class teachers in the past, we applied a questionnaire of our own design, "Educational Needs of Class Teachers", to the data collection. The method of statistical inference was the Mann-Whitney U-test. The sample consisted of lower and upper secondary teachers performing the specialised activity of class teachers (n = 266). Conclusions: Teachers with longer experience as class teachers subjectively perceive a lower educational need in selected collaboration indicators with the student's family than teachers with shorter experience as class teachers. Both lower secondary school teachers and vocational school teachers perceive a higher educational need in selected collaboration indicators with the family compared to grammar school teachers.

**Keywords:** educational needs, class teacher, family, collaboration, professional training, ISCED 2, ISCED3, verification of research instruments.

### 1. Introduction

Effective collaboration between school and family is seen as the basis for quality and satisfaction in education and training. The effectiveness of education and training at school is based in many ways on and related to the quality of collaboration between school teachers and student's parents. The limits of this collaboration are mutual and are mainly influenced by the willingness to collaborate. There is still a significant gap between Slovakia and other countries in

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this area. Unlike the United States, which is actively researching the topic of school-family partnerships, they also have a lot more research available. There are family-school collaboration programmes in use that are actively applied in practise, from which we can say that they have a positive impact. In Slovakia, the issue of school-family partnership is in the development stage. Furthermore, the amount of literature and preparation necessary for future teachers to communicate and collaborate with parents of students absent (Frýdková, 2010). The national education policy has always placed a high priority on teacher education (Oňušková, PISOŇOVÁ, 2022). Furthermore, the quality of professional preparation for teachers remains a prominent topic in discussions regarding changes in content in undergraduate teacher preparation programmes at universities. According to Hermochová (2012), we consider that the current state of undergraduate teacher preparation is inextricably affected by the fact that class teacher competencies are not adequately covered in university curricula as a standard practise in the faculty of education. Although, in some faculties, these forms of preparation are already being implemented, in the belief that teachers in the role of class teachers will be competent enough to influence the personal development of their students and their relationships with each other, as well as prepare them not only professionally, but also humanly (Hermochová, 2012).

The aim of the KEGA project 066UK-4/2021, of which the research tool is presented here, is to contribute to content changes in the university education of teachers in the field of classroom management. It seeks to contribute to the development of professional key competencies of the class teacher in the area of classroom management and organisation, coordination of the classroom team, educational activities of the class teacher, in the area of collaboration of the class teacher with legal representatives of students, school management, other pedagogical and professional staff of the school, or other school partners, also in the area of pedagogical diagnostics and preventive activities of the class teacher. In addition to the research outputs, the Web portal will also feature a publication, a university textbook, for classroom management in electronic format, based on the results of the applied research and focussing on the activities of the class teacher, which are absent in our current educational system.

## **2. Theoretical background**

The roles of the teacher and the class teacher overlap in many ways; however, they are not identical. The position of a class teacher carries several specific tasks and expectations associated with it. According to the Slovak legislation, teachers can perform several specialised activities (§ 36, Law n. 138/2019), and the most widespread specialised activity is that of a class teacher, which in Slovakia (for illustration) was performed by 34.2 % of teachers in 2016 (Rehúš, 2017). Instruction of the Ministry of Education of the Slovak Republic no. 39/2017 issued professional standards for pedagogical and professional staff, which also includes the professional standards of class teachers. The class teacher standard, among other things, names activities for which the class teacher as a specialist is responsible, and it is at the same time the basis for the development of specialisation training programmes. It is also the basis for the content of the undergraduate preparation of students in teacher education programmes.

However, valuable information can also be gleaned from teacher research in general that is more closely tied to the position of the class teacher, as will be discussed in the following. Novice teachers, as well as novice class teachers, encounter many difficulties at the beginning of their practise and often perceive that their previous pre-service preparation is insufficient (Johnson et al., 2014; Jones, 2006). Teachers often judge pre-service preparation as too 'theoretical', even though pedagogical practise is also an important part of it and enables prospective teachers to apply the knowledge gained from theoretical training to practise (Sirotová, Michvocíková, 2019). In earlier research on novice Czech teachers (n = 141), Šimoník (1994) reports that the beginning of a teacher's career is often accompanied by disappointment from previous faculty preparation, which is "saturated" with theory, and novice teachers perceived the main shortcomings of pre-service preparation in the areas where they expend most of their effort; these areas included (among others) individual conversations with parents of students and conduct parent-teacher meetings. Similarly, Havlik's research (2002) on novice Czech teachers (n = 315) revealed the perspectives of teacher graduates on how they were prepared for their profession by faculty. Young teachers retrospectively gave specific examples of what was lacking in the content of their preparation, again citing communication and collaboration with parents as one of the areas absent from their undergraduate preparation. The lack of preparedness of pre-service teachers has also

been confirmed by research conducted in Slovakia, where, for instance, Valkovičová (2008), in her research on pre-service teachers' perceptions (n = 17), pointed out that although pre-service teachers perceived their preparedness in the field as sufficient, they reported the need to improve their skills in solving relational problems, not only at the level of the teacher-student relationship but also at the level of the teacher-parent relationship. More recent international Czechoslovak research on the induction of novice teachers (Vitečková, Gaďušová, 2015; Záhorec et al., 2023) came to similar conclusions, aiming to understand the needs of novice teachers, including reflexion on the experiences and challenges that teachers face right from the beginning of their practise. One of the research questions investigates how novice teachers in Slovak (n = 132) and Czech schools (n = 148) evaluate their pre-service training in relation to their current teaching practise. In both countries, a lack of preparedness was identified in the area of communication with parents (among others).

Research that focusses more narrowly on the class teacher is rather marginal, either in the domestic or foreign literature. In the Czech environment, Krátka (2007) has carried out research as part of her dissertation. One of her research questions was how class teachers perceived the difficulty of their profession. Among the areas named by class teachers was also collaboration with parents (Krátka et al., 2020). Omerdić, and Riđić (2017) claim that today everyone talks about a partnership between teachers and parents. Partnership relationships between teachers and parents mean that the child is at the centre of every activity they do. The research of Bacúšan Nevoľna (2023) confirmed the above, Slovak teachers (n = 290) consider this partnership necessary to strengthen the area of class teacher preparation not only for working with students during class lessons but also for working with parents. As Epstein (1992, p. 1141 in Symeou, 2006) argues, even the most ardent proponents of initiatives to involve families in schooling admit that the benefits will only be realised when families are aware, informed, encouraged, and involved. According to studies (Viktorová, 2020; Pohnětalová, 2015; Urbanovská, 2017 and others), teacher-parent communication is a significant source of stress and teacher burden. Teachers perceive working with under-cooperative or overly critical parents as challenging (Horká, 2022).

Another study shows that parental involvement in school life is rarely conscious and is rather involuntary. Parental interest in their child's progress in school appears to be the primary factor in their involvement. The degree of interest shown is determined by two very important indicators: the level of education of parents, which seems to have a considerable influence on the mode of collaboration and their standard of living (Omerdić, Riđić, 2017).

The lack of parental collaboration with the school was identified as one of the indicators of school risk behaviour in the investigation of child and young person risk behaviour, based on the results of a depistage questionnaire completed by class teachers in selected primary schools (n = 1509) (Smíková et al., 2018). Likewise, communication with parents and, students' problem behaviours are also among the significant sources of teachers' professional burden. Fazel et al. (2014) in this context described the so-called burnout cascade, where difficulties in managing student behaviour negatively affect the relationships between teachers and parents and the classroom environment, gradually damaging the mental health of both teachers and students. It appears from previous research that one of the key areas for which class teachers are underprepared and needs to be strengthened is the collaboration with parents (Šimoník, 1994; Lasky, 2000; Keyes, 2010; Havlík, 2002; Frýdková, 2013; Vitečková, Gaďušová, 2015; Martanová, Konůpková, 2019; Bacúšan Nevoľná, 2023). Among teachers, the class teacher is the one who is in most personal contact with parents. Furthermore, Martanova and Konůpková (2019), based on the results of their study, recommend including in the teacher training the teacher's communication with adults, especially communication in emotionally difficult situations, or preparation for class teaching (where, according to the authors, the class teacher solves communication difficulties the most).

### **3. Methodology**

The sub-objective of the research was to find out and compare whether there are differences in the educational needs of class teachers in the area of collaboration with the student's family. The educational needs of the class teachers in the subject area were compared with respect to the length of experience of the class teacher and the type of school in which he/she works as a class teacher.

Research questions and hypotheses

Are there differences in the educational needs of class teachers in the area of collaboration with the student's family due to the length of experience as a class teacher?

Are there differences in the educational needs of class teachers in the area of collaboration with the student's family due to the type of school in which the class teacher works?

Hypothesis 1: Class teachers differ in their perceived educational needs for collaboration with the student's family due to the length of experience as a class teacher.

Hypothesis 2: Class teachers differ in their perceived educational needs for collaboration with the student's family based on the type of school in which they work.

Research method

A self-designed questionnaire titled "Educational Needs of Class Teachers" was applied as the data collection method.

The questionnaire consisted of scaled (5-point Likert scale), closed, semi-closed, and open-ended questions. The overall validity and reliability of the questionnaire was verified through triangulation of research methods. As it was a non-standardised instrument, it was validated for its reliability in pilot tests (2022). The overall reliability was measured through the Cronbach alpha, the standardised reliability coefficient, and the correlation coefficient.

$$a = (k/(k-1)) * [1 - S(\text{si}^2)/\text{ssum}^2]$$

In this formula, the  $\text{si}^2$ 's denote the variances for the  $k$  individual items;  $\text{ssum}^2$  denotes the variance for the sum of all items.

The measurement findings indicated a high internal consistency of the questionnaire in question and ensured a reliable data collection from the research of Záhorec, Poliaková, and Zemančíková (2023). Data processing methods: statistical description and inference processed through a statistical computing programme. Taking into account the distribution of data, a nonparametric statistical test, the Mann and Whitney U-test, was chosen to test the hypotheses.

The semi-closed and open-ended questionnaire items in the research were complementary in relation to the scaled items. They will be the subject of further qualitative analyses of the research results. The overall validity of the research instrument used was verified through pilot testing. Subsequently, content validity was ascertained through expert judgment by 3 independent experts.

Research sample

The sample consisted of  $n = 26^1$  lower and upper secondary teachers performing the specialised activity of a class teacher according to the legislative provision of Section 37(2) of Act no.138/2019 Coll. on pedagogical and professional staff.

Random selection was applied using the RAND random number function.

The administration method was electronic and the principals of the drawn schools were contacted during the distribution of the questionnaire. The number of schools contacted was distributed proportionally to each region of Slovakia.

Of the total of the respondents, 232 (87.2 %) were female and 34 (12.8 %) were male, of which lower secondary teachers (lower secondary schools and lower secondary level of grammar schools) accounted for  $n = 113$  (42.5 %) respondents and upper secondary teachers (upper level of grammar schools of 8 years, 4-year of grammar schools and high schools...) accounted for  $n = 153$  (57.5 %) respondents.

The average age of the respondent was 45 years.

Regarding the length of experience as a class teacher, teachers with extensive experience as a class teacher (15 years or more) participated in the research in the largest number:  $n=107$  and, conversely, the least number of novice class teachers (up to 2 years of experience in class teaching experience):  $n=28$ ; then class teachers with 3-5 ( $n = 40$ ), 6-10 ( $n = 54$ ), and 11-15 (37).

#### **4. Statistical analysis**

Hypothesis 1: Class teachers differ in their perceived educational needs for collaboration with the student's family due to the length of experience as a class teacher.

The selected items of the questionnaire "Educational Needs of Class Teachers" were used as an indicator of perceived educational needs in the area of collaboration between the class teacher

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<sup>1</sup> In the analysis of the selected sub-outcomes, the number of respondents was lower because we had to exclude them due to incomplete responses. For instance, for the hypothesis in relation to length of experience, we worked with a total number of respondents of  $n = 251$ .

and the student's family, namely the subjectively perceived need for further education in the areas of: “new approaches to school-family collaboration”; “collaboration with parents with problematic attitudes” (uncooperative, hyper-protective, overly involved, etc.); “collaboration with parents of students with poor school performance, problematic behaviour, students with special educational needs” and “written communication with parents”.

The subjectively perceived educational need in each area was determined by the class teachers on a 5-point scale. The higher the value, the more urgent the perceived educational need.

**Description**

We first briefly delineate the central tendency measures of indicators of subjectively perceived educational needs of class teachers (CT) in the area of family collaboration that are valid for the entire sample. Starting from a Likert scale (1 – no; 2 – rather no; 3 – neither yes, nor no; 4 – rather yes; 5 – yes), teachers expressed the degree of subjectively perceived educational need in the area of collaboration with the family in the following areas: “new approaches to school-family collaboration”; “collaboration with parents with problematic attitudes”; “collaboration with parents of students with poor school performance, problematic behaviour, SEN” and “written communication with parents”. Among the four indicators of perceived educational need in the area of family collaboration, the most frequent option (Mod) was “rather yes” (4). The values of the median (Med), the mode (Mod), and the arithmetic mean (MR) reflect that on average teachers perceive their further education in the studied indicators of collaboration with the student's family to be mostly necessary. According to the MR (mean) values, we conclude that the most significant educational needs are perceived by class teachers in the area of “collaboration with parents with problematic attitudes” (mean = 3.823) and “collaboration with parents of students with poor achievement, problematic behaviour or with SEN” (mean = 3.887). The perceived need for additional training in “new approaches to collaborating with families” was on average slightly lower (mean = 3.504) and additional training in “written communication with parents” scored the lowest mean (mean = 3.086), indicating a subjectively lower perceived need for further training in written communication with parents on average.

**Table 1.** Descriptive statistics of the indicators of the educational need of CT in the area of family collaboration

<b>An indicator of educational need is “collaboration with the family”</b>	<b>N</b>	<b>Mod</b>	<b>Med</b>	<b>MR</b>	<b>SD</b>
Collaboration with parents with a “problematic” attitude	266	4	4	3,823	1,147
Collaboration with parents of students with poor grades, problematic behaviour, SEN	266	4	4	3,887	1,117
New approaches to family collaboration	266	4	4	3,504	1,173
Written communication with parents	266	4	3	3,086	1,296

In the next step, regarding hypothesis 1, we compare measures of central tendency (MR, Med., Mod.) of indicators of perceived educational needs in the area of collaboration with the family among teachers with different lengths of experience as class teachers. Comparing mean values (MR) concerning the length of class teacher experience, in all four measured indicators, teachers with longer classroom experience, i.e., 11-15 years and more than 15 years, show on average lower values of subjectively perceived learning needs in the area of collaboration with the student's family.

**Table 2.** Descriptive statistics of the indicators of the educational need of the CT in the area of collaboration with the family in relation to the length of experience of the CT

	<b>LENGTH OF PRACTISE</b>	<b>N</b>	<b>Med</b>	<b>MR</b>	<b>Mod</b>	<b>SD</b>
<b>Collaboration with parents with a “problematic” attitude</b>	0-2	25	4.000	<b>4.080</b>	5.000	1.115
	3-5	38	4.000	<b>4.000</b>	5.000	1.185
	6-10	50	4.000	<b>4.080</b>	4.000	0.853



	11-15	35	4.000	<b>3.686</b>	4.000	1.157
	more than 15	103	4.000	<b>3.621</b>	4.000	1.181
<b>Collaboration with parents of students with poor grades, problematic behaviour, SEN</b>	0-2	25	4.000	<b>4.000</b>	4.000	1.080
	3-5	38	5.000	<b>4.184</b>	5.000	1.111
	6-10	50	4.000	<b>4.220</b>	4.000	0.790
	11-15	35	4.000	<b>3.800</b>	4.000	1.079
	more than 15	103	4.000	<b>3.641</b>	4.000	1.187
<b>New approaches to family collaboration</b>	0-2	25	4.000	<b>3.560</b>	4.000	1.193
	3-5	38	4.000	<b>3.737</b>	4.000	1.201
	6-10	50	4.000	<b>3.640</b>	4.000	1.064
	11-15	35	4.000	<b>3.229</b>	4.000	1.285
	more than 15	103	4.000	<b>3.437</b>	4.000	1.126
<b>Written communication with parents</b>	0-2	25	3.000	<b>3.280</b>	4.000	1.370
	3-5	38	3.000	<b>3.184</b>	4.000	1.249
	6-10	50	4.000	<b>3.360</b>	4.000	1.208
	11-15	35	3.000	<b>2.914</b>	4.000	1.292
	more than 15	103	3.000	<b>2.932</b>	3.000	1.308

#### Inference

The distribution of the research population by experience is uneven. We tested the proportions using the Multinomial Test (tested against the expected proportions  $H_0$  (a)). This distribution of the proportions of the research population is significant.

#### Multinomial Test

$$\frac{\chi^2}{dfp}$$

$$H_0 (a) 72.900 4 < .001$$

Based on the distribution of the data in the set, we chose the type of non-parametric test<sup>1</sup>: Mann-Whitney U-test<sup>2</sup>; we set the significance level at 5 % (= 0.005).

The following significant differences were found between the studied groups regarding the length of experience in the indicator “collaboration with parents with problematic attitude”: Teachers with a length of experience as CT 3-5 years. (mean = 4,000) perceived a greater need for improvement in this area than teachers with more than 15 years of CT experience. (mean = 3,621). Additionally, teachers with 6-10 years of CT experience were more likely to report a higher level of improvement. (mean = 4.080) perceived a greater need for improvement in this area than teachers with more than 15 years of CT experience. (mean = 3.621).

Collaboration with parents of students with poor school performance, with problematic behaviour, with SEN: Teachers with 3-5 years of experience of CT. (mean = 4.184) perceived a higher need for improvement in this area than teachers with 11-15 years of experience. (mean = 3.800). Teachers with 3-5 years of CT experience (mean (1.800)). (mean = 4.184) perceived a higher need for improvement in this area than teachers with more than 15 years of CT experience. (mean = 3.641). Teachers with 6-10 years of CT experience were more likely to have a higher level of improvement than teachers with 6-10 years of CT experience. (mean = 4.220) perceived a greater need for improvement in this area than teachers with more than 15 years of CT experience. (mean = 3.641).

There were no significant differences between the study groups in the indicators “new approaches to collaboration with the family and written communication with parents”.

The measured data support hypothesis 1. Class teachers differ in their perceived level of educational needs in collaborating with the student's family due to the length of their classroom experience. Significant differences were observed in the indicators: “collaboration with parents with a problematic attitude” and “collaboration with parents of students with poor academic achievement, problematic behaviour or with SEN”. There were no statistically significant

<sup>1</sup> Normality testing was performed using the Shapiro-Wilk test.

<sup>2</sup> Normality testing was performed using the Shapiro-Wilk test. The data in each item did not come from a normal distribution. Therefore, we will use non-parametric tests to test for differences.

differences in the indicators “new approaches to collaboration with the family” and “written communication with parents” between the studied groups.

**Table 3.** Significant results of the Mann-Whitney U-test in the educational need “collaboration with the student’s family” in relation to the length of experience of the class teacher

	LENGTH OF PRACTISE	N	Med	MR	U	p
Collaboration with parents with a “problematic” attitude	3-5	38	4	4,000	2366.000	<b>0.046*</b>
	more than 15	103	4	3,641		
	6-10	50	4	4,080	3085.000	<b>0.036*</b>
	more than 15	103	4	3,641		
Collaboration with parents of students with poor grades, problematic behaviour, SEN	3-5	38	5	4,184	833.000	<b>0.049*</b>
	11-15	35	4	3,800		
	3-5	38	5	4,184	2534.500	<b>0.005**</b>
	more than 15	103	4	3,641		
	6-10	50	4	4,220	3268.500	<b>0.004**</b>
	more than 15	103	4	3,641		

Notes: Mann-Whitney U test. \*p<.05, \*\*p<.001, \*\*\*p<.001

Hypothesis 2: Class teachers differ in their perceived educational needs for collaboration with the student’s family based on the type of school in which they work.

Description

In the data collection, 10 categories of schools were identified, where teachers identified the type of school in which they performed the specialised activity of the class teacher: lower secondary school (lower secondary); 8-year grammar school (lower level of grammar school); 8-year grammar school (upper level of grammar school); 4-year grammar school (upper secondary); vocational school (upper secondary) with study fields; vocational school with apprenticeship fields (upper secondary); vocational school with both study and apprenticeship fields (upper secondary); conservatory, school of industrial design, sports school (upper secondary).

Due to the over-differentiation of the research set and the very large partial differences, we have grouped related school types into one set:

- 8yGS – 8-year grammar schools (both lower and upper levels);
- VOC – vocational schools (vocational schools with a study field, vocational schools with an apprenticeship field, vocational schools providing education in both study and apprenticeship fields);
- OTH – other schools (conservatory, school of industrial design, sports school).

Lower secondary schools (LSS) and 4-year grammar schools (4yGS) have been retained as separate categories.

**Table 4.** Descriptive statistics of indicators of CT’s educational need in the area of collaboration with the family in relation to the type of school

	TYPE OF SCHOOL	N	Med	MR	Mod	SD
Collaboration with parents with a “problematic” attitude	8yGS	16	4.000	<b>3.750</b>	4.000	1.065
	4yGS	52	4.000	<b>3.442</b>	4.000	1.349
	VOC	80	4.000	<b>3.950</b>	4.000	1.005
	LSS	94	4.000	<b>3.936</b>	4.000	1.096
	OTH	9	4.000	<b>3.889</b>	4.000	0.782
Collaboration with parents of students with poor grades, problematic behaviour, SEN	8yGS	16	4.000	<b>3.625</b>	4.000	1.088
	4yGS	52	4.000	<b>3.577</b>	4.000	1.273
	VOC	80	4.000	<b>4.088</b>	4.000	0.970
	LSS	94	4.000	<b>4.032</b>	4.000	1.062
	OTH	9	3.000	<b>3.111</b>	4.000	0.928

<b>New approaches to family collaboration</b>	8yGS	16	4.000	<b>3.625</b>	4.000	1.204
	4yGS	52	3.500	<b>3.212</b>	4.000	1.160
	VOC	80	4.000	<b>3.500</b>	4.000	1.201
	LSS	94	4.000	<b>3.649</b>	4.000	1.114
	OTH	9	4.000	<b>3.556</b>	4.000	1.014
<b>Written communication with parents</b>	8yGS	16	3.000	<b>2.625</b>	1.000	1.360
	4yGS	52	3.000	<b>2.865</b>	3.000	1.253
	VOC	80	4.000	<b>3.237</b>	4.000	1.324
	LSS	94	3.000	<b>3.181</b>	4.000	1.270
	OTH	9	3.000	<b>2.889</b>	3.000	1.054

From the data of descriptive statistics (MR values), it appears that on average, mostly lower secondary school class teachers and VOC school class teachers perceive a higher educational need in the indicators of collaboration with the family: “collaboration with parents with a problematic attitude”;

“collaboration with parents of students with poor grades, problematic behaviour, with SEN” and “written communication with parents”.

In the indicator “new approaches of collaboration with family”, the mean values (MR) of the perceived educational need of CT of all the schools surveyed – except for 4yGS teachers – were close to each other. The descriptive data show that 4yGS teachers perceived on average a lower need for training in new approaches to family-school collaboration compared to teachers of other schools.

#### Inference

Despite the above adjustment of the set concerning school type (merger of related schools), the set is significantly skewed in terms of proportions. We tested the proportions using the Multinomial Test (tested against the expected proportions  $H_0$  (a)).

However, except for the other schools (OTH), the other proportions are represented at least slightly more abundantly than they were originally, which allows us to perform difference testing via non-parametric tests. The chosen statistical test was the Mann-Whitney U-test.

#### Multinomial Test

$$\chi^2 \quad \text{df} \quad \text{p}$$

$$H_0 (a) \quad 111.075 \quad 4 < .001$$

**Table 5.** Significant results of the Mann-Whitney U-test in the educational need “collaboration with the student's family” concerning the type of school

	TYPE OF SCHOOL	N	Med	MR	U	p
<b>Collaboration with parents with a "problematic" attitude</b>	LSS	94	4.000	<b>3.936</b>	<b>1959.500</b>	<b>0.037*</b>
	4yGS	52	4.000	<b>3.442</b>		
	VOC	80	4.000	<b>3.950</b>	<b>1672.000</b>	<b>0.047*</b>
	4yGS	52	4.000	<b>3.442</b>		
<b>Collaboration with parents of students with poor grades, problematic behaviour, SEN</b>	LSS	94	4.000	<b>4.032</b>	<b>1956.500</b>	<b>0.035*</b>
	4yGS	52	4.000	<b>3.577</b>		
	VOC	80	4.000	<b>4.088</b>	<b>1628.500</b>	<b>0,025 *</b>
	4yGS	52	4.000	<b>3.577</b>		
<b>New approaches to family collaboration</b>	LSS	94	4.000	<b>3.936</b>	<b>1926.000</b>	<b>0.027*</b>
	4yGS	52	3.500	<b>3.212</b>		
	VOC	80	4.000	<b>3.950</b>	1783.500	0.152
	4yGS	52	3.500	<b>3.212</b>		

Notes: Mann-Whitney U test. \*p < .05, \*\*p < .001, \*\*\*p < .001

Significant differences were found in the type of school in which class teachers work in the indicator “collaboration with parents with problematic attitudes”: lower secondary school teachers (mean = 3.936) perceived a greater need for improvement in this area than 4yGS teachers (mean = 3.442). Also, VOC school class teachers (mean = 3.950) perceived a greater need for improvement

in this area than 4yGS class teachers (mean = 3.442). Statistically significant differences between the studied groups were also observed in the indicator “collaboration with parents of students with poor school performance, problematic behaviour or with SEN”, where lower secondary school teachers perceived a greater need for improvement (mean = 4.032) than 4yGS class teachers (mean = 3.577). Additionally, the VOC school class teachers perceived a greater need for further training in this area (mean = 4.088) than the 4yGS teachers (mean = 3.577). Lower secondary school teachers also reported a significantly higher need for in-service training in “new approaches to working with families” (mean = 3.936) compared to 4yGS teachers (mean = 3.212). No statistically significant differences were observed between the groups of teachers studied in the “written communication with family” indicator.

The measured data support hypothesis 2: There are differences in perceived educational needs between teachers in terms of the type of school in the area of family-school collaboration. Lower secondary school teachers and vocational school teachers perceive a greater need for training in the subject area compared to grammar school teachers. Significant differences were found in the indicators “collaboration with parents with problematic attitudes”, “collaboration with parents of students with poor grades, problematic behaviour, SEN”, and “new approaches in collaboration with the family”.

## 5. Discussion

We aimed to compare the subjective perceived learning needs of the class teachers in the area of family collaboration. The lack of pre-service teacher training in collaboration with parents has been pointed out by many authors and this fact has been confirmed by several studies (Šimoník, 1994; Lasky, 2000; Keyes, 2010; Havlík, 2002; Frýdková, 2013; Vitečková, Gadušová, 2015; Martanová, Konůpková, 2019; Bacúšan Nevoľná, 2023). We have more closely identified that, on average, class teachers perceive a need for further training in the area of collaboration with the family, naming the most prominent training needs in the areas of “collaboration with parents with problematic attitudes” and “collaboration with parents of students with poor achievement, problematic behaviour, or with SEN”. Teachers perceived the need for further training in “new approaches to working with families” to be slightly lower on average. Thus, according to our findings, class teachers perceive the need for their further training primarily in the area of “collaboration with parents with a problematic approach”, or “parents of students with challenging behaviour, poor achievement, or SEN”. As well as the problematic behaviour of students themselves, communication with parents, especially parents of students with problematic behaviour, is one of the significant sources of teachers' professional burden. Teacher-parent communication is often a source of stress and professional burden for teachers (Viktorová, 2020; Pohnětalová, 2015; Urbanovská, 2017; Mlčák, 1999 and others), and teachers perceive it as particularly challenging to work with uncooperative or overly critical parents (Horká, 2022), and especially to communicate with emotionally challenging situations, and it is clear that such challenging communication situations occur particularly in the context of student problem behaviours (Martanová, Konůpková, 2019). From the above, it is clear why more training in the area of collaboration with the above-mentioned groups of parents is perceived more intensively by class teachers.

The lowest subjectively perceived educational need was in the area of “written form of communication with parents”. These results also correspond to the findings of Beňo, Šimčáková, Herich (2006), who investigated the preferred form of mutual collaboration between teachers and parents. The respondents agreed that the most preferred for both parties is a personal meeting with parents, i.e., individually (at the request of the teacher or parent), followed by regular meetings of the parents' association, followed by visits to students' families, and other forms of collaboration. Written or other forms of information exchange received the least preference.

We also analysed the perceived learning needs concerning the length of experience of the class teacher and the type of school in which the teachers work. We hypothesised that the above variables play a significant role in the perceived need of class teachers to further their education in the subject area. The measured data supported our hypotheses, and we found that class teachers differed in their perceived level of educational need in the area of collaboration with the student's family due to the length of their class experience.

We found that teachers with longer experience as class teachers subjectively perceived a lower educational need in selected indicators of collaboration with the student's family (collaboration with parents with problematic attitudes” and “collaboration with parents of students

with problematic behaviour..."). Our findings support selected results of other research in which, for instance, Havlik (2002), Šimoník (1994), Vitečková and Gadušová (2015), pointed to the lack of perceived preparedness of especially novice teachers in the area of communication and collaboration with parents. It goes without saying that with the increase in professional experience of class teachers in the field of collaboration with different types of parents and different situations, the class teacher gains more confidence and competence in collaboration with parents, and along with this, his/her educational need in the subject area decreases. The importance of their own pedagogical experience and also their own parental experience for the performance of the position of class teacher was confirmed in the research within the final thesis of Boďo's (2011) by the class teachers themselves (n = 129), according to whom many of them found the undergraduate preparation for the position of class teacher only minimally helpful, in practise they drew the most from their own pedagogical and parental experience. However, we see a need to strengthen the preparation of preservice class teachers in working with families and not leave novice class teachers fearful, uncertain, and unprofessional about working with students' parents. Similar conclusions are confirmed by the results of research by Krátka (2007, p. 73). Specifically in relation to the educational issues that class teachers address with students' parents.

Class teachers also differ in their perceived educational needs for collaboration with the student's family, depending on the type of school in which they work. We found that lower secondary and vocational school teachers perceived their need for improvement in this area more than grammar school teachers. One of the explanatory reasons for the more intensive perceived educational need of lower secondary and vocational school class teachers in the area of collaboration with the student's family could be the different incidences of students' problem behaviour in particular schools. Grammar school teachers perceived a lower educational need in the indicator "collaboration with parents of students with problem behaviour...". However, according to Zemančíková's research (2014), grammar school teachers are the least confronted with the problem behaviour of students compared to teachers of lower secondary and vocational school teachers. From this, we conclude that one of the reasons for the lower educational needs of grammar school teachers in the area of collaboration with the student's family is the lower incidence of problem behaviour of students.

According to other findings, GS teachers also perceive a lower need for training in the area of collaboration with parents with problematic attitudes compared to lower secondary and vocational school teachers. GS teachers may come into contact less frequently with parents with problematic attitudes, which could be suggested by Pétiová's research (2015), which investigated the views and experiences of class teachers and prevention coordinators working in lower secondary and vocational schools on the quality of relationships between teachers, students and their parents. The research findings showed that the respondents teaching in grammar schools were most satisfied with the quality of parent-teacher collaboration, while the respondents from vocational schools expressed the most critical views.

## **6. Limitations of the study**

Survey instrument was too time-consuming to complete and could lead to response bias, i.e. a systematic tendency to answer similarly worded questions in the same way regardless of their content. Which is a risk for all questionnaire surveys with Likert scaling (Bahna, Zagraban, 2019: 5). Considering the results published at this point, we perceive the application of only quantitative analysis as a partial limitation, which we plan to complement in the next steps of the research with a qualitative approach (Focus Group).

## **7. Conclusion**

Through the research and its partial results, we wanted to point out that the area of family-school collaboration is one of the keys, but at the same time, most neglected areas in terms of teacher preparation.

It is a part of the class teacher's agenda in which there is a significant professional impact, mainly due to the lack of undergraduate preparation (Krátka, 2007: 77). However, according to Frýdková (2013), based on analyses of teacher education programmes (at pedagogical or philosophical faculties), there is an obvious tendency to pay more attention to the theoretical preparation of teacher collaboration with parents, and this preparation is implemented only marginally.

The above-mentioned area of the class teacher's work is all the more challenging if the practise was preceded by insufficient undergraduate training for this area of activity. Frýdková (2013) perceives the necessity to strengthen the preparation of future teachers for the area of family collaboration.

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## **Views of Teachers and Support Staff at Schools on the Implementation and Development of Family Life Education**

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### **Abstract**

In many education systems, the curriculum includes preparation for independent living, sexual or family life, and social relationships. The relevant literature includes research on the target groups' attitudes to and evaluations of these modules. The novelty of our research is that we examined the views of school professionals to be involved in the implementation before the launch of the programme. Our aim was to explore their stance on the development of family and adult life education and relationship culture. The target groups of the study were class teachers and subject teachers in grades 5-13 as well as school support professionals in the three most disadvantaged counties of Hungary. The research method was qualitative, with individual and focus group interviews. Respondents were selected using quotas (county, type of school, school provider and career stage) and snowball sampling (N = 53). Our results highlight the role of school professionals' existing knowledge and experience of family pedagogy and that public education can rely not only on accumulated individual experience but also on well-functioning initiatives at the institutional level. We have found that teachers do perceive dysfunction in families and inadequate or dysfunctional preparation for adult life, and see the need to prepare young people for adulthood, but commitment to this task is not general.

**Keywords:** family life education, implementation, teacher attitudes, school support professionals.

### **1. Introduction**

The range of OECD publications makes one realise that 21<sup>st</sup>-century development policies are rediscovering the importance of families. While one and a half decades ago it was the Teachers Matter (OECD, 2005) report that caused a great stir, the past decade has seen several pieces of writing published by this global think tank on the effect of families on children's future (OECD

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2012; Ulferts, 2020). Human society, both at national and global levels, is currently struggling with countless social, economic and health problems which are rooted in family socialisation and which are easily handed down to subsequent generations, imposing tremendous strain on everybody. The OECD analyses raise awareness of the facts that spontaneous processes of family socialisation must be dealt with consciously and that the impacts new generations are exposed to can easily become issues of public concern.

In recent decades, family life has undergone fundamental changes, with traditional extended family and local community patterns no longer being passed on due to social and geographical mobility. The concepts of marriage and family have diversified, fertility and marriage rates have declined and the number of divorces and single-parent households have increased (Pusztai et al., 2022). In OECD countries, 17 % of children under 18 grow up in single-parent families or in multiple households due to joint custody arrangements (Ulferts, 2020). The proportion of ethnically and culturally mixed families is high, in which some of the complex and sensitive issues of family life are avoided as they can easily lead to cultural conflicts (Buehler, 2020). As a result, new generations' views on family life and adult life management have become uncertain, and therefore prevention as well as professional assistance are needed within the education system (Csók, Pusztai, 2022).

Family life education, preparation for independent living and life skills are existing educational content in many countries. In Hungary, family life education has been part of the new National Curriculum and the related content regulations as an independent field since 2020. Its aim is to prepare school-age groups for independent adult life, responsible relationships and family life in order to have a significant positive impact on unfavourable demographic and social tendencies (Engler, 2020; Engler et al., 2020).

Consulting teachers is an inevitable part of the implementation process, both in the preparation, process tracking and evaluation phases. It should be taken into account that in different education systems, teachers have different responsibilities depending on the presence of other support professionals in schools and the staff assisting them in their teaching. Teachers' roles can also vary according to the nature of the childcare, welfare and leisure activities delegated to educational institutions due to typical family structures and the proportion of female employment in a given society, and according to the length of time pupils spend at school during the week.

### **Family Life Education from an International Perspective**

The early definitions of family life education were narrower than those today. Family life education meant educational activities at schools with the aim of developing those skills that could help students find constructive solutions to problems arising in their present or future families (Avery-Lee, 1964).

Today's concepts, however, are more complex (National Council..., 2015). Engler (2020) distinguishes between two branches of family life education, one that concentrates on families' problems in the present aiming to assist, counsel and provide remedy and another that prepares for the future focusing on education and prevention.

In order to decide on the most appropriate working method in family life education, it is worth reviewing international experience, as there is great diversity in the curricula, working methods and pedagogical approaches. There are basically two opposing views in the literature. One view is that family life educators must have specific knowledge and competence to be able to apply this knowledge creatively in different socio-cultural contexts, periods and situations. The other concept is the evidence-based approach, which has recently emerged as a result of the infiltration of the methodology of medical sciences into social sciences. According to this approach, family life education curricula, methods and programmes are to be tested and only those that have been proved to be effective should be widely used (Darling et al., 2020). This implies that before the introduction of family life education, teachers should be involved in a preparatory, pilot research phase in which work organisation, didactic methods and curricula are tested on the basis of research findings. The next step is to decide on the solutions that have proved to be effective.

Several authors have discussed the extreme context sensitivity of family life education (Myers-Walls, 2000; Ballard, Taylor, 2011; Darling et al., 2020), particularly the need for culturally responsive family life education both in terms of content and methodology, and the importance of this approach in the design and implementation. In different cultures, the practices and content of family life education may be very different. In addition to the diversity of families in terms of

religion, culture, language, social status, region and place of residence, the variety of family structures within the same culture must also be taken into account. Therefore, in the everyday practice of family life education, educators must also choose carefully what and how to teach, while selecting from a range of procedures and teaching materials that have been proved to be effective by research evidence. In other words, in addition to being evidence-based, modern family life education is expected to bear socio-cultural relevance (Ballard, Taylor, 2011). For example, one of the authoritative handbooks on family life education lists specific approaches to family life education in a range of contexts. It devotes separate chapters to children in rural settings, to different minority groups, classifying them by language and culture, to children raised by grandparents and to children of convicts and prisoners, etc. (Ballard, Taylor, 2011). It also emphasises that overlapping characteristics could be used to further break down family life education methodology into intersecting types, i.e. children from certain families could be classified into several types. It is an important recurrent idea that taking socio-cultural diversity into consideration during the implementation of family life education does not only mean identifying the specific difficulties and problems in a particular setting, but also exploring the strengths of the families of the pupils concerned (Myers-Walls, 2000).

Two important research questions arise in relation to family life education programmes. First of all, based on previous practices, a fundamental research goal for the future of the programme is to identify the content focus and the themes that can be genuinely used by learners in different social and cultural contexts. Secondly, it is considered necessary to launch longitudinal research to follow up how the knowledge, skills and values acquired through the programmes promote a healthy transition to adulthood (Nasheeda et al., 2019).

Research has shown that family life education and preparation for adult life are highly important and urgent tasks due to the transformation and dysfunctionality of families. By living together, families spontaneously educate for family life, which is a very strong influence, currently characterised by a low level of parental awareness, being completely distanced from traditional ways of socialising for family life and being flustered by financial and time pressure – but all this does not provide sufficient preparation for the challenges of adulthood. It is clear that among all the institutions and organizations functioning in a society, it is the institutions of the educational system, i.e. schools, that can reach all young people and provide useable models for family life education apart from the ones existing in families. The literature also points out that there is not one uniform curriculum and method for family life education that could be applicable in every segment of society because of the constant interaction between institutional influences and spontaneous family life education taking place in families.

The aim of our research was to explore current school practices regarding preparation for family life, school staff's expectations of the modern approaches and learning materials assisting their work and the help they need for successful implementation. The target group of the study included class teachers, subject teachers and support professionals working with students from grades 5 to 13. We have two principal research questions: (1) What range of challenges will family life education be faced with in the Hungarian school setting when it is introduced? (2) What do teachers and other school professionals think of the potential of family life education and the development of relationship culture? What are their views on those and what specific recommendations do they have?

## **2. Methods**

As the international literature did not provide well-proven measures to be used before the introduction of family life education, we worked out an innovative conception to plan the structured interviews. We established quotas for the selection of interviewees in order to have an adequate number of respondents from each professional branch of teaching. The quotas were set according to county, type of school, school provider and stage of teaching career. The career composition of the responding teachers corresponded to the age composition of the Hungarian teaching profession (6 teachers in their early career stage, 7 teachers who have been teaching for 5-10 years, 13 teachers who have been teaching for 10-20 years, 19 teachers who have been teaching for 20-30 years and 8 teachers who have been teaching for more than 30 years). Quotas were adjusted by type of school (20 primary, 15 secondary vocational, and 18 secondary general), by type of school provider (31 public, 19 church-run, and 3 private), and by the spatial criteria (according to the number of pupils in the 40 districts of the 3 counties). We conducted detailed

individual interviews with ten highly experienced teachers who had worked extensively as class teachers, seven focus group interviews with another 39 teachers and one focus group interview with four support professionals (kindergarten and school social workers, school counsellors). The focus groups consisted of 4 to 8 respondents. Altogether, we analysed a text database comprised of 53 professionals' interview answers. The text database, based on the verbatim transcripts of the interviews, was processed using open coding by thematic units. In addition to triangulation within the qualitative method, validity was ensured through personal triangulation.

### 3. Research results

This section of the paper discusses the findings of the interviews conducted with school professionals (teachers and support professionals). First, we will present one aspect of their work that is currently classified by them as family pedagogical and support activities including school activities preparing for family life. Next, we will focus on their views on the potential, possibility and function of family and adult life education programmes, and finally we will highlight their suggestions for implementation. International models and debates in the literature indicate that a very important decision is to be taken as to how wide the thematic range of the programme could be. This adds considerable weight to the opinions of teachers and support professionals, who are closely familiar with the student population and spontaneous family life education as well as the transmission of adult behaviour patterns existing in their students' families. Apart from teachers, school support professionals also proved to be very useful sources of information for our research. [Table 1](#) contains the issues, constructs and variables.

**Table 1.** Frequency of assigned codings

Investigated issues	Construct	Assigned coding	Times codes were assigned throughout all interviews
Family pedagogy-related problems in today's schools	Family structure	Non-intact family	50
		Single parent	17
		Foster parent	15
	Way of life in family	Decline of communication/attention	73
		Child abuse	9
		Drug	15
		Alcohol	19
		Unemployment	20
		Criminal	6
		School absence	17
Teachers and school support professionals on how to implement the plan for family life education	Knowledge and attitudes towards family life education	No information	35
		Uncertain information	18
		Reject	7
		Welcome	46
	Practical implementation	Working method	159
		Expert	106
		Need	80
		Skills	94
		Family-school partnership	133

#### 4.1. Family pedagogy-related problems in today's schools

We have found that the spontaneous family and adult life education experienced by young people in Hungary today is extremely diverse, and family subcultures are much further apart from one another than in societies with strong and stable middle classes. This has to be taken into account when planning family life education for schools. There is an almost general tendency towards the decline of communication within families, the shrinking – or disappearance – of time

spent together and the dysfunction of family structures, all of which lead to families being no longer able to fulfil their traditional role of educating for adult and family life. This is even more so in single-parent families, where children might find themselves in adult roles prematurely. In patchwork families, children might experience a lack of belonging or the negative consequences of competition between parents. It is characteristic of middle-class families that paying full attention to and spending quality time with children are on the decline, and so are activities that promote emotional and intellectual development. Instead, parents tend to replace care with buying objects for their children. *“What I can see is that our world has become so materialised and objectified that the personal contact between parents and children is very different from what it was like 20 or 30 years ago. Parents try to substitute objects for their personal presence, which has an impact on children. Admittedly, they really want to provide their children with everything, but they fail to devote enough time to them, which would be the most important thing. I know parents also have a hard time working three shifts and the like, but they should still find time for such things because this is the root of the problem.”* (F5/2, interviewee) Teachers and support professionals working with disadvantaged children report a wide spectrum of family problems including long-time unemployment, alcohol or drug consumption, parents with a criminal record, dropping out of school, affairs with the police and raising children under guardianship. In contrast, in schools where the student population has a more favourable composition, support professionals are confronted with concealed or ostensibly resolved problems. In low-status families, however, preparation for adulthood and family life is even more likely to include verbal aggression in communication as well as physical aggression, child abuse and transmitting deviant behaviour patterns. *“A few weeks ago one of my pupils informed me of her intention of going home early every day from then on, and as it was upon the mother’s request, I couldn’t suspect truancy or the like. When I asked her about the reason, she said that the child would like to get home earlier than dad so that dad couldn’t beat mum up. She had filed for divorce, and her husband was not too keen on the idea.”* (F1/3 interviewee)

4.2. Teachers and school support professionals on how to implement the plan for family life education.

It is noteworthy that the majority of the focus group interview participants and half of the individual interviewees had not heard about the inclusion of family life education in the National Curriculum, and of those who answered they had, several were uncertain: *“it was probably included”* (E/7 interviewee), *“I only heard about it.”* (E/9 interviewee) There is a sharp distinction between groups of respondents according to their attitudes towards family life education. A minority holds a strong opinion rejecting this additional task on grounds of being overloaded or lacking competence. The second group considers that this is not a new task, as it is already part of the school’s informal functions. The third group is made up of those who consider that, although it is a new task, it is a useful initiative.

The question of the form and place of this new content in school life is an extremely interesting one. An insignificantly small number of people are in favour of introducing a separate subject, suggesting a maximum of one lesson per week. The vast majority of respondents would like to integrate family life education into several subjects (e.g. class teacher lessons, humanities, arts and sciences). Among the topic areas to be covered, respondents have mentioned some for which it is difficult to provide an academic context (and facilities) in the current school system: some teachers consider practical training, cooking and handicrafts to be necessary in family life education. *“Practicality is the basis of growing up, (...) it would be new for today’s children, it would inspire them.”* (E/6 interviewee)

Interviewees are even more unanimous about the educational impact of extracurricular activities than about curricular training. In essence, in all focus groups and individual interviews, mention has been made of theme weeks/days, project weeks/days, film clubs, lectures, workshops, tea parties, board game clubs, afternoon classes in student residence houses, family days, student council days, etc. as family life education opportunities. For those who think in terms of a larger time frame (a project week, for example), the ideal frequency is one occasion per year or per semester, and for those who prefer individual lectures, film clubs, tea parties or project days, one occasion per month. *“I am a great believer in project work and its complex impact. Not in saying, well, this is project work that prepares you for family life or adult life, but in giving it a name and even targeting several areas and working together. Doing something that attracts and hoo children and that helps them learn a lot, directly or indirectly, about family life, or about being in a family,*

*about the conditions for being in a family... and they can acquire many new competences. So, all in all, I can imagine this kind of knowledge transfer within school, but perhaps there would be even more room for it outside school, embedded in project work.”* (F8/2 interviewee)

Opinions are divided as to whether schools' own teachers or external professionals are more suitable for this task. Most respondents opt for a combined solution: the collaboration between authentic, renowned guest speakers well known to the school and apt, well-prepared and motivated teachers. Apart from the professionals to be involved, we also asked interviewees about specific content related to this subject area. They hold the view that it is not lack of information that primarily causes problems in family life although some (mainly practical) knowledge needs to be conveyed such as handling money, what to do in an office, “management” and other practical information. Slightly more theoretical but still close to everyday life are communication and conflict management techniques, which respondents think could be taught as knowledge. Most respondents, however, opt for transmitting only a minimum amount of factual knowledge and believe in raising awareness and skills development instead. *“Skills development and raising awareness are more important than information, which changes all the time. Some of it is obviously permanent, but it is much more changeable than anything else we deal with”.* (F7/2 interviewee) *“I wouldn't even think of information. I really mean it.”* (F7/3 interviewee) *“I agree, God forbid”.* (F7/4 interviewee)

What content to include in family life education is a critical question, whether it is the transmission of knowledge, skills development or raising awareness. Most school professionals would start with self-awareness and personality development as well as the questions of independent work and taking responsibility. *“I think every adult should have good self-knowledge before starting a family. They need to work on that”.* (F5/6 interviewee) Whether it is caused by a lack of or unawareness of expectations or by one-sided and maximalist expectations, children do not have a realistic self-image, are unaware of their abilities and potential, adapt poorly to rules and each other, have poor problem-solving skills, stress tolerance, conflict management, empathy and social sensitivity. Respondents also often mention crisis situations, the prevention and treatment of self-destructive alcohol or drug abuse, and healthy lifestyle. All these thematic sets could be summarised as life management skills since family life can only be founded on healthy adult personalities. Once mature personalities are formed or while they are being formed, family life education can commence.

Sex education is a fundamental part of family life education. Beyond the biological, practical issues of sexuality, respondents lay more emphasis on responsible relationships, knowing one's partner, adaptation and listening to each another. While family life education is intended to focus on future family plans, the vast majority of pupils in public education still live in their own families of origin, with their norms and possible dysfunctions, and will obviously compare with those what they hear during lessons, various activities or lectures, and it is questionable what conclusions they will draw. Respondents agree that children should not be brought up against their own families, but that they should be made aware of possible relationship problems. *“Children should recognise what hurts their own personalities and realise that they can handle these situations. This is something they aren't usually aware of. (...) Children unconditionally trust those they love, and this is right. (...) They just have to be taught to recognise what is no longer love but abuse, so they have to notice that something goes beyond a certain limit”.* (F5/5 interviewee)

The professional development of class teachers is also essential for the successful introduction of family life education, as interviewees feel only partially prepared for this task. Although all of them have completed psychology courses at university, without basic knowledge of child welfare, sociology, social pedagogy, and, if necessary, romology, mental health, communication, etc., professional competence is incomplete. Almost all the interviewees consider their own educational and family experience as well as their helping selves as primary resources in this work. As the interviews were conducted mostly with experienced teachers, we received more answers leaning towards optimism. At the same time, we should be aware that in most schools, beginner teachers are assigned to be class teachers immediately or within 1-2 years, so it is not possible for them to rely on life experience that will develop, but this should be included in teacher training. The biggest challenge is that only a complex reform can bring family life education into schools, and that this can only be achieved by motivating teachers and making them interested. *“This whole system, from examination requirements, would have to be reformed in a complex*

*way to make it work (...) Yes, and that complex reform needs to be approved by a teacher society that is extremely intolerant of change (...) So it's not a simple story.” (E/4 interviewee)*

#### **4. Discussion**

The most important task is to define family life education and determine its purpose. Internationally, its interpretation is either limited to romantic relationships and sexuality or entails a wider range of life skills (Plaza-del-Pino et al., 2021). In Hungary, where society displays great social and regional inequalities, it is obvious that the latter, more comprehensive model is needed, which is also supported by the latest National Curriculum as well as the teachers and support professionals interviewed.

Regarding thematic orientation, the foundation of family life education should be individual personality development so that individuals can become mature and healthy adult personalities capable for taking responsibility and participating consciously and productively in working life. The next layers would be the development of interpersonal relationship culture and the issues of future family life and raising children. It is advisable that the name of the programme should reflect this thematic diversity. The term family life education refers to an important subarea of the thematic target but does not apply to the full content. A synthesis should be created, which would also include the content behind the terms “interpersonal relationship culture” and “life skills” (Engler, 2020).

According to our respondents, family life education should have a highly complex thematic structure. Details to be elaborated include the breakdown by age groups, the structuring of curricular goals, of competences to be developed and of subject areas to be covered. In addition, specific content, stages and timeframes are to be assigned to the points above. Alignment with the organizational structure of public education, with its work schedules and timetables also require careful consideration. Under the present circumstances of curriculum structure and student workload it is impossible to introduce family life education as an independent subject. Integration into other subjects is also a matter to be weighed as it would entail the modification of the content of the subjects concerned along with the correction of current textbooks and workbooks. However, if these steps are not taken, education for family and adult life will only exist on paper. It is also avoidable to delegate this task outside the scope of schools. Most of the course content should be delivered through extracurricular activities at school, which can also serve as experience-packed, community-building leisure activities for pupils. The most suitable activities include lectures, discussions, drama sessions, film clubs, project work or workshops, soft skills training, competitions and board game sessions. It is advisable to abandon the traditional class setting and work in smaller groups.

For the implementation of family life education, human resources are needed both from within and from outside schools. It is not recommended that every teacher or class teacher should be assigned to this task because this might turn out to be counterproductive since even our research has proved that it is not equally welcomed by everybody. The programme should also heavily rely on the initiatives, organizing skills and expertise of school support professionals (Csók, Pusztai, 2022). The best idea would be to form teams of teachers and support professionals to coordinate work and mentor their colleagues in their schools. This task should be included in their compulsory working hours or they should be otherwise remunerated. Professionals who will take part in family life education need special training, which is to be made available both in higher education and in the nationwide system of professional development for teachers and which is to be acknowledged as a measure in the teacher evaluation system as well.

Owing to the social context-sensitivity of this content (Myers-Walls, 2000; Ballard, Taylor, 2011; Darling, Ballard 2020), the programme should provide ample room for differentiation while keeping a few standardized thematic items. According to local circumstances such as the ethnic or cultural composition of schools or localities, the appropriate content would be selected by school staff, but it would even be possible for pupils to choose from a choice of required optional or optional modules. This opportunity would increase participants' motivation levels and provide them with knowledge and skills more relevant to them.

When it comes to family life education, there is another group of stakeholders who must not be ignored, namely parents and caregivers (Oz, 1991; Varani-Norton, 2014; Yildirim, 2019; Plaza-del-Pino et al., 2021). First of all, these programmes are not expected to educate children against the culture of their families. Parents should be involved as much as possible in the planning and implementation

phase at the school level (through the parents' council and other parental organisations). A wider circle of parents can be addressed by organizing family days and inviting guest speakers. In this way, their views can be shaped and their family lives influenced at the same time.

### **5. Conclusion and recommendations**

This study has focused on showing Hungarian professionals the diversity of challenges that will be encountered in the reality of school life once family life education is introduced. These challenges can and should be prepared for. Even today, school documents contain objectives and ideals on preparing for family and adult life, and curricula for class teachers also include the subject, but this content is generally overlooked. However, whether explicitly or implicitly, all schools provide education for family and adult life, but with very different values. Even teachers who do not see preparing for family and adult life as their mission are constantly confronted with situations which involve them in family education. Educators feel the need for preparation for family and adult life because they perceive dysfunction in families and inadequate or dysfunctional preparation for adult life.

The practical conclusion that can be drawn from our research is that this content is still before the experimental phase. The international literature finds it essential that only practices with proven effectiveness should be generally implemented. We therefore propose that family life education should not be introduced all at once everywhere, but that educational research centres should support the launch of pilot projects for which schools and teams of teachers can volunteer. It is to be noted that the issue of funding cannot be avoided. Sufficient funds must be provided for research, pedagogical experiments, teachers and support staff who prepare and implement the programme, events, guest speakers and any additional costs (e.g. travel) to enable students to participate. Additionally, maintenance costs after the launch must also be covered in order for the programme to be effective.

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## **Some Trends in Islamic Education Forming Spiritual and Cultural Values of the Youth under the Influence of COVID-19 (the Experience of Madrasah Colleges in the Republic of Kazakhstan)**

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### **Abstract**

This study focuses on the spiritual and cultural aspects of education and upbringing in specialized Kazakh Islamic Madrasah colleges before and after the COVID-19 pandemic. The authors used mixed methods research approach for studying trends, including the analysis of documents and interviews with teachers and experts in the field of Islamic education, as well as students of Islamic educational institutions. The results show that Islamic spiritual and cultural education in the Republic of Kazakhstan has a traditional methodology and is difficult to radically change. A survey of students and teachers reveals several problems that they face in online learning and the impacts of distance learning on the quality of education and upbringing. In conclusion, the study emphasizes the need for further research on Islamic education in Central Asia, especially in Kazakhstan, with due regard to the regional and global events of recent years that have adjusted the methodology of education and upbringing.

**Keywords:** islamic education, spirituality, culture, pandemic, Madrasah college.

### **1. Introduction**

In the modern world, where globalization and technological progress become increasingly important (Degtev et al., 2022), the preservation and development of the spiritual and cultural heritage is a key task (Otrokov et al., 2023). In this context, Kazakh Madrasah colleges play a crucial role in forming the spiritual and cultural education of young people. Under the COVID-19 restrictions, the educational process and the models of Islamic education have undergone a major transformation. Therefore, it is relevant to preserve and develop spiritual and cultural education in the Madrasah colleges of the Republic of Kazakhstan (Janguzhiyev et al., 2023; Burova et al., 2023).

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In the process of learning, teachers and students of Islamic educational institutions face several tasks which can be solved by the formation and institutionalization of religious education; the solutions prove themselves as effective methods for the fastest achievement of the educational goals set (Aleksandrova et al., 2023). However, the COVID-19 restrictions revealed that these traditional methods were mainly connected with the social component and personal contact between teachers and students (Yakimova et al., 2023; Gerasimova et al., 2023). Therefore, their effectiveness is seriously reduced during the period of social distancing.

Many scholars consider the issues of Islamic spiritual and cultural education and upbringing. Among studies in this area, we should highlight the works by Z. Sardar and J. Henzell-Thomas (2017) and M. Zaman and N. Memon (2016). These authors propose a new approach to Islamic education based on the integration of knowledge and the importance of religion in student education. Z. Zainud and L. Hakim (2020) describes the influence of religious culture on the development of students' educational abilities and the increase of competence and competitiveness in their field. This approach consists of the implementation of religious values through various activities, including curricular and extracurricular activities. J. Bolhari and M. Mohsenikabir (2019) and M. Bagherpur et al. (2022) examine the influence of spiritual and cultural qualities on one's integration into the educational and professional environment.

Among Kazakh scholars, we should mention N.L. Seitakhmetova (2009), B.M. Satershinov (2017), M.K. Bektenova et al. (2017), R.R. Yusupov (2016), T.E. Sedankina (2013), and I.S. Mavlyautdinov (2007). Their research is concerned with the philosophy of religion, Islamic values, and cultural characteristics of the inhabitants of the post-Soviet countries and Central Asia. It laid the foundation for further research and development in the field of spiritual and cultural education in Kazakh Madrasah colleges.

Despite the previous studies of a general nature and a review of the existing issues in religious education, the conceptual approach to forming spiritual and cultural values of young people under the influence of Islamic education in a secular society has not been fully disclosed.

Therefore, the study aims at assessing the impact of trends in Islamic education in Kazakh Madrasah colleges, with due regard to the changes caused by the COVID-19 pandemic, on the formation of the spiritual and cultural values of young people.

## **2. Methods**

Considering the research objective, we applied mixed research approach using the methods of philosophical and religious science: comparative analysis, field research, quantitative analysis of the questionnaire survey using the chi-square test, content analysis, and data processing. The study was conducted from December 14, 2022 to April 26, 2023.

We studied the trends of Islamic education in secondary educational institutions in Kazakhstan during three time periods: pre-pandemic; during the COVID-19 restrictions; after the pandemic.

In the first stage, we analyzed documents and reviewed relevant literature, including scientific articles, research reports, and government documents regulating the requirements for secondary Islamic educational institutions in Kazakhstan.

In the second stage, we conducted face-to-face interviews with experts, including scholars and faculty staff of Madrasah colleges, as well as an online sociological survey of students using the All Counted system to identify the pros and cons of online learning and attitudes toward new forms of education.

We selected the respondents from among students of Madrasah colleges considering their period of enrollment in an Islamic educational institution. The main criterion for sampling for a sociological survey was the period of admission from 2019 to 2020. At the time of the survey, the respondents were in their senior year and some were already completing their studies. All respondents had experience in both online distance learning and traditional offline learning.

The survey consisted of several questions related to online learning and the impact of the COVID-19 pandemic on the quality of education. The specific questions included in the analysis were:

"What are the advantages of online learning?"

"How did the pandemic affect the quality of education?"

"What are the disadvantages of online education?"

"Are there more pros or cons of distance education?"

"Which is better: online or offline education?"

The data collected for each question were categorized and expressed as percentages.

In the third stage, we analyzed interviews with the experts and the results of the online survey using content analysis methods.

Also when analyzing the answers we have employed the Chi-Square Test to examine the association between variables in the context of Islamic education in Madrasah colleges. The test was applied to analyze the data collected through surveys conducted among students of Madrasah colleges in Kazakhstan. A significance level of 0.05 was chosen to evaluate the results.

The analysis was conducted using appropriate statistical software, taking into account the assumptions of the Chi-Square Test and the independence of variables. The results were interpreted based on the p-values obtained from the test.

### **3 Results**

#### **3.1. Islamic Education in Central Asia: History and Pre-Pandemic Trends in the Spiritual and Cultural Education of Students at Madrasah Colleges**

The system of Islamic education in Central Asia has undergone significant changes over the years, reflecting the historical and modern context of the region. In the pre-Soviet era, Islamic education was mainly provided through Madrasah religious schools that taught Islamic theology, law, and literature. These colleges were often associated with Sufi orders that emphasized spiritual development and devotion to Allah. The Soviet era, which lasted from the 1920s to the 1990s, had a profound effect on Islamic education in Central Asia. The Soviet authorities pursued a policy aimed at the secularization of society, including the destruction of various religious institutions, the suppression of religious activity, the ban on rituals, and the promotion of atheism. The Soviet regime also persecuted Sufi orders which were viewed as a threat to Communism because they provided religious education despite the closure of Islamic educational institutions. This led to the persecution of Sufi leaders and the destruction of Sufi shrines and mosques (Temirbayev, Temirbayeva, 2023; Zhapekova et al., 2020).

In recent years, there has been a renewed interest in vocational education at Madrasah colleges as they have been playing an important role in the spiritual and cultural life of Kazakhstan since the 19<sup>th</sup> century (Smagulov, 2018). Today the government is investing in the modernization and development of Islamic education. There are currently nine Madrasah colleges in Kazakhstan.

The Kazakh model of Islamic religious education at Madrasah colleges is notable since these are registered republican educational institutions that have a state license for education from the Ministry of Science and Higher Education of the Republic of Kazakhstan (Muftyat). The educational process is organized by such a religious republican association as the Spiritual Administration of the Muslims of Kazakhstan. The term of study is three years, after which a state diploma is issued in the specialty “Islamic Studies”, “Imam-Khatib”, or “Teacher of the Fundamentals of Islam” (Law of the Republic of Kazakhstan) (Ministry of Education..., 2022; Parliament of the Republic of Kazakhstan, 2007).

In essence, modern Madrasah colleges of Central Asia, including such educational institutions in Kazakhstan, are the successors of traditional Madrasah schools originating in the Middle Ages (a logical extension of the former education system). An example of synthesis and continuity was the House of Wisdom or the Academy (Bayt al-Hikmah and later Dar al-Hikmah) founded by caliph Al-Ma'mun in the 820s. It covered all spheres of life and social needs: political, economic, social, humanitarian, spiritual, cultural, educational, etc.

Based on the analysis of the works of medieval scholars (Nurull-Khodzhaeva, 2018), the transfer of knowledge and methodology did not depend on any institutional structures (or formal systems established by the authorities). The unique institutional scheme was based on the teacher's authority and was determined by the relationship between teachers and students. The basis of Islamic education is the concept of “ijāz” and the “connecting thread” of the intellectual elite (preserving social solidarity), including the personal and informal transfer of knowledge between teachers and students.

Based on this understanding of educational principles, curricula were built and projects arose to create and develop institutionalized education. This is how the three main foundations of professionalism in the Islamic philosophy of education were formed:

- The social organization of research and teaching guilds;
- The establishment of a special discussion method in the process of teaching and learning;
- A professional license to teach (a modern diploma equal to a doctoral dissertation).

The medieval philosophy of education in Islam was based on this triad, the identity of the members of intellectual guilds was formed, and devotion was developed rather to the teacher than to the educational system as a whole. According to traditions (emphasized by ibn Sīnā), the process of acquiring knowledge should be life-long (the interpretation of the Platonic teachings) and represent the ultimate goal of a Muslim.

Due to the above-mentioned conditions, a more complicated link is added to the school (Arabic: maktab or kuttāb), which is gradually integrated into the system of mosques (in some of them) and partially replaces libraries as centers of learning. This is how Madrasah colleges were established (Arabic: “a place where one studies”). Approximately from the middle of the 11<sup>th</sup> century, the influence of the House of Wisdom (and other institutions of this kind) was gradually decreasing.

In the course of these transformations, the key goal of Islamic pedagogy was highlighted, i.e. the education of virtue (Al-Qurtubi, 2003; Nurull-Khodzhaeva, 2018). All Madrasah colleges of Kazakhstan focus on this goal that was achieved through classical forms of learning and teaching Islamic sciences and instilling its values into the youth (Ofitsialnyi sait DUMK, 2023). In modern society, where spiritual values and culture are of much importance, spiritual and cultural education becomes the most important component of the upbringing of young generations.

### 3.2. Methods of Religious Education during the COVID-19 Pandemic

Obtaining an academic degree at a Madrasah college is a traditional way for many Muslims, allowing them to acquire in-depth knowledge of Islam and its fundamental principles, and is one of the important components in the life of the Muslim community in Kazakhstan. However, given the changes during the COVID-19 pandemic, the traditional methods of Islamic religious education in Madrasah colleges faced several challenges.

One of the main challenges is maintaining social distance to prevent the spread of the virus (Nasution et al., 2022). As a result, Madrasah colleges could not accept students in their classrooms and switched to a distance learning format. However, distance learning proved its ineffectiveness in terms of spiritual and cultural development since Islamic religious education includes not only theoretical knowledge but also practical skills and non-verbal methods of communication and interconnection. For example, Madrasah students should know how to properly pray in mosques and perform other religious rites, instruct parishioners, and interact with society and their environment. These skills cannot be acquired through distance learning and require their physical presence in a classroom or a place of worship.

After enrolling at Madrasah colleges, students from other regions are provided with a place in a hostel, where they spend their free time. For the most part, the educational process is carried out outside school hours by a mentor who monitors the internal order and student interaction, holds collective prayers, and fulfills the rules of living in the hostel. Thus, it helps students to adapt and evaluate the manifestation of the Islamic spiritual and cultural values instilled in the learning process. Many students of Madrasah colleges exchange views and discuss problems in live communication, which helps them better understand the theology of Islam. Being physically present at a Madrasah college also helps students develop the leadership qualities they need after graduation and strengthen their moral principles.

In turn, online learning has led to a lack of moral support and interaction between students and teachers. Within the traditional model of Islamic education, it is important to educate a person and promote spiritual and moral values through education, based on the personal example of a mentor.

In the traditional methodology of teaching Islamic theology, the whole process is based on the study of not only the Quran and the Sunnah but also classical theological texts (matns) (Kaliyev et al., 2023). Therefore, it is difficult to understand these texts without the teacher’s assistance and even more challenging to learn spiritual and moral concepts to use them in modern realities. The teacher is entrusted with the function of explaining the meanings of these scriptures and organizing the educational process so that students can learn the full spiritual and moral essence of the religious topics presented.

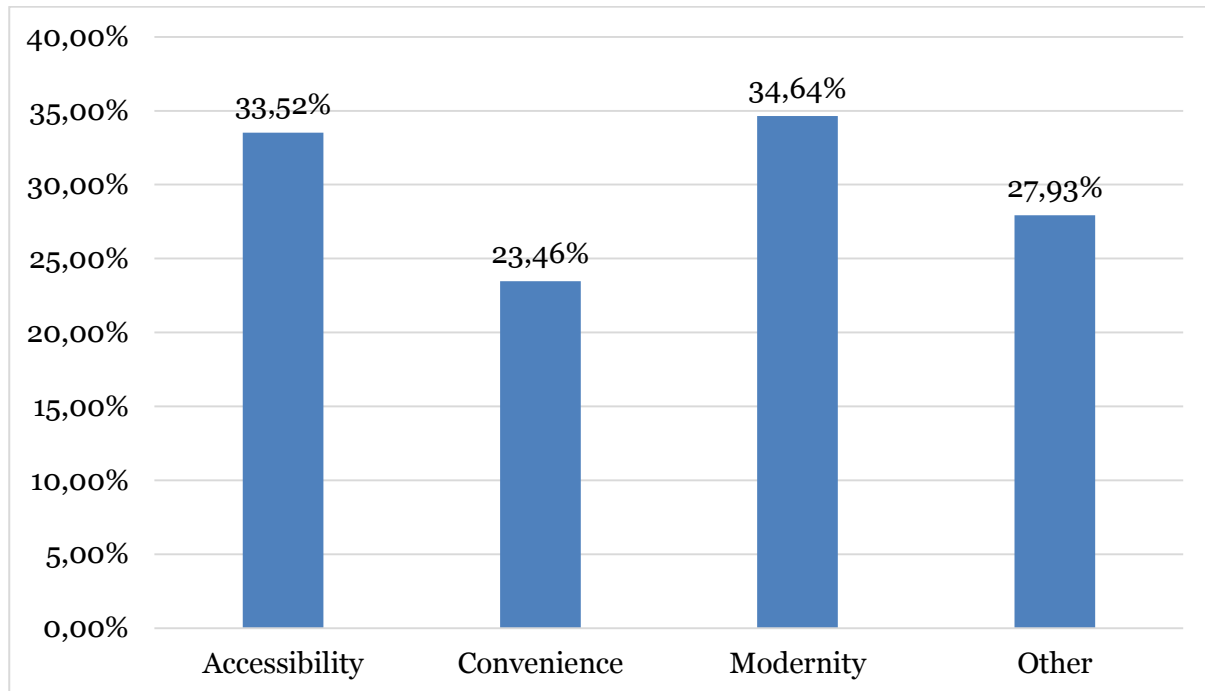
Thus, the restrictions caused by COVID-19 revealed a wide range of problems in the conservative methodology of Islamic education and a lack of readiness for modern trends and societal demands in the field of mobility and sociability.

Another problem associated with distance learning was the lack of developed and tested Islamic online courses and resources prepared in the Kazakh language, as well as their availability.

The latter are kept in paper form and are not suitable for online learning. Many students of Madrasah colleges did not have access to the Internet, laptops, or other digital technologies for one reason or another (there is no Internet in all settlements, especially in rural areas, and some students were from extended or low-income families, etc.). This significantly limited the ability of students to access the necessary electronic resources and study the material together with the teacher. As a result, the effectiveness of education decreased.

### 3.3. Pros and Cons of Online Education

Answering the first question “What are the advantages of online learning?”, the respondents mostly described online education as modern and accessible, rather than convenient. As a result of the survey, the majority (34.64 %) highlighted the modernity of this approach, and 27.93 % focused on negative aspects of online learning or no awareness of this format (Figure 1).

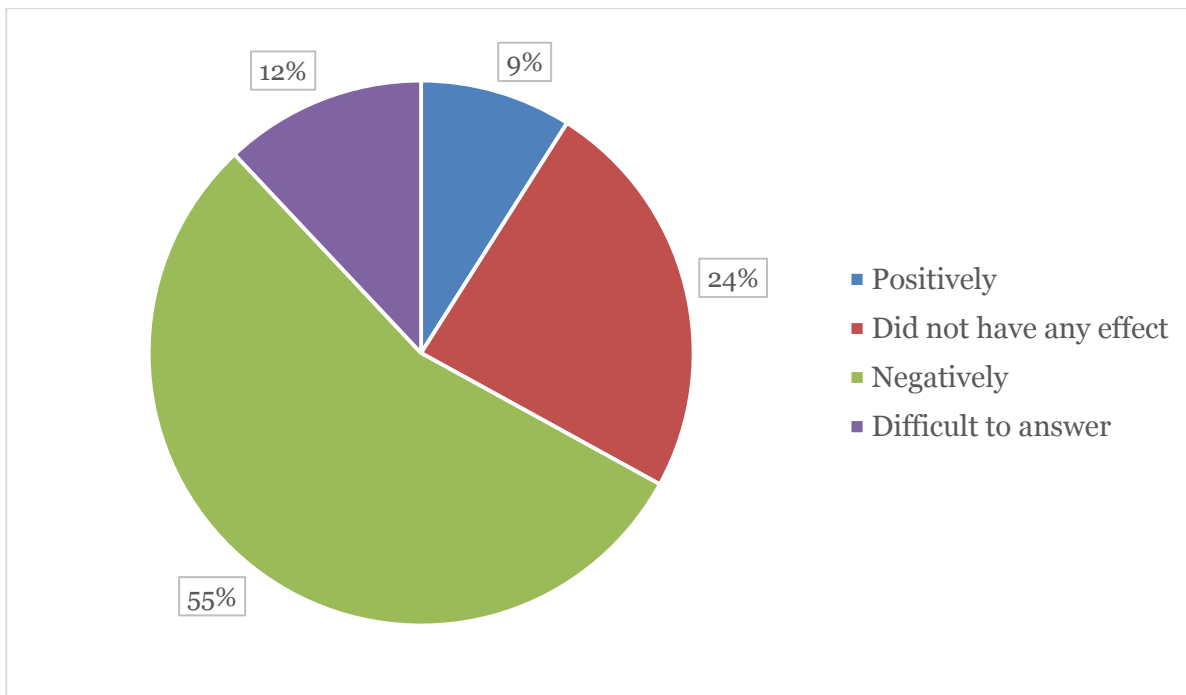


**Fig. 1.** Answers of the respondents from students of Madrasah colleges to the question “What are the advantages of online learning?”, %

Based on the results of the Figure 1 a significant association was found between the categories of advantages of online learning ( $\chi^2 = 8.19$ ,  $df = 3$ ,  $p = 0.042$ ). The categories "Accessibility," "Convenience," and "Modernity" showed varying proportions, indicating a significant difference in the perceived advantages of online learning among the respondents.

A similar question was asked to the expert community and teachers during interviews. While answering the question “What are the advantages of online learning?”, some experts and teachers highlighted the convenience of communication and obtaining additional information, improving skills; quick access to lectures by world-class specialists; modernity; alternative online education; the faster process of mastering new technologies and online educational platforms.

Despite positive feedback about the new teaching methods, a negative opinion about online education and its impact on the spiritual and cultural component of the personality prevailed among the answers of the students surveyed. This statement was reflected in the answers of the students of Madrasah colleges to the question “How did the pandemic affect the quality of education?” (Figure 2).



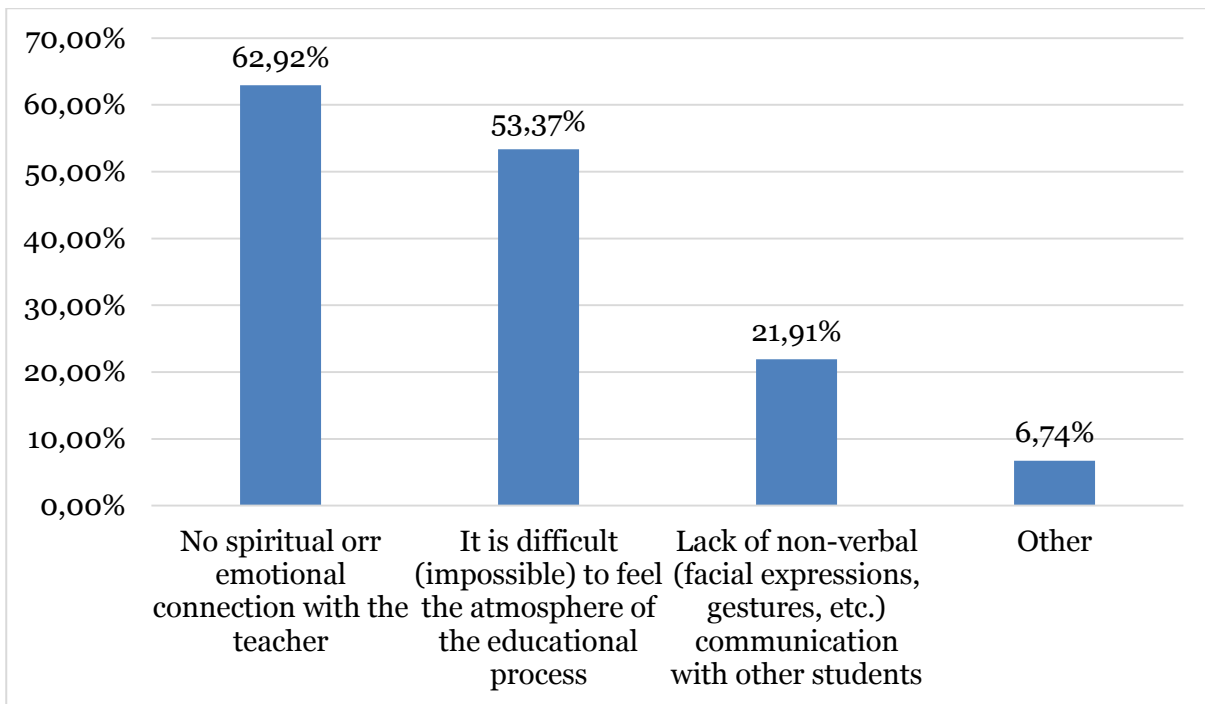
**Fig. 2.** Answers of the respondents from students of Madrasah colleges to the question “How did the pandemic affect the quality of education?”, %

The vast majority of the students (55 %) answered “negatively”, while 9% of the respondents considered that the pandemic and the transition to online learning had a positive impact on the quality of their education.

The impact of the pandemic on the quality of education showed a significant association among the categories ( $\chi^2 = 47.81$ ,  $df = 3$ ,  $p < 0.001$ ). The majority of respondents indicated a negative impact on the quality of education, while a smaller proportion reported a positive impact or no effect.

One of the main disadvantages of online learning is the impossibility of direct contact between students and teachers. As practice shows, communication with teachers, colleagues, and peers is crucial for the formation of spiritual and cultural values. In online learning, students lose this opportunity, which can affect the quality of their education and the formation of spiritual and cultural values. This conditions the next disadvantage of online learning, namely, a limited opportunity to gain practical skills and experience. Since online learning is mainly focused on theoretical knowledge, the spiritual and cultural values of students are limited to theory and not supported by practice. Without practice, it is difficult to develop skills in such subjects taught at Madrasah colleges as the interpretation of the Holy texts and the recitation of the Quran (tajwid), Islamic morality (ahlak), preaching (dagva), communal prayer (du'aa') before the start of the meal, etc. For the most part, these subjects are better mastered through joint practice, exchange of experience, and discussion. The lack of practice makes it difficult to obtain virtuous qualities inherent in a well-developed person (al-insan al-kamil). Students might not get the relevant experience and practical skills, which affects their future work and the formation of Islamic spiritual and cultural values.

Another disadvantage of online education is the lack of personal contact between students and their mentors and guardians, which can negatively affect the formation of Islamic spiritual and cultural values. This is evidenced by the answers of the students to the question “What are the disadvantages of online learning?” (Figure 3).



**Fig. 3.** Answers of the respondents from students of Madrasah colleges to the question “What are the disadvantages of online education?”, %

An association was found between the categories of disadvantages of online education ( $\chi^2 = 35.59$ ,  $df = 3$ ,  $p < 0.001$ ). The categories "No spiritual or emotional connection with the teacher" (63 %) and "Difficult to feel the atmosphere of the educational process" (53 %) were identified as the major disadvantages reported by the respondents.

According to 22 % of the respondents, another disadvantage of online learning is the lack of non-verbal (facial expressions, gestures, etc.) communication with other students. This also has a negative impact on the assimilation of the acquired knowledge and materials in both spiritual and emotional terms.

When answering the question “What are the disadvantages of online learning?”, the experts and teachers emphasized the lack of feelings and visible perception of the data received by students since the monitor cannot transmit these signs. Within the educational process, spiritual, emotional, and non-verbal contact is established between teachers and students, which provides the mentor with feedback. According to the experts, distance education violates and breaks this connection between teachers and students. If the goals set are not achieved and students do not understand the materials given, the mentor can give another example that describes the issue in more detail or ask a clarifying question to assess the understanding of the topic under discussion.

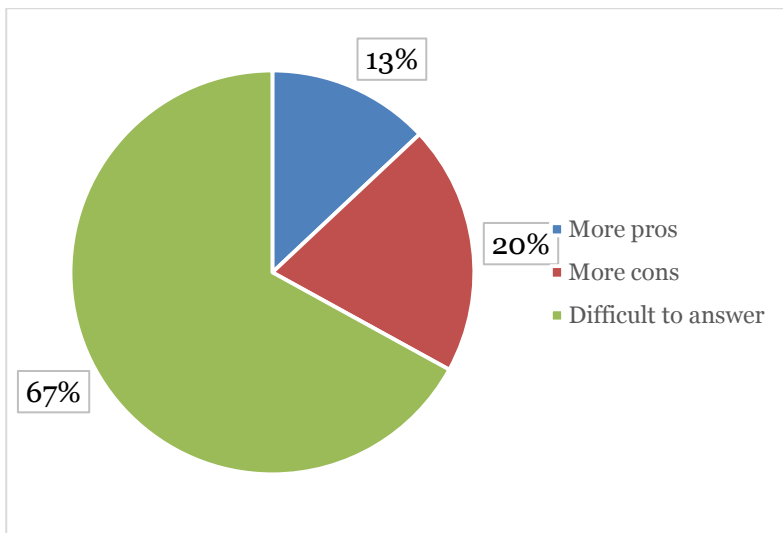
#### 3.4. Post-COVID Trends in Islamic Education

The pandemic has had a profound effect on how Madrasah colleges approach spiritual education. A key trend is a greater emphasis on online education. The administration of Madrasah colleges invested in new technology and developed online courses for students who could not attend their classes in person. This has opened up new opportunities for students, especially those who live in remote areas or are in outpatient care.

One more trend that has emerged in spiritual education is an increased focus on self-learning and self-development. Madrasah colleges introduce extracurricular activities and elements of self-development and self-improvement under the guidance of a mentor. This is due to the changing needs of society, as well as the principle of life-long learning. Madrasah colleges also place more emphasis on critical thinking and problem-solving skills. This is reflected in the development of new courses that include ethics, logic, and reasoning. Courses are designed to help students develop the skills they need to deal with complex social and spiritual challenges.

According to the survey about learning during the COVID-19 pandemic, the results were distributed as follows (Figure 4).

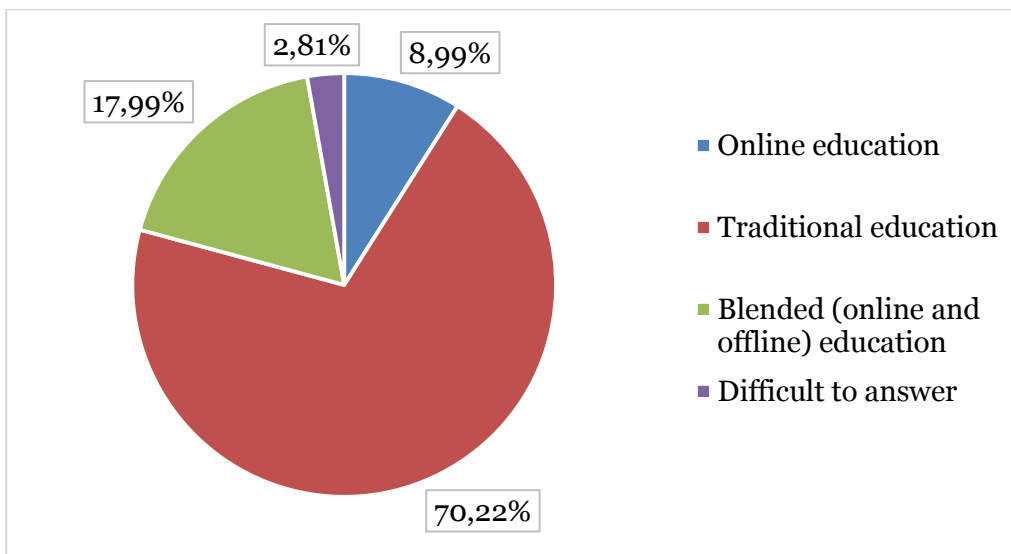




**Fig. 4.** Answers of the respondents from students of Madrasah colleges to the question “Are there more pros or cons of distance education?”, %

A significant association was observed among the categories of pros and cons of distance education ( $\chi^2 = 33.29$ ,  $df = 2$ ,  $p < 0.001$ ). The majority of respondents perceived more cons than pros associated with distance education.

After comparing these data with the received answers to the question “Which is better: online or offline education?” (Figure 5), we concluded that online learning can be an alternative form of education in religious educational institutions of Kazakhstan (the adoption of blended learning).



**Fig. 5.** Answers of the respondents from students of Madrasah colleges to the question “Which is better: online or offline education?”, %

Significant differences were found among the categories of preferences for online or offline education ( $\chi^2 = 95.12$ ,  $df = 3$ ,  $p < 0.001$ ). Traditional offline education was preferred by the majority of respondents, while a smaller proportion expressed a preference for blended (online and offline) education.

Although 70 % of the students surveyed at Madrasah colleges prefer the traditional offline form of education, 18 % of the respondents supported blended (online and offline) Islamic education, and only 9 % of the students supported online learning.

The introduction of blended education might become acceptable when mastering general educational disciplines or additional subjects. Thus, the experts and teachers of Madrasah colleges were not against the introduction of online education into non-Islamic and non-theological

subjects, for example, world history and Kazakh history, self-knowledge, information and communications technologies, etc. Since they do not have a direct impact on the formation of religious values and Islamic culture, they do not require direct emotional and spiritual contact between teachers and students.

In addition, alternative education is a sign of respect for the rights of all participants in the educational process. If individuals need it, the right to choose must be respected. This reflects one of the important principles of Islam, i.e. the availability of education for everyone.

To achieve high academic performance at Madrasah colleges, managers and teachers ask them to hand over smartphones on school days and return their gadgets on weekends. This originates from the classical model of religious education when nothing should distract students from the educational process. This method has both its pros (focus on the educational process, no external distractions and irritants) and cons (blinker vision in terms of information, no readiness for modern challenges of the globalizing world).

#### **4. Discussion**

We studied the influence of trends in Islamic education on the formation of spiritual and cultural values of young people with due regard to the changes caused by the COVID-19 pandemic. The vast majority of scholars ([Bagherpur et al., 2022](#); [Bolhari, Mohsenikabir, 2019](#); [Sardar, Henzell-Thomas, 2017](#); [Seitakhmetova, 2009](#); [Yahya, Rahmat, 2021](#); [Zainud, Hakim, 2020](#); [Zaman, Memon, 2016](#)) adheres to our opinion about the impossibility of instilling spirituality and Islamic culture in students without educational practices and personal communication with each student. The student's satisfaction with distance learning is not always considered ([Jeong, Chung, 2023](#)).

A change in goals toward the creation of a competent graduate can lead to a decrease in attention to spiritual and cultural values. In this regard, it is necessary to develop strategies that will maintain a balance between spiritual and cultural values and competencies in online education. E-learning is a competitive educational tool but teachers and students should be aware of its pros and cons and, if possible, overcome them.

In the modern world, it is necessary to transform the existing models of religious education through Islamic education since cases when graduates of religious educational institutions completely abandoned religious practice indicate its inefficiency. This is due to the crisis of secular values experienced by the former Soviet republics generated by the separation from the spiritual and cultural values of past generations.

According to Z. Sardar and J. Henzell-Thomas, the feature distinguishing secular education from Islamic is that the German tradition sees the purpose of higher education in the advancement of science. The French model prioritizes the promotion of the knowledge and competence needed by the nation. The British tradition emphasizes the development of the student's personality and competence ([Sardar, Henzell-Thomas, 2019](#)). The Islamic model differs in the goals pursued and the functions performed. The purpose of religious education is to form a perfect personality (al-insan al-kamil), i.e. upbringing through education rather than a formal interpretation of knowledge and information. The key factor in this process influencing the formation of a versatile personality is religious practice as a method of consolidating the information received.

During the COVID-19 pandemic, religious education had to adapt to new conditions, which became a problem for many Islamic educational institutions. Islamic online education turned into a new tool having its advantages and merits. The pandemic also provided Madrasah colleges with an opportunity to rethink their approach to Islamic spiritual and cultural education. The transition to distance learning helped them experiment with new teaching methods and develop new ways to interact with students.

The passed stage of restrictions and distance Islamic education confirmed the effectiveness of traditional methods. In the pre-pandemic period, the management of Madrasah colleges prohibited students to use smartphones in the educational process. The traditional methodology of protecting students from excessive information in social networks and information portals needs to be revised psychologically and spiritually since the lack of a continuous information flow can negatively affect students after graduation. Graduates who are accustomed to constant protection from external stimuli to inculcate Islamic values and culture after entering the globalized world and secular society might experience cognitive dissonance and feel depressed. This entails the loss of moral and spiritual values adopted during the period of education. However, it is more effective to put an internal filter on external stimuli and destructive information and learn to focus on useful content,

communication through social networks, and modern information flows. This method allows for forming perfect personalities (al-insan al-kamil) with due regard to the realities of the globalized and information world.

This study has limitations that should be considered when interpreting its findings. The study's primary focus on Madrasah colleges in Kazakhstan could constrain the generalizability of its findings to a broader context. The unique cultural and historical background of Kazakhstan may not be universally applicable to other regions or countries, making it important to exercise caution when extrapolating these findings beyond the study's specific setting. It is imperative for future research to encompass a more extensive geographical and cultural scope to better understand the broader implications of the study's conclusions in diverse contexts.

## 5. Conclusion

We conclude that the COVID-19 pandemic has had a significant impact on spiritual and cultural education in Madrasah colleges in Kazakhstan. The trends that have emerged in spiritual and cultural education, such as a greater focus on online education and critical thinking, are shaping the future of Madrasah college education. We observe a change in goals toward the creation of a competent graduate. Accordingly, it is necessary to consider the difference between the formation of spiritual and cultural values and competence in the modern globalizing world.

Online learning contributes to the safety of students and teachers, saves time and costs, provides accessibility for a wide range of students, and ensures flexibility and mobility in the educational process. However, new forms of education do not fulfill all goals of this process, which is confirmed by the results of the study. Islamic e-learning is a competitive tool that continues to develop in the future. To use online learning in Islamic education more effectively, teachers and students should be aware of its pros and cons and, if possible, overcome them and find new methods for solving problems.

The Islamic philosophy of education contributes to the formation of culture and understanding of historical religious values by young people. These are as follows: the need to develop strategies to mitigate the problems of online distance learning, such as the quality of infrastructure, widespread access to information technology, and the expansion of opportunities for social interaction between students and teachers of the new generation.

The educational and social changes that affect the spiritual and cultural education of Kazakh students in Madrasah colleges require a more detailed and in-depth study.

## 6. Acknowledgments

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## **Researching the Potential of Interactive Timelines for the Development of Schoolchildren's Creative Thinking in Additional Education**

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### **Abstract**

One of the most important tasks facing a digital school teacher is to prepare a school leaver who is able to use the acquired knowledge in further life and generate new ideas, offer non-standard solutions, go beyond the usual patterns and circumstances. The authors investigate the problem of substantiating the effectiveness of using timeline services for the development of schoolchildren's creative thinking in additional education.

The purpose of the study is to research the didactic potential of interactive timelines in the additional education classroom for the development of schoolchildren's creative thinking.

The methodology is based on identifying the possibilities of additional education and technologies of the university's digital environment for the formation of creative thinking components; on clarifying the study program and methods of organizing activities in studios when creating time lines. The experimental work was carried out in studios for speech development, photo and video art. The Timeline JS service is used to create timelines.

The results show the study program, methods of organizing activities in studios when creating timelines: displaying facts in chronological order, compiling algorithms, creating biographies, and presenting statistics. Difficulties that complicate the use of services are also formulated: management of temporary resources, the need to develop criteria and indicators of the effective use of web applications of corresponding designation. The results obtained can be used in additional education classes for career guidance, free time organization and support of schoolchildren's intellectual development.

**Keywords:** content of education, information interaction, digital technologies, creativity indicators, intellectual development, time scale, Timeline JS.

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## 1. Introduction

The Club of Rome Report presenting the conclusions made by the analytical center "Development Alternatives", which together with experts from the United Nations deals with issues of sustainable development, has determined that one of the tasks of modern education is to form problem-solving abilities in all students, as well as critical, independent and original thinking skills ([Doklady Rimskogo Kluba, 2023](#)). According to A. Dilekci, H. Karatay, a drastic refocusing of the content of education presume ([Dilekci, Karatay, 2023](#)): transferring knowledge gained on the basis of past experience; expanding the areas of knowledge, skills and capabilities that will be required in the future; adaptation and creative response to those uncertain conditions and challenges that are only envisaged.

According to D.E. Dobrinskaya, the processes of globalization and digitalization of society presuppose the development of an integrated educational space in the world ([Dobrinskaya, 2021](#)). Globalization of education has the following aspects: the general growth of the importance of knowledge, the introduction of information and communication technologies, etc. These aspects are catalysts for new forms of providing education (distance, virtual, mixed, etc.). There is an increase in the mobility of both participants of educational relations and training programs.

Many didactic projects may go beyond educational institutions, cities and countries, e.g. the project "Advanced Engineering Schools", launched in 2022 on the initiative of the Ministry of Science and Higher Education of the Russian Federation ([Proekt..., 2023](#)). The conditions for its implementation involve cooperation between representatives of economic structures, teachers of universities and schools from different countries. Project directions are development of high-tech industries, support for creative students who are not afraid to experiment. The project program provides interactive training complexes, networking, participation in brainstorming sessions, etc.

Thus, the vector for integrating the work of the school and the university to train qualified engineering personnel of the future is determined at the federal level. In addition, as M.I. Bocharov, T.N. Mozharova, E.V. Soboleva, T.N. Suvorova note that the role and importance of such a skill as "self-education and self-improvement throughout life" increase in modern education ([Bocharov et al., 2021](#)). So, the digital society requires such personal qualities that would help to solve quickly, unconventionally and effectively problems facing the society in the new millennium.

The Ministry of Education of Russia within the framework of the national project "Education" launches a federal project "Success of every child" ([Ministerstvo prosveshcheniya..., 2023](#)). According to its requirements, 80 % of teenagers should be engaged in additional education by 2024. In particular, there should be:

- Updating the content of additional education in all areas;
- Improving the quality and variability of educational programs;
- Transferring training programs into a network format (according to the interests of children with different educational needs);
- Improving the infrastructure and professional skills of teaching/managerial personnel.

The Conception of the development of additional education for children until 2030 also focuses on the development of creative abilities of students; on the individualization of education, taking into account the interests and inclinations for a particular creative activity ([Kontsepciya razvitiya..., 2023](#)).

Social Internet services, according to the conclusions of N.Ya. Ageev, Yu.A. Tokarchuk, A.M. Tokarchuk, E.V. Gavrilova, when used in education are universal, interdisciplinary in nature ([Ageev et al., 2023](#)). But naturally, the technological features of some services are better implemented in teaching a single subject (history, geography, computer science) or a specific topic (the history of computer development). The corresponding areas of applying services for working with timelines, of course, represent a certain didactic potential for the including relevant timeline constructors in various forms of additional education.

However, as noted by S.Yu. Stepanov, I.V. Ryabova, E.V. Gavrilova, very significant risks in terms of the development of thinking are associated with the spread of new digital technologies, web services and screen gadgets. They are used by teenagers mainly for entertainment, leisure activities ([Stepanov et al., 2021](#)). According to scientists, the earlier a child starts using digital devices, the severer the consequences for the formation of higher mental functions may be: delays in the development of speech, attention, memory and thinking.

This begins to affect the ability and readiness for learning, for self-development, as well as for creative activity especially strongly in school years. At the same time, as E.N. Malova,

V.G. Shubovich, M.M. Shubovich show, if digital means are used moderately and taking into account the requirements (norms) of the Sanitary Regulations and Norms for developmental and educational purposes, then it is possible to create additional didactic opportunities in terms of the formation and development of higher mental functions in the younger generation (Malova et al., 2019).

The hypothesis of the study is that including schoolchildren's work with online timeline services in the program of additional education classes will contribute to the creative development of students if the features and structure of this type of thinking, the possibilities of additional education and information technologies of the digital environment for the formation of creativity components are taken into account.

## **2. Relevance**

### **2.1. Literature review**

#### **2.1.1. Analysis of Russian scientific and pedagogical literature**

The result of creative thinking, according to Ya.A. Ponomarev, is new discoveries, and sometimes works of art (Ponomarev, 1976). Creative thinking involves generation of qualitatively new or improvement of existing solutions to the problem. D.B. Bogoyavlenskaya proposes to single out intellectual activity as a unit for research creativity (Bogoyavlenskaya, 2002). A creative person, according to E.P. Ilyin, is usually the one who has committed an act (mental or activity), which was highly appreciated by the majority (Ilyin, 2009).

B.M. Velichkovsky, G.G. Knyazev, E.A. Valueva, D.V. Ushakov determine originality, flexibility of thinking, independence, activity, initiative as qualities of a creative personality (Velichkovsky et al., 2019). Creative thinking is also the subject of teachers' study, mainly in relation to the learning process. The pedagogical aspect of creativity, according to the justification of M.N. Dolgikh, N.N. Dolgikh, does not imply the creation of a significant (marketable) product itself. Its function is monitoring the success of competencies development and training the components of the competence acquired. According to S. H. Khaknazarov, in the modern digital educational environment, the "education – teaching" model should be replaced by the "education – interaction" model (Dolgikh, Dolgikh, 2019). As S.Yu. Stepanov, I.V. Ryabova, E.V. Gavrilova conclude, due to the changed strategy in the Russian education system, it is necessary to revise approaches to teaching children in specific educational institutions (Stepanov et al., 2021).

S.S. Bykova, I.B. Buyanova, L.A. Serikova propose to carry out systematic work to identify creative, non-standard thinking students using TIPS technology (Bykova et al., 2020). The authors attribute the following to the peculiarities of adolescents' creative thinking: the possibility of distraction from specific situations, the ability to generate original ideas; the ability to predict the desired result; to anticipate the consequences of their decisions. Scientists suggest to include a system of methods in the training program: method of focal objects; brainstorming; Robinson Crusoe method; role-setting; the ideal end result.

E.V. Soboleva, T.N. Suvorova, N.Y. Blokhina, E.L. Batakova describe the possibilities of "virtual walls" for the formation of group creative thinking (Soboleva et al., 2021). The authors note that virtual communication, online collaboration, work with digital objects, the use of software and hardware has become an obligatory element of modern (including additional) education. Scientists prove that such interactive resources contribute to a comprehensive study of the object (search for information, presentation, creative processing, author's presentation, establishing relationships); collective creativity; evaluation of the result obtained from the position of its application in qualitatively different conditions (in the future).

According to S.Kh. Khaknazarov, additional education is an important socializing factor today, ensuring the productive use of schoolchildren's free time, as well as direct career guidance work for their intellectual development (Khaknazarov, 2022). Yu.A. Karvunis, M.B. Lozhkina, L.V. Kapilevich explore the possibilities of using e-learning elements in additional education of children on the example of sports and tourism programs. They come to the conclusion that the principle of mixed learning is at the heart of such forms of work: modern technologies make it possible to increase the effectiveness of schoolchildren's intellectual development due to greater visualization of the material (Karvunis et al., 2021). For example, the content of concepts is enriched, the student learns to distinguish essential and secondary features, to notice the connections and relationships between them, etc. According to the authors' conclusions, working with interactive maps and local history information in an electronic environment in all age groups



contributes to the improvement of generalized results in the areas of search and research, project and creative activities.

V.V. Uranova, O.V. Bliznyak, M.V. Mazhitova, R.R. Isyakayeva prove that a timeline can become an effective tool for creating an effective, attractive "packaging" of educational material. This is a graphical interactive scale that contains labels with information about an event, process, phenomenon in chronological order. They describe digital timeline as a web application that is designed to view, create, edit and publish interactive graphical timelines (Uranova et al., 2022).

M.E. Manshin, O.A. Kazanchyan note that there is a large number of software complexes for creating and editing chronological lines designed for both business and school and student audiences. The authors conclude that the use of a timeline when studying a writer's biography in literature lessons is the optimal means of activating interest in the author's personality among schoolchildren. Creating tapes in a specialized program simplifies the process and contributes to the development of ICT competencies, which is an indispensable criterion for modern education (Manshin, Kazanchyan, 2019).

A.V. Dikov highlights the following possibilities for using timelines in the pedagogical process (Dikov, 2016):

- Online familiarization with events on a public line for analysis and a holistic view of the studied phenomenon;

- Creation of tapes with the results of research within the framework of project activities;

- Using timelines as a task for independent work of pupils.

Unfortunately, the author does not note the potential for applying timelines to develop creative thinking.

At the same time, according to the conclusions of K. S. Chitailo, the use of information technologies in additional education determines new forms, methods of activity in classes and new options for interaction between teachers and schoolchildren (Chitailo, 2021).

Thus, using a timeline allows you to get a visual history of the development of a process. Events can be presented in the form of a text, pictures, video and audio recordings. When describing events on the timeline, it is enough to simply insert a hyperlink to Internet resources related to the fact, discovery. In other words, there are new opportunities that have a certain potential for the development of students' thinking. The specifics of additional education, in turn, make it possible to create conditions for the formation of self-awareness, self-determination and self-realization of the child. Moreover, the process of socialization is mediated by creativity, creative activity in the team. It has its own logic of development, involves overcoming and removing contradictions. This means that it can, when designing certain pedagogical conditions, contribute to the adaptation of the students' personality, the development of their creative abilities.

Thus, the following facts were revealed during the analysis:

- The presence of formed creative thinking is an important universal personality skill (Dolgikh, Dolgikh, 2019);

- Digital technologies with interactive capabilities have the potential for the development of creative thinking (Soboleva et al., 2021);

- Timelines are actively used for school education, to activate information interaction (Chitailo, 2021);

However, Russian scientific and pedagogical works devoted to identifying the possibilities of time scales to support the processes of generating ideas, improving the existing solutions to the problem are clearly not enough.

### **2.1.2. Analysis of foreign studies**

M. Durnali, Ş. Orakci, T. Khalil conclude that manifesting creative thinking is inextricably linked with the intensity of emotional characteristics (Durnali et al., 2022). The authors note that combining the concepts "intelligence" and "emotions" raises controversial issues, which is quite natural for the scientific branch of knowledge. But at the same time, these issues require discussion, especially when it comes to the education system.

S. Lee, J. Kenworthy, P. Paulus define that creativity (as a synonym for creative work) is a mental ability and inclination to generate new ideas and products that have a specific purpose, utility or value (Lee et al., 2022). The authors conclude that at the present stage of the development of psychological and pedagogical knowledge, there is a conscious need to identify the essential characteristics of the cognition process in various learning models, the determining factor in which is an increase in the level

of creativity. Further S. Lee, J. Kenworthy, P. Paulus substantiates that the effectiveness of the educational process increases if you include elements of humor. Humor lowers the level of tension. According to the results of their research, generation and perception of humor is an intellectual activity. In addition, the process of cognition based on humor proceeds through the resolution of contradictions and is mediated by intellectual activity (Lee et al., 2022). That, in general, as scientists conclude, creates conditions for the effective training individual creativity based on humor.

According to J. Guilford, creative thinking is conditioned by the formation and expression of four characteristics: fluency, flexibility, productivity and complexity (degree of development) (Guilford, 1956).

According to Th. Hardman's conclusions, the creative process (in art, business or science) includes both intellectual, conscious thinking processes and less conscious intuitive processes of cognition and discovery (Hardman, 2021). In creative activity, logical methods and strategies for solving problems interact with intuitive thinking mechanisms, mutually reinforcing each other. The power of the human psyche lies precisely in the fact that all forms of human reflection of reality (imagination, memory, different levels of thinking, etc.) coexist in close unity and complement each other.

Y. Görlich develops the author's scale of evaluation of the creative process: problem detection; search and evaluation of information; combination of concepts; generation of ideas; determination of the approach to the solution; evaluation of the idea; adaptation and implementation; communication and fulfillment (Görlich, 2023).

A. Dilekci and H. Karatay investigate the impact of an educational program developed in accordance with the "skills of the 21st century" on the development of such indicators of creative thinking as flexibility and originality (Dilekci, Karatay, 2023). According to their conclusions, creative thinking skills can be developed if there are appropriate conditions. Many people, according to L.S. Colzato, S.M. Ritter, L. Steenbergen, are not aware of their own creativity, because there is no suitable environment for its manifestation (Colzato et al., 2018).

Ü. Avcı and H. Yildiz-Durak study the factors influencing the development of creative and innovative thinking in the educational environment. In particular, scientists investigate internal and external motivation, learning goals, academic success (Avcı, Yildiz-Durak, 2023). L. Azaryahu et al. describe the possibilities for developing creative thinking in music and mathematics classes (Azaryahu et al., 2022). When developing new teaching methods and activities, the authors describe didactic resources that contribute to the formation of schoolchildren's positive attitude to the study of theoretical facts. For example, tasks on association, improvisation and composition.

B. Bridglall, E. Gordon in their study describe the essence of additional education and emphasize that general education develops as formal (it has a standard) one, and additional develops as informal (beyond the standard) one (Bridglall, Gordon, 2002). At the same time, today both general and additional education acquires formal and informal features. The authors point out that the principle of "availability of additional education for children" is not fulfilled for many families. But at the same time, it is additional education, according to J.B. Carroll, J. Goodwin, M.K. Oliver, that promotes academic, civic and social success to children from such families. In the conditions of additional education, children get the opportunity for creativity and self-expression, "going beyond" the social environment (Carroll et al., 2007).

According to the conclusions of X. Zhao, J. Yang, family, relationships between parents and parenting styles in the family play an important role in the development of creative thinking of the individual (Zhao, Yang, 2021). Its formation, a person's readiness for creativity are important conditions for the competitiveness of future graduates, skills of political importance.

Y. Wang et al. discuss at a more scientific and technical level the potential of computer visualization tools to increase visibility using the example of research projects in industry (Wang et al., 2022). With regard to education, similar conclusions are contained in the work of G. Zhang et al. (Zhang et al., 2022) Scientists conclude that in the framework of e-learning, the information presented is multimedia: text, images and video. The data itself display a variety of events, facts. But they do not allow to convey the dynamics, cause-and-effect relationships between them. This creates problems for correlating, comparing information from different sources to obtain valid conclusions. To solve this problem, special web analytics tools are to be used. R. Archana offers to use interactive tools of the information environment for the development of creative and artistic thinking. In particular, she considers digital art, the use of computer graphics tools (Archana, 2018).

Digital art, according to the author, can be defined as art that explores computer, engineering technologies and digitally encoded information content as a tool and material for creativity.

S. Bagossi, O. Swidan, F. Arzarello consider timeline possibilities in mathematical training for schoolchildren in Italy and Israel. Service tools are identified to activate information interaction when working with graphs and diagrams. However, the potential of time scales remains hidden, taking into account the specifics of additional education (Bagossi et al., 2022).

Such components of pedagogical activity, of course, suggest going beyond the class-and-lesson system. So, the analysis of the above-mentioned scientific works of foreign researchers also allows us to identify:

- Development of pupils creative thinking is an objective necessity due to the challenges of modern digital society to the level of training of graduates (Dilekci, Karatay, 2023);
- Timelines as a part of additional education give further opportunities for creating creativity (Bridglall, Gordon, 2002);
- Interactive services, computer visualization tools have powerful didactic potential for the development of creative thinking (Wang et al., 2022);
- Timelines are also interactive multimedia. However, the number of works devoted to their use to support the creative expression of schoolchildren is clearly not enough (Bagossi et al., 2022).

Thus, there is an objective scientific problem associated with the necessity for additional study of the development of schoolchildren's creative thinking in the conditions of additional education when working with timelines.

## **2.2. Purposes and objectives of the study**

The purpose of the study is determined by the need to study the didactic potential of online services for working with timelines in the additional education classrooms for the development of schoolchildren's creative thinking.

The following tasks were identified as the main ones:

- To identify the factors influencing the development of schoolchildren's creative thinking in additional education when working with online timeline services;
- To clarify the didactic potential of the information educational environment of the university in terms of forming the components of creativity: fluency, flexibility, productivity and complexity (development);
- To develop a program of classes and methods for organizing activities in studios when creating timelines.
- To experimentally test the effectiveness of the proposed system of classes on working with interactive timelines in additional education.

## **3. Materials and methods**

### **3.1. Theoretical and empirical methods**

To achieve the goal and solve the research tasks, theoretical analysis and generalization of literature were used to identify problems and prospects for using timeline services in conditions of additional education, to clarify the didactic potential of digital technologies for the formation of creative thinking.

A timeline is a time scale on which labels with data about the event, process, or phenomenon are placed in chronological order. Digital services for timelines analyzed were: StoryMap JS, Tiki-Toki, Sutori, Timeglider, Preceden, MyHistro, SmartDraw, Timeline JS. Comparison criteria included: information about developers, the year of release, paid/free, the option to choose the Russian language for the interface, the convenience and clarity of the registration form, functionality and principles of operation (working with Russian text, the ability to download graphics and videos, the form of saving: publication on the service/publication on any site). Timeline JS was chosen for detailed study and practical application in additional education. Its advantages are:

- The service is free, simple and multi-purpose and allows you to incorporate the result into the page of any website;
- The service "creates" a timeline based on the Google table;
- The information can be accompanied by a link to a photo, video or a code, for example, to a map or infographic;
- By clicking "Open Preview in a new window", the timeline will open in a new window. This link can be distributed, for example, on social networks.

Experimental work was carried out on the basis of studios: the speech development studio «In the know» and the studio for photo and video art «Perspective», involving 60 schoolchildren. The study was conducted in 2021–2023.

To diagnose and assess the formation of creative thinking, the method "Divergent (creative) Thinking Test" was used. The author is F. Williams (adapted by E. E. Tunic). This is a series of drawing tests revealing the student's creative self-expression abilities according to the following indicators: fluency of thinking (productivity), flexibility of thinking (mobility), originality, degree of development, naming (richness of vocabulary and imagery of speech). These indicators correspond to the essence of creative thinking according to J. Gilford: fluency, flexibility, productivity and complexity (degree of development).

To collect of experimental data, the test with a duration of 25 minutes was carried out twice: at the beginning of the lesson system and after it. Scoring was performed after familiarization with the methodology and instructions.

Five indicators were evaluated: fluency (maximum score – 12); flexibility (maximum score – 11); originality (maximum score – 36); development (maximum score – 36); name (maximum score – 36). The procedure is presented in detail in clause 4.3.1.

Mathematical methods: methods of quantitative processing of research results; methods of mathematical statistics (Pearson's chi-square coefficient –  $\chi^2$ ).

### **3.2. The base of research**

The main purpose of the experimental work was to test the effectiveness of using online services to create timelines for the development of schoolchildren's creative thinking in additional education.

The use of timeline services within the framework of experimental search work for the development of creative thinking was carried out during classes: in the speech development studio «In the know» (guidance – K.A. Chaplygin, N.Yu. Kryuchkova) and in the studio for photo and video art «Perspective» (N.I. Zhukova).

The choice of these studios is due to the fact that they operate on the basis of Vyatka State University. E.V. Soboleva as a teacher of the university oversees the introduction of digital technologies into the pedagogical activities of specialists in the additional education system.

Possible external variables for the experiment: material and technical base, motivation and mood of the pupils, parental consent, experience and qualification of the studio manager, duration and time of classes.

To take into account the external variables of the organization during the experiment, the following features were taken to eliminate their influence on the experiment:

- The consent of all schoolchildren, their parents and legal representatives to participate in the experiment was obtained;
- A program of classes was drawn up, their frequency and time did not change;
- Strict control of conditions and fixation was carried out for the entire process of working with timelines;
- It was monitored that in other educational institutions attended by schoolchildren during the experiment there was no systematic work affecting the monitored indicators;
- The same studio managers participated in the experiment;
- Studies were held in the same classrooms. The tool of timeline has not changed.

Possible external variables: material and technical base, motivation and mood of the subjects, parental consent, experience and qualification of the studio manager, duration and time of classes.

The tasks of the speech development studio «In the know» are to master the technique of speech, to develop the natural voice, to get rid of the stiffness in speech and in the body, to learn how to manage emotions and keep the attention of the interlocutor.

Individual classes are focused on choosing a personal program aimed at spot detection and correction of speech errors, psychological and bodily stiffness.

Group classes according to the programs of training courses offered in the studio allow to improve the speech together, in a team, overcome embarrassment and fear of public speaking.

The tasks of the studio for photo and video art «Perspective» are the development of teenagers' creativity; the study of technologies for creating artistic photography, video and animated films from the script, videography to editing and post-processing.

The unique character of the presented additional education studios consists in a comprehensive method of teaching fundamentally different types of activities within the same direction.

The system-forming factor for the developed classes is the timeline implemented in the web service.

The practical application of interactive timelines has also been implemented in the activities of the Pushkin Central City Library (Kirov) during planning and holding the All-Russian action "Biblionight – 2023".

### **3.3. Stages of research**

At the preparatory stage, the teacher analyzed the potential of innovative digital technologies for the development of schoolchildren's creative thinking in additional education, studied the timeline constructors.

Further testing was carried out under the conditions of the modified and adapted Williams test. The maximum possible total for the entire test is 131. While interpreting the results, points were calculated for each of the indicators.

According to the sum of the points, levels of the development of creative thinking were determined: "High" (the total number of points from 89 to 131), "Medium" (69–88 points) and "Low" (up to 68 points)

The level is "High" when the student offers interesting, non-standard solutions for designing the timeline, compiling text explanations and formulating its name. He/she is active in "sketching" associations and easily changes the interactive timeline based on comments (new requirements and challenges). The participant of information interaction is independent in detecting and visualizing cause-and-effect relationships between events.

The level is "Medium" if the student quite actively offers solutions for designing the timeline, but they are not always non-standard and interesting from the point of view of the design or the content of the timeline. When formulating a name for the resource, he/she refers to additional information sources. He/she is periodically active in "sketching" associations. But changing the timeline based on comments (new requirements and challenges) often causes confusion and a decrease in the pace of work for a teenager. The participant of information interaction is not always independent in detecting cause-and-effect relationships between events, however, easily visualizes them by means of a web application.

The level is "Low" when the student experiences significant difficulties in designing and composing a text for the timeline, labeling and formulating its name. He/she practically does not find associations. He/she sharply negatively perceives the proposal from studio managers to improve the interactive timeline based on comments (new requirements and challenges). The participant of information interaction finds and visualizes cause-and-effect relationships between events only with constant pedagogical support.

Thus, it was possible to collect data on 60 schoolchildren who attended the speech development studio «In the know» and the studio for photo and video art «Perspective».

Based on the testing materials (the essence is described in clause 4.3.1.), control (30 schoolchildren) and experimental (30 schoolchildren) groups were formed.

In order for the survey results to be representative of the study, the size of the population is equal to the number of all pupils of studios.

On the second stage of the study, the implementation of the training program was carried out according to the system of classes described in clause 4.2. The systematization of theoretical and accumulated empirical experience in the aspect of the problem was also carried out.

On the third stage of the study, the main conclusions and recommendations on the use of timelines for the development of schoolchildren's creative thinking in additional education were formulated.

## **4. Results**

### **4.1. Key concepts and factors influencing the development of schoolchildren's creative thinking in the conditions of additional education when working with online timeline services**

Additional education in the presented study is a type of education focused on:

- Forming and developing creative abilities of participants in the didactic process;
- Satisfying their individual needs for intellectual, moral and physical improvement;

- Forming a culture of life safety, including information;
- Organizing free time for children and adults.

Additional education is studied by the authors in technical, natural science, socio-humanitarian, artistic, tourist and local history directions.

The basis for experimental work is the creative studios «In the know» and «Perspective».

The choice of these institutions of additional education is due to the following factors:

- 1) Classes according to the studio managers' training programs are focused on the development of creativity of the younger generation;
- 2) Classes contribute to the artistic, aesthetic, moral education of children on different stages of their socialization, including a difficult period of growing up in middle and high school;
- 3) Classes allow to distract children from negative influences and help them professionally decide in the future. The culture of modern society is becoming more and more spectacular, and skills in the field of photography, computer presentation, video are in demand for people of any specialty.

The main directions of the studios («Perspective»/«In the know»):

- "Fundamentals of Photography"/"Fundamentals of Speech";
- "Videography and editing technique"/"Speech technique";
- "Scenario work"/"Public speaking";
- "Fundamentals of acting"/"Voice and Confidence";
- "Fundamentals of computer animation", "History and development of cinematography (or variants – printing, computers)".

In the presented study, creative thinking is considered from the position formulated by A.Ya. Ponomarev: it involves generating qualitatively new or improving existing solutions to the problem (Ponomarev, 1976). But at the same time, according to the previously mentioned ideas of J. Guilford, "creativity" will be considered through the prism of the maturity of such indicators as fluency, flexibility, productivity and complexity (degree of development) (Guilford, 1956).

The atmosphere of informal communication prevailing in studio classes, the encouragement of personal creative activity affects the formation and manifestation of children's creative initiative, synthetic skills, flexibility of thinking. They develop creative abilities and artistic taste, interest in cinema and photography, imaginative perception of the world around them, the ability to assess their own capabilities and work in a creative group.

The study presented understands the "timeline" as an infographic tool that allows you to create a visual history unfolding in time based on events and facts organized in chronological order, and to present it as a time axis.

Timeline Designer is an online service that allows you to create, edit and distribute a timeline in a digital representation on the Internet.

Thus, the timeline constructors in the educational process are optimal to use in the following cases: familiarizing with the events in chronological order, in order of their significance; performing a comprehensive analysis and forming a holistic view of the phenomenon under study; designing a "timeline" with research results by stages (end/beginning) of project activity; supporting self-organization, self-improvement (at trainings, courses); fixing the deadlines for individual tasks (individual route) and independent work.

An interactive timeline created in the online service is easy to open for editing and creative collaboration. The ability to track changes on a virtual timeline in real mode stimulates imagination, triggers cognitive activity. According to Ya.A. Ponomarev, creative thinking is initiated (Ponomarev, 1976).

Online services for creating interactive timelines expand the space of creative activity, provide new opportunities for activating creative potential.

It was determined that the timeline should be distinguished from other types of information visualization, in particular, based on the following features: a bulk of text component; mandatory fixation of time intervals; the possibility of a fully functional existence only on the Internet.

Digital content is defined as information material that can become a conductor of the main idea, act to convey a message or the main idea.

The integration of educational areas when working with timelines fits seamlessly into the project method, which, according to the requirements of additional education, is the leading method in working with children. It is the "timeline" that can support students in understanding the retrospective of the surrounding world.

Indeed, the formation of ideas about time and historical development cause special difficulties for schoolchildren. It is quite difficult to imagine without using visual aids such concepts as "film development algorithm", "heteroclines", "structure and principles of operation of a video camera", "data search", "network etiquette". The timeline as a time scale allowed schoolchildren to perceive these abstract concepts and apply them in practice.

Next, we will present a system of classes for working with an interactive timeline, which does not have a rigid structure. The system of classes can adapt to the challenges of society and the needs of the participants of information interaction in the conditions of additional education.

#### **4.2. The program of classes on working with interactive timelines**

The system-forming factor in the system of developed classes is a timeline implemented in the web service.

Lesson I is the analysis of ready-made timelines presented in print and electronic forms, with identifying potential opportunities for their use in the studio work: biographies of prominent figures, the history of discoveries, algorithms of actions, discussion of the advantages/disadvantages of timelines in a digital format.

Lesson II is the analysis of Internet resources to create interactive timelines. The participants of the information interaction analyzed digital services for timelines: Story Map JS, Tiki-Toki, Sutori, Timeglider, Preceden, MyHistro, SmartDraw, Timeline JS. It was decided to use the latter in the studios of additional education.

Lessons III and IV are devoted to creating interactive timelines.

The work was organized according to the algorithm:

1. Carrying out preparatory work with information. Events were collected in a text files, which were then added to the timeline. The following information was determined for each event: the date, a link to a photo, video or code, for example, on a map or infographic.

2. Switching to the Timeline JS web service (<https://timeline.knightlab.com/>). You do not need to register on the service. To get started, you click on the green button in the center of the screen "Make a Timeline", then on the blue button "Get the Spreadsheet Template".

3. Creating a new Google table using the service template. It was copied to the Google Drive account when clicking on the "Make a copy" button.

4. Filling in the table. Preview and modification.

The use of the timeline in additional education was carried out in the following cases: to display historical facts in chronological order; to prepare a chronicle of current events; to create a biography; to illustrate statistics.

Working with online services for creating timelines affected the main indicators of the maturity of creative thinking in the following way:

1) originality, i.e. the ability to see non-standard solutions, develops when drawing up a plan (reference points, milestones, division scales) on the timeline;

2) fluency – the variety of associations that students have when visualizing history, for example, when designing a timeline on the history of the development of artificial intelligence (web, human brain, fantastic character);

3) flexibility manifests itself when the teacher formulated and gradually supplemented the system of requirements for the timeline, for example: place at least 10 events on the line; provide for two or more events starting at the same time, etc.;

4) degree of development appears when students found and visualized cause-and-effect relationships between phenomena. For example, "Johann Gutenberg is the Creator of printing. "Latin grammar" and indulgences. Life before the printing press. The first experiments. Financial difficulties. Gutenberg studies. On the way to discovery. Career of a jeweler Who invented printing? Time travel. American inventions. Memory".

5) naming, i.e. the students skillfully and wittily used language tools and the vocabulary in the design of the text on the timeline. The timeline text is a meaningful element of infographics that combines multimedia components.

Lesson V is the analysis, discussion of the designed interactive timeline and the result obtained (a developed film). If there were significant disagreements, the timeline was re-checked and finalized.

Lesson VI is a foresight session, when options for using the developed interactive timeline were proposed, for example, for students of the Vyatka State University, or to support the Pushkin

Central City Library while planning and holding the All-Russian action "Bibliomonth – 2023". The developed timelines were used in the framework of exhibitions and virtual excursions "From Voronezh to Paris" and "Bunin in the Oryol region".

The participants further applied the received timelines at other studio events (art meetings, brainstorming sessions, auctions of knowledge, etc.).

### **4.3. Experimental assessment**

#### **4.3.1. The ascertaining stage of the experiment**

60 schoolchildren (50 % – boys, 50 % – girls) were involved in the experimental work in conditions of additional education.

To assess the input conditions (the level of the creative thinking development), students were offered 12 pictures. The instruction for schoolchildren said: "It is necessary to draw quickly an unusual picture that no one else can come up with. You will be given 20 (25) minutes. When creating an image, use a line or a figure inside each square. Make it a part of the picture. You can draw anywhere inside the square, depending on what you want to depict. You can use different colors. After completing the work, come up with its name and fix it. The name should tell about what is depicted in the picture, reveal its meaning".

The result is five indicators expressed in points:

- Fluency – the maximum possible score is 12;
- Flexibility – maximum possible score – 11;
- Originality – the maximum possible score is 36;
- Degree of development – the maximum possible score is 36;
- Naming – the maximum possible score is 36.

Thus, taking into account the results of the materials processed, it was possible to collect data on 60 schoolchildren. Experimental and control groups were formed. 30 people were selected for the experimental group: 15 girls and 15 boys. The average age of respondents is 15 years.

The norms of research ethics are also taken into account when conducting the experiment (especially considering that the experiment is conducted with the participation of minors). Studio managers informed both schoolchildren and their parents about the stages of work. They answered all the questions that arise, solved organizational difficulties. All rules of information security and sanitary-hygienic requirements were observed.

#### **4.3.2. Forming stage of the experiment**

The tasks of the speech development studio «In the know» are to master the technique of speech, to identify the natural voice, to get rid of the stiffness in speech and in the body, to learn how to manage emotions and keep the attention of the interlocutor.

The tasks of the studio for photo and video art «Perspective» are developing teenagers' creativity; studying technologies for creating artistic photography, video and animated films from the script, videography to editing and post-processing.

The unique character of the presented additional education studios consists in a comprehensive method of teaching fundamentally different types of activities within the same direction.

Classes in the speech development studio «In the know» were held twice a week (Tuesday-Thursday), also twice a week in the studio for photo and video art «Perspective», but on Wednesdays and Fridays. Studio managers did not change during the study period.

The participants of the experimental group started working with services for creating interactive timelines (using the Timeline JS service) according to the program presented in clause 4.2.

We will describe the algorithm of developing the film formulated in the process of information interaction: preparation of solutions (fixer and developer); placing the film in the tank for development; setting the time for development on the timer; pouring the solution with the developer into the tank with the film; rotation of the spiral located inside the tank; draining the solution once the time expires and filling the tank with water; scrolling the spiral and draining the liquid; pouring a fixative into the tank; flushing the tank with the film; cleaning the film from drops using suede and forceps; hanging the film and fixing it.

Text messages for the stages were registered in the studio «In the know», and photo/video accompaniment was provided by the participants of the studio «Perspective». Then the algorithm was implemented in accordance with the timing.



Other examples of timelines developed by the participants that were included in the further educational process: the chronology of the invention of radio; the history of printing (the evolution of ideas and technology); the sequence of actions of the rhetorician in preparing an argumentative speech; rules of network etiquette, etc.

The participants of the control group also studied in the studios of the speech development and photo and video art and used computer-free timelines. The production of the "line" necessarily represented an artistic and aesthetic process. Students photographed or drew, cut, pasted and signed images of objects. Music was often used in classes with the "line": dances of the peoples of the world, round dances, singing songs, etc.

However, they were not involved in the study of online services for creating time lines.

Examples of tasks fulfilled by the participants with the help of information resources: compilation of cards with the rules of network etiquette, the analysis of vector and raster data, the image of road signs and logos.

### 4.3. 3. Control stage of the experiment

Information about the results of evaluating "before" and "after" experimental research work and the use of online services to create timelines for the development of schoolchildren's creative thinking additional education is provided in [Table 1](#).

**Table 1.** Results of the work on creating timelines for the development of schoolchildren's creative thinking additional education

Level	Groups			
	Experimental group (30 pupils)		Control group (30 pupils)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
«High»	5 (16.7 %)	12 (40.0 %)	5 (16.7 %)	6 (20.0 %)
«Average»	11 (36.6 %)	14 (46.7 %)	12 (40.0 %)	12 (40.0 %)
«Low»	14 (46.7 %)	4 (13.3 %)	13 (43.3 %)	12 (40.0 %)

The following hypotheses were accepted: H<sub>0</sub>: the level of schoolchildren's creative thinking in the experimental group is statistically equal to the level in the control group; H<sub>1</sub>: the level in the experimental group is higher than the level in the control group. For  $\alpha = 0.05$ ,  $\chi^2$  is 5.991. We got:  $\chi^2_{\text{observed.1}} < \chi^2_{\text{critical}}$  ( $0.081 < 5.991$ ), and  $\chi^2_{\text{observed.2}} > \chi^2_{\text{critical}}$  ( $6.154 > 5.991$ ). Consequently, the increase in the level of the development of schoolchildren's creative thinking  $f$  in additional education in the experimental group can be considered non-accidental.

Performing a qualitative assessment of the results obtained, we note that the number of students in the experimental group with the level of the development of creative thinking "High" increased from 16.7 % to 40 %. In the control group, this indicator increased from 16.7 % to 20 %. In the experimental group positive dynamics was recorded at the "Average" levels: the increase was 10.1 %. In the control group, this indicator remained unchanged. In both groups, the number of students with the "Low" level decreased: in the experimental group from 46.7 % to 13.3 %, and in the control group – from 43.3 % to 40 %.

Thus, the obtained qualitative and quantitative changes in the results allow us to make an objective conclusion about the significant didactic potential of using timeline services for the development of schoolchildren's creative thinking additional education.

## 5. Limitations

Let's pay attention to possible limitations for the study:

1. Choosing the form of additional education – a studio. Unlike clubs, the purpose of classes in the studio is not to prepare children to participate in competitions and achieve high results. Although, the participants sometimes take part in small local competitions. The main purpose of the classes is creative development, leisure activities and the formation of basic knowledge and skills in accordance with the challenges of the XXI century. In studios children do not just play, they necessarily get theoretical knowledge and master certain skills.

2. An important condition is that throughout the experiment the same studio managers were engaged with schoolchildren. Classes were held according to the same schedule (days of the week,

duration, rest period after lessons in a general education institution). Sanitary and hygienic standards were taken into account for the organization of the activities of studios using ICT tools (computer, electronic gadgets, etc.).

## **6. Discussion**

The development of schoolchildren's creative thinking in the conditions of modern digital educational environment is an urgent problem of research for Russian and foreign scientists. The research materials correspond to the principles and goals of sustainable development formulated by the UN, in particular Goal 4 ([17 Goals..., 2023](#)). When developing the training program, it was taken into account that working with interactive timelines in additional education will contribute to:

- 1) Acquiring knowledge and skills to promote sustainable development;
- 2) Creating didactic resources that would be informative, safe and taking into account all the needs, including children with disabilities.

During the discussion, there were identified the activities with timelines that most affect the development of creative thinking:

1. Of particular value is the activity with online services, when schoolchildren's ability to portray events and phenomena of the future is formed. Events where they need to convey not only the appearance of the idea, but also add new functions to it.

2. In the course of discussing and constructing the timeline, its creators had a variety of associations, which contributed to the development of fluency of thinking.

3. The scale of the Internet allowed students to work with a large array of information, to find unique materials. All these factors contribute to the development of such characteristics as originality of thinking.

4. The opportunity to use Internet services when editing, modifying the timeline allows you to support foresight technologies for designing the goals of the future in education, self-study and self-improvement. At the same time, flexibility of thinking develops.

5. At the same time, the virtual format allows you to create an objective retrospective of historical events (discoveries, biographies), revealing cause-and-effect relationships between them. In other words, the degree of development of thinking is manifested.

6. And, of course, all the work with timelines took place in an information communication environment, which contributes to the development of language tools and vocabulary.

The conclusions obtained confirm the results of the work of J.B. Carroll, J. Goodwin, M.K. Oliver about the importance of additional education for increasing creative activity and successful socialization ([Carroll et al., 2007](#)).

In addition, the didactic potential of digital services for the development of students' creative thinking was confirmed, presented in the work of N.Ya. Ageev, Y.A. Tokarchuk, A.M. Tokarchuk, E.V. Gavrilova ([Ageev et al., 2023](#)).

A significant result of the study is the description of the basic ideas of the approach that expand the ideas of S.Yu. Stepanov, I.V. Ryabova, E.V. Gavrilova about the influence of the digital environment and additional education on the schoolchildren's intellectual and creative abilities ([Stepanov et al., 2021](#)).

It is proved that working with an interactive timeline really creates additional conditions for the development of schoolchildren's imagery, originality and speed of perception. It is the computer "timeline" that helps to understand that a person can creatively approach the transformation of the real world around him, purposefully "adjust" objects (and phenomena) to both his own and social needs.

## **7. Conclusion**

The results of the study made it possible to identify the following didactic possibilities of using online services to create timelines for the development of schoolchildren's creative thinking in additional education:

- Multiple use – an interactive timeline can be incorporated in a blog, website and repeatedly accessed; a digital archive can be created. In the future, if necessary, it is possible to return to the information resource and creatively process it;

- Social orientation – the interactive timeline can be viewed by a large number of users, commented and evaluated, distributed and applied in network communication;

- Multimedia presentation – not only text messages, but also graphics and videos are placed on the interactive timeline;
- Artistic and aesthetic education – the development of accuracy, aesthetics of perception. This is manifested and supported through the desire to design an interactive timeline in a single style; to create an up-to-date design. The student has an opportunity to show creativity, individuality in the design of both the visual series and in the text content;
- Technical minimalism – timeline services do not impose special requirements on the software. Interactive timelines are supported by most browsers;
- A combination of different types of educational materials (reference books, dictionaries, atlases). There are opportunities to systematize the information presented in different types (including various classifications);
- Cognitive analysis – interactive timelines allow you to visually and dynamically establish cause-and-effect relationships.

As difficulties that complicate the use of timeline in additional education, we note: the need for a systematic study of the experience of evaluating the effectiveness of using services for working with timelines; the development of criteria and indicators for the effective use of web services for appropriate purposes in an institution of additional education for children (managerial, educational, educational, personnel and aspects).

The results obtained can be used:

- In the activities of developing courses aimed at in-depth study of the school curriculum and expanding the schoolchildren's horizons;
- In students' project and research activities;
- In the work of experimental sites. When organizing classes not only on the territory of the university, but also in schools and organizations of primary and secondary vocational education;
- In social projects (center for helping children with disabilities; social cluster for raising awareness of families);
- In various additional education programs to support and promote the ideas of the federal project "Success of every child" of the national project "Education".

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## **Influence of Historical Education on the Formation of Civic Identity of University Students in the Learning Process**

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### **Abstract**

The article describes the results of an empirical study of the effectiveness of historical education in the process of forming the civic identity of modern university students. According to the constructivist approach, civic identity is a cognitive values-based phenomenon that is formed in the process of personal development and expressed in the subjective significance of nationality. Within the framework of the study, such qualitative methods as a case study are used. The authors of the article develop tools for data collection. The method of content analysis was selected for data analysis. At the ascertaining stage, the research results reveal that university students have some knowledge about the history of their country but partial awareness of intangible objects of cultural heritage. The conducted experiment emphasizes the importance of using intangible resources of cultural heritage in the educational process and the need to create new educational programs. The study also reveals the main reasons to form the civic identity of university students. This is done through an analysis of the experience of predecessors in the field of forming the civic identity of university students and a comparison of various pedagogical approaches, as well as the definition and update of the role of individual elements in the education system that are of particular importance for this process and on whose basis a comprehensive conclusion can be drawn.

**Keywords:** civic identity, education, formation, active civil society, critical thinking.

### **1. Introduction**

In today's globalized world, the development of civic identity becomes a necessary condition for the preservation and development of the state. The civic identity of adolescents is developed through the growing awareness of civic values and beliefs and the integration of civic knowledge and skills with personal experience.

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We determined that there are several reasons why it is important to form the civic identity of students:

1. It helps create civil society and strengthen democratic institutions;
2. It is an important component of education as it develops personal qualities necessary for life in modern society;
3. It helps preserve the cultural heritage and social traditions;
4. It is an important factor in the development and maintenance of a stable society;
5. It helps society deal with the challenges that arise in the process of development, such as conflicts, crises, etc.

The key tasks of education and upbringing are not only the acquisition of new knowledge and professional skills by students but also the formation of values, the development of ethical principles and moral attitudes, the improvement of general culture and tolerance for other cultures and worldviews, and the awareness of their belonging to civil society and responsibility for its well-being. All this is the basis for developing the spiritual and moral sphere of the individual, which is important for the formation of civic identity.

When forming the civic identity of students, it is important to pay attention to historical education since the knowledge of one's national history is among the important components of this process. Historical memory forms ideas about the ideals and values on which society is based.

One of the main problems associated with the formation of civic identity among students is the lack of a unified methodology and approaches that guarantee the achievement of this goal. In addition, the formation of civic identity can be influenced by various factors, such as the cultural and historical characteristics of students, their level of education, social status, etc.

To solve this problem, it is necessary to develop a unified methodology that considers various factors influencing the formation of civic identity among students. An important element of this methodology is the creation of conditions for the development of socio-cultural competencies among students, which allow them to better understand and adapt to different cultural environments and social contexts. The study results help identify the most effective methods and approaches to the formation of civic identity that can be used in pedagogical programs aimed at the development of civic identity among students. In addition, the results can become the basis for further research on this problem and the creation of new methods and approaches in the educational field.

Thus, this study aims at determining the effectiveness of using various methods and approaches to the formation of civic identity among students by introducing and applying an original program "Civic Identity and Cognition".

## **2. Literature review**

The civic identity of young people is a relevant issue for all countries. For example, Schubert (Schubert, 2006: 623) defines civic identity as "an identity that connects an individual with the state and civil society based on common values, principles and institutions, respect for the rights and freedoms of people, responsibility and participation in public life".

Levine (2009) emphasizes that civic revitalization is essential for a healthy democracy, including improved civic education, the active participation of citizens in the political process, and the strengthening of civil society (Levine, 2009).

Holovii et al. (2022) define civic identity not only as love for one's history and country but also as the will to defend it and the conscientious work of each person (Holovii et al., 2022).

Considering the civic identity of young people as a socio-cultural process that is the basis for civic engagement and youth participation in the democratic process, Mitchell (2015) emphasizes the need to form it through participation in civic initiatives, education, social experience, and other factors, offering an integrative model for the formation of civic identity through five main components: cognitive, emotional, social, behavioral, and contextual (Mitchell, 2015).

According to Denney (2021), personal identity can contribute to the development of civic identity in adolescents and increase commitment to their community and awareness of social responsibility. The scholar also believes that the discussion of social problems among students can stimulate the development of critical thinking and enhance their motivation for civic engagement (Denney, 2021).

Ballard et al. (2021) claim that young people participating in high-quality development programs, such as citizenship training programs, social programs that strengthen their social ties,

or programs that encourage their participation in the community and public life, significantly increase their civic engagement skills (Ballard et al., 2021).

Fraga and Holbein (2018) argue that civic education has a positive effect on students' participation in civic activities and contributes to the development of their civic identities through voting, participation in social events, and community work (Fraga, Holbein, 2018).

Johnson (2017) emphasizes the importance of the education system which has the potential to influence the civic and social participation of students. However, this influence is ambiguous and depends on many factors, such as economic status, gender, race, cultural differences, the quality of education, etc. Education can help develop civic and social identities, teach citizenship skills, strengthen social bonds, and many other factors that can increase civic and social participation (Johnson, 2017).

According to a study by Bartlett and Schugurensky (2021), to achieve a sufficient level of civic identity by the moment of graduation, it is necessary to use the concept of the student voice to ensure the active participation of students in civic education. This means that students should be involved in decision-making that affects their life in both university and society. As a result, students become active citizens, which can contribute to the development of their civic identity (Bartlett, Schugurensky, 2021).

Mitchell (2015) mentions that civic education should be aimed at developing critical thinking, analyzing social and political problems, as well as finding ways to solve them with due regard to different views and interests. These skills need to be developed through participation in public discussions and actions, where citizens can express their opinions and make decisions concerning society as a whole (Mitchell, 2015).

Badaki et al. (2019) refer to a video from the Youth Voices project that promotes the development of critical thinking, digital literacy, and civic identity among young people. The scholars state that "the project participants had become aware of the problems of their communities and grew more confident in their ability to contribute to their solution" (Badaki et al., 2019).

Maratova (2019) describes some factors that can influence the formation of students' civic identity, including political beliefs, family upbringing, and educational experience. Thus, civic identity is closely connected with students' social activity (Maratova, 2019).

Shevchenko (2019) discusses the importance of forming the civic identity of students during the educational process and using the potential of history and cultural heritage to improve this process (Shevchenko, 2019).

McCullough (2017) highlights that the study of the history of one's country can play a key role in the formation of civic identity, considering such topics as freedom, equality, democracy, moral values, and religion and discussing the role of great personalities in the history of the United States, which inspires the people to new achievements (McCullough, 2017).

Souto-Otero et al. (2019) believe that the formation of students' civic identity is a complex and dynamic process that depends on many factors. The knowledge of national history has been recognized as one of the main factors in the formation of students' identities (Souto-Otero et al., 2019).

In our opinion, historical heritage is an important element in the formation of students' civic identity as a source of history, culture, traditions, customs, beliefs, and values that are passed from one generation to another, linking with the past and pointing to the future. The preservation and transfer of historical heritage to students is a public responsibility and requires efforts on the part of the state, educational institutions, and the public.

The views and opinions of the aforementioned authors on the formation of the civic identity of students are different. However, we can mention the following similarities formed in the course of educational activities:

- The formation of civic identity includes the development of individual independence, voluntary compliance with generally accepted standards and behavioral patterns, responsibility for one's actions, and the fulfillment of moral and legal obligations to society;

- A person assumes personal, political, and economic obligations, including care for their family and children, their education, social awareness, voting, paying taxes, and fulfilling duties to the authorities in accordance with their capabilities;

- Respect for human dignity and other opinions, civic behavior, considering the interests of fellow citizens and adherence to the majority principle, recognition of the right of minorities to dissent;

- Guidance by universal human principles in the collision of different views on moral standards and life values;



- Participation in civic affairs, such as public debates or elections, as well as the priority of the public good over personal interests;
- Support for a healthy democracy which includes awareness and attention to common causes, control over the actions of political leaders and public organizations, as well as adherence to certain political views;
- Respect for the law and the development of initiative and responsibility, as well as the ability to use personal freedoms in accordance with the law;
- Critical thinking, the ability to resist manipulation by the authorities and the media, independence in their judgments, as well as the ability to rationally justify an opinion.

### **3. Materials and methods**

This study is part of a dissertation and is based on the application of both theoretical and practical methods. One hundred and eighty-one students of pedagogical specialties of the Toraighyrov University and the Pavlodar State University participated in the survey.

To form the experimental and control group, we applied the method of random assignment (Dawson-Shepherd, Morris, 2017). Random assignment involves randomly assigning participants to different groups to minimize bias and ensure that the groups are comparable. The experimental group included 91 respondents, and the control group consisted of 90 respondents. Both groups were of mixed gender. Due to the ethical need to maintain the confidentiality of the respondents, their statements were coded.

We used the method of case study for easier sampling, the reasons of speed and practicability (George, Bennett, 2005).

In the course of the research, we analyzed scientific literature and studied Kazakh and foreign experiences in the formation of the civic identity of students.

Empirical methods were used to obtain knowledge and draw conclusions.

The data obtained were processed using content analysis, which can be used to analyze the interviews of experts (Zimnyaya, 2015).

The research also utilized the constructivist approach of K. Charmaz (2014) for collecting and analyzing qualitative data to create a theory based on these data.

A survey was conducted among lecturers to assess the conformity of content and closed-ended/open-ended questions in our questionnaires, which were presented for research purposes and finalized based on an expert assessment. Later these questionnaires were used to collect research data and assess the formation of students' civic identities. The results of surveying students were carefully analyzed and assessed.

For the statistical verification of the results obtained the  $\chi^2$  criterion were used.

The content-functional component plays a key role in the formation of all structural elements of civic identity, including cognitive (CC) (the knowledge of belonging to a given community), values-based and semantic (VBSC) (positive, negative, or ambivalent attitude to belonging), emotional-evaluative (EEC) (acceptance or rejection of one's belonging), and activity-based (ABC) (a civic position in communication and activity). Each of these components interacts with the others, forming a complex system for the formation of students' civic identity. When assessing the formation of the civic identity of students, we identified three levels: high, medium, and low.

The formative stage was devoted to the formation of students' civic identities. The students were given control tasks on civil topics and participated in thematic conversations and discussions.

At the formative stage, we used custom surveys. To determine the subjective hierarchical structure of identities, the respondents were asked the question "Who am I?". It was necessary to give a free-form answer that first came to mind.

The mass survey contained the following question: "What does it mean for you to be a citizen?". It was necessary to choose one answer from several options presented in the list.

When creating a comprehensive system for the formation of the civic identity of students, we considered the requirements of psychological and pedagogical sciences for the educational process and the real-life experience of students.

### **4. Results**

In the course of the study, we revealed that the presentation of materials on the history of the country led to a change in the worldview, internal motivation, and interest of students in civic topics (civic position, patriotic consciousness, belonging to society, familiarization with the

historical values of their country, deepening knowledge about the political system, legal norms, social institutions, awareness of one's role in society and showing interest in solving social problems, expressing one's views and opinions, etc.).

The rating of received answers to the question "Who am I?" is as follows:

68.1 % of the respondents answered "I am a citizen of my country";

17.2 % of the respondents answered "I am a person", which indicates their distance from their social status;

14.70 % of the respondents answered "I am a son".

The data obtained from the survey "What does it mean for you to be a citizen?" indicate the presence of citizenship, for example:

30.1 % – respect for the laws and regulations of the country;

51.4 % – pride in the country;

18.5 % – devotion and love for the motherland.

The results obtained guarantee certain rights and obligations for young people.

We received the following answers to the question "**Which grounds can contribute to a change in the worldview of your fellow citizens?**":

- Education and promotion of positive examples of history and culture;

- Spirituality and morality (24.9 %);

- Social responsibility (22.1 %);

- State justice (23.1 %);

- Participation of citizens in decision-making at the local and national level (29.9 %), etc.

The question "**How do you see your role in strengthening civil society in the state?**" was answered in the following manner:

- Participation in various actions and events aimed at supporting public and social initiatives (17.4%);

- Being an active citizen, following laws and regulations, respecting the rights and freedoms of other people, and fighting for one's rights (39.1 %);

- Taking an active part in elections and referendums, as well as in public organizations that protect the rights of citizens and establish a dialogue between citizens and authorities (35.2 %);

- I do not see my role in strengthening civil society, it is enough for me to attend to my personal affairs (5.3 %);

- I do not think that one person can make a significant contribution to the strengthening of civil society (1.4 %);

- Strengthening civil society is the task of the state, not individual citizens (1.6 %).

The desire to move to another country and the lack of a stable connection with the homeland are indicators of low civic identity and one's plan to seek better living conditions abroad. The desire to travel abroad does not automatically indicate low civic identity as it might be related to the desire to experience other cultures and broaden one's horizons. Therefore, the respondents were asked the following question: "**Do you dream of moving to another country?**".

- No, I don't want to move to another country. I love my country and want to live and work here (47.6 %);

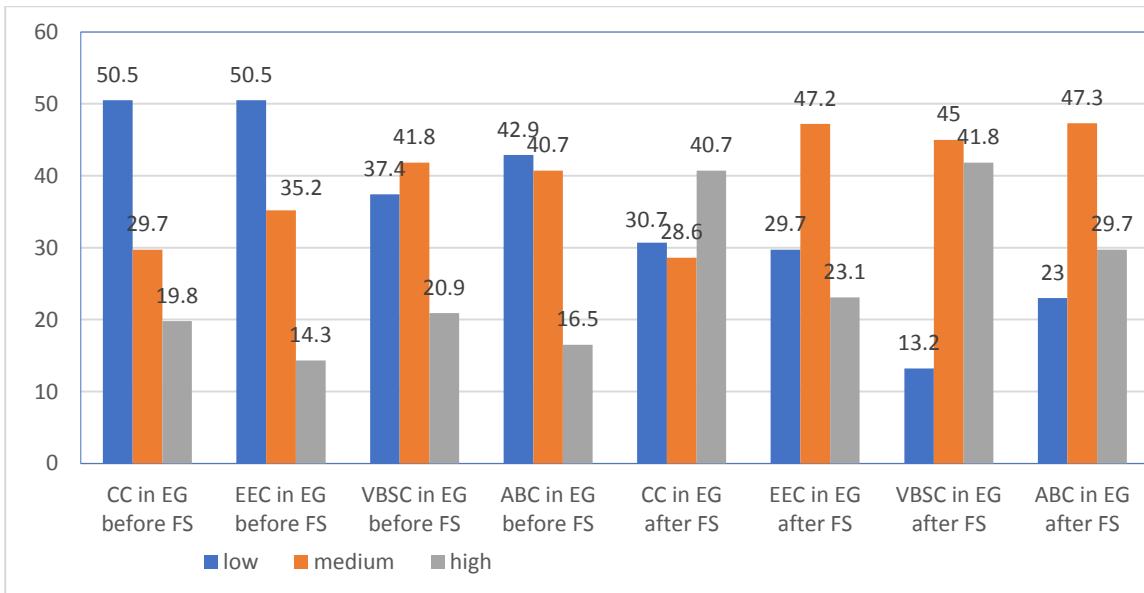
- I would be interested in living in another country, but this does not mean that I do not love my motherland (42.9 %);

- Yes, I would like to move to another country because I do not think that my motherland can offer me enough opportunities to develop and achieve my goals (6.3 %);

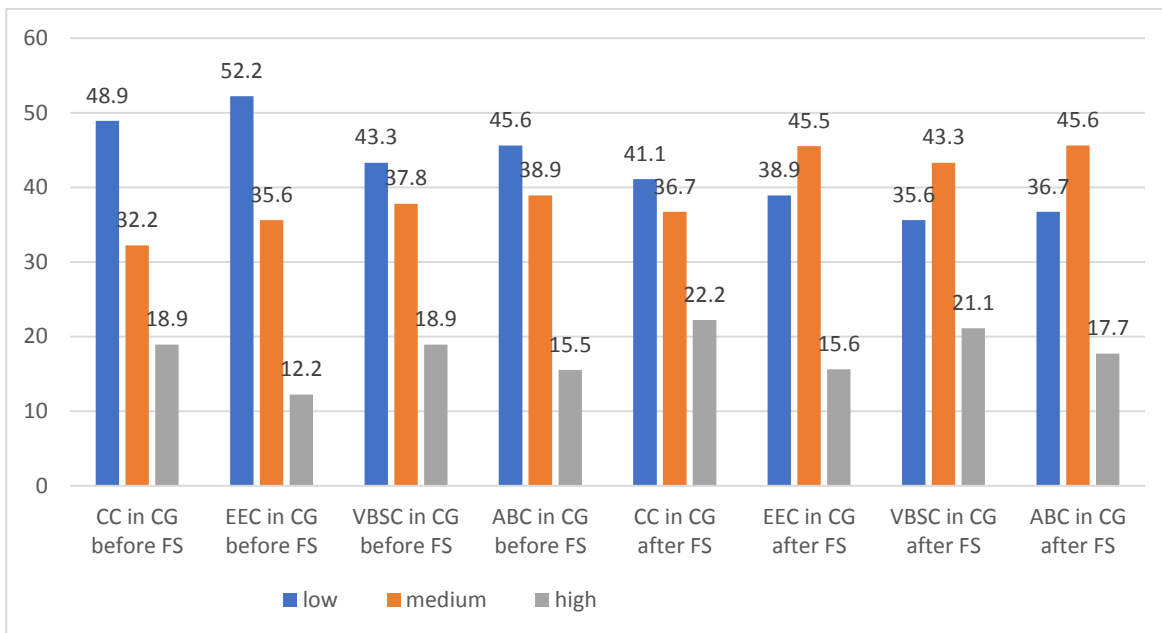
- I do not care where to live. I do not feel a strong attachment to my country and I am ready to move to another place if it works best for me (3.2 %).

At the ascertaining stage, there were slight differences in the levels of the civic identity of students.

The graphs below show the generalized results of studying the control group and the experimental group at the beginning and the end of the experiment.



**Fig. 1.** Comparative analysis of the levels of formation of civic identity at the ascertaining and formative stage (FS) in the experimental group (EG) (%)



**Fig. 2.** Comparative analysis of the levels of formation of civil identity at the ascertaining and formative stage (FS) in the control group (CG) (%)

To run a statistical test for differences between the experimental and control groups in four components of the civic identity of future teachers, we applied the  $\chi^2$  criterion with a significance level of  $\alpha = 0.05$ .

$$\chi^2 = \frac{1}{M_1 N_2} \sum \frac{(m_1 N_{2i} - n_2 M_{1i})^2}{M_{1i} + N_{2i}} \quad (1)$$

where N is the number of students in the experimental group;

M is the number of students in the control group;

n is the score vector for the experimental group (high, medium, low)

m is the score vector for the control group (high, medium, low).

$$\chi^2 = 1/91 \times 90 [(91 \times 15 - 90 \times 16)^2 / 31 + (91 \times 32 - 90 \times 33)^2 / 65 + (91 \times 43 - 90 \times 42)^2 / 85] = 0.11$$

Under the conditions for applying the  $\chi^2$  criterion test according to one degree of freedom ( $v = 4 - 1 = 3$ ) and significance level = 0.05,  $T_{\text{critical}} = 7.8$ . Hence, the inequality  $T_{\text{observed}} < T_{\text{critical}}$  ( $0.11 < 7.815$ ) is verified. Thus, we do not reject the hypothesis that the formation of civic identity of students in the experimental group does not exceed that in the control group.

At the formative stage, there are the following indicators of civic identity among students: the share of high-level students increased by 17.32 % (experimental group) and 3.20 % (control group), respectively; the proportion of medium-level students increased by 5.17 % (experimental group) and 6.60 % (control group), respectively; the number of low-level students decreased by 19.48 % (experimental group) and 9.40 % (control group), respectively. A comparative analysis of the indicators showing the formation of civic identity of students in the experimental and control groups confirms the accuracy of the study.

For the statistical verification of the results obtained, we also used the  $\chi^2$  criterion.

$$\chi_n^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i} \quad (2)$$

where  $E_i$  is the expected frequency of results before the formative stage of the experiment;

$O_i$  is the observed frequency of results after the experiment;

$n$  is the total number of groups taken part in the experiment.

The experimental group:

$$\chi^2 = (33.7 - 17.8)^2 : 17.8 + (42.02 - 36.8)^2 : 36.8 + (25.8 - 45)^2 : 45 = 14.2 + 0.7 + 8.2 = 23.1$$

The control group:

$$\chi^2 = (19.15 - 16.3)^2 : 16.3 + (42.7 - 36.1)^2 : 36.1 + (38.1 - 47.5)^2 : 47.5 = 3.5$$

Under the conditions for applying the  $\chi^2$  criterion test according to three degrees of freedom ( $v = 4 - 1 = 3$ ) and significance level = 0.05,  $T_{\text{critical}} = 7.81$ . Hence, the inequality  $T_{\text{observed}} < T_{\text{critical}}$  ( $23.1 > 7.81$ ) is verified. According to the decision rule for the  $\chi^2$  criterion, the result obtained gives sufficient grounds for rejecting the null hypothesis, i.e. the study of history contributes to the formation of students' civic identity.

This can be explained by the fact that in the process of forming the civic identity of students through the study of history, the lessons were memorable and entertaining, which contributed to the better memorization of materials.

At the ascertaining stage, it was revealed that the CC of the formation of students' civic identity seemed to be the most problematic since in most cases the students did not have sufficient knowledge and understanding of their role in society, their rights and obligations as citizens, knowledge of the national history, etc.

## 5. Discussion

To understand the process of forming students' civic identity, we used the theory of self-determination by Deci and Ryan (2012) and the theory of self-determination by Magolda (2001) (Deci, Ryan, 2012; Magolda, 2021). The current research demonstrates that students evolve from simple levels of civic identity to more complex ones through understanding their values and beliefs formed in the process of life experience, as well as the ability to integrate them into everyday life and in interaction with other people. According to the results of the second stage, students reached a higher level of cognition, which allowed them to better understand and analyze social phenomena and problems and the opinions of other people and consider them, which is crucial for self-awareness and personal development. This phenomenon is consistent with the model of several dimensions of identity developed by Chalon (2015). This reveals the relationship between different dimensions of identity and considers their influence on the behavior and attitudes of people in various social contexts (Chalon, 2015).

The results of empirical research in the field of forming students' civic identity are vital for understanding the effectiveness of various approaches and methods. For example, a study conducted at the University of California confirmed that the use of discussion groups in the classroom can significantly increase the civic identity of students (Parker, Rapa, 2014).

History is an effective method of forming a civic identity. First of all, studying the history of the country helps people understand their roots and traditions, which contributes to the formation of belonging to their nation and country. Secondly, the study of history allows one to better

comprehend the present and develop critical thinking, as well as to form a respectful attitude towards the cultural heritage of the country.

However, the use of history as a means of forming a civic identity can cause conflicts and tensions between different social groups, especially if its interpretation varies in different contexts. Therefore, it is important to use history in the formation of civic identity with due regard to multiple interpretations and diverse views. In addition, the formation of students' civic identity is not a quick process and requires a combination of different approaches and actions.

It is important to note that while the discussion section provides valuable insights into the research findings and their implications, there are limitations to the experiment. One significant limitation is that the study relies solely on the survey method to collect data. Surveys may not capture all aspects of civic identity formation, and the results may be influenced by participants' self-reporting bias. Therefore, future research could benefit from incorporating additional research methods, such as interviews or observations, to provide a more comprehensive understanding of the topic.

## 6. Conclusion

This study provides an overview of the process of civic identity formation and serves as a basis for educators to think about how this process develops in students.

Modern education challenges teachers to form the civic identity of students and encourage their participation in the democratic life of society by applying various approaches. One of these approaches is to study the history of one's country, which allows students to gain knowledge about the past and see its cultural and spiritual heritage. Another method is to hold discussions, which develops students' communication, dialogue, and argumentation skills, as well as helps to develop their positions on important social issues. It is worth mentioning the use of modern technologies, such as online platforms and social networks, to create virtual communities where students can communicate, share their experiences and ideas, and jointly solve social problems. Each of these approaches has its advantages and can be effective in forming the civic identity of students.

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## **Effect of the Development of Didactic and Practical Skills in Future Special Education Teachers on Their Professional Readiness for Work in an Inclusive Educational Environment**

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### **Abstract**

A major part of solving difficult problems in inclusive education is played by the teacher. They shape the educational and upbringing process and systematize and specify the content of educational material for the successful acquisition of the necessary knowledge and skills by students. Thus, they create opportunities for the personal development of each child. The purpose of the study is to determine the effect of the didactic and practical skills of future special education teacher diagnosticians on their professional readiness for work in an inclusive educational environment. The study involves 143 students training in special education. For research work, the authors develop tasks to test the level of professional readiness of future special teachers. The research allows determining requirements for the training of special education teachers for work in an inclusive educational environment. Analysis of the obtained results suggests the need for further development of the didactic knowledge and practical abilities and skills of special education teachers for work in an inclusive educational environment.

**Keywords:** inclusion, inclusive education, inclusive educational environment, competence, special education teacher.

### **1. Introduction**

The primary goal of social development of today's society is respect for human diversity and establishing the principles of solidarity and safety, which provides protection and complete integration of all population groups into society, including persons with special needs (Kryshtanovych et al., 2023).

The world community has come to affirm the right of such persons to fully participate in public life and has realized the need to create conditions for the realization of this right. The Convention on the Rights of the Child (1989) and the Convention on the Rights of Persons with

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Disabilities adopted by the UN General Assembly (2006), as well as legislative acts of many individual countries, define among the priorities the right of the child with special educational needs (SEN) to education. Thus, the educational integration of children with SEN is a worldwide trend characteristic of developed countries. This is a logical step in the development of the system of special education for children with SEN that is associated with society and state recognition of the attitude to persons with disabilities and to the affirmation of their right to engage on a par with others in various spheres of life, including education. Ensuring access to quality education for children with SEN is among the priorities of Kazakhstan at the current stage.

On June 26, 2021, the Law “On Amendments and Additions to Some Legislative Acts of the Republic of Kazakhstan on Education” was adopted ([Law of the Republic of Kazakhstan, 2007](#)). Under this Law, the state undertakes to create conditions for children with SEN to receive education within the educational system, considering their characteristics of development, by developing special educational programs.

There is a need for the development of new approaches to teaching SEN children in the context of Kazakhstan’s general education to better meet their development needs, improve the process of correction and rehabilitation, develop an adaptive personality, and contribute to integration in society ([Gordon, 2013](#); [Omarkhanova et al., 2022](#)).

However, educational institutions come to face several problems in creating inclusive groups or classes ([Chernaya et al., 2023](#)). A topical issue is the readiness of teachers to work with different categories of children in an inclusive educational environment (IEE). Only 17 out of 130 universities operating in Kazakhstan have special education educational programs, which is less than 14 % of all universities in the country ([Diusenbaeva, Sarzhanova, 2019](#)).

Importantly, the effective performance of all functions in the educational and upbringing process of an inclusive educational institution largely depends on the quality of the future special teacher’s training for work in an IEE ([Butenko et al., 2021](#)). Therefore, a key to the successful introduction of inclusive education is the development of the professionalism of the future teacher in the context of inclusion.

Recently, various aspects of the issue of teachers’ readiness for professional practice and the development of professional competencies in the framework of inclusive education have been gaining relevance. Among such issues are trends in the development of inclusive education ([Florian et al., 2010](#); [O’Rourke, 2015](#)), identification of the elements of the inclusive competence in the teacher ([Koreneva et al., 2022](#); [Kuzmina et al., 2014](#)), factors in teachers’ readiness for inclusive education ([Milkevich et al., 2023](#)), readiness to work in the framework of inclusive education in higher education institutions ([Morozova et al. 2023](#)), and the creation of a satisfactory psychological climate for children with SEN ([Falkmer et al., 2015](#); [Togaibayeva et al., 2020](#)).

Contemporary approaches to teaching children with SEN give reason to consider the special training of pedagogy students as an indispensable part of the educational space. An important condition in teacher training is the complex of special psychological, pedagogical, and anatomical knowledge, skills, and abilities, as well as personal qualities and behavioral strategies and tactics that allow to implement and apply effective pedagogical technologies for the education and upbringing of various categories of special needs children ([O’Rourke, 2015](#)).

The key factors on the way to the progressive implementation of the inclusive model of education, according to ([Koreneva et al., 2022](#)), are the appropriate vocational training of teachers to work with SEN children, the availability of special methodologically substantiated educational software that would support students with SEN in the general education space.

Of particular significance in the teacher’s readiness for inclusive education are not only their abilities and desire to adapt to the new requirements of the educational process but also their professionally important personal qualities ([Milkevich et al., 2023](#)). Preparedness for the inclusive educational process consists not just of new methodical material but of the mental and psychological readiness of the teacher to work with special needs children.

The research proposes the following components of psychological readiness:

- a) emotional acceptance of children with SEN;
- b) engagement of children with SEN in the classroom;
- c) satisfaction with one’s pedagogical practice ([Morozova et al. 2023](#)).

Considerable importance is also gained by the personal readiness of the future teacher to work in an inclusive educational institution. For this reason, educators must have an adequate attitude to the stereotypes of pedagogical support for SEN children ([Falkmer et al., 2015](#)).



A significant aspect of the training of teachers to work in the context of inclusion is the development of their professional qualities (Feizuldayeva et al., 2018). Among such qualities, researchers indicate the professional-value orientation of the teacher working with SEN children; recognition of the value of the child's personality regardless of the disorder (Malika et al., 2022); awareness of their responsibility as a carrier of culture and its translator for children with special developmental needs (Shalbayeva et al., 2021).

For efficient correctional and upbringing work with SEN children, the teacher needs to have a certain body of diverse professional knowledge, as well as knowledge of special pedagogy and psychology (Aleshkov et al., 2022). For this reason, pedagogy students must have a comprehensive knowledge of the specific development of children with SEN and be able to carry out corrective measures in the context of general education schools (Belenkova et al., 2022a). However, it is not enough for the future teacher to acquire the knowledge, they also have to be able to apply it in practice, that is, have professional skills in the context of inclusive education (Sergeeva, 2017; Zakaria, 2023).

Apart from the general, there are also special professional abilities associated with pedagogical work with SEN children. The professional skills of specialists in inclusive schools include a proper assessment of the special needs and abilities of children; adaptation and modification of curricula and educational programs in accordance with the child's developmental characteristics; application of supplementary educational technologies, including diversified teaching methods; carrying out correctional and upbringing work with children; planning and realization of the joint activity of various specialists and parents; application of the newest technologies in the educational process, etc. (Medova, 2016).

In teaching practice, to provide the best conditions for the learning and upbringing process in an inclusive school, pedagogy students have to maintain a strong cooperation with parents and take note of their suggestions and recommendations (Mattson, Hansen, 2009). The next step is active participation in an outreach program aimed at raising parents' awareness about inclusion and the various options of education for SEN children (Mattson, Hansen, 2009). In this context, it is important to emphasize in the training of special teachers that the assistance and support in the learning process should not be more than necessary, otherwise, the child may become too dependent on this support and their compensatory abilities may decline (Mattson, Hansen, 2009).

Scholars note the lack of data on the extent to which the specialists training pedagogy students to work with SEN children are ready to do such work themselves (Jreisat, 2023). S.F. Jreisat (2023) asserts that one of the reasons may be the lack of knowledge and practical experience, as well as awareness of the importance and primacy of the problem of inclusion among university professors. Accordingly, a major precondition is also the training of university staff for their important role in the training of special education teachers.

The work of the teacher and the student with SEN is built on sympathetic, friendly relationships. The quality of teachers' professional training has a greater impact on students' results than, for instance, the number of students in a class. This determines the importance of developing all the competencies required for such work (Tebenova et al., 2015). The competencies necessary to work with SEN children, as proposed by K.S. Tebenova et al. (2015), are: knowledge of child development; faith in the possibility of the student's success; continuous improvement and acquisition of experience from other persons and perception of the school as an environment of professional development; ability to work with different paces of students' learning; application of diagnostic skills; the use of information and communication technologies (Ramzanova et al., 2022) and other technical tools (Korotaeva, Kapustina, 2022).

A. Margaritoiu (2015) argues that future teachers need to be ready to perform four professional functions, which are characterized by varying degrees of cooperation between the subject teacher and the special education teacher:

- 1) cooperation/consultation – the subject teacher helps the special education teacher solve various issues in the team;
- 2) mutual support and assistance of teachers in solving problems;
- 3) team support – special teachers provide information support to the subject teacher;
- 4) joint teaching – special teachers and subject teachers cooperate in the search for efficient solutions to various problems.

I.M. Iakovleva and S.V. Iakovlev (2021) define the following standards that should be realized in teaching practice: formation of ethical consciousness; awareness that there are students with

SEN and ability to use their potential in individual work; acquisition and improvement of competencies in work with a group of students, in particular, distribution of tasks within a team; distribution of tasks among different groups of students to achieve a common goal; development of skills for simultaneous work with different groups of students. Apart from this, teaching practice helps the student assess their theoretical knowledge in a specific educational environment. For this reason, students need to be assigned to those schools and classes that implement inclusion in practice (Iakovleva, Iakovlev, 2021).

J.-R. Kim (2011) emphasizes several aspects in the training of teachers for inclusive education: participation in introductory (general pedagogical) practices during training; conducting classes with the head of pedagogical practice; carrying out pedagogical duties under the guidance of the head of practice.

A.R. Rymkhanova et al. (2015) point out that professional training should develop both the technical (methodical and practical and moral (communication, interpretation) competencies of students equally. However, we should note that communication competencies are leading in working with special needs children. That being said, the problem of the readiness of pedagogical staff for work with SEN children arises already during their vocational training. In this context, we need to stress that not all training courses in inclusive pedagogy are integrated into university programs of pedagogical education. This, in turn, leads to students' unawareness of the entire system of inclusive education, lack of knowledge on the problem and specifics of implementing school reforms in the context of an inclusive school, and the reinforcement of stereotypes about persons with SEN and their ability or inability to learn educational material.

The goal of the present study is to determine the effect of the didactic and practical skills of a future special education teacher diagnostician on their professional readiness to work in the context of an IEE.

To achieve the goal of the study, the following research objectives are established:

1. To identify the criteria of the future specialist's readiness to work in an IEE;
2. To describe the levels of development of didactic knowledge and practical skills in students and assess their impact on readiness to work in an IEE.

## **2. Methods**

To achieve the established research goal, the study employs several general and specialized research methods, among which we note, first of all, analysis of psychological and pedagogical and scientific and methodical literature (Sakenov et al., 2023) and a pedagogical (diagnostic) longitudinal study.

The study was conducted on the basis of the Aktobe Regional University named after K. Zhubanov, Faculty of Pedagogy. To determine the level of future special teachers' readiness for work in the context of an IEE, a diagnostic research program was developed. The study involved 143 students training under the educational program 6B01902-Special Pedagogy. The longitudinal study did not require the division of students into the control and experimental groups. By its principle, longitudinal studies are valuable for investigating changes and development over time within the same group of individuals.

The purpose of the study was to establish the levels of development of components in the readiness of future special teachers for work in the context of an IEE.

The procedure of the pedagogical longitudinal study demanded a clear sequence of actions. For this purpose, schedules in different academic groups of students were created, indicating the time of the experiment and auditoriums. The duration of research work was determined based on the number of tasks, their difficulty, form of presentation, way of completion, etc.

The teachers involved in the pedagogical longitudinal study were provided with instructions with a clear algorithm of the research procedure. After completing the tasks, students were informed of the rules of behavior when completing the tasks, the general algorithm for completing them, and particular stages. The tasks were read to students in the course of the pedagogical longitudinal study. Each task had clear instructions for its completion.

For the study, special tasks (for the examples of tasks, see Appendix 1 "Tasks on the criterion of didactic and technological readiness") were developed for each identified criterion indicator (Table 1). Among these tasks were tests (for readiness to innovation, for purposefulness), analysis of problem situations, storytelling, discussions, Exchange of Work Experience round table,

pedagogical games, analysis of problem pedagogical situations, etc. A specific rating scale was developed for each task.

**Table 1.** Criteria and indicators of the readiness of future special education teachers for work in inclusive educational institutions

Criterion characteristic	Criterion indicators
<b>Criterion of motivational-emotional readiness</b>	
considers the student's motives and attempts to work purposefully and with determination in an inclusive educational institution, stable emotional state during work with SEN children	perseverance and commitment to practice-oriented knowledge on work in the context of an IEE characterizes the purposeful nature of work in an inclusive educational institution; emotional stability is defined by the balance and lability of emotional state; motivation to succeed in the practical realization of didactic objectives involves motives concerning promising practice-oriented professional work in an IEE
<b>Criterion of didactic and technological readiness</b>	
reflects the student's theoretical and didactic education and methodical training	meaningfulness of didactic and technological knowledge on the specifics of the organization and work in inclusive education is characterized by the ability to use the acquired didactic and technological knowledge to solve the set tasks; the creativity of practice-oriented knowledge describes the ability to diversify and modify tasks for children based on the characteristics of their physical, mental, and language development in the context of inclusive education; practical modeling of a developing environment in the context of inclusion characterizes the ability to create an educational and upbringing environment for SEN children in the context of an inclusive educational institution
<b>Criterion of deontological-speech readiness</b>	
reflects ethical culture, behavior, tolerance, and verbal communication competence	the tolerance of a special education teacher is characterized by developed normative culture, the culture of communication, good manners, and tolerance in interaction with children, parents, and colleagues; the development of deontological competence is defined by observation of deontological principles and norms; the culture of speech is characterized by knowledge of the features of communication with various categories of people; knowledge of the system of language, its phonetic, lexical, and grammatical parameters; the ability to communicate using language, to correctly use the system of speech norms, to maintain communicative behavior that is appropriate in the specific communicative situation
<b>Criterion of reflexive-practical readiness</b>	
reflects the ability to reflection, self-assessment, and reciprocal assessment of the work of other teachers	reflection of one's behavior reflects the ability to control one's actions in critical situations and carry out self-assessment; practical readiness for correctional and developmental work in the context of an inclusive educational institution characterizes the ability to practically apply the acquired knowledge of didactics while working in inclusion; reciprocal evaluation and analysis characterizes the ability to carry out a comprehensive analysis of the activities of other psychological and pedagogical workers in the IEE, to highlight the innovative technologies and methods of educational work that gave a positive result in practice

After the completion of the diagnostic research program, the data were processed via Spearman's rank correlation coefficient to determine the interrelation of components in future special teachers' readiness for work in the framework of an IEE.

The aim of the research was also to identify differences in the distribution of a specific characteristic (task performance level) when comparing four empirical distributions (constituting the readiness of future special educators to work in the conditions of IEE). To achieve this, the  $\chi^2$  Pearson criterion was used.

The measurement scale consists of 3 categories ("high level," "medium level," "low level"). The critical theoretical value of  $\chi^2$  for a significance level of 0.05 in a three-level scale of gradation was  $\chi^2(0.05) = 5.99$ , and for a significance level 0,01 -  $\chi^2_{0,01} = 9,21$

### 3. Results

Proceeding from the conducted diagnostics based on the developed tasks, we identified three levels of development of components in the readiness of future special education teachers for work in the context of an IEE: high, average, and low (Table 2).

**Table 2.** Levels of development of components in the readiness of future special education teachers for work in the context of an IEE

Level	Level characteristic
<b>Motivational-emotional readiness</b>	
high	developed motivation and determination to work in an IEE, readiness to solve problems in the context of inclusive education; high emotional stability, ability to manage students' emotional stimulation and improve their stress-resistance
average	situational motivation and determination to work in an IEE, insufficient readiness to solve problems in the context of inclusive education; high emotional stability, insufficiently developed ability to manage students' emotional stimulation and improve their stress resistance. The greatest difficulties are faced in completing practical tasks (lack of readiness to solve problem situations in an IEE) and developing and holding discussions
low	lack of understanding of the specifics of work in an IEE, undeveloped ability to solve problems in the context of inclusive education; emotional instability and inability to manage students' emotional stimulation and improve their stress resistance. The greatest difficulties are faced in completing tasks at the practical and creative levels (development of a positive situation model, discussion, creative approach to solving problem situations)
<b>Didactic and technological readiness</b>	
high	quality application of the acquired knowledge to solve correctional-diagnostic, correctional-developmental, correctional-educational, and correctional-upbringing objectives in the context of inclusion; ability to modify tasks for children based on the characteristics of their physical, mental, and language development; ability to create a developing and upbringing environment for the development of special needs children in the context of an inclusive educational institution
average	application of the acquired knowledge to solve tasks in the context of inclusion and parallel acquisition of new knowledge; insufficient development of the ability to modify tasks for children based on the characteristics of their physical, mental, and language development; undeveloped understanding of the specifics of creating an educational and upbringing environment for special needs children in the context of an inclusive educational institution
low	insufficient development of the ability to use the acquired knowledge to solve tasks in the context of inclusion; undeveloped ability to modify tasks for children based on the characteristics of their physical, mental, and language development; undeveloped ability to create an educational and upbringing environment for special needs children in the context of an inclusive educational institution
<b>Deontological-speech readiness</b>	
high	observation of deontological principles and norms, established ability to find solutions to problem situations with tolerance, openness to communication with all participants in the education and upbringing and correctional-developmental process in the context of an IEE, ability to predict the course of events and encourage students through one's speech, acceptance of the values of inclusive education

average	observation of deontological principles and norms, underdeveloped ability to find solutions to problem situations with tolerance, stiffness in communication with all participants in the education and upbringing and correctional-developmental process in the context of an IEE, ability to predict the course of events and encourage students through one's speech, acceptance of the values of inclusive education
low	partial observation of deontological principles and norms, inability to find solutions to problem situations with tolerance, stiffness in communication with all participants in the education and upbringing and correctional-developmental process in the context of an IEE, undeveloped ability to predict the course of events and encourage students through one's speech, partial acceptance of the values of inclusive education
<b>Reflexive-practical readiness</b>	
high	adequate assessment of the level of one's pedagogical practice, developed ability to use innovative technology to improve the level of pedagogical practice, ability to correctly organize the educational-correctional process in an inclusive educational institution, to control one's actions during work, and to analyze the experience of other teachers in the context of an IEE
average	insufficient level of self-assessment, lack of understanding of the expediency of pedagogical innovations in professional practice, ability to quite properly organize the educational-correctional process in an inclusive educational institution, to control one's actions during work, and to analyze the experience of other teachers in the context of an IEE
low	undeveloped ability to adequately assess the level of one's pedagogical practice and use innovative technology to improve the level of pedagogical practice, inability to correctly organize the educational-correctional process in an inclusive educational institution, insufficient control over one's actions during work, inability to analyze the experience of other teachers in the context of an IEE

Quantitative indicators of the components of future special education teachers' readiness for work in the context of IEE are presented in [Table 3](#).

**Table 3.** Quantitative indicators of the components of future special teachers' readiness for work in the context of IEE, number of students who completed the tasks, %

<b>Motivational-emotional readiness</b>								
perseverance and determination			emotional stability			motivation for the successful practical implementation of didactic tasks		
H	A	L	H	A	L	H	A	L
8.2	38.3	53.5	12.6	36.3	51.1	14.3	35.2	50.5
<b>Didactic and technological readiness</b>								
meaningfulness of didactic and technological knowledge			creativity of practical knowledge			practical modeling of the developing environment		
H	A	L	H	A	L	H	A	L
12.2	44.4	43.4	12.2	40.9	46.9	7.7	41.3	51.0
<b>Deontological-speech readiness</b>								
tolerance			development of deontological competence			culture of speech		
H	A	L	H	A	L	H	A	L
9.2	43.9	46.9	8.7	45.4	45.9	15.3	33.2	51.5
<b>Reflexive-practical readiness</b>								
reflection on one's behavior			practical readiness for and correctional developmental work			reciprocal evaluation and analysis of the work of other teachers		
H	A	L	H	A	L	H	A	L
7.1	39.3	53.6	7.7	39.8	52.5	6.1	40.8	53.1

Notes: H – high level, A – average level, L – low level.

As can be seen from [Table 3](#), by the indicator of “perseverance and commitment to practice-oriented knowledge on work in the context of an IEE” in the criterion of motivational-emotional readiness, high readiness is demonstrated by 8.2 % of future special education teachers, an average level – by 38.3 % (EG), and the low level – by 53.5 %. By the indicator of “emotional stability”, the high level is displayed by 12.6 %, the average level – by 36.3 % (EG), and the low level – by 51.1 %. By “motivation for the successful practical implementation of didactic tasks”, the high level is found in 14.3 % of students, the average – in 35.2 %, and the low level – in 50.5 %.

By the indicator of “meaningfulness of didactic and technological knowledge” in the didactic and technological component of readiness, at the high level are 12.2 %, at the average level – 44.4 %, and at the low level – 43.4 %. By the “creativity of practical knowledge”, high readiness is demonstrated by 12.2 %, average – by 40.9 %, and low – by 46.9 %. By the indicator of “practical modeling of a developing environment in the context of an inclusive educational institution”, at the high level of readiness are 7.7 %, the average level – 41.3 %, and the low level – 51.0 %.

By the “tolerance of the special teacher” in the deontological-speech component, high readiness is found in 9.2 %, average in 43.9 %, and low readiness in 46.9 %. On the indicator of “development of deontological competence”, the high level is recorded in 8.7 %, the average – in 45.4 %, and the low – in 45.9 %. By “the culture of speech of a special teacher”, at the high level of readiness are 15.3 %, the average – 33.2 %, and the low – 51.5 %.

Within the reflexive-practical component of readiness, by the indicator of “reflection on one’s behavior”, the high level is demonstrated by 7.1 %, the average – by 39.3 %, and the low – by 53.6 %. By the indicator of “practical readiness for correctional and developmental work in the context of an inclusive educational institution”, at the high level are 7.7 %, at the average level – 39.8 %, and at the low level – 52.5 %. Finally, in terms of “reciprocal evaluation and analysis of the work of other special teachers”, the high level is demonstrated by 6.1 %, the average – by 40.8 %, and the low – by 53.1 %.

Statistical data processing shows the following correlations between components in the readiness of future special education teachers to work in the context of an IEE ([Table 4](#)).

**Table 4.** Spearman rank-order correlation coefficient values

	ME	DT	DS	RP
ME	1.0	0.712	0.683	0.567
DT	0.712	1.0	0.589	0.673
DS	0.683	0.589	1.0	0.724
RP	0.567	0.673	0.724	1.0

Notes: ME – motivational-emotional readiness, DT – didactic and technological readiness, DS – deontological-speech readiness, RP – reflexive-practical readiness

Data analysis demonstrates moderate (0.5-0.7) and high (0.7-0.9) (on the Chaddock scale) correlations between all components in the readiness of pedagogy students for work in an IEE.

Two statistical hypotheses were formulated to analyze the differences in the distribution of a specific characteristic (task performance level) when comparing four empirical distributions (constituting the readiness of future special educators to work in the conditions of IEE):

- 1) The hypothesis of no differences in the indicators of the components of readiness of future special educators for work in IEE conditions (null hypothesis).
- 2) The hypothesis of the significance of differences in the indicators of the components of readiness of future special educators for work in IEE conditions (alternative hypothesis).

The results of pairwise calculation of  $\chi^2_{emp}$  for various components of the readiness of future special educators for work in IEE conditions are presented in [Table 5](#).

**Table 5.** Results of pairwise calculation of  $\chi^2_{emp}$

	Motivational-Emotional Readiness	Didactic-Technological Readiness	Deontological-Speech Readiness	Reflective-Practical Readiness

Motivational-Emotional Readiness				
Didactic-Technological Readiness	14,33			
Deontological-Speech Readiness	13,02	1,17		
Reflective-Practical Readiness	4,24	19,88	18,21	

The calculations of the  $\chi^2$  criterion for the indicators of the components of readiness of future special educators for work in IEE conditions (see Table 5) demonstrated that  $\chi^2 > \chi^2_{crit}$  when comparing didactic-technological readiness on one hand, and motivational-emotional and reflective-practical readiness on the other hand (specifically  $14.33 > 9.21$ ,  $19.88 > 9.21$ ), as well as when comparing deontological-speech readiness on one hand, and motivational-emotional and reflective-practical readiness on the other hand (specifically  $13.02 > 9.21$ ,  $18.21 > 9.21$ ). Therefore, for these indicators, the hypothesis of the significance of differences in these components of readiness of future special educators for work in ICS conditions is confirmed. In this context, students demonstrated the best performance in didactic-technological readiness for working in IEE conditions and the lowest performance in reflective-practical readiness.

Based on the results of the study, we were able to identify three levels (high, average, and low) of development of the didactic and practical knowledge and skills of future special education teachers to work in an IEE (Table 6).

**Table 6.** Levels of development of the didactic and practical knowledge and skills of future special education teachers to work in an IEE

Level	Level characteristic
high	developed motivation and determination to work in the framework of an IEE, high emotional stability, developed ability to use the acquired knowledge to solve the tasks at hand, substantial methodical training for work in an IEE, tolerance of a future special teacher, high speech-communication competence, ability to reflection, self-assessment, and reciprocal assessment of the work of other specialists
average	situational motivation and determination to work in the framework of an IEE, predominantly high emotional stability, insufficient practical skills to use the acquired knowledge to solve tasks in the context of inclusion, sufficient methodical training for work in an IEE, tolerance, insufficiently developed speech-communication competence, ability to reflection, self-assessment, and reciprocal assessment of the work of other specialists
low	undeveloped motivation and determination to work in the framework of an inclusive educational institution, lack of emotional stability, lack of ability to use the acquired knowledge to solve the tasks at hand, lack of methodical training for work in an IEE, intolerance, insufficiently developed speech-communication competence, ability to reflection, self-assessment, and reciprocal assessment of the work of other specialists

The distribution of future special education teachers by the levels of development of didactic and practical knowledge, abilities, and skills for work in the context of an IEE shows that the high level is demonstrated by only 7.2 %, average by 42.4 %, and low by 50.4 %.

#### **4. Discussion**

The research findings give reason to conclude the need for further development of the didactic knowledge and practical skills and abilities of special education teachers for work in an IEE, as over half of the students involved in the study demonstrate a low level of development of didactic and practical knowledge, abilities, and skills, while the high level is found in less than 10 %.

The results of the study demonstrate that the formation of a certain level of knowledge, abilities, and skills in future special teachers assumes the presence of the following qualities:

- motivation, which forms a stable interest in inclusive education and a striving to involve the child in the educational process while accounting for their special developmental needs.

Our findings are consistent with the results of (Belenkova et al., 2022a), indicating that the teacher's motivation for inclusion and conviction in its expediency as a means and a goal of teaching SEN children, as well as the teacher's reflection on their experience will promote the improvement of their competence. This conclusion testifies to the need for special training of teachers to foster their high professional readiness. Our study has determined the following components in the professional and personal readiness of a future teacher for work in inclusive education:

- emotional, assuming the establishment of emotional contact with the child and constant maintenance of a stable positive emotional state of the teacher;

- gnostic, implying the mastery of a certain body of knowledge, skills, and abilities to work in inclusive educational institutions, deliberate use of the acquired knowledge in the inclusive process. Our results align with a study by (Butenko et al., 2021), which indicates that in training future teachers for work in an IEE, it is important to give students diverse theoretical knowledge and develop their practical skills in working with special needs children. The students need to navigate well in the activities taking place in the practical work of a teacher (Aleshkov et al., 2022). In this, an important role is also played by clearly planned and competently organized teaching practice (Belenkova et al., 2022b). In this aspect, according to S. Lindsay et al. (2015), the essential characteristics of tolerant interaction are the recognition and acceptance of the equal existence of varied thoughts and beliefs, the ability to self-control, particularly in the sphere of emotions, and the need for freedom of choice and respect for the freedom of choice of others (Shalbayeva et al., 2021). Targeted work with parents (Sadvakassova et al., 2022) and children on the formation of tolerance can yield positive results only when the teacher sets an example of a benevolent attitude toward others, demonstrating a model of humane interaction with families.

Further on, A. Margaritoiu (2015) argues that future special education teachers should be geared to the fact that the work of professionals in inclusive schools is meant to be continually creative and subject to the principle of flexible curricula that meet the needs of children with different abilities and capacities. Children with SEN receive the necessary additional support in studying the general curriculum rather than some specially designed programs or programs for special institutions. Support is provided continuously, starting with minimal assistance provided by a special teacher who is also involved in the educational process.

The conducted study has identified the specific features of training special education teachers for work in the context of an IEE. Among these specifics are:

1) insufficient motivation for work in inclusive institutions, which aligns with the results obtained by (Butenko et al., 2021);

2) emotional instability, which has also been noted by E.A. Martynova and N.A. Romanovich (2014);

3) a lack of systemic didactic and practical training of future special education teachers for work in inclusive classes, as has been stated by A.I. Sergeeva (2017);

4) the limited content of academic disciplines that do not offer the basics of didactic and practical preparation of future special teachers to work in the context of an IEE.

As a further example, we can cite the findings of I.M. Iakovleva and S.V. Iakovlev (2021) on the reasons behind teachers' unpreparedness to work with students with educational challenges, which are consistent with the results of this study. The study indicates that 60 % of teachers lack basic psychological and pedagogical knowledge and professional training. Of the remaining, 13 % claimed to have acquired this knowledge while studying at pedagogical universities, 12 % mentioned independent learning through courses or special literature, and 15 % completed postgraduate courses on the fundamentals of supporting the development and education of children with SEN.



We concur with the opinion of N.A. Medova (2016), that the development of professional competence in pedagogy students calls for the introduction of new disciplines with the use of innovative monitoring and educational technologies into the curricula of higher educational institutions (Bolina et al., 2022). This measure will promote the interest of special education teachers in work in the context of an IEE and foster the skills of independent accumulation of knowledge and its further application in professional practice in the sphere of development, education, and upbringing of special needs children. The purpose of studying these disciplines is the familiarization of students with the regulatory and legal acts on the introduction and regulation of special education teachers, as well as with foreign practice, the tasks and responsibilities of a special teacher in the process of organizing inclusive education in general educational institutions, and the specifics of organizing correctional and developmental work (Aristizábal Gómez et al., 2020; Mattson, Hansen, 2009). Such disciplines will help establish the role of teachers and special education teachers in practical work with children with SEN and consolidate the theoretical knowledge and methods of work in an inclusive school (Sahoo, Divi, 2023; Sergeeva, 2017).

*A limitation of this study pertains is that only students from one university were studied, which limits the generalizability of the study results.*

## 5. Conclusion

The readiness of a special education teacher to work in an inclusive school is based on an adequate positive attitude to inclusion in general, the development of professional inclusive competence, readiness to overcome difficulties in the education and upbringing process, as well as on mastery of professional and methodical knowledge. Special teachers' readiness to work in the framework of inclusion is defined by their openness and desire to obtain new knowledge and practical experience, exchange it with colleagues, and closely cooperate with local authorities, public and charitable organizations, and specialized institutions.

The paper characterizes the competencies required for special education teachers to work in an inclusive educational institution. These include professional (special professional) competencies and general (key, basic) competencies, which in the upcoming years will orient the work of higher education institutions toward the content of training specialists for work in the IEE.

The study also defines criteria for the future specialist's readiness to work in the framework of an IEE and indicators for each criterion. Based on the tasks developed for each indicator, the levels of development of the didactic knowledge and practical skills of students are characterized.

Prospective further research could focus on the development of a comprehensive method for training special education teachers for work in the context of an IEE and the identification of effective conditions for its implementation.

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## Appendix 1

### Tasks on the criterion of didactic and technological readiness

The level of meaningfulness of theoretical and technological knowledge of the features of organization and work in inclusive education is proposed to be assessed with the following tasks:

Task 1. Making a report for a scientific and practical seminar	Task 2. “Pedagogical game”
<p>Purpose: to test the level of students’ theoretical knowledge about the features of work in an inclusive educational institution.</p> <p>Procedure: the experimenter offers students to independently write a report for a scientific and practical seminar, choosing the topic and content of the report with consideration of topical problems in inclusive education and the means of its presentation.</p>	<p>Purpose: to test the level of mastery of the methods of educational and upbringing work in an inclusive educational institution.</p> <p>Procedure: the experimenter offers students to independently invent a game for children with special developmental needs and children within the norm in the context of inclusive education to establish friendly relations between them.</p>
<p>Assessment scale: High level (2 points) – exhaustive knowledge of organizational work as part of inclusive education, independent preparation for the seminar, and explanations during the report. Average level (1 point) – needs additional help in completing the task, partial knowledge of the organization of a correctional teacher’s work in inclusive education;</p>	<p>Assessment scale: High level (2 points) – freely navigates the theoretical and practical plane of the issue, proposing independently created games and making assumptions on certain difficulties in the organization of play activities in the context of inclusive education, assesses colleagues’ work, voices recommendations and suggestions. Average level (1 point) – has an unclear understanding of the objectives and technology of organizing play activity in inclusive education, has</p>

Low level (0 points) – lack (complete or partial) of knowledge, abilities, and skills in training for work in inclusive education.	certain difficulties in assessing the materials presented by others. Low level (0 points) – is unable to or refuses to complete the task.
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The level of creativity of technological knowledge is proposed to be tested with the following tasks.

Task 1. “Consultations for teachers”	Task 2. “Case analysis”.
<p>Purpose: to determine the level of knowledge, abilities, and skills in meaningfully presenting the essence of the problem and explaining it in accordance with the audience’s interests.</p> <p>Procedure: The experimenter presents materials of prepared consultations for teachers (correctional teachers, elementary school teachers, educators, etc.) and asks the students to determine their orientation toward a category of listeners and analyze it when justifying the answer.</p>	<p>Purpose: to test the ability to creatively approach situational problem tasks and to argue the accuracy of one’s pedagogical position.</p> <p>Procedure: The experimenter hands out cards describing pedagogical cases in inclusive education. Students are asked to determine the accuracy or inaccuracy of the teacher’s actions using emojis (smiley face – correct, frowning face – incorrect) and justify their opinion.</p> <p>Situation 1. In the classroom, a fight broke out between two students, one with special features of psychophysical development and one with the norm.</p> <p>A. The teacher first hugged one and then the other student and whispered something nice and comforting to each one.</p> <p>B. The teacher called on students to stop fighting immediately, threatening to give them a bad mark for their behavior on the report card.</p> <p>Situation 2. During the lesson, one student with special developmental needs used obscene language. How should the special education teacher respond to that?</p> <p>A. Hold a conversation with students about the history of obscene language and emphasize the inadvisability of its use.</p> <p>B. Kick the student out of class and tell them not to come back the next day with their parents.</p> <p>Situation 3. During an educational game, students in an inclusive class fought with getting the desired role. How should this conflict be resolved?</p> <p>A. Organize a mini-casting for the best performance of the roles.</p> <p>B. Selectively convince each student that they cannot play the desired role well.</p>
<p>Assessment scale:</p> <p>High level (2 points) – completes the task correctly, emphasizing the specifics of the process of inclusive education both for students and teachers;</p> <p>Average level (1 point) – has difficulties completing the task, shows uncertainty when substantiating the specifics of work in inclusive education, incorrectly identifies the advantages and disadvantages.</p>	<p>Assessment scale:</p> <p>High level (2 points) – the correctional teacher solves the situation fast, can find mistakes; has a clear stance in justifying their viewpoint, can offer their solution.</p> <p>Average level (1 point) – has difficulties solving the pedagogical case, arguing the opinion, and offering their solutions to the problem.</p> <p>Low level (0 points) – is unable to complete the task.</p>

Low level (0 points) – is unable to or refuses to complete the task.	
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For testing students’ ability to create a development-promoting environment in the context of an inclusive educational institution, the following tasks are proposed.

Task 1. “Presentation”	Task 2. “Pedagogical football”
<p>Purpose: to test the ability of students to creatively present an educational project on the problems of inclusive education.</p> <p>Procedure: The experimenter offers to present an educational project and illustrative material with case illustrations in arbitrary form (business game, crossword, puzzle, problem solution).</p>	<p>Purpose: to test students’ ability to create a development-promoting environment in the context of an inclusive educational institution.</p> <p>Procedure: the experimenter randomly divides the students into two groups, each of which proposes a variant of a creative task or game to be used in an inclusive educational institution. Students exchange opinions, thus scoring goals. The team that “misses” a goal loses.</p>
<p>Assessment scale: High level (2 points) – the correctional teacher has prepared the presentation quickly, can generate interesting ideas. Average level (1 point) – has difficulties in creating their presentation and in completing the task independently. Low level (0 points) – is unable to complete the task.</p>	<p>Assessment scale: High level (2 points) – students propose many options and can generate interesting ideas. Average level (1 point) – there are difficulties in creating tasks and completing the assignment independently. Low level (0 points) – unable to complete the task.</p>



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## Financial Skills and Gender Difference on College Students

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### Abstract

This work focused on determining if there is a difference in the level of financial skills that college students have in programs in the economic-administrative area: Public Accounting, Business Administration, Accounting and Finance, Actuary, Markets and International Business, as well as Engineering: in Business, Industrial, Mechanical and Mechatronic Management. All this according to gender and the type of educational institution in where, they are enrolled. To obtain the data, we build the hybrid instrument from the scales proposed by: Mandell and Kline (2009); Lusardi and Mitchell (2008, 2011); CFI Official Global Provider of the Financial Modeling and Valuation Analyst (FMVA)<sup>TM</sup> Certification Program (2015); Technological of Costa Rica (TEC) (2016–2017) and LearningExpress (2017). The test was applied virtually to university students, where the participation of 309 students was achieved, from seven municipalities in the state of Veracruz: Acayucan, Alvarado, Banderilla, Boca del Río, Martínez de la Torre, San Andrés Tuxtla, Veracruz Puerto, enrolled in 10 Higher Education Institutions, three are public institutions and seven are private. For data analysis, the non-parametric Kruskal-Wallis test to detect the existence of differences by gender was used. The results indicate that the level of financial ability of the respondents does not differ in relation to gender and educational institution.

**Keywords:** skills, finance, college students, gender.

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## 1. Introduction

Currently, it is essential that young people develop financial skills for life, in order to have equitable access to social opportunities (Amidjono et al., 2022). In this sense, it is essential that they have confidence in the use of financial knowledge, which allows the identification of financial products and services; acquire financial skills that will provide them with elements to promote good financial behavior to manage their finances and achieve prosperity (Dwiastanti, 2015).

An adequate financial knowledge is associated with an increase in confidence towards money management and investment decision-making (Kotzè, 2008). In addition, financial training is a very special class for schools, governments, markets, international organizations, among others (Avendaño et al., 2021a). Lusardi (2019) points out that financial knowledge must be known, because financial preparation is a priority as well as the right to basic education, which must be considered a fundamental right and a universal need.

The college student acquires greater financial knowledge when this knowledge is developed in an academic context (Yaringaño, 2018). The knowledge that the student acquires contributes to aspects such as caring for, planning, and valuing money in favor of their daily activities and their professional future (Aguilar, Ortiz, 2013; Sánchez et al., 2020). In this sense, Mancebón et al. (2020), refer that when financial knowledge is acquired, skills are also acquired that become healthy financial habits that lead to the possibility of having an investment fund and being less likely to finance purchases with personal loans. It is very important to evaluate this financial knowledge, mainly in young college students, as mentioned by Annabi, González and Müller (2018) since it is likely that during this stage they will have the need to face expenses, decide on saving, and request credit cards for the first time credit and student loans. They are also investing in their human capital and this will favor their future decision-making towards the work.

In the same way, knowledge in financial topics becomes essential in the current world context due to the considerable increase in the supply of financial and credit products for citizens, which gives evidence of the importance of training them in this area with the purpose of helping them in making the right decisions (Yaringaño, 2018; Wong, Burneo, 2019).

Several studies carried out in the last ten years reveal some reasons why university students are required to be financially educated with financial knowledge and skills. It is important to spread the interest in taking care of their money and their professional future as a graduate, to analyze their available financial information (Saldarriaga Restrepo, 2020).

To implement and execute their personal strategies regarding the selection of alternatives towards the correct decision making that allow the best use of financial services (Yaringaño, 2018). To carry out their financial planning and avoid unpayable debts (Wong, Burneo, 2019). In this way, to be able to acquire financial skills for their practical application and avoid looking for informal savings and credit schemes and participating in investments that endanger their assets and financial stability (Sanchez et al., 2020). Additionally, financial knowledge in young university students plays a key role in the ability to save (Saldarriaga Restrepo, 2020; Mancebón et al., 2020; Yaringaño, 2018; Wong, Burneo, 2019). It is essential that the young adult understand this financial knowledge because it supports the development of a country (Herdjiono et al., 2018). On the other hand, Sole (2014), considers that financial skills are valuable in professional and personal life to apply them inside and outside of school. They avoid falling into over-indebtedness with high costs, lack of liquidity and lack of money (Lusardi, Mitchell, 2014).

In this idea, Andreou and Philip (2018) highlight the importance that degree programs include the development of financial skills and knowledge through practical applications in finance issues. All of the above will provide training to students by exercising attitudes that favor proper financial behavior, as well as in the long term it can benefit them in making correct decisions towards their personal benefit.

In this same line, Kocoglu (2021), recognizes two benefits that consumers acquire when they have financial knowledge and skills, the first is that the financial knowledge and skills received will help them to use financial resources, ensuring constant financial well-being, and the second benefit will give them self-confidence and motivation to test that knowledge and skill. Regarding gender personality, Gudjonsson, Minelgaite, Kristinsson and Pálsdóttir (2022) consider that, based on gender personality attributes, men are more interested in things, while women are more interested by the people. Studies reflect differences in the way men and women perceive financial problems (Hira, Mugenda, 2000).



Other studies showed that men obtained better results than women in financial knowledge (Falahati, Paim, 2011; Khurshed, Iftikhar, 2014; Yaringaño, 2018). Regarding financial perception, men came out better than women (Yasar, Turğut, 2020). Recently, in the work of Happ, Hahn, Jang and Rüter (2022), which they carried out in Germany, they found a gender difference, but not in Korea, whose results were different. German male students scored higher than female students did. No gender differences were found (Herdjiono et al., 2018; Yasar, Turğut, 2020).

From the above, the research question arises: is there a difference between the level of financial skills of the students in relation to gender and the educational institution? The objective of this research is to determine if there are difference in the level of financial skills on college students have in the programs of the economic-administrative and engineering area, specifically in young people who are in their last semesters of their degree, who also have already received formal instruction related to finances.

## **2. Literature review**

Recently, the studies on financial knowledge and financial skills have gained importance in recent years, example of them the work of Andreou and Philip (2018); Annabi, González and Müller (2018); Avendaño, Rueda and Velasco (2021b); Wong and Burneo (2019); Moreno-Garcia, Garcia-Santillan and Gutierrez-Delgado (2017); Khurshed, Iftikhar (2014); Happ, Hahn, Jang and Rüter (2022). Some especially in young people Andreou, Philip (2018); Cude, Lawrence, Lyons, Metzger, LeJeune, Marks and Machtmes (2006, 2019); Moreno-Garcia, Garcia-Santillan and Gutierrez-Delgado (2017); Falahati and Paim (2011); Khurshed and Iftikhar (2014) and Turğut (2020).

### **Financial knowledge and financial skills**

Particularly in the study developed by Andreu and Philip (2018) they measure the level of financial knowledge about the understanding of basic concepts such as: interest rates, inflation, risk and diversification among Turkish university students. To do this, they examined the financial education, financial aptitude and financial behavior of 881 college students. The findings show that financial knowledge favors college students, since it favors their understanding of managing their credit card debt, as well as enabling them to avoid fraudulent investments. The findings show a low level of financial knowledge specifically in first-year college students, which determines the need to implement a reform in education, improving financial training in the study plans.

In an American context, Cude, Lawrence, Lyons, Metzger, LeJeune, Marks and Machtmes (2006), carried out a study, for which they apply an online survey among university students with the purpose of identifying who has had the most significant influence on the formation of what he knows and thinks about money. They conclude that some college students are not managing their finances well, perhaps due to a lack of practice in these financial topics recommended, but they do not done. In this idea, Annabi, González and Müller (2018), applied a survey to students from a private university. In their research, they reported the identification of some key determinants that influence financial knowledge, such as; the need to acquire a student loan and apply for a credit card. Based on this result, they recommended offering personal finance workshops, primarily to minorities, women, recently graduated students, and students who have a student loan.

In the Latin context, some works were identified; such is the case of Avendaño, Rueda and Velasco (2021b), who carried out a study in an educational institution of the public sector in the city of Ocaña in Colombia. 307 Colombian college students participated in the study. The purpose was to analyze the perception of financial issues, as well as financial skills. The results showed that the students have a favorable perception and attitude regarding financial issues, although the weakness they showed in the dimensions related to skills in the use of financial products and services is evident.

In the same idea, Wong and Burneo (2019) carry out research in the Peruvian context, which focused on measuring the level of financial knowledge that prevails in the educational field. The idea focused on finding solutions through educational tools that allow increase the level of financial knowledge. For this purpose, they applied a survey to 819 students belonging to 39 Professional Schools from both the Private University of Tacna and the Jorge Basadre Grohmann National University. The main finding confirmed, the level of knowledge on financial issues was very low, which was the main argument for implementing actions to improve this situation.

In the Mexican context Moreno-García, García-Santillán, Gutiérrez-Delgado (2017) carried out a study, whose results show a low level of financial education on 115 college students. The only knowledge and skill identified is the habit to carry out a budget, but the level of financial education is very low compare with the rest of the variables evaluated.

### **Empirical evidence on gender differences**

Regarding the gender difference, several studies developed on this topic, such is the case of the work of Falahati and Paim (2011), who carried out a study in which 2,340 university students from six public and five private universities participated in the Malaysian region. For the empirical study, they used the stratified sampling method and used as an instrument to obtain the data, the test developed by Sabri et al. (2006). The purpose of the work focused on the measurement of knowledge in financial education on financial issues and general knowledge about personal finance.

Following the same idea, Khurshed and Iftikhar (2014), surveyed 250 students from five universities: three from the public sector and two from the private sector, in the Faculty of Business and Business managerial sciences, belonging to the University of Peshawar in Pakistan. Topics on the time value of money, financial records, financial goals, saving, investing, education loans, general personal finance knowledge, and financial management skills to manage daily expenses were discussed. The results showed that men have greater skills in future needs, financial goals, investment and general knowledge about personal finance. In general, male students have more knowledge in financial education than female students.

A study carried out in Peru by Yaringaño (2018) analyzes the level of financial knowledge. For the work, 176 university students participated; it also verifies if there are significant differences when comparing the variables sex, age, professional career, marital status, if they have children, if they have a job and if they have a debit or credit card. The sample is made up of college students from the administrative, accounting, educational and psychological careers of the Marcelino Champagnat University. The results showed that 47.8 % of the college students, they have basic financial knowledge and the average level of students in administrative fields is significantly higher than other careers.

Herdjiono et al. (2018) focused on determining gender differences in financial knowledge, financial attitude and financial behavior in 382 university students from the border region of Indonesia. The findings showed that there is no difference between men and women in terms of financial knowledge, financial attitude and financial behavior.

Similar work carried out by Yasar and Turğut (2020) did not find significant differences in relation to gender, in the study carried out with 654 university students. The purpose was determine economic well-being on college students of the Sport Education career according their gender, age, semester among others indicators. Using the Turkish version of the financial well-being scale to obtain data, which were measured by the t-test and one-way ANOVA, they found that the financial situation of university students was low. Regarding financial perception, men showed better results than women did.

Finally, the work of Happ, Hahn, Jang and Rüter (2022), which they carried out on Korean and German college students, evaluated their financial knowledge specifically in the topic of money management, banking and insurance. A gender difference was determined in Germany, but not in Korea. Male students in Germany scored higher than female students. They concluded that the Korean and German students with more preparation in financial subjects achieved higher scores in financial knowledge.

Based on the empirical evidence, the research hypotheses are formulated:

H1 = There is a difference between the level of financial ability of the students in relation to gender.

H2 = There is a difference between the level of financial ability of the students in relation to the institution to which they belong.

## **2. Method**

Non-experimental cross-sectional design study, descriptive and exploratory. The participants in this study are college students in the last semesters belonging to programs in the economic-administrative and engineering areas.

The population are university students, and the type of sample is non-probabilistic by self-determination, since those accessible students who agreed to participate in the study were selected.

The sample was by the criteria of convenience, accessibility and proximity of the participants to the research team. The participating students are from seven municipalities in the state of Veracruz: Acayucan, Alvarado, Banderilla, Boca del Río, Martínez de la Torre, San Andrés Tuxtla, Veracruz Puerto, belonging to 10 Higher Education Institutions of which three are public institutions and seven private.

The students are enrolled in nine careers related to the economic-financial field and engineering: 1) Bachelor's Degree in Public Accounting, 2) Bachelor's Degree in Business Administration, 3) Bachelor's Degree in Accounting and Finance, 4) Bachelor's Degree in Actuary, 5) Bachelor's Degree in Markets and International Business, 6) Business Management Engineering, 7) Industrial Engineering, 8) Mechanical Engineering and 9) Mechatronic Engineering.

Questionnaire: To obtain the data, a hybrid questionnaire built from the scales proposed by: Mandell and Kline (2009); Lusardi and Mitchell (2008, 2011); CFI Official Global Provider of the Financial Modeling and Valuation Analyst (FMVA)<sup>TM</sup>; Certification Program (2015); Tecnológico de Costa Rica (TEC) (2016–2017); as well as, LearningExpress (2017). The instrument consist of 23 items grouped into 9 dimensions, which is made up of cases that allow measuring the ability acquired in their academic training, as part of the courses related to finance. The estimated time to answer the test was approximately 15 to 20 minutes. For the analysis of the data, the non-parametric Kruskal-Wallis test was used to detect the existence of differences in the distribution of the data. A priori, this procedure assumes that there is no difference in the populations analyzed.

### 3. Results

First, [Table 1](#) shows the students who participated in the study according to gender and educational institution. 309 students participated in the study, 185 women and 124 men. As we can see, the highest percentage (59.95 %) corresponds to women, and 61.8 % study in a private institution.

**Table 1.** Descriptive analysis

Variable	Frequency	Percentage	Variable	Frequency	Percentage
Female	185	59.9	Public Inst.	118	38.2
Male	124	40.1	Private Inst.	191	61.8
Total	309	100.0		309	100.0

Source: own

The percentage corresponding to gender between men and women is distributed by careers according to the following information in [Table 1b](#) and [Table 1c](#) it show the associations measures (ETA) among gender and career, which is acceptable.

**Table 1b.** Descriptive analysis, gender and type of program they belong to

Gender	BDPA 1	BDBA 2	BDAF 3	BDA 4	BDMI 5	BME 6	IE 7	ME 8	ME 9	Total
Female	79	41	5	4	21	13	19	2	1	185
Male	30	28	2	3	9	3	22	23	4	124
Total	109	69	7	7	30	16	41	25	5	309

Notes: 1) Bachelor's Degree in Public Accounting, 2) Bachelor's Degree in Business Administration, 3) Bachelor's Degree in Accounting and Finance, 4) Bachelor's Degree in Actuary, 5) Bachelor's Degree in Markets and International Business, 6) Business Management Engineering, 7) Industrial Engineering, 8) Mechanical Engineering and 9) Mechatronic Engineering.

Initially, the test used is validated and an internal consistency coefficient  $\alpha = 0.691$  is obtained, which is considered acceptable in the terms suggested by Hair, Anderson, Tatham and Black (1999). Subsequently, [Table 2](#) shows the ability level of the students, the results indicate that a high percentage of students (63.4) is within the medium to excellent level.

**Table 1c.** Directional career by gender and career

			Value
Nominal by interval	Eta	a. Dependent Gender	.387
		f. Name of the career: dependent	.274

Notes: In the association measure, the values are between 0 and 1: The value 0 indicates that there is no association between the row and column variables, and values close to 1 indicate that there is a great relationship between the variables.

**Table 2.** Financial Skill Level

Scores	Frequency	%	Interpretation
1 a 11	113	36.6	Null
12 a 14	94	30.4	Medium
15 a 19	98	31.7	Regular
20 a23	4	1.3	Excellent

Source: own

Subsequently, [Table 3](#) shows the results that allow the research hypothesis to be contrasted: H1 = There is a difference between the level of financial ability of the students in relation to gender; it is observed that the higher average range was for women. Since the test p-value (.923) is greater than 0.05, these values provide evidence that there is not enough evidence to say that there is a statistically significant difference between the median level of financial ability in these groups.

**Table 3.** Difference in financial ability and gender

Gender	N	Average range
Female	185	155.40
Male	124	154.40
Kruskal-Wallis H(1df)		Significance
0.09		.923

Source: own

Finally, [Table 4](#) shows the results of the hypothesis test: H2 = There is a difference between the level of financial ability of the students, in relation to the educational institution in which they are enrolled. The results reveal that the highest average range occurs in the private institution for women. The p-value (.191) is greater than 0.05, this allows us to verify that there is not enough evidence to say that there is a statistically significant difference between the median level of financial ability in these groups of study.

**Table 4.** Difference of financial ability and institution

Educational Institution	N	Average range
Public	118	146.58
Private	191	160.20
Kruskal-Wallis H (1df)		Significance
1.706		.191

Source: own

#### 4. Discussion

The results show a good general level of financial ability, since the level ranges from medium to excellent (63.4 %). However, it should not be overlooked, the percentage of students who lack this ability (36.6 %). Likewise, the results show that there is no significant difference in financial ability between men and women, in the same way there is no difference among those who study in a public or private institution.

Having demonstrated that there is no gender difference in the level of financial skills of the college students participating in the study, even with the type of institution where the students,

are enrolled. Therefore, the objective is achieved. These results are consistent with the results of Herdjiono et al. (2018) and Yasar and Turğut (2020). Additionally, the results of this research differ in relation to the findings reported in other works on gender differences, where men obtained better financial results than women (Falajahi, Paim, 2011; Khurshed, Iftikhar, 2014; Happ et al., 2022).

## **5. Conclusion**

As we can see, the study found that higher education institutions, both public and private, develop finance-related skills in students, considering the importance of this, since they will use them not only in their work environment, but also, in their daily life. It should be noted that these skills, are observed in the same way in women, which provides an opportunity for this sector to be included in financial inclusion statistics, which is currently a relevant issue worldwide.

## **Theoretical implications**

A theoretical implication of the study was the validation of the hybrid model to assess financial skills, which was designed based on the proposals of: Mandel and Kline (2009); Lusardi and Mitchell (2008, 2011); CFI Official Global Provider of the Financial Modeling and Valuation Analyst (FMVA)<sup>™</sup>; as well as the Certification Program (2015). In addition, the instrument proposed by the Tecnológico de Costa Rica (TEC, 2016–2017), as well as LearningExpress (2017). With all these proposals, the instrument used in this work was designed, whose results showed a significant evidence that allows us to have a better understanding of the financial skills that college students should have.

Another theoretical implication of this study is to have shown that the level of financial skills of the surveyed students does not differ in relation to gender and the educational institution they are enrolled, constitutes a contribution to the discipline according to its scope and limitations. In addition, something important to highlight is that the work was carried out in a Mexican context.

In addition, having verified that the level of financial skills of the students surveyed, does not differ in relation to gender and the educational institution of affiliation, it constitutes a contribution to the discipline according to its scope and limitations. Moreover, something important to highlight is, that the work was carried out in a Mexican context.

## **Practical implications and importance of the finds**

Knowing the level of financial ability in university students provides elements so that the academic authorities of public or private HEI (Higher Education Institution) can take specific measures on these results. The actions carried out by educational institutions must be equitable, benefiting both the female and male gender, allowing greater financial knowledge to improve their level of financial ability.

## **Limitations and future research**

A great limitation is in relation to the population surveyed, since initially the instrument designed to measure the financial capacity of the student, would be applied face to face in the classrooms of the universities. The conditions to answer the survey would be: not to use a calculator and that the survey was completed in a maximum time of 20 minutes, however in March 2021 as a result of the arrival of the Covid-19 pandemic in the world, and with the confinement measures and healthy distance, it was not authorized to apply it face to face, therefore, the instrument was adapted and designed in electronic format (Google forms) for its application. Another limitation was the size of the sample; a greater participation it was expected that would allow a better result of the total population. Therefore, it is suggested to future research, that the population can be extended. With larger samples, we may generalized behavioral in relation to populations studied, as well as, proposals of solution.

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## Testing of Digital Skills of Students and Teachers in Slovakia

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### Abstract

In Slovakia in 2022 there was carried out already the eleventh cycle of the monitoring of the digital skills of the Slovak population. In their paper the authors pay attention to the results which in this monitoring were achieved by its participants – Slovak pupils/students and teachers of lower and upper secondary schools and higher education institutions. The authors of the present study results of these categories of the monitoring participants based on their comparison with the results which the given categories of the Slovak inhabitants had obtained in the previous years (cycles) of the monitoring. Involvement in the public testing has provided pupils of lower secondary schools (ISCED 2), students of upper secondary schools (ISCED 3) and higher education institutions (ISCED 5), or graduates of these schools, an opportunity to get a clear idea of whether they are properly prepared to work with computers and the internet. At the same time enabled lower and upper secondary teachers to assess themselves in terms of their digital skills and to identify what knowledge and skills they need to strengthen in this area to better cope with the demands placed on their teaching activities. An analysis of the test results shows that pupils and students' basic digital skills and IT knowledge, as well as their ability to apply them within different practical tasks have improved slightly and only in several cases there was recorded only the same level as which was achieved two or three years ago. However based on the comparison of the average testing success in two or three different testing cycles no explicit conclusions can be drawn, as the recorded changes have been influenced by a lot of factors which could more or less significantly influence these changes.

**Keywords:** digital skills, education, innovative technologies, IT knowledge, Slovakia, student, teacher, testing.

### 1. Introduction

Digital skills as part of information literacy have become increasingly important in the last decade. It is an important competency for life and work in the 21st century, which has been

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multiplied in particular by the rise of digitalization in everyday and working life. Digital skills, especially with the advent of artificial intelligence, should become one of the important skills receiving increased attention in schools (Ng et al., 2023). As Andres and Hrmo (2020) state in their study, schools and education must naturally adapt to the change that comes with the Industrial Revolution 4.0, as it will trigger a change in the job system as we know it today. Based on various analyses and foresight studies, we can predict (Hall et al., 2019; Herich, 2019) that the labour market demands for school graduates in the future will evolve more in the way of increasing digital skills, analytical and language skills, critical thinking and team collaboration. In this context, Leoste et al. (2022) point out that it is essential to improve education in engineering, science and mathematics in particular. In addition to soft skills, it is essential to develop STEM knowledge, which is essential for Industry 4.0. It is predicted that schools will have to change comprehensively over the next twenty years due to the changes brought about by the more invasive emergence of artificial intelligence (Giang et al., 2021).

## **2. Theoretical framework**

For almost two years, the crisis caused by the COVID-19 pandemic has been testing the digital skills of us all, unnoticed by the main actors involved in the education sector. For the first time, teachers were left with no choice but to use digital means to deliver education and training. This pandemic was a great opportunity for teachers and students alike, challenging them to improve their use of digital teaching tools. Several recently published studies report (Antonova et al., 2021; Nilsberth et al., 2021; Pavlíková et al., 2021) that in the new conditions of lockdowns, those teachers who were able to adapt to the new situation, also thanks to better digital skills, were especially better able to overcome obstacles in their teaching activities. Despite the many extensive restrictions on face-to-face teaching in schools during the ongoing COVID-19 pandemic crisis, we believe that this situation has convinced teachers of the necessity to continuously improve their digital skills, without which they will not get far in their private and professional lives (Barnová et al., 2020). Teachers have to get used to the fact that the future will belong to a hybrid form of education in which some students attend classes in school classrooms in person, while others learn from home at the same time (Singh et al., 2021). Therefore, it is the responsibility of every teacher to be prepared for this model of teaching and learning for pupils/students and to fully exploit the potential of digital didactic tools (Perifanou et al., 2021).

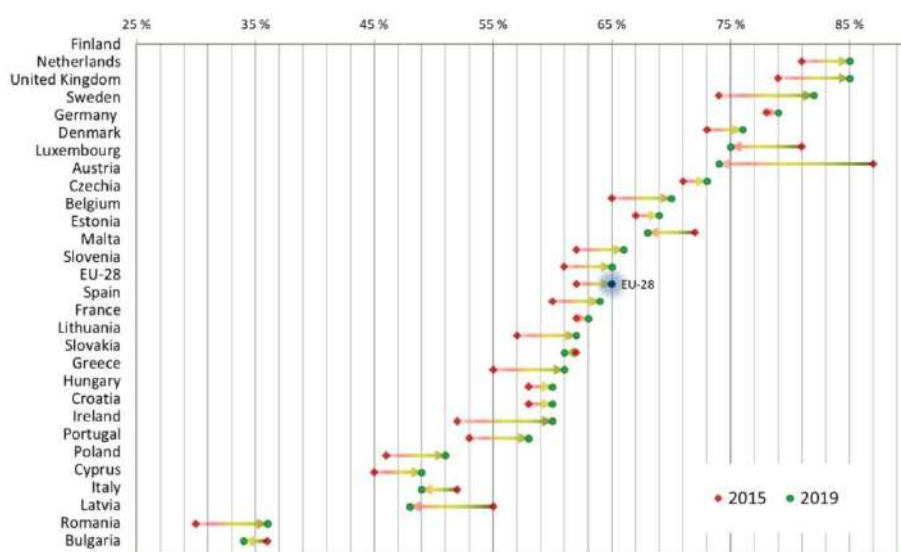
As the world becomes increasingly digital in its many dimensions, European citizens need a certain level of digital skills in the application of innovative digital technologies in order to be able to manage both their private and working lives. Regarding the level of digital skills, the European area refers in particular to the European Digital Competences Framework for Citizens (DigComp in current version 2.2), which requires an adult citizen with a basic level of digital skills to be able to perform simple tasks in all the domains listed by the European Council (Carretero et al., 2018). The level of digital skills is determined by several factors. These include, for example, physical infrastructure, i.e. the availability of computers and good internet connectivity. Analysis by OECD (2019) shows that although gender differences are not particularly pronounced, the educational attainment and age of citizens have a significant impact on their digital skills levels. In most European Union (hereafter EU) countries, many low-educated adults lack basic proficiency in using digital tools in everyday private and professional life, while these digital skills are almost universal among adults with tertiary education (level ISCED 5, ISCED 6). In terms of age, the digital skills of those over thirty in the sample are gradually deteriorating. The state of this reality is also reflected in various international measurements.

Every year since 2015 (with the exception of 2018) the Statistical Office of the European Union (Eurostat) publishes a composite indicator to measure the digital skills of EU citizens in the four domains under assessment, known as the Digital Skills Indicator (DSI), which corresponds to the five domains of the European Digital Competences Framework for Citizens (DigComp), with the exception of the Safety competence area. However, since 2021, the Digital Skills Indicator (currently version 2.0) has been updated and its scope expanded by adding a fifth competency area, Safety, to the four existing areas – Information and data literacy; Communication and collaboration; Digital content creation and Problem solving, thus usefully aligning the indicator with the DigComp 2.2 framework (Vuorikari et al., 2022). According to Eurostat data, around half of EU citizens (54 %) who were students, in employment or looking for work in 2021, i.e. people aged 16-74, had at least basic digital skills, 26 percentage points below the EU's 2030 vision for

Europe's digital transformation goals (Eurostat, 2022). This proportion was higher among people with low levels of education, the elderly and the unemployed. Eurostat's European Digital Skills Survey found that the level of digital skills of the adult population is growing slowly, with significant differences between EU member states. In 2021, the share of 16-74 year olds with at least basic digital skills was highest in the Netherlands and Finland (both 79 %), followed by Ireland (70 %). On the other hand, Romania had the lowest share (28 %), followed by Bulgaria (31 %) and Poland (43 %).

OECD (2015) states that a consequence of the 'digital divide' between citizens within EU countries is that adults with lower levels of digital skills are more likely to face problems finding employment and earn less when they do enter the workforce than adults with higher levels of digital skills. OECD (2016) analysis shows that demand for basic digital skills has increased in most countries. As a result, many working adults use digital resources regularly without adequate IT skills – on average, more than 40 % of workers using Microsoft Office software applications every day do not have sufficient skills to use it effectively. In February 2020, the European Commission highlighted in its document Shaping Europe's Digital Future that more than 90 % of jobs already require at least basic digital skills, but the need for digital skills goes beyond the labour market (European Union, 2020).

Based on Eurostat's *Digital Skills Indicator*, we can observe from a long-term perspective that the level of both basic and advanced digital skills in most member states has gradually increased in recent years to the EU average. Figure 1 shows the evolution of digital skills of economically active adults captured over time from 2015 to 2019 in all EU member states. As can be deduced from the graphical visualisation, in seven member states – including Slovakia – the share of adults with at least basic digital skills decreased slightly between 2015 and 2019 (European Union, 2021).



**Fig. 1.** Percentage of the workforce aged 25-64 (at least) with basic digital skills  
Source: European Union, 2021

Other relevant measurements providing indicators in the field of digital skills of some target groups of the Slovak population include, for example, the international measurement of the level and way of developing computer and information literacy of Slovak pupils and teachers called ICILS (The International Computer and Information Literacy Study), as well as the international survey of competency profiles of teachers working at ISCED level 2 called PIAAC online. However, in the last part of the paper, we cross-sectionally map the results achieved by Slovak researchers – pupils of primary schools, students of lower and upper secondary schools, students of grammar schools over 15 years of age and students of higher education institutions and the teachers of these schools, as well as other interested parties, participating in the national measurement of digital skills in different educational contexts through the online tool IT Fitness Test. It is worth mentioning that the eleventh edition of the IT Fitness Test 2022 was available for the first time in all four V4 countries, i.e. in Slovakia, the Czech Republic, Hungary and Poland.

Based on the above literature review, as well as further extensive research of available domestic and foreign sources, we can predict that the digital skills of the entire population of Slovakia, from lower primary school pupils and eight-year grammar schools to adults, must be improved if they are to successfully face the challenges of digital transformation. Improving digital skills takes time and systematic implementation of measures. The need to educate and upskill people in Slovakia to work with and use digital technologies is supported by a number of national strategies. An example is the National digital skills strategy of the Slovak republic and the Action plan for the years 2023–2026. The need for this national document is also demonstrated by the intensive deployment of digital elements and systems in almost all areas of the economy, industry and society. This creates pressure to expand the basic literacy of the workforce with new digital skills and competences. However, this applies not only to the current workforce, but also to the future workforce. Digitalization affects the lives of all citizens, regardless of age, gender or geographical location. An adequate level of digital skills is a prerequisite for an individual's employability in an ever-changing labour market. Without adequate knowledge of digital skills, an individual's ability to communicate electronically, especially in the near future, will be severely limited, especially in terms of employment. Therefore, in acquiring this knowledge and skills, active support is necessary not only from the state, but also from other representatives of private companies and nonprofit organizations, in order to build digital literacy and competences of the general public, not only professionals, but also the general public.

At this point, we consider it necessary to note that the paper is a follow-up to a paper presented at the 19th international conference on Efficiency and Responsibility in Education 2022 (Záhorec et al., 2022). In this conference paper, the authors present some of the results achieved by the different categories of solvers in the tenth cycle of the IT Fitness Test conducted in 2021. The current paper discusses the results from the testing carried out in the last (2022), eleventh cycle of testing by comparing them with the results obtained from the previous two years, i.e. 2021 and 2020.

### **3. Research sample and methods**

Since 2009, Slovak citizens have had the opportunity to (voluntarily) test their digital knowledge and skills through the online tool IT Fitness Test and thus get a realistic picture of their level compared to the European average. The priority target groups of the testing are pupils in the ending years of lower secondary schools and lower grades of eight-year grammar schools, respectively graduates of lower secondary schools aged from 14 to 16 years, students of upper secondary schools and higher education institutions older than 15 years of age. In addition to their pupils and students, IT Fitness test can also be taken by their teachers and educators, as well as other interested persons of any age. The IT Fitness Test is published annually on a publicly accessible portal, so anyone who has filled in the required data can take part.

For the knowledge and competence part of the IT Fitness Test, which focuses on the actual practical verification of the respondent's digital skills in various IT areas, two variants of test tools are administered.

The first test instrument is optimally designed for the age group of 14 to 16 years. This means that this variant of the IT Fitness Test is designed by the authors with a view to verifying the key digital competences of pupils in the lower grades of eight-year grammar schools, ninth grades of upper secondary schools or their graduates continuing their studies at a higher level of education, i.e. students currently in the first year of secondary school. In designing this easier variant of the test each year, the aim is to create tasks that are more interesting, more practice-based and less directly focused on the context taught in a particular school. Rather, the intention is to focus on testing the ability to analyse input information. Further, the emphasis is on understanding contexts and drawing conclusions, problem solving and critical thinking. Tasks at different, but rather higher cognitive levels (comprehension, application, analysis, evaluation) are represented in the test. Some of the tasks are more complex and are therefore designed as a cluster of dichotomous tasks.

The second test instrument is designed for test takers over 15 years of age. This group includes students and teachers of upper secondary schools and higher education institutions, as well as various age categories of other employed citizens of the Slovak Republic. This more demanding variant of the test is aimed at determining the level of their basic and more advanced knowledge and skills in the field of digital technologies, determining their competences in creating

and presenting digital information (office software, Internet), as well as determining their practical skills in searching and processing information (sources, searching and sorting, communication).

Each year, the tasks in the IT Fitness Test come from five thematic areas, namely:

- Internet,
- Digital safety and computer systems,
- Complex tasks,
- Office software tools,
- Collaborative tools and social networks.

Each topic area contains a certain number of questions/tasks depending on the age group of the test takers for which the test variant is intended. Each subject area of the test for pupils upper secondary schools, pupils in the lower grades of eight-year grammar schools or graduates of those schools aged 14 to 16 years contains four tasks. The test for those aged 15 and over contains five items in each subject area. The respondent will receive information on the achievement in each subject area at the end of the test. The content structure of the IT Fitness Test is created by a team of experts from the Technical University of Košice and educators from primary and secondary schools.

The eleventh year of the largest and most extensive IT knowledge and skills testing in Slovakia, the IT Fitness Test 2022, brought interesting results, when all target groups, for which this digital skills testing was intended, ended up with better success rates than in 2021, but on the other hand worse than in "Covid's" year 2020 (Kučera, Jakab, 2022). The improvement in performance is evident in basic IT skills and knowledge, but also in their connection to practice. From the testing results, it can be observed that the difference in the year-on-year success rate achieved by solvers in the tasks varies from 0 to 20 percentage points. However, this cannot be interpreted as an absolute improvement, as it reflects other factors, such as a change in the research sample, a slight change in the wording of the questions, or a change in the testing conditions, which may have had a more or less pronounced effect on the testing results.

Based on the results of the success rate achieved in 2021 (Kučera, Jakab, 2021), the authors of the IT Fitness Test in 2022 wanted to create both variants of the test with approximately similar difficulty of the tasks as in 2021. Behind this conceptual intention was an effort to make the final success rate of the test as close as possible to the middle of the interval of the optimal success rate of 50-60 % in the individual categories of the solvers. A success rate in this interval will help to maximise the discriminatory power of the test, i.e. the sensitivity of the test, i.e. the test will be able to distinguish between solvers with good knowledge and skills and those with poor knowledge and skills. Therefore, the authors sought to design both variants of the IT Fitness Test to contain tasks of varying difficulty, but with the aim of avoiding extremely difficult and extremely easy tasks – as stated in testing theory, the optimal task difficulty is approximately from the interval 20-80 % (Munk, 2011). When the IT Fitness Test tasks are not piloted in advance on a selected set of respondents, estimating their difficulty parameter tends to be very difficult each year.

#### **4. Results and discussion**

As part of the eleventh edition of the IT Fitness Test, 27 757 solvers took part in its more challenging variant intended for the target group older than 15 years of age (in 2021 it was 27 436 solvers; in 2020 only 13 649 solvers), what compared to 2021 means a year-on-year increase of 1.16 %, respectively, an increase of 50.83 % compared to 2020. In terms of participation by gender, there was a slight increase in female participation from 47 % to 49 % compared to the previous year of testing. Men made up 51 % of the entire corpus of respondents to this variant of the test. The overall average pass rate in this test variant is 52.55 %. There was an increase of almost 12.37 percentage points compared to 2021 (40.18 %). We were not surprised by this result; what was surprising was the lower result compared to the so-called "Covid" year of 2020 (average pass rate of 61.65 %), when there was a decrease of almost 9.1 percentage points. In terms of the test's discriminatory power, there was an increase from 58.65 % in 2021 to 66.38 % this year. So we can say that the test had an excellent resolution. We believe that the year-on-year increase in the sensitivity of the test was probably influenced by, among other things, the fact that the tasks did not have a set compulsory answer. That is, the respondent did not have to answer every task, and thus if they did not want to guess the answer and wanted real feedback, they could do so. The very good sensitivity of the test also affected the reliability of the test (Cronbach's alpha), which increased to 0.88 compared to 2021. The test for respondents over 15 years of age was attended by students from 567 secondary schools, universities and educational institutions, while in 2021 they

participated in the testing of 535 schools and in 2020 from 376 schools. The strongest age category consisted of respondents aged 16-18 (82 %), which corresponds to secondary school students (year 2021 – 82 %). The percentage of teachers in the more challenging variant of the IT Fitness Test 2022 remained the same as in the previous measurement, i.e. at the level of 9 %. More detailed basic psychometric parameters of IT Fitness Test 2022 compared to 2021 and 2020 in a group of solvers over 15 years of age are tabled at the top of [Table 1](#).

In the easier variant of digital skills and knowledge testing designed for primary schools and lower grades of eight-year grammar schools, the eleventh edition of the IT Fitness Test involved 14 193 solvers in the age category of 7 to 16 years. We therefore detect a year-on-year decline of almost 15 %, with 16 698 test takers in 2021 (in 2020 only 7 246 solver). Pupils from 701 primary schools took part in testing the digital skills of solvers in the category of 7 to 16 years of age, while in 2021, pupils from 790 schools took part (in 2020 – 445 schools, in 2019 – 496 schools). The strongest representation of respondents in the easier variant of the test were pupils aged 13, 14 and 15. The average pass rate for the easier variant of the test achieved in the primary age group of 14-16 year olds is 58.72 % (in 2021 the average pass rate was 42.53 %), which means that the result achieved is within the desired intentions of an optimal pass rate of 50-60 %. A comparison of the results shows that the success rate in the IT Fitness Test 2022 in the primary age category of pupils, i.e. those aged 14-16, has increased by more than 16 percentage points compared to the results achieved in 2021. The same positive fact regarding the optimal pass rate (50-60 %) is also observed for the whole group of test takers involved in the easier variant of the test, i.e. for the age group of pupils aged 7-16 years, when the pass rate reached 55.03 %. At the same time, it should be emphasized that the test discriminated very well the results of the respondents. The overall discriminatory power of the test was 66.97 %, which is a significant increase compared to 2021 (51.01 %). A detailed percentage picture of the average success rate in the different age categories of solvers participating in the easier variant of the test is tabulated in the lower part of [Table 1](#).

**Table 1.** Basic psychometric parameters of the IT Fitness Test 2022 vs. 2021

<b>Test for solvers over 15 years old</b>	<b>2022</b>	<b>2021</b>	<b>2020</b>
Number of test takers over 15 years of age	27 757	27 436	13 649
Overall average success rate of all solvers	52.55 %	40.18 %	61.65 %
Average success rate of students from secondary schools/universities	51.77 %	38.25 %	60.60 %
Average success rate of teachers	57.39 %	52.23 %	70.55 %
Average success rate of teachers – digital coordinators	78.49 %	category of respondents was not tested	
Average success rate of other employees	60.41 %	54.64 %	68.44 %
Sensitivity of the test	66.38 %	58.65 %	63.28 %
Test Reliability (Cronbach's alpha)	0.877	0.846	0.870
<b>Test for pupils of primary and lower secondary schools and graduates aged 7 to 16</b>	<b>2022</b>	<b>2021</b>	<b>2020</b>
Number of test takers aged 7-16	14 193	16 698	7 246
Overall average success rate of solvers aged 7-16 years	55.03 %	39.99 %	64.98 %
Average success rate of solvers aged 7-13	50.27 %	36.72 %	59.49 %
Average success rate of solvers aged 14-16	58.72 %	42.53 %	67.94 %
Sensitivity of the test	66.97 %	51.01 %	54.26 %
Average success rate of teachers	66.09 %	57.61 %	73.19 %
Average success rate of teachers – digital coordinators	82.06 %	category of respondents was not tested	
Test Reliability (Cronbach's alpha)	0.845	0.730	0.787

Source: own elaboration based on [Kučera, Jakab, 2021](#); [Kučera, Jakab, 2022](#)

The test for the age limit over 15 years was completed by 2 549 solvers who said they were teachers (in 2021 it was 2 396 teachers; in 2020 only 414 teachers). As mentioned in [Table 1](#), the average success rate of teachers in this test variant was 57.39 % (year 2021 – 52.23 %; year 2020 –

70.55 %; year 2019 – 73.19 %), which means that success rate in the verification of digital skills and the knowledge of this group of solvers, 50-60 % is again in the interval of the optimal test success.

The easier variant of the IT Fitness Test was completed by 637 solvers who indicated that they were teachers (in 2021 it was 547 teachers; in 2020 it was 136 teachers; in 2019 only 243 teachers). Of these, 17 were teachers who are also digital coordinators within their school. The average pass rate achieved by teachers in the easier variant of the test was 66.09 %, an increase of almost 9 percentage points (8.48 %) compared to 2021 (57.61 %). On the other hand, this is still below the average pass rate for this test variant achieved in the "Covid" year of 2020 (73.19 %). The percentage picture of the average success rate in the group of teachers in the easier version of the IT Fitness Test, differentiated according to the municipal regions of Slovakia, is presented in [Table 2](#).

**Table 2.** Average teachers' success achieved in the easier variant of the test administered in 2022 and 2021 differentiated by region

Autonomous Region of the Slovak Republic	Average success rate in 2022		Average success rate in 2021	
	students and absens of elementary school at the age of 7-16 [%]	Teachers [%]	students and absens of elementary school at the age of 7-16 [%]	Teachers [%]
Trenčín region	51.94	70.09	36.95	63.24
Nitra region	51.27	64.83	39.05	60.56
Bratislava region	62.47	64.90	45.58	59.20
Trnava region	53.31	65.24	40.85	58.93
Žilina region	54.87	75.26	38.65	55.96
Banská Bystrica region	53.55	63.48	38.98	55.44
Košice region	52.40	65.93	40.55	54.92
Prešov region	55.18	65.81	39.50	53.86

Source: own elaboration based on [Kučera, Jakab, 2021](#); [Kučera, Jakab, 2022](#)

As in the two previous years, the highest success rate of respondents in the regions completing the easier version of the IT Fitness Test, primarily intended for students or graduates of upper secondary schools, was in the Bratislava region in 2022, followed by the Prešov region in second place. The representation of teachers completing the lighter version of the test has increased in most cases within individual self-governing regions (the only exception is Žilina region – 2022/N = 39; 2021/N = 99). The highest representation of teachers within regions was in the Prešov (N = 124) and Nitra (N = 120) regions; in the previous year, the Nitra (N = 117) and Žilina (N = 99) regions had the highest representation. The average success rate of teachers in the regions who completed the easier variant of the test is the highest in Žilina region (75.26 %), followed by Trenčín region (70.09 %). On the contrary, the lowest success rate in this version of the test is in the Banská Bystrica region (63.48 %) and the Nitra region (64.83 %). In all groups of teachers with respect to the region, a year-on-year increase in the average testing of testing has been recorded compared to previous testing. Compared to 2021, there was the greatest increase in the average success of testing, almost 20 percentage points in the group of teachers from the Žilina region. On the contrary, the smallest increase in average success (4.27 %) was recorded in a group of teachers from the Nitra region. At this point it is worth mentioning that while in the previous cycle of testing in 2021 teachers in Trenčín region had the highest success rate of 63.24 %, in the testing in 2022 teachers in Banská Bystrica region with approximately the same success rate (63.48 %) were ranked last in the regions. This can be seen as a positive development.

[Table 1](#) shows that the best results achieved in the more challenging variant of the IT Fitness Test 2022, designed for the target group of test takers aged 15 years and over, were achieved by the category of other employed (as was the case in 2021), with a pass rate of 60.41 %. In 2022, the second and third place in the digital skills and knowledge verification were teachers and students of secondary schools/university respectively ([Table 1](#)). Teachers' overall average passing score on the test was approximately 1.11 times the overall average passing score of secondary schools/university students (in 2021 it was 1.37 times; in 2020 it was 1.16 times; in 2019 it was

1.33 times). Based on the statistical evaluation of the IT Fitness Test results obtained from the previous years, a trend was observed where the gap in the success rate of the test between secondary school/university students and teachers has been narrowing year by year. The exception is the year 2021, when the difference in success rate between the two groups was more pronounced. The percentage picture of the average success rate of the whole corpus of respondents, without their differentiation into groups categorised according to their age and according to their occupation or school (with age at least 15 years), as well as separately for the group of teachers, the group of students of upper secondary schools and higher education institutions and separately for the group of other employed citizens of the Slovak Republic of different age categories, achieved within individual self-governing regions of Slovakia (hereinafter referred to as the Slovak Republic) in the years 2022 and 2021 is presented in [Table 3](#).

**Table 3.** Average success rate in the variant of the test administered in 2022 and 2021 for solvers over 15 years of age differentiated by region

Autonomous Region of the Slovak Republic	Average success rate in 2022				Average success rate in 2021			
	All respondents [%]	Teachers [%]	Secondary school/ University students [%]	Others [%]	All respondents [%]	Teachers [%]	Secondary school/ University students [%]	Others [%]
Trenčín region	52.80	65.56	51.01	61.33	39.81	52.73	36.36	59.96
Nitra region	54.66	59.46	53.89	62.59	38.70	54.54	36.76	48.38
Bratislava region	52.04	56.69	50.91	64.02	41.20	61.19	39.02	52.53
Trnava region	50.55	56.74	49.48	59.49	42.41	56.14	41.01	48.96
Žilina region	51.62	58.87	50.97	64.05	39.41	52.93	37.64	59.16
Banská Bystrica region	53.85	58.26	52.85	63.28	38.18	51.29	34.86	60.37
Košice region	49.91	54.84	49.09	59.17	39.65	50.26	37.74	51.40
Prešov region	59.10	61.36	58.99	56.62	43.21	52.40	42.28	53.11

Source: own elaboration based on [Kučera, Jakab, 2021](#); [Kučera, Jakab, 2022](#)

Regarding the success of respondents in a more demanding variant of the IT Fitness Test 2022, it has achieved, as in the three previous years, i.e. also in 2022, the highest success rate was in the Prešov region (59.10 %). In the previous edition 2021, the difference between the region with the highest success rate (Prešov region) and the lowest success rate (Banská Bystrica region) was 5 percentage points. In 2022, the difference is 9 percentage points. Last year was the Nitra region (38.70 %) and the Banská Bystrica region (38.18 %) in the success of the regions in the last places, now they got to the second and third position (Nitra region – 54.66 %; Banská Bystrica Region – 53.85 %).

The highest average success rate was achieved by teachers in the Trenčín region, 65.56 %. The second highest average success rate was achieved by other employed citizens in the Žilina Region – 64.05 %. Teachers from the Košice region are significantly represented among teachers, making up 43 % of all teachers participating in the testing. The lowest success rate was achieved by students in the Košice region – 49.09 %. It may be interesting to compare other employed citizens

of different age categories and teachers within the regions. The highest difference between the success rate of other employed citizens and teachers is in the Bratislava region – 7.34 percentage points in favour of others. On the contrary, in the Prešov and Trenčín regions, the success rate of teachers is higher by 4.74 and 4.23 percentage points, respectively, in contrast to other employed citizens of the Slovak Republic in the same region.

The test for solvers over 15 years of age was divided into five thematic areas. Each thematic area contained five tasks. Table 4 shows the average success rate achieved in individual thematic areas of the test for the whole corpus of the solver, as well as for a group teachers of lower secondary schools, for a group students of upper secondary schools and higher education institutions and especially for a group of other employed Slovak citizens of different age categories. From the taboo data presented in Table 4, it can be seen that a group of teachers has achieved the highest test success in the thematic area of the Internet (70.71 %). Almost the same and at the same time the highest percentage of success (71.26 %) in the thematic area of the Internet is also mentioned in the group of secondary school/university students. Here we consider it necessary to note that in all five areas of digital skills verification was the most successful group of secondary school/university students. Within the four areas of testing, the group of teachers ranks second in the order of success after the group of students of secondary schools/universities, and finally the group of other employed citizens of the Slovak Republic who completed the test. A group of other employed citizens of different ages have achieved a better average success than a group of teachers, only in the thematic area of Collaborative tools and social networks.

From the results of the IT Fitness Test 2022 designed for solvers over 15 years of age, we can see (Table 4) that the strongest digital skills (without differentiating them into individual categories) were demonstrated by the solvers in the area of *Internet* use (65.60 %), such as searching for information in various forms on the internet, or using internet services. Based on the results obtained, we can conclude that the success rate in this area of digital skills testing has increased significantly compared to 2021, by approximately 16 percentage points (year 2021 – 49.83 %). This positive result can be stated despite the fact that the overall average success rate in the *Internet* topic area of all solvers over 15 years of age who took the more challenging variant of the IT Fitness Test is still lower by approximately 10 percentage points compared to the success rate achieved in the "Covid" year 2020 (success rate in 2020 – 75.18 %) (Kučera, Jakab, 2020).

The easier variant of the IT Fitness Test 2022 was divided into five thematic areas (as in the case of a test for solvers over 15 years of age), with each thematic area containing four tasks. In this variant of the test for lower secondary schools, primarily intended for solvers aged 14 to 16 years, are regularly the best results in a thematic area called *Internet*. In 2022, the best results were in the *Digital safety and computer systems* category. The *Internet* category had only the second highest success rate, reaching 62.72 % (year 2021 – 52.46 %; year 2020 – 79.19 %) (Table 5). Based on the analysis of the results achieved in this task area of the IT Fitness Test 2022, it can be observed that pupils are good at directly searching for specific information that is explicitly mentioned in a source. Pupils performed best in locating a place on a map from a photograph. They also regularly perform well in searching for transport links. In 2022, pupils aged 14 to 16 years of age, compared to the previous year, improved in the search for video and its content. On the other hand, we would like to proclaim that the success rate in finding information on the internet is significantly reduced if pupils are to seek a source and evaluate some information in it and opt for the truth of these claims. If the information to be retrieved is in a certain complex structure from which only a certain part needs to be selected, the success rate of the solvers in the task also decreases. Tasks are also more difficult to find the information and then work to the correct answer through several steps. As for the sensitivity of the test for lower and upper secondary schools in each category, each of the five categories reached a sensitivity value above 60 %, of which we deduce that all categories have very well distinguished the test sample for solvers with good knowledge and skills from solvers with poor knowledge and skills. Tasks in the *Internet* category very well divide the test sample, the sensitivity of the category is the third highest of all categories and is 68.19 %. In 2021, this category had a sensitivity of 58.71 %.



**Table 4.** Achievement in each category of solvers with respect to the queried subject area in the test for solvers over 15 years old

Testing area/Category of solvers	Average success rate in each category			
	All respondents	Teachers	Secondary school/ University students	Others
Internet	65.60 %	70.71 %	71.26 %	64.86 %
Digital safety and computer systems	62.26 %	63.30 %	68.53 %	61.72 %
Complex tasks	45.68 %	50.84 %	53.88 %	44.85 %
Office software tools	34.78 %	47.07 %	50.16 %	32.95 %
Collaborative tools and social networks	54.45 %	53.01 %	58.20 %	54.47 %

Source: own elaboration based on Kučera, Jakab, 2022

**Table 5.** Achievement in each category of 14-16 years old with respect to the queried subject area in the easier variant of the test

Testing area/Year of testing	Average success rate 14-16 yrs. solvers		
	2022	2021	2020
Internet	62.72 %	52.46 %	79.19 %
Digital safety and computer systems	65.24 %	37.84 %	60.70 %
Complex tasks	50.76 %	39.50 %	71.71 %
Office software tools	44.17 %	31.82 %	42.83 %
Collaborative tools and social networks	52.23 %	38.78 %	70.46 %

Source: own elaboration based on Kučera, Jakab, 2022

Based on the results achieved in a more demanding variant of the IT Fitness Test 2022, we can state (Table 4) that in the field of Digital safety and computer systems, solvers from the global aspect (without differentiating them into individual categories according to occupation or school), solved the tasks with an overall success rate of 62.26 %, the same as in 2021 (46.52 %), the second highest success rate compared to other testing areas. The second best success rate in the implementation of test tasks in the area of Digital safety and computer systems was also achieved within the individual partial groups of solvers – teachers – 63.30 %; students of secondary schools/universities – 68.53 %; other employed citizens of the Slovak Republic – 61.72 %. At the same time, we can say that tasks in this category were very well distributed by better and weaker students when its sensitivity reached 63.83 % (the second highest sensitivity). The authors of Kučera and Jakab (2022) state in the final IT Fitness Test 2022 report that respondents are well oriented in the field of safety in the common knowledge they often encounter. In less standard situations, they navigate better than in the past. Respondents can understand safety settings and predict the behavior of the system. They can link basic knowledge and apply them to a less standard situation.

In the easier variant of IT Fitness Test 2022 in the group participating in the age category from 14 to 16 years of success, the success of solving Digital safety and computer systems tasks 65.24 % (year 2021 – 37,84 %; year 2020 – 60,70 %), which represents the highest level of success in this year compared to other areas of testing. In the past, this area of verification of digital skills and knowledge waved the second lowest success rate compared to other testing areas (Table 5). IT safety pupils can respond appropriately to basic safety situations and we can see the trend of year-on-year improvement of the entire corpus of respondents. In the past, the worst results in this area of testing and probably focusing on this issue in the context of the creation of various educational and test activities for teachers as well as pupils helped to change the knowledge of IT safety.

The thematic area Complex tasks included tasks aimed at solving problems of an algorithmic nature, i.e. tasks requiring higher cognitive thinking, also tasks aimed at complex skills in working with files, tasks to find information in an interactive graph and then evaluate it, and last but not least, tasks to discover the control and setup of a certain sequence of commands in the program notation. The overall success rate of solver filling the more demanding test variant was recorded at 45.68 % (in 2021 – 31.30 %), which is the second lowest result compared to four other areas of digital skills verification (Table 4). Similarly, the second lowest success rate in the more difficult variant of the test was also achieved within the different categories of solvers, teachers – 50.84 %, students – 53.88 % and other employed citizens of the Slovak Republic – 44.85 %. On the other hand, compared to 2021, we can observe a very slight improvement in the average success rate achieved within the individual groups of solvers – teachers 2021/39.86 %; students 2021/29.68 %; other employed citizens of the Slovak Republic 2021/46.44 %. The discriminatory ability of the test achieved in the thematic area of Complex tasks is very good, namely 66.43 %.

Although the success rate in the Complex task topic area is higher compared to 2021, we see that secondary school and university students completing the more challenging variant of the test are deficient in solving algorithmic problems with higher cognitive demand, where problem solving is required at a complex level. In solving, students prefer answers resulting from a quick decision. In the final report of the IT Fitness Test 2022, the authors Kučera and Jakab (2022) state that solvers from a global perspective, i.e. without differentiating them into individual categories according to occupation or school, are less willing to investigate the features of the system in more detail, to doubt the correctness of the result, and then to verify the answers that are quickly offered. Also based on the comments made on the tasks, it can be observed that there is a tendency towards less acceptance of the defined rules in the task and that it is cognitively more comfortable for the respondent to solve the task in the context of his/her own ideas. We share the opinion of the authors of the IT Fitness Test 2022 that there is still a lot of room for improvement and refinement of respondents' skills in solving complex algorithmic tasks. We believe that in order to improve testing results in the future, it is necessary to include tasks of this nature more often in the teaching process in primary school.

In the easier variant of the IT Fitness Test 2022, designed primarily for students aged 14 to 16 years, the average pass rate in the Complex tasks topic area was 50.76 % (Table 5). From the analysis of the results obtained, it can be deduced that pupils in the ending years of lower secondary schools or eight-year grammar schools and the graduates of those schools aged between 14 and 16 years have reserves in evaluating the sequence of commands when debugging a program, in deciding whether a given sequence of program commands performs exactly what it was programmed to do.

The IT Fitness Test 2022 again revealed large reserves in the field of work with Office software tools, understanding and working with data in some structure, working with tables and charts, while digital skills in this area are today one of the basic conditions for successful enforcement conditions to the labor market. This area of testing has long been one of the categories with the lowest success rate achieved, whether within a more demanding test variant (year 2022 – 34.78 %; year 2021 – 37.17 %), as well as a variant of the test for lower and upper secondary schools, primarily intended for solvers of age agencies from 14 to 16 years (year 2022 – 44.17 %; year 2021 – 31.82 %). Tasks in the Office software tools area focus on formatting and copying text, or copying set format properties of text paragraphs within the structure of a large text document. This area of digital skills verification also contains tasks aimed at processing tabled data through mathematical expressions and their graphic visualization. We believe that this topic is probably less attractive for pupils/students, so it is necessary to look for suitable methods and context that will be more interested in pupils/students.

Despite the lower success rate, the sensitivity of the thematic area was the Office software tools in the more demanding test variant very good, namely 59.59 %. This means that we also have very clever respondents and vice versa, respondents who have significant reserves on the subject. In this area, especially other employed citizens of the Slovak Republic have significant reserves, when the average success rate of respondents is 32.95 %. A large proportion of teachers and students of secondary schools and universities also had problems with the tasks of this area of testing (average teachers' success: 47.07 %; average success rate of secondary school/university students: 50.16 %) (Table 4). Based on the results achieved from the IT Fitness Test 2022, it seems that these groups of solvers have little practical experience with the characteristics of the formatted

text and its copying, and that they are little understanding of the structure of a large textual document. The results of the IT Fitness Test from previous years have been observed for a long time, when in this area of verification of digital skills was achieved the biggest difference in success between the teachers and a group of pupils of 14-16 year olds of lower secondary schools filling the easier variant of the test, respectively among the teachers and a group of students of upper secondary schools and higher education institutions filling in a more demanding test variant of the test, of course upper, for the benefit of teachers – in the past more than 15 percentage points. From the results achieved in 2022, it can be noted that the differences in the success of solving tasks from the thematic area of Office software tools among these groups of solvers who have completed one of the test variants are beginning to shrink. This can be considered a minor positive.

The overall average success rate of pupils aged 14-16 years as part of the easier variant of the IT Fitness Test 2022, the Office software tools reached a level of 44.17 %. Although the Office software tools topic area had the lowest achievement of all five areas of digital skills testing, we see a slight year-on-year improvement of 12.35 % in this area compared to 2021. In the actual work with tabulated data and its graphical visualisations, we see a significant improvement compared to 2021 for the group of pupils aged 14-16 (year 2022 – 44.17 %; year 2021 – 31.82 %), as well as for teachers completing the easier variant of the test (year 2022 – 58.72 %; year 2021 – 42.53 %). We observe that if the task tests some knowledge only theoretically or by inducing a model situation, the results are better, but not sufficient. As the authors Kučera and Jakab state in their final report (2022), the difference in the success rate achieved in the individual tasks is whether the respondents have to understand the tabulated data, the information visualized through a graph and evaluate it, or whether they have to work further with these structured data objects, for example, to search for specific information according to a given criterion, or to use spreadsheet tools to arrive at certain calculations and only in a subsequent step to evaluate the obtained data. Significant reserves in the group of pupils aged 14-16 filling in the easier variant of the test are also seen in critical thinking, in the need to express themselves accurately and to focus on a precise description of the information. Slight improvement is seen in tasks aimed at understanding graphical visualisation of data and in identifying the source data belonging to the graph produced. In the words of the authors of the IT Fitness Test 2022, based on the unflattering result achieved by the above group of solvers, there is room for improvement. Looking at the sensitivity of 70.33 % achieved in the more challenging version of the test (the category with the second highest sensitivity), we can see that the tasks from the Office software tools topic area distributed the sample of test takers very well. It appears that it is in this area of digital skills testing that the scissors between the high achievers and the low achievers are significantly blurred. Perhaps this is also due to the difference in the quality of teaching in individual schools. We believe that it is in schools with higher quality teaching in the area of applying digital tools to the solution of educational activities that they have enough time to address this topic at an appropriate cognitive level.

In the area of testing called Collaborative tools and social networks, the success rate for the group of teachers (53.01 %) completing the more challenging version of the IT Fitness Test 2022 was within the intent of the optimal average test pass rate (50 % to 60 %). However, this is still almost 18 percentage points lower than the success rate achieved by teachers in the Internet subject area (70.71 %). The average success rate falling within the range of the optimal average success rate can also be observed within the group of students of secondary schools/universities (58.20 %) or the group of other employed citizens of different age groups (54.47 %) who completed the test (Table 4). Based on testing the same digital skills compared to 2021, we see a slight improvement in the category of teachers (year 2021 – 47.63 %). In the past, the success rate of teachers in this area of testing has been higher than or at least comparable to that of students. This year, student achievement was 5 percentage points higher than teacher achievement. Nevertheless, we still see space for a significant improvement in the level of digital skills in a group of teachers, as well as students over 15 years of age (students of secondary schools and universities) filling in a more demanding test variant of the test. At this point, we consider it necessary to note that it is precisely the tasks of Collaborative tools and social networks that best distributed a sample of tested respondents, when the sensitivity in this area reached an excellent value of 76.29 %. In the category of pupils of the ending years of lower secondary schools or eight-year grammar schools and graduates of these schools aged 14 to 16 years filling the easier variant of the test, an average test success rate of 52.23 % was achieved 2021 (38.78 %) falls into the intentions of optimal average test success (50-60 %) (Table 5).

From the results of the IT Fitness Test 2022, we can conclude that the solvers of both variants of the test are proficient in questions focused on searching for specific posts on the social networks Instagram and Facebook, but still this year they had small reserves when it comes to verifying the required information on the social network Twitter. On the other hand, this cannot be considered a surprising result, as it is a less used social network among pupils/students. In the group of solvers completing the more challenging variant of the test (i.e. over 15 years old), the file sharing task had the highest success rate in this area of testing (66.18 %). Its success rate was comparable to previous years (year 2021 – 58.09 %; year 2020 – 57.25 %). Although similar skills have been tested in previous editions of the IT Fitness Test, the results do not see a significant improvement in these skills. Overall, we see that respondents are well versed in this area of testing. They have experience of Instagram and Facebook, and can search, identify basic information and interpret it. Based on the results obtained, we can conclude that the basic knowledge and working with cloud-based tools designed for collaboration in the field of creation and management of electronic online documents are also at a good level (Kučera, Jakab, 2022). In the group of solvers aged 14 to 16 years completing the easier variant of the test, the results in tasks aimed at working with shared files are slightly better (the average success rate of all four variants of tasks from the Cloud group within the category Collaborative tools and social networks reached 66.18 %) compared to the previous year 2021 (61.13 %), but not better than in previous years (e.g. year 2020 – 83.49 %). The situation is similar for searching for video files in the YouTube online database. Pupils also have some reserves when it comes to evaluating the veracity of information presented on social networks or searching for it themselves. Similarly to other categories of solvers completing the more difficult variant of the test, we see that the skill level of the solvers has decreased, with 14 to 16 year olds struggling with tasks that require higher cognitive operations and linking contexts. We share the view of the authors of the IT Fitness Test 2022 stated in the final report (2022) that pupils in the 14-16 age group still need to be engaged in the development of critical thinking, evaluating information and assessing its quality, credibility and veracity.

## **5. Conclusion**

We share the view of Frolova et al. (2020) that digital competences are nowadays essential not only in studies or work, but also in everyday life. The IT Fitness Test is a tried and tested method of testing digital skills and knowledge, which has provided the graduates of lower and upper secondary schools a clear idea of whether they can work with computers and the internet at the level commonly demanded by employers in today's labour market. It gave teachers of regional education, i.e. teachers of primary (ISCED 1) and of lower (ISCED 2) and upper secondary schools (ISCED 3), a relevant picture of where they stand in terms of digital skills and where they need to strengthen in this area in order to be better able to overcome obstacles in their teaching activities in the future.

The results of the descriptive measurement statistics achieved in the IT Fitness Test 2022 clearly show us that we cannot stay satisfied with the proven level of digital skills and knowledge of the target groups of solver – pupils of the ending years of lower secondary schools and eight-year grammar schools or graduates of these schools between the ages of 14 to 16, students of upper secondary schools and higher education institutions preparing for their future professional application within the company, as well as last but not least in a group of teachers of lower and upper secondary schools. Obviously, it is necessary to focus more on the circumstances of developing digital literacy of pupils in primary and lower secondary schools and addressing investment in this area of education.

Based on the above measurement results achieved in the IT Fitness Test 2022, we believe that one of the main conceptual goals of the Department of Education of the Slovak Republic in the near future is to prepare educational institutions in the field of regional education for the implementation of concrete steps towards their digital transformation into schools that develop digital competencies of their students and teachers, effectively use digital technologies in communication with the community of educational actors, in teaching and in active student cognition, assessment and self-assessment. Overall, these are comprehensive materials that include a strategy for developing digital skills not only for young people but for society as a whole through lifelong learning.

## 6. Recommendations

We are convinced that schools should focus more on linking knowledge from several IT areas, but also on linking theoretical knowledge with practical skills of pupils, experience, to encounter various new problems in different context. Teachers should, to a greater extent, award project educational activities requiring higher cognitive operations that engage pupils in longer-lasting open issues or problems. The aim of these projects is to point out some possibilities of linking digital skills and knowledge with practice. Pupils should be more creative to solve tasks and analyze the problems more thoroughly. It is also necessary to start more actively on raising awareness of students of secondary (vocational) and universities, as it is constantly confirmed that the extent to which the students at school acquire digital skills will later have a high impact on their life chances to assert themselves on the market work (Hrmo et al., 2016). Already today, surveys among employers indicate that for most of them the ability to work with digital means at the basic level is expected and key skill of a potential employee with secondary education (Khuraisah et al., 2020; Feijao et al., 2021). At the same time, part of them states the lack of preparedness of school graduates in this area.

The presented outcomes from the measurement of the IT Fitness Test 2022 suggest to us that there is a need to emphasize the undergraduate preparation of future teachers. In this context, we agree with the assertion of the authors Nagyová (2016) and Napal Fraile et al. (2018) that it is essential to focus attention in the area of academic disciplines that, in the context of undergraduate education, prepare future teachers to be erudite in the application of digital didactic tools and software applications in the teaching of the subjects of their apprenticeship. Therefore, it remains for discussion and assessment by the relevant experts how to adapt the teaching of the relevant educational disciplines – in their content, time allocation and the way of their inclusion in the curricular structure, to the study programmes of teaching at the tertiary level of education in the context of the current needs of pedagogical practice with regard to the formation of professional digital skills of teachers.

We are convinced that, to further increase the level of digital skills of Slovak pupils/students and teachers of lower and upper secondary schools and higher education institutions, European investments from the plan for renewal of Slovakia will also contribute in the near future, where considerable funds are intended not only for digitization of teaching, but also improving the education itself in this the area of the area. We consider a modern and innovative approach to the way of providing education and training in individual areas in the process of smooth digital transformation of education in Slovakia.

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## The History of Education

### Social Portrait of Foreign Professors in the Universities of the Russian Empire (1755–1835)

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#### Abstract

Currently, the European education system is changing drastically. That depends on the institutional infrastructure shifts and access to education itself. Ukraine possesses such features as well, which confirms its constant belonging to European educational traditions.

The scientific questions and problems actualized in this manuscript, to some extent, fill the existing gaps in the system of knowledge about the actual issues of formation and development of higher education in the Russian Empire.

The purpose of this manuscript is to comprehend the history of formation and development of higher education in the Russian Empire. We have analyzed the biographies of foreign professors invited to the imperial Russian universities. Their teaching and research activities implemented the university idea into the system of higher education of the Russian Empire in accordance with the values and ideals of the European educational space.

It is them who marked further ways of the university education development. At the stage of founding Russian universities, foreign professors (usually, German ones) performed a significant role. They unfolded new institutions, created textbooks and curricula, founded scientific schools, conducted fundamental research in separate branches, which was a good example for future academic generations. Such an activity is needed to adapt and revise the European university idea in the new culture context. Therefore, this problem has a specific topicality.

**Keywords:** education, universities, education reform, educational governance, educational policy, higher education, foreign professors.

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## **1. Introduction**

The analyzed biographies of foreign professors provide a scientific portrait gallery of the European science in its “golden age”. We are going to trace a personal contribution of separate researchers to the cultural heritage of the Russian Empire. In general, the represented biographical analysis offers a basis for further studies.

For example, the above-mentioned may investigate how academic life emerged and evolved in the autocratic Russian Empire. Also, it can probe into intellectual awareness, norms and class privileges existing within state and local authorities. Altogether, interrelations between Russian and foreign scientists become obvious. There is an interesting question to answer: how deeply did foreign professors of the first Russian Empire universities influence the academic mind and behavior in future?

With university foundations, new spheres of spreading and developing culture emerged. In this case, it is foreign scientists who mediated as much as possible. Via their own interest and influence, they promoted the higher education change when new prospects opened and more valuable people entered the academic community. In the second part of the 19th century, universities became available for many students. Consequently, that shifted the status and image of intellectuals.

The bibliographical analysis results make us not only reconsider fate and heritage of foreign professors. We may also compare categories of European knowledge history, their filling and social context. Initially, the Russian Empire higher education developed as an open system with ideas coming from Europe. Such a European “university idea” was gradually implemented in the Russian Empire. It adapted in contact with local traditions, social and state reality.

Within this “academic transfer”, a typical feature of all Russian universities in their first existence decades was the vast presence of foreign professors. Since the Russian university constitution of the 18th-19th centuries was originated in Europe, it was Europe where carriers of these principles came from. Such scientists could embody the university order similar to the European one. The lack of specialists in separate branches mattered as well. Here, the general organizational transfer of European academic principles combined with the scientific school transfer. Subsequently, own research schools were established.

Such an academic transfer included an obvious contradiction: university as a European idea construction had little to do with needs of the Russian society in that time. Respectively, foreign scientists coming to work at these universities were alien to society as well. Moreover, their European habits, mentality and activities contradicted the Russian autocratic policy. That caused sharp conflicts and prevented professors from succeeding in their teaching and research. Therefore, it happened quite often that their skills were not realized to a full extent. In each separate case, there was a combination of different factors determining the fate of a foreign professor. His activities are a rich field of investigation for researchers of higher education history.

## **2. Materials and methods**

The professors’ staff of Russian imperial universities is regarded as a specific phenomenon in the home higher education history. The chronological research frame is defined by its historical context. The initial point is the middle of the 18th century since foreign professors appeared in Moscow after foundation of the first Russian university in 1755. The final point is the 1830s (adopting the New University Charter in 1835; assigning S. Uvarov to the education minister post).

S. Uvarov promoted a new academic policy. In particular, he refused to invite many foreigners to teach at home universities. Instead, he insisted on European training of own Russian professors who headed departments when the New University Charter came into effect (the 1830s). Later, they were assigned to Russian academic posts rarely. Therefore, they were not treated as a separate historical phenomenon anymore.

In this article, we analyzed the professors’ staff of four imperial institutions (founded before the New University Charter adoption in 1835). They were the Moscow Imperial University, the Kazan Imperial University, the Kharkiv Imperial University, the Saint Petersburg Imperial University.

Into our study, we did not include the universities in Dorpat and Vilna that belonged to the Russian Empire in the first third of the 19th century. Managed by the Education Ministry, their local educational traditions were different (the Polish ones at the Vilna University and the German ones at the Dorpat University). Development trends of these institutions differed greatly from traditions of the so-called “Russian home universities”. Similarly, we omitted the Saint Volodymyr Kyiv University. It was founded and upgraded in the full swing of the Uvarov Reforms.

Let us explain what principle we used to identify foreign professors. We included their birth place and citizenship. All professors born outside the Russian Empire during the given period were regarded as foreign. As foreign scientists, we did not treat their children (who were born in Russia, acquired the Russian citizenship and became university professors). Another requirement to identify foreign researchers was their assigning to the academic posts at one of the above-mentioned Russian universities till the middle of the 1830s.

Totally, we analyzed biographies of 105 foreign professors. They worked at the Moscow Imperial University (37 persons), the Kazan Imperial University (28 persons), the Kharkiv Imperial University (28 persons), and the Saint Petersburg Imperial University (12 persons). That confirms a great contribution of foreigners to the academic development in the Russian Empire.

### **3. Discussion**

The history of higher education in the Russian Empire can be considered in terms of both general trends and prospects for the development of the bureaucratic system of the Russian state (Degtyarev, 2012; Lebid, Shevchenko, 2021b and etc.); the development of "university space" and corporatism (Andreev, 2009; Andreev, 2006; Maurer, 2015; Maurer, 2003; Ocherki istorii..., 2011 and etc.).

It is appropriate to analyze the formation of the system of higher education in the Russian Empire in the context of the establishment and development of the Imperial Russian Universities and their contribution to the scientific and social life of the country (Bagalej, 1906; Imperatorskij Moskovskij universitet, 2011; Ocherki istorii..., 2011); their structural subdivisions (Fiziko-matematicheskij fakultet, 1908; Istoriko-filologicheskij fakultet..., 1908; Lebid, 2023; Lebid, Shevchenko, 2021a; Medicinskij fakultet..., 1905–1906; Yuridicheskij fakultet..., 1908) and their teaching staff (Biograficheskij slovar..., 1904; Biograficheskij slovar..., 1902–1903; Biograficheskij slovar..., 1855; Feofanov, 2013; Lebid, 2022; Lebid, Degtyarev, 2023; Lebid, Lobko, 2022; Lebid, Stepanov, 2023; Niks, 2008; Volkov, Kulikova, 2003; Volkov i dr., 2003).

It is also important to study the peculiarities of the initial stage and formation of university education in the Russian Empire. At this stage, a significant influence on the process of formation of university education in the Russian Empire was exerted by foreign professors invited to Russia as carriers of the European university idea (Andreev, 2006; Bajer-Toma, 2003; Bedoeva, 2020; Feofanov, 2011; Inostrannye professora..., 2011; Kunc, 2002; Maurer, 2015; Petrov, 1997; Yakushev i dr., 2004).

A. Andreev investigates the development of university education in the Russian Empire in the context of the spread of European university education. His scientific works show the formation of the idea of Russian universities at the turn of the XVII–XVIII centuries. The historian pays special attention to the reform of Alexander I, during the development of which the experience of German universities was taken into account. He traces the influence of the model of "classical university" (Andreev, 2006; Andreev, 2009).

As D. Bedoeva notes, "in the first quarter of the 19th century, Russian universities lacked professors. Therefore, they were invited from Germany". She identified the reasons for the relocation of German professors, studied their living conditions. The contribution of German professors to Russian science and the development of university education was analysed (Bedoeva, 2020).

The works by V. Volkov and M. Kulikova study the main milestones in the life and activities of professors of the Imperial Moscow University. In the works by Volkov V. and Kulikova M. the main milestones in the life and work of Moscow professors from the 18th to the beginning of the 20th centuries are studied (Volkov, Kulikova, 2003; Volkov i dr., 2003).

E. Kunz's study analyses the contribution of the Imperial Moscow University in the context of the functioning of European universities. It shows the educational activities of the Moscow University in the last third of the 18th century, as well as the role of foreign university professors in the reforms of public education in the early 19th century (Kunc, 2002).

Maurer T. investigates the formation of the teaching staff of Russian universities in the nineteenth century. His works consider the problems of self-determination of universities in the conditions of state building. (Maurer, 2003; Maurer, 2015).

The study of the social portrait of professors of the Imperial Moscow University is made in the works of N. Niks. The author's research is based on sources of personal origin and numerous statistical materials. The researcher shows the role of Moscow University professors in the formation of science and higher education in the Russian Empire, as well as in the formation of

cultural ties in Russian society at the turn of the century (Niks, 2008). F. Petrov devoted his research to the history of German professors at the Imperial Moscow University (Petrov, 1997).

A. Feofanov's works analyse the number and social composition of professors of the Imperial Moscow University in the second half of the 18th – first quarter of the 19th century. The author studies the age, marital status, career, social status and other issues of professors. The biographies of foreign professors of Russian universities are analysed and as a result it is shown that they made a significant contribution to the development of university education in the Russian Empire (Feofanov, 2011; Feofanov, 2013).

As A. Yakushev and other researchers note, "due to the opening of new universities in Russia, the problem of scientific and pedagogical personnel became acute" (Yakushev i dr., 2004). In this regard, the Ministry of Public Education and universities were forced to invite foreign scientists and professors. These were mostly representatives of German universities, who were engaged in professional training of specialists and scientists in Russian universities (Yakushev i dr., 2004).

#### **4. Results**

At the first stage of the existence of universities in the Russian Empire, a significant part of their teachers were foreign professors, who had to be attracted to create educational institutions of European scale. Such qualified personnel were absent in the higher educational institutions of the Russian Empire. Thus, it was German universities that served as a source of personnel for the newly formed universities (Andreev, 2006; Petrov, 1997).

Most of the foreign professors invited were from Germany by their origin or nationality – 80 out of 104. It was German educational traditions and models that became a reference point for Russian reformers of the higher education system. I. Shuvalov acted in this way when recruiting professors for the Imperial Moscow University, and later the trustees of the Kazan and Kharkov Universities. Apart from Germans, foreign professors included Frenchmen invited to teach French (Feofanov, 2011; Inostrannye professor..., 2011: 11-24).

All invited foreign professors at Russian imperial universities can be conditionally divided into three groups. The first group includes 23 professors of the Imperial Moscow University in the second half of the 18th century. The second group consists of foreign professors who were invited to Russian universities during the university reforms of the early 19th century – 70 persons. The third group of foreign professors consists of scientists who taught in Russian universities in the first third of the XIX century – 11 persons (Inostrannye professor..., 2011: 11-24).

As the analysis shows, the average age of professors of the first group at the time of their invitation to Russian universities was 30 years. The duration of their work at the university was on average 15 years. Six professors taught for more than 20 years (the record-breaker was Professor I. Rost, who had 34 years of experience at the Imperial Moscow University).

The age of professors of the second group was lower, which may indicate the Russian reformers' bet on young people. The duration of their stay in Russian universities was also shorter and did not exceed 10 years, and some – even 5 years. Many professors, unable to withstand the conditions of life and labour, died. Many, having worked in Russia for a short time, returned to their homeland and continued teaching there.

By the middle of the 20s of the XIX century in 4 imperial universities – Moscow, Kharkov, Kazan and St. Petersburg – only 8 out of 70 invited professors remained. This indicates their short-term influence on Russian universities, although the number of professors in this group was significant (Bedoeva, 2020: 65-72; Yakushev i dr., 2004: 159-162).

The influence of foreign professors on the system of higher education of the Russian Empire depended on many factors, in particular, on the positions they held in the university hierarchy. Thus, there were 9 university rectors and 38 deans.

Foreigners became rectors and deans least often at the Imperial Moscow and St. Petersburg Universities, and more often at Kharkov and Kazan Universities. This can be explained by the fact that the Imperial Moscow University had already formed its own (domestic) corporation, from which representatives of university management were elected. The corporations of Kazan and Kharkov universities were just being formed. That is why administrative posts were occupied by foreign professors. At the Imperial St. Petersburg University its management was represented by a small number of foreign professors due to their insignificant number in the university itself in the period from 1819 to 1835. The longest administrative position was held by Professor I. Geim of the Imperial Moscow University: in 1805 he was elected Dean of the Faculty of Letters, and in 1808–

1819 he was elected Rector. – rector ([Imperatorskij Moskovskij universitet, 2011](#); [Biograficheskij slovar..., 1904](#); [Biograficheskij slovar..., 1902–1903](#); [Biograficheskij slovar..., 1855](#); [Volkov, Kulikova, 2003](#); [Volkov i dr., 2003](#)).

In addition, many professors held other administrative positions: director of the institute, member of committees, librarian, and others.

From the point of view of teaching activity of foreign professors, most of them (26 professors) were invited to the historical and philological faculties. They taught philological historical sciences, geography and statistics ([Istoriko-filologicheskij fakultet..., 1908](#)).

Twenty-three professors taught at the physical and mathematical faculties of universities. They taught physics and mathematics, chemistry, astronomy, zoology, botany, etc. At the philosophical-legal faculties/departments 18 foreign professors taught: jurists, economists, philosophers ([Fiziko-matematicheskij fakultet, 1908](#)).

Often professors taught at several faculties or moved from one department. Everywhere the visiting professors taught a particular academic discipline for the first time, which was the purpose of their teaching activities in Russian universities – to expand the list of lecture courses in accordance with European traditions and standards.

Visiting professors made a significant contribution to the development of university science in the Russian Empire. Thus, Professor M. Bartels in his lectures outlined the latest mathematical achievements of European science, contributed to the formation of scientific views of N. Lobachevsky – an outstanding mathematician.

The establishment of chemical science in the imperial universities was also greatly promoted by foreign professors: Professor F. Giese at the Imperial Kharkov University.

The Imperial Moscow University was famous for its research in botany and zoology, conducted by foreign professors: G. Fischer and G. Hoffman. The latter, among other things, also educated his student – botanist, writer, historian, the first rector of the Imperial University of St. Vladimir in Kiev, M. Maksymovych.

The influence of foreign professors at the faculties of history and philology was limited. Their activity had little influence on the teaching of legal sciences – they were developed thanks to domestic professors. The influence of foreign professors in the field of philosophical disciplines was significant: I. Boulet at the Imperial Moscow University and I. Schad at the Imperial Kharkov University. Lectures on the philosophy of Schelling, Fichte, Kant, etc. were professionally delivered at the philosophical departments of the universities. Their own philosophical theories were discussed ([Bagalej, 1906](#); [Istoriko-filologicheskij fakultet..., 1908](#)).

The Philology Faculties of the imperial Russian universities had few foreign professors compared to other faculties and departments. This was due to the fact that "own" professors were naturally employed to teach Russian literature and history. The exception was ancient languages, which were taught at a high level by visiting professors.

With regard to the participation of foreign professors in university and public life, it should be noted that scientific and educational societies were founded at the Imperial Moscow University, in which German professors played an important role, in particular I. Schwarz, a philanthropist and Freemason ([Biograficheskij slovar..., 1855](#); [Inostrannye professora..., 2011: 11-24](#)).

The ideas of foreign professors were reflected in their speeches in connection with solemn occasions and anniversaries of universities, in which scientific and social, as well as ethical and political views of scientists were presented: Professor G. Grellmann in his speeches spoke out against serfdom. Professor E. Knorr argued about the usefulness for science for life. Professor G. Corritari made some remarks on the relation of the experimental sciences to philosophy. Professor X. Rommel made a speech on the importance of enlightenment ([Biograficheskij slovar..., 1904](#); [Bagalej, 1906](#); [Istoriko-filologicheskij fakultet..., 1908](#)).

Many foreign professors were members of various societies and organisations: Free Economic Society, Russian Archaeological and Russian Geographical Society, Bible Society and others.

At the same time, invited foreign professors founded scientific schools in Russian universities, leaving behind their students: P. Chebyshev, O. Somov, N. Nadezhdin, I. Davydov, N. Lobachevsky, G. Hess-de-Calve, A. Dudrovich and others.

## 5. Conclusion

Thus, the review and analysis of sources and materials have shown that foreign professors of imperial Russian universities made a significant contribution to the development of higher

education in the Russian Empire. Occupying high administrative positions, foreign professors in some way determined the policy of management and development of universities, as well as the spheres of scientific activity of higher educational institutions.

It was foreign professors who, for the first time giving lectures at imperial Russian universities, brought the teaching of these subjects closer to European standards. Also, the scientific ideas of the visiting foreign professors had a significant influence on the formation of the academic community of the imperial Russian universities. In this regard, there was undoubtedly a transfer of the European university tradition into the sphere of Russian higher education of the Empire period.

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## The System of Public Education in Don Host Oblast (1790–1917). Part 2

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### Abstract

This study explores the system of public education in Don Host Oblast in the period 1790–1917. The present part of the study focuses on the period 1900–1917.

The study's source base is divided into the following two groups of sources: 1) archival materials from the Russian State Historical Archive (Saint Petersburg, Russian Federation); 2) periodicals produced by the Don Host Statistics Committee and the Holy Synod. The archival materials are represented by relevant documents from Holding No. 733 ('Department of Public Education at the Ministry of Public Education'). The periodicals include *The Memorandum Book for Don Host Oblast, Don Oblast and the North Caucasus*, and *The Most Faithful Report of the Chief Procurator of the Holy Synod*.

The study's findings revealed that the system of public education in Don Host Oblast saw much success during the imperial period. Both genders there had access to all the levels of education, including higher education. As early as 1914, the combined number of educational institutions in the region was above 2,500, and the combined number of students there was over 206,000. The government of Don Host Oblast achieved significant success in primary education, with more than 80 % of the region's school-age children going to school in 1914.

**Keywords:** Don Host Oblast, Russian Empire, system of public education, schools, gymnasiums, period 1790–1917.

### 1. Introduction

At the beginning of the 20th century, Don Host Oblast was part of the Kharkov Educational District (Cherkasov, 2023: 1686). In 1901, it had a population of over 2.6 million. By 1914, the

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figure had reached 3.4 million (RGIA. F. 733. Op. 207. D. 30. L. 1). The region was overwhelmingly dominated by Orthodox Christians. The present work aims to examine the system of public education in Don Host Oblast in the period 1900–1917.

## 2. Materials and methods

The study's source base is divided into the following two groups of sources: 1) archival materials from the Russian State Historical Archive (Saint Petersburg, Russian Federation); 2) periodicals produced by the Don Host Statistics Committee and the Holy Synod.

The archival materials are represented by relevant documents from Holding No. 733 ('Department of Public Education at the Ministry of Public Education'). The periodicals include *The Memorandum Book for Don Host Oblast, Don Oblast and the North Caucasus*, and *The Most Faithful Report of the Chief Procurator of the Holy Synod*. It must be noted that the local statistics committee did not gather specially detailed information about the development and state of the system of public education in Don Host Oblast. As a consequence, the materials published in the periodicals contain information about educational institutions under the purviews of all the Departments, not detailed by departmental affiliation.

As in the previous part of the work, use was made of content analysis to extract from a vast body of statistical information only data deemed relevant to the study. In addition, use was made of the systems method to divide the material into groups (that on educational institutions under the purview of the Ministry of Public Education and that on educational institutions under the purview of the Holy Synod). Lastly, the use of the retrospective method helped examine the subject in historical sequence.

## 3. Discussion

The historiography on the subject may be divided into two thematic groups: 1) publications on the history of the system of public education in Don Host Oblast; 2) publications on the history of the system of public education in other governorates and oblasts across the Russian Empire in the early 20th century.

Public education in Don Host Oblast began to be conceptualized back in the prerevolutionary period. Specifically, A.M. Savel'yev devotes some attention to education there in his 1870 work, dedicated to the Host's 300th anniversary (Savel'ev, 1870), while the work by A.A. Kirilov is focused on the history of public education in the 19th century Don region (Kirilov, 1902).

In the late 20th century, R.M. Sit'ko touched upon public education in Don Host Oblast as part of exploring the making and development of the system of public education in Southern Russia (Sit'ko, 1997). The system of public education in the region in the post-reform period was also investigated by M.A. Kolomeytseva (Kolomeitseva, 2015).

As regards the second group, the early-20th-century systems of public education in governorates and oblasts across the Russian Empire have been explored in the following works: the one by T.A. Magsumov and his colleagues, focused on the system of public education in Astrakhan Governorate (Magsumov et al., 2022), the one by A.M. Mamadaliyev and his colleagues, focused on the system of public education in Penza Governorate (Mamadaliyev et al., 2022), the one by O.V. Natolochnaya and her colleagues, focused on the system of public education in Vilna Governorate (Natolochnaya et al., 2020), the one by V.S. Molchanova and her colleagues, focused on primary education in another Cossack region, Kuban Oblast (Molchanova et al., 2020), and the one by K.V. Taran and his colleagues, focused on private education in the Caucasus Educational District, including in the early 20th century (Taran et al., 2021).

## 4. Results

### *Educational institutions under the purview of the Ministry of Public Education*

By 1900, Don Host Oblast had nine male and six female secondary educational institutions (Rajović et al., 2023: 1034). There were 11 lower educational institutions for boys and four for girls (Donskaya oblast'..., 1902: 16). The total number of primary schools in the region, inclusive of those under the purview of the Ecclesiastical Department, was a combined 1,518 schools for boys and both genders and 162 schools for girls (Donskaya oblast'..., 1902: 16).

In 1907, Novocherkassk became home to the region's first higher educational institution – Alekseyevsky Don Polytechnic Institute, and in 1910 the same city became home to the Higher Women's Natural-Science Courses, making higher education accessible to females as well.

In 1908, the number of students in Don Host Oblast was 159,093 (Pamyatnaya knizhka..., 1913: 44). The figure was 161,644 the following year (Pamyatnaya knizhka..., 1914: 47).

In 1910, the number of students in Don Host Oblast was 169,477 (Pamyatnaya knizhka..., 1915: 38). The figure was 175,551 in 1911 (Pamyatnaya knizhka..., 1915: 38).

In 1912, the number of students in Don Host Oblast was 178,970 (Pamyatnaya knizhka..., 1915: 38). The region had 40 secondary and 1,357 primary educational institutions (Pamyatnaya knizhka..., 1914: 43-44).

By 1913, the region had all the levels of education available to learners – from higher to lower.

The higher level was represented by Alekseyevsky Don Polytechnic Institute, with an enrollment of 251 males, and the Higher Women’s Courses, with an enrollment of 37 females (Pamyatnaya knizhka..., 1915: 36).

The secondary level was represented by a group comprised of 42 secondary educational institutions<sup>1</sup>, which included the following: a Cossack school, a cadet corps, five classical male gymnasiums, an ecclesiastical seminary, seven real schools, a teacher’s institute, a surveyor’s school, a technical school, a commercial school, an agricultural school, an institute for maidens, eight female gymnasiums, two diocesan female schools, and 11 private schools. These educational institutions had a combined enrollment of 5,448 students (Pamyatnaya knizhka..., 1915: 36-37).

The lower level of education in the region was represented by the following types of school at the start of the 20th century: teacher’s seminary; church-teacher’s; two-grade; technical; urban; higher primary; ecclesiastical; parish; trade; private; garden nursery; nautical; military-feldsher, military-trade; forestry; enology-and-viticulture; and some others<sup>2</sup> (Pamyatnaya knizhka..., 1915: 37).

As at January 1, 1914, the region’s 1,491 educational institutions under the purview of the Ministry of Public Education had a combined enrollment of 111,427 (81,663 boys and 29,764 girls) (Pamyatnaya knizhka..., 1915: 38). Its 1,426 primary schools had a combined enrollment of 109,611 (77 students per school). At that time, the region’s higher educational institutions had a combined enrollment of 896, and its secondary – 6,181 (RGIA. F. 733. Op. 207. D. 30. L. 1).

*Educational institutions under the purview of the Ecclesiastical Department*

As already noted earlier, in 1900 Don Host Oblast had 497 such schools, with a combined enrollment of over 23,000. It is fair to note that the figure is exclusive of the region’s literacy schools under the purview of the Ecclesiastical Department (opened in its little-populated areas). Inclusive of these schools, the figure would be 889, with a combined enrollment of 37,000 (Vsepoddanneishii otchet..., 1902: 66-67).

The data in Table 1 illustrate the dynamics of the development of parochial education in the Don Diocese in 1900–1914.

**Table 1.** Parochial Schools in the Don Diocese in 1900–1914 (Vsepoddanneishii otchet..., 1902: 66; Vsepoddanneishii otchet..., 1905: 66, 72; Vsepoddanneishii otchet..., 1905a: 66, 72; Vsepoddanneishii otchet..., 1909: 118, 122, 126, 134; Vsepoddanneishii otchet..., 1910: 212-213, 228-229, 248-249; Vsepoddanneishii otchet..., 1911: 214-215, 218-219; Vsepoddanneishii otchet..., 1913: 110-111; Vsepoddanneishii otchet..., 1913a: 172-173, 176-177; Vsepoddanneishii otchet..., 1915: 120-121; Vsepoddanneishii otchet..., 1916: 122-123)

Year	Number of schools			Number of students			Number of students per school
	Church schools	Literacy schools	Total	Boys	Girls	Total	
1900	–	–	497	14,347	9,224	23,571	47,4 <sup>3</sup>
1901	546	373	919	35,519	18,746	54,265	59,0
1902	571	369	940	27,298	17,799	45,097	47,9
1903	582	345	927	28,263	19,077	47,340	51,0
1904	604	302	906	28,487	19,535	48,022	53,0
1905	661	323	984	34,117	22,752	56,869	57,7
1906	680	281	961	33,608	23,179	56,787	59,0

<sup>1</sup> This level includes secondary educational institutions under the purviews of all the Departments.

<sup>2</sup> The group incorporates lower educational institutions under the purviews of all the Departments.

<sup>3</sup> Data incomplete

1907	690	247	937	32,890	22,452	55,342	59,0
1908	705	214	919	33,281	23,170	56,451	61,4
1909	652	189	841	29,857	21,562	51,419	61.1
1910	877	21	898	31,703	22,704	54,407	60,5
1911	881	18	899	31,192	22,864	54,056	60,1
1912	826	1	827	27,864	21,212	49,076	59,3
1913	887	17	904	32,782	25,748	58,530	64,7
1914	910	13	923	34,325	28,723	63,048	68,3

As evidenced in [Table 2](#), in the period 1901–1914 the number of parochial schools in the region varied from 827 in 1912 to 984 in 1905. Furthermore, the number of students per school in this sector grew virtually every year. An interesting transformation was also experienced at the time by the region’s literacy schools – the figure gradually dropped from the maximum value of 373 in 1901 to one in 1912; afterwards, there was a sharp increase in their number – to 17 in 1913; and then it dropped again – to 13 in 1914. This transformation indicates that, despite the authorities’ intention to eliminate the literacy school sector, it was not possible to eliminate it entirely in Don Host Oblast. Apparently, there were areas in that region where it was not advisable to set up even a small parochial school.

Of interest is also the gender composition of the student body in the region’s parochial school sector. Specifically, in 1901 girls accounted for about one-third (34.5%) of the student body in that sector. By 1914, the figure was 45.5 %. As a reminder, in 1897 the region also experienced a gender imbalance, with males outnumbering females (1.3 million versus 1.275 million) ([Naselenie..., 1898: 27](#)).

The data in [Table 2](#) provide a general picture of the development of the system of public education in Don Host Oblast between 1891 and 1914.

**Table 2.** System of Public Education in Don Host Oblast in 1891–1914 ([RGIA. F. 733. Op. 207. D. 30. L. 1](#))

Year	Population	Number of schools	Number of students	Number of residents per student
1891	2,078,878	362	47,271	44
1901	2,629,752	1,844	114,024	24
1910	2,987,635	2,234	172,860	18
1914	3,445,908	2,596	206,786	17

It must be noted that the 1914 figure of one student per 17 residents of the oblast was equal to the average among the country’s 11 Cossack hosts ([RGIA. F. 733. Op. 207. D. 30. L. 1](#)). Viewed over time, in the period 1891–1910 the figure had always been below the average (1891 – 41, 1901 – 23, and 1910 – 19). But in 1914 the region managed to match the average, which is testimony to its success in developing the education sector.

Let us now take a look at the region’s primary education sector. By 1914, educational institutions in the Don Host Oblast had a combined enrollment of 206,786 students, with 199,706 of those attending primary school ([RGIA. F. 733. Op. 207. D. 30. L. 1](#)). At that time, the region had 245,409 school-age children (ages 8 to 11) ([RGIA. F. 733. Op. 207. D. 39. L. 1](#)). Thus, in 1914 primary school was attended in the region by 81.3% of its school-age children. Taking into consideration the gender distribution in the region’s school sector under the purview of the Ecclesiastical Department, we can, with a degree of confidence, assume that school was attended by nearly all boys and the majority of girls in the school-age population.

Finally, it can be added that the region’s system of public education continued its development during World War I, with the Russian government intending to have implemented universal access to education as early as by 1918 ([Cherkasov, 2011: 147](#)).

## 5. Conclusion

The system of public education in Don Host Oblast saw much success during the imperial period. Both genders there had access to all the levels of education, including higher education. As early as 1914, the combined number of educational institutions in the region was above 2,500, and the combined number of students there was over 206,000. The government of Don Host

Oblast achieved significant success in primary education, with more than 80% of the region's school-age children going to school in 1914.

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## **Revisiting the Evolution of the System of Higher Education in the Russian Empire in 1830–1916**

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### **Abstract**

This paper examines the evolution of the system of higher education in the Russian Empire in 1830–1916. It gives consideration to the classification and typology of such educational institutions.

The study's findings revealed that in the first third of the 19th century the Russian higher education sector mainly relied on two types of educational institution – classical universities and lyceums. By 1830, Russia had 11 institutions of higher learning. In the mid-19th century, classical universities continued to lead the way. There was a decline in the number of lyceums. It is in this period that The Main Pedagogical Institute emerged. By 1869, there had emerged the first veterinary institutes in Russia and its first private institution of higher learning, with the number of educational institutions in the sector reaching 13.

By 1890, Russia now had 25 institutions of higher learning, with these including universities, lyceums, and veterinary institutes. This period saw the emergence there of higher vocational education institutions, institutes of history and philology, the country's first institute of Oriental languages, and its first female institution of higher learning, with the number of private educational institutions there increasing fourfold.

By 1910, the number institutions of higher learning in Russia had increased by 10. This was the result of the opening of a classical university, a veterinary institute, four higher vocational education institutions, an institute of foreign languages, a private educational institution, and two female schools. Six years later, on the eve of the February Revolution, the country saw the establishment of another 20 institutions of higher learning, with 16 of these being a private educational institution, three – a higher vocational education institution, and one – a folk high school. Thus, during the period under review the Ministry of Public Education had under its purview an entire network of educational institutions of varying types, with the combined number of these reaching 55 in 1916.

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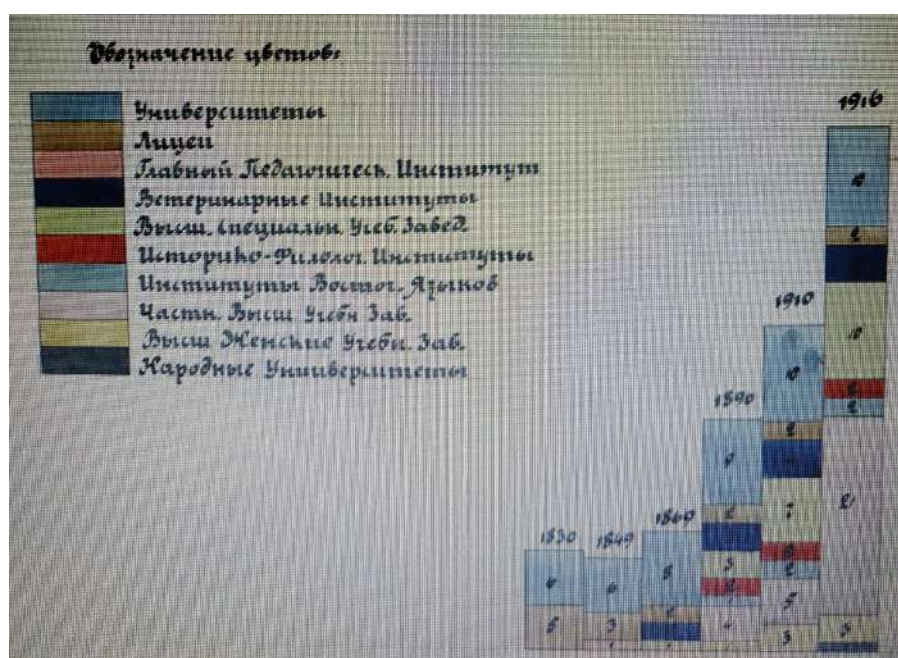
**Keywords:** Russian Empire, network of institutions of higher learning, period 1830–1916, Ministry of Public Education.

### 1. Introduction

When most think of the system of higher education in the Russian Empire, Russian imperial universities are probably the first thing that comes to mind. Yet, in actual fact, the country's system of higher education was a lot more complex and extensive than that. This work aims to consider only institutions of higher learning under the purview of the Ministry of Public Education in the Russian Empire in the entire imperial period up to 1916.

### 2. Materials and methods

The study's source base is derived from relevant documents from the Russian State Historical Archive (Saint Petersburg, Russian Federation), namely materials from Holding No. 733 ('Department of Public Education at the Ministry of Public Education'). There is a piece of material that the study introduces into the literature for the first time – a diagram illustrating the increase in the number of institutions of higher learning in the Russian Empire in the period from 1830 to 1916 (Figure 1).



**Fig. 1.** Diagram illustrating the increase in the number of institutions of higher learning in the Russian Empire in 1830–1916 (RGIA. F. 733. Op. 207. D. 42. L. 1).

Methodologically, the study relies on the following basic historical principles: historicism, systematicity, and objectivity. The use of these principles in conjunction with the statistical and chronological methods helped conduct a detailed analysis of the evolution of the system of higher education in the Russian Empire in the period 1830–1916 and draw meaningful conclusions.

### 3. Discussion

The historiography on the subject is vast and includes not only the historiography associated with the work of the Ministry of Public Education, which oversaw the operation of institutions of higher learning in the Russian Empire, but also that concerned with issues related to educational institutions of different types, the most famous of these being imperial classical universities. In addition, researchers have explored the operation of narrowly specialized educational institutions as well. Of particular note here are the work by Ye.A. Knyazev, which examines the development of the pedagogical school sector in the Russian Empire in the period between the 18th and 20th centuries (Knyazev, 2010), the one by A.V. Zyryanov, focused on the history of the making and development of commercial education in Russia in the imperial period (Zyryanov, 2012), the one by V.A. Zmeyev, which explores the management of higher education institutions in

Russia in the early 19th century (Zmeev, 2016), and the one by R.M. Allalyev and his colleagues, which addresses the pedagogical periodical press of the Ministry of Public Education (Allalyev et al., 2022).

The other relevant works that are worthy of note are the one by A.V. Tret'yakov, which examines the making of the agricultural education sector in Russia in the first half of the 19th century (Tret'yakov, 2023), the one by A.N. Kuksa, which explores the activity of folk high schools (Kuksa, 2022), the one by M.V. Gribovsky, which considers Russia's imperial universities as a factor in modernizing the country (Gribovskii, 2011), the one by Yu.A. Disson, focused on lyceums and university-based boarding schools in Russia in the period between the late 18th and the first third of the 19th centuries (Disson, 2007), the one by V.M. Avilov and his colleagues, devoted to the history of veterinary education (Avilov i dr., 2020), the one by A.V. Torkunov, which examines certain aspects of the history of Lazarev Institute of Oriental Languages (Torkunov, 2015), the one by M.R. Yusupov, focused on the history of folk high schools in Russia (Yusupov, 2015), the one by O.V. Zhukov, devoted to the Bestuzhev Higher Women's Courses in Saint Petersburg (Zhukov, 2015), and the one by I.V. Bortashevich, focused on the similar educational institution in Moscow (Bortashevich, 2016).

#### **4. Results**

The first institution of higher learning in the Russian Empire, Imperial Moscow University, was established in 1755 (Cherkasov, 2023: 1685). As early as the very beginning of the 19th century, during the period of ministerial reforms, the country saw the establishment of as many as several new universities – Imperial Dorpat University (1802), Imperial Vilna University (1803), Imperial Kazan University (1804), and Imperial Kharkov University (1805) (Cherkasov, 2023: 1683-1694).

In addition, beginning in 1803, efforts were undertaken to establish institutions of higher learning such as lyceums. More specifically, in the first quarter of the 19th century, Russia saw the establishment of as many as five lyceums: Demidov Lyceum in 1803 in Yaroslavl, Alexander Lyceum in 1811 in Tsarskoye Selo (RGIA. F. 73. Op. 7. D. 607. L. 3), Richelieu Lyceum in 1817 in Odessa, Kremenets Lyceum in 1819 in Kremenets, Volyn Governorate, and Nezhin Lyceum in 1820 in Nezhin. In 1868, Imperial Katkov Lyceum was established in Moscow in memory of Tsesarevich Nicholas. These educational institutions fared differently. Kremenets Lyceum was in operation the shortest period of time, closing down in 1834 (its students had taken an active part in the Polish Insurrection). After being in operation for a little less than 50 years, Richelieu Lyceum was reorganized in 1865 as Imperial Novorossiia University. Nezhin Lyceum was in operation for 55 years. In 1875, it was reorganized as an institute of history and philology. Each of the remaining lyceums functioned until 1917.

By 1830, the Russian Empire had just two types of institution of higher learning under the purview of the Ministry of Public Education – universities and lyceums, the combined number being 11 (RGIA. F. 733. Op. 207. D. 42. L. 1).

By 1849, despite the opening of The Main Pedagogical Institute, the number of institutions of higher learning in Russia had reduced to 10 – as a result of Kremenets Lyceum closing down and another lyceum leaving the purview of the Ministry.

The first veterinary school in Russia was opened in 1848 in Dorpat. In 1873, it was transformed into Yur'yev Veterinary Institute. That same year, Kazan and Kharkov Institutes were established, and in 1889 Warsaw Veterinary Institute was opened (Avilov i dr., 2020: 91). Of note is the fact that Kharkov Institute was established as a consequence of the reorganization of Kharkov Veterinary School (established in 1851). On the other hand, Warsaw Institute was created as a result of the reorganization of Warsaw Veterinary School (established in 1884).

In 1867, Saint Petersburg became home to an institute of history and philology, with its primary focus being on training teachers for secondary education institutions. In 1875, a similar institute was reorganized as Nezhin Lyceum.

In 1869, Warsaw became home to another classical university in the Russian Empire – Imperial Warsaw University (Cherkasov, 2023: 1689).

An interesting niche among institutions of higher learning in the Russian Empire was occupied by institutes of Oriental languages. The country's first such school, Lazarev Institute, was established back in 1815 – as a gymnasium offering language courses in Arabic, Armenian, Persian, and Turkish (Torkunov, 2015: 9). In 1872, the institute was officially split into two departments. The first department continued to function as a gymnasium, and the second, which



offered a 3-year program of study, was focused on Oriental languages, as well as the history and culture of the Middle Eastern region.

In 1876, higher education also became accessible to women in Russia – thanks to the establishment of the Kazan Higher Women's Courses. Two years later, in 1878, similar educational institutions were established in Saint Petersburg (Bestuzhev Higher Women's Courses) and in Kiev (Zhukov, 2015: 98).

A special category of institutions of higher learning in the Russian Empire was private educational institutions. These numbered 15 in the period 1905–1912 and 21 by 1916 (RGIA. F. 733. Op. 207. D. 42. L. 1). Educational institutions of this kind were normally established with funds from the merchantry and trained specialists for the following sectors: commerce-and-industry, banking-and-insurance, cooperative, public, administrative, foreign trade, and some others.

Table 1 displays the data on the increase in the number of institutions of higher learning in the Russian Empire in 1830–1916.

**Table 1.** Institutions of higher learning under the purview of the Ministry of Public Education in the Russian Empire in 1830–1916 (RGIA. F. 733. Op. 207. D. 42. L. 1)

Type of educational institution	Year					
	1830	1849	1869	1890	1910	1916
University	6	6	8	9	10	10
Lyceum	5	3	2	2	2	2
Pedagogical institute	-	1	-	-	-	-
Veterinary institute	-	-	2	3	4	4
Higher vocational education institution	-	-	-	3	7	10
Institute of history and philology	-	-	-	2	2	2
Institute of Oriental languages	-	-	-	1	2	2
Private institution of higher learning	-	-	1	4	5	21
Higher female educational institution	-	-	-	1	3	3
Folk high school	-	-	-	-	-	1
Total	11	10	13	25	35	55

As evidenced in Table 1, in the early 19th century, the system of higher education developed in the Russian Empire mainly owing to the establishment of classical universities and lyceums. By the mid-19th century (1849), the sector had changed very little – there appearing The Main Pedagogical Institute and the number of lyceums decreasing by two. Thus, in the period from 1830 to 1849, institutions of higher learning in the Russian Empire exhibited a negative change in number, down from 11 to 10.

In 1869, the number of universities was up from six to eight; there also was an addition of two veterinary institutes and one private institution of higher learning. At the same time, the number of lyceums decreased from three to two. While including the two veterinary institutes, which at that time had the status of a veterinary school, in Table 1 under the year 1869 may raise some eyebrows, we cannot rule out the possibility that the schools were institutions of higher learning at the time already.

The next twenty-year period (up to 1880) was very productive for the system of higher education in Russia – the number of educational institutions almost doubled (from 13 to 25). The number of classical universities increased by one – to nine. The number of lyceums did not change. There now were three veterinary institutes. There appeared two institutes of history and philology and one institute of Oriental languages. The country's first three higher vocational education institutions were established. There was a sharp increase in the number of private institutions of higher learning (from one to four), and there also appeared the country's first female institution of higher learning. Once again, we are talking here about educational institutions under the purview of the Ministry of Public Education exclusively.

In 1910, the number of institutions of higher learning in the Russian Empire was now 35. The following educational institutions were added to the list: one classical university, one veterinary institute, four higher vocational education institutions, one private educational institution, and two higher female institutions.

Finally, in 1916 the number of educational institutions was up by 20 on 1910, with the growth on average being more than three institutions a year. The largest part of this growth was accounted for by private institutions of higher learning, their number increasing by 16. An increase was also exhibited by higher vocational education institutions (plus three institutions), and for the first time did the Ministry of Public Education have a folk high school under its purview.

## 5. Conclusion

In the first third of the 19th century the Russian higher education sector mainly relied on two types of educational institution – classical universities and lyceums. By 1830, Russia had 11 institutions of higher learning. In the mid-19th century, classical universities continued to lead the way. There was a decline in the number of lyceums. It is in this period that The Main Pedagogical Institute emerged. By 1869, there had emerged the first veterinary institutes in Russia and its first private institution of higher learning, with the number of educational institutions in the sector reaching 13.

By 1890, Russia now had 25 institutions of higher learning, with these including universities, lyceums, and veterinary institutes. This period saw the emergence there of higher vocational education institutions, institutes of history and philology, the country's first institute of Oriental languages, and its first female institution of higher learning, with the number of private educational institutions there increasing fourfold.

By 1910, the number institutions of higher learning in Russia had increased by 10. This was the result of the opening of a classical university, a veterinary institute, four higher vocational education institutions, an institute of foreign languages, a private educational institution, and two female schools. Six years later, on the eve of the February Revolution, the country saw the establishment of another 20 institutions of higher learning, with 16 of these being a private educational institution, three – a higher vocational education institution, and one – a folk high school. Thus, during the period under review the Ministry of Public Education had under its purview an entire network of educational institutions of varying types, with the combined number of these reaching 55 in 1916.

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## Revisiting the Pedagogical Periodical Press in the Odessa Educational District (1864–1917)

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### Abstract

This paper examines the pedagogical periodical press in the Odessa Educational District in the period 1864–1917. It considers the geographical distribution of these publications and gives an internal criticism of them as historical sources.

The principal sources for this study were prerevolutionary publications published in the Odessa Educational District (*Izvestiya Odesskogo Uchebnogo Okruga* and *Vestnik Opytnoy Fiziki i Elementarnoy Matematiki*) and reference publications concerned with the imperial-period Russian periodical press. Methodologically, use was made of the content-analysis method, employed to draw a sample of journals published at different times in the Odessa Educational District. Of importance was the use of the retrospective method, employed to construct this work in historical sequence.

The study's findings revealed that, despite the fact that there were just five academic pedagogical publications in the Odessa Educational District, these were of considerable interest. More specifically, the journal *Vestnik Opytnoy Fiziki i Elementarnoy Matematiki* was published in Odessa for more than 20 years and was one of Russia's first popular-science publications concerned with mathematics and physics. Of interest is also the operation of one of Russia's first pedagogical newspapers, *Shkol'noye Obozreniye*, published in Odessa weekly from 1889 to 1892. Lastly, in 1913 they launched in Odessa one of Russia's first narrowly specialized publications concerned with student excursions and school museums – the journal *Shkol'nyye Ekskursii i Shkol'nyy Muzey*.

**Keywords:** pedagogical periodical press, Odessa Educational District, Russian Empire, period 1864–1917.

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### 1. Introduction

The Odessa Educational District was established in 1832. With its capital in the city of Odessa, it comprised Bessarabia, Yekaterinoslav, Taurida, and Kherson Governorates. In 1897, these areas had a combined population of 8.2 million (4.2 million males and 3.9 million females), with 1.6 million of these being urbanites (Naselenie..., 1898: 5-29). In 1865, Odessa became home to Imperial Novorossiya University, the district's first university of its own (Cherkasov, 2023: 1687).

### 2. Materials and methods

The principal sources for this study were prerevolutionary publications published in the Odessa Educational District (*Izvestiya Odesskogo Uchebnogo Okruga* and *Vestnik Opytnoy Fiziki i Elementarnoy Matematiki*) and reference publications concerned with the imperial-period Russian periodical press (Bibliografiya..., 191; Belyaeva, 1960; Ablov, 1937).

Methodologically, use was made of the content-analysis method, employed to draw a sample of journals published at different times in the Odessa Educational District. Of importance was the use of the retrospective method, employed to construct this work in historical sequence.

### 3. Discussion

The historiography on this subject may be divided into the scarce historiography on the Odessa Educational District and periodicals published there and the historiography on periodicals published in other educational districts across the Russian Empire.

Among the works concerned with the history of the Odessa Educational District and its periodical press worthy of particular mention are the one by V.V. Samodurova, which explores the journal *Vestnik Opytnoy Fiziki i Elementarnoy Matematiki*, part of the holdings of Odessa National University (Samodurova, 2011), and the one by N.N. Andreyev and his colleagues, devoted to the same popular-science journal (Andreev i dr., 2014). In 1913, they launched in Odessa a narrowly specialized publication concerned, among other things, with student excursions – this subject is discussed in the work by N.V. Tarasova (Tarasova, 2014). On the other hand, the history of the Odessa Educational District has been discussed in the context of the work of this district during the imperial period, by T.V. Shushara (Shushara, 2015), and as part of a study investigating the work of the district's trustees, by I.S. Grebtsova (Grebtsova, 2017).

As regards the historiography on the periodical press in other educational districts across the Russian Empire, of particular note are the following works: the one by I.Yu. Cherkasova and her colleagues, which discusses pedagogical publications in the Orenburg Educational District (Cherkasova et al., 2023), and the ones by A.M. Mamadaliyev and his colleagues, which investigate similar processes in the Kiev (Mamadaliyev et al., 2023), Kharkov (Mamadaliyev et al., 2023a), Riga (Mamadaliyev et al., 2023b), and Caucasus Educational Districts (Mamadaliyev et al., 2022). In addition, the pedagogical periodical press in the Kazan Educational District is explored in the work by V.D. Muzykant and his colleagues (Muzykant et al., 2022).

### 4. Results

The fact that the Odessa Educational District had an imperial university of its own did not have a significant effect in terms of facilitating the development of the pedagogical periodical press there. In all, the district had five pedagogical journals, with four of these published in its capital, Odessa, and the fifth produced in the city of Simferopol, Taurida Governorate.

In 1864, they began to publish in the district its first monthly journal – *Tsirkulyar po Upravleniyu Odesskim Uchebnym Okrugom* (Russian: “Odessa Educational District Administration Bulletin”). In 1887, the journal was renamed as *Tsirkulyar po Odesskomu Uchebnomu Okrugom* (“Odessa Educational District Bulletin”), and in 1917 – as *Izvestiya Odesskogo Uchebnogo Okruga* (“Odessa Educational District News”) (Figure 1). That same year, 1917, the journal ceased publication.

As at 1917, the journal comprised the official section, the circular one, the one on the Odessa Educational District, the one on other educational districts, and the unofficial one.

The official section comprised eight themes: 1) imperially enacted regulations of the Council of Ministers; 2) imperial commands; 3) imperial commendations; 4) imperial awards; 5) edicts of His Imperial Majesty issued to the Directing Senate; 6) imperial directives; 7) edicts of the Directing Senate; 8) N.K. Kul'chitsky's assumption of charge of the Ministry of Public Education (Ofitsial'nyi otdel..., 1917: 71-81).



**Fig. 1.** Cover of the journal *Izvestiya Odesskogo Uchebnogo Okruga*. 1917. Issue 2

The circular section carried circular ordinances of the Ministry of Public Education concerned with various issues (e.g., the significance of directives issued by the Ministry of Public Education, the procedure for and ways of expending funds allocated by the government toward the preliminary military training of students, the recommendation of pedagogical works, the granting of deferment of call-up to persons of varying ages subject to military service, and the provision of percentage salary increments and one-time allowances in conjunction with the war) ([Rasporyazheniya ministerstva..., 1917: 81-89](#)).

The section on the Odessa Educational District carried ordinances from the Ministry of Public Education in respect of this district on various issues (e.g., renaming educational institutions, establishing scholarships, conferring new ranks on professors, and inviting parents' committee chairmen to attend board of trustees sittings) ([Rasporyazheniya ministerstva..., 1917a: 89-94](#)).

The section on other educational districts, likewise, carried ordinances from the Ministry of Public Education on various issues (e.g., preparatory grade teachers' entitlements, a 30% raise for the pedagogical staff of teacher's institutes, seminaries, and schools, the impossibility of appointing priests and deacons as full-time or part-time instructors of general subjects, and the hiring of females as instructors of general subjects at lower and secondary technical schools). It also carried directives from the Trustee of the Odessa Educational District and scholarship regulations ([Rasporyazheniya ministerstva..., 1917b: 95-106](#)).

The unofficial section carried pedagogical academic works and information about academic and vocational activities. More specifically, it published an extensive work by A. Shcherbina, 'Revisiting Students' Extracurricular Reading' ([Shcherbina, 1917: 49-58](#)), and V. Chemena's 'A Report on the Fieldwork Carried Out by a Work-Team of Students of Odessa Second Gymnasium in Villages Within Kurtovka Volost in the Summer of 1916' ([Chemena, 1917: 58-71](#)). In addition, the section carried information about the First All-Russian Congress of Teachers of Russian ([Pervyi vsrossiiskii..., 1917: 79-89](#)), as well as a list of new books just out ([Knigi..., 1917: 90](#)).

In 1891, they launched the second journal in Odessa – the monthly *Vestnik Opytnoy Fiziki i Elementarnoy Matematiki* (“Annals of Experimental Physics and Elementary Mathematics”) (Dakhiya, 1956: 548), which basically was a continuation of the Kiev periodical *Zhurnal Elementarnoy Matematiki* (“Journal of Elementary Mathematics”), introduced in 1884 by Professor V.I. Yermakov. At different times, the journal’s publisher-editors were E.K. Shpachinsky (1886–1897), V.A. Zimmerman (1898–1904), and V.F. Kogan (starting in 1904) (Ablov, 1937: 48). The journal was published until 1915.

In terms of content, in 1900 the journal carried short pieces by the editorial staff, publications representing translated and original articles related to physics and mathematics, as well as extensive materials of an informative nature, like, for instance, reports of meetings of academic societies (Mathematics Department of the Novorossiia Society of Natural Scientists; Warsaw Club for Instructors of Physics and Mathematics). In addition, the journal published reviews of specialized academic journals, as well as books, brochures, and ads (Soderzhanie, 1900: 1).

In 1889, they began to produce in Odessa the periodical newspaper *Shkol'noye Obozreniye* (“School Review”). Its publisher was M.D. Gonzal', and its editor was P.I. Gusarenko. The newspaper came out weekly until 1892. It was one of the first attempts to produce a newspaper concerned with pedagogical issues. Alongside local pedagogues, this periodical was contributed to by authors such as Ya.V. Abramov, K. Abaza, V. Vakhterov, and others. Reviews for this newspaper were published in the journal *Zhenskoye Obrazovaniye* (“Women’s Education”) – in its first issue in 1890 (Ablov, 1937: 49).

The district’s fourth journal was *Tavricheskiy Narodnyy Uchitel'* (“Tauric Popular Teacher”), published in Simferopol starting in 1907. The periodical came out every two weeks. In 1907–1908, its editor-publisher was Ye.Z. Zotova, and in 1909–1910 – P.P. Kreshchanovsky (Belyaeva, 1960: 339). The journal was published until 1910. It was produced through the efforts of the local pedagogical community and those of the Society for Mutual Support Among Former and Current Teachers in Taurida Governorate. The journal aimed to explore issues of public education, draw attention to the arduous work conditions faced by teachers, encourage unity among teachers, and inform the public about local school life and schools in Southern Russia (Ablov, 1937: 71).

The fifth publication in the district was the illustrated popular journal *Shkol'nyye Ekskursii i Shkol'nyy Muzey* (“School Excursions and the School Museum”). The journal was published in 1913 in Odessa (Issues 1 through 4). Starting with the fifth issue, it was produced in the city of Bendery, Bessarabia Governorate, which was part of the Odessa Educational District, where it was published from 1913 to 1916. The head of its editorial staff and its publisher was A.F. Grekulov. In 1913, the journal was edited by S.A. Klipenina. Starting with the fifth issue, it was edited by A.F. Grekulov (Belyaeva, 1960: 614-615). Between eight to nine issues of this publication were produced yearly. The journal aimed to provide teachers with material for engaging students in discourse during excursions and having them build collections. In terms of content, the journal carried descriptions of excursions undertaken by students, materials related to geographical, botanical, and zoological excursions, and material related to the organization of excursions in the context of particular classroom lessons and activities.

## 5. Conclusion

Despite the fact that there were just five academic pedagogical publications in the Odessa Educational District, these were of considerable interest. More specifically, the journal *Vestnik Opytnoy Fiziki i Elementarnoy Matematiki* was published in Odessa for more than 20 years and was one of Russia’s first popular-science publications concerned with mathematics and physics. Of interest is also the operation of one of Russia’s first pedagogical newspapers, *Shkol'noye Obozreniye*, published in Odessa weekly from 1889 to 1892. Lastly, in 1913 they launched in Odessa one of Russia’s first narrowly specialized publications concerned with student excursions and school museums – the journal *Shkol'nyye Ekskursii i Shkol'nyy Muzey*.

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## **The Education of a Common Early-19th-Century Cossack: The Reminiscences of I.S. Ul'yanov**

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### **Abstract**

This article is based on a text that represents the reminiscences of I.S. Ul'yanov, a 19th-century Cossack general. While childhood and schooling are described in the reminiscences of other Cossack generals of that time (specifically, A.K. Denisov and I.I. Krasnov), what makes I.S. Ul'yanov's particularly unique is that he came from a common and poor family. The article attempts to reconstruct, based on his reminiscences, both the real education received by I.S. Ul'yanov and his pedagogical views with regard to that education.

A conclusion drawn in the article is that I.S. Ul'yanov's education was extremely limited – he received very little education in his family home, where there were very few books; he was not placed in a school; instead, he was enrolled in a program of study with the local administration, where his mentor taught him very little. Nor did I.S. Ul'yanov receive any serious military education or training. In fact, he characterizes himself as having been an “underdeveloped” child prior to joining service. Yet it appears paradoxical that he idealizes traditional Cossack education as a whole, claiming that it was facilitative of the development in Cossack children of useful moral and physical qualities. We are dealing here with an idealization of a past and a consideration of a system as a timeless exemplar. One has witnessed this done by contemporary Russian pedagogue-scholars. There appears to be a need to weigh the notion found in the literature that Cossack pedagogy was once a fairly effective system against concrete facts, including those communicated by I.S. Ul'yanov.

**Keywords:** history of pedagogy, historical pedagogical views, traditional pedagogy, Don Cossacks, microhistory, history of daily life.

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## 1. Introduction

An interesting characteristic of 19th-century Don Cossack culture is the existence of a large number of texts created by relatively little-educated individuals (some with no formal education at all). Even one of the most prominent prerevolutionary Don scholars, Kh.I. Popov, who was the founder of the Don Museum in Novocherkassk, went to no school – according to a biography of him written while he was still alive, he received a home education in a common (as opposed to noble) Cossack family, which could be characterized as his grandfather teaching him “Church Slavonic and Russian literacy” from the age of 6 and his family exposing him to books of “religious, historical, and narrative content” (Dontsy..., 2003: 408). By the age of 12, he had already familiarized himself with ‘A History of the Russian State’ by N.M. Karamzin, and at the age of 15 he became a clerk with the local administration (Dontsy..., 2003: 408).

Owing to the above-mentioned characteristic, one has access today to interesting 19th-century texts describing the home or extremely limited school education of members of the Don elite. The first such text must be the reminiscences of Don Ataman A.K. Denisov, in which he provides a short account of his education, which he received back in the 1770s in the Don region and in Saint Petersburg, where he even attended a private boarding school (Istoriya kazaka..., 1874: 22). A more detailed and in-depth account of the education received was provided by Crimean War hero I.I. Krasnov, who described the education he received during the period 1800–1810 in the home of his grandfather, Major General I.K. Krasnov (Vospominaniya..., 1873: 363-380).

The currently available array of sources covering the Don Host has enabled gaining insight into this complex and fairly exotic subject – what education was like in a region where the school system was only in its infancy (the first educational institution in the Land of the Don Host opened up only in 1790, and the number of students at Don schools surpassed 100 only close to the end of the 1820s) (Rajović et al., 2023: 1032-1033). Yet it is the education of the children of members of the Don elite and relatives of rich and influential generals that both of the texts on the subject known at this point (i.e., the above-mentioned works by A.K. Denisov and I.I. Krasnov) appear to describe.

The State Archive of Rostov Oblast contains an extremely interesting and unlooked-for text – the reminiscences of Major General Ivan Samoylovich Ul'yanov about his childhood years and the beginning of his service (GARO. F. 243. Op. 1. D. 28. L. 369-399). Similar to Kh.I. Popov, his younger contemporaries considered him an “original”, as he was a person with no formal education at all (Dontsy..., 2003: 408, 480). An analysis of the reminiscences revealed that at the time he joined service as a youth I.S. Ul'yanov was a person extremely “underdeveloped” (GARO. F. 243. Op. 1. D. 28. L. 392). His family was fairly poor and had no ties to the Don elite (this is discussed in more detail later below). Thus, we are dealing here with a unique source – an autobiography of a 19th-century Cossack from a common family who engaged in self-education when he was quite a grown-up man, which describes in a fairly detailed and critical manner his childhood nurture and the overall intellectual state of affairs within the circle he lived in.

The present article draws upon I.S. Ul'yanov's reminiscences to provide an insight into the way a common Cossack was brought up and educated in the period 1800–1810 – and that is based on one's own account, as opposed to observations and educated guesses from third-party sources, including those offered by modern scholars.

## 2. Materials and methods

The main source for this study is the reminiscences of I.S. Ul'yanov. As a caveat, not all of that has survived in whole – what is missing is the initial part, which must have covered the early years of his life and his initial education. Another thing that needs to be taken into account is that the reminiscences were written in the 1860s (one of the pages lists the date the text was written – December 11, 1865) (GARO. F. 243. Op. 1. D. 28. L. 395) – i.e., I.S. Ul'yanov describes something that took place nearly half a century before. Accordingly, his text might contain errors resulting from distortions. Finally, it was in the 1860s that I.S. Ul'yanov took an active part in a public discussion in the Don region between proponents of liberal government reforms and their opponents – the so-called “Cossackomaniacs”, who were keen on protecting Cossack traditions (he was part of this group) (Volvenko, 2015: 101). He sometimes calls on this discussion in his reminiscences, including in the context of Cossack nurture (GARO. F. 243. Op. 1. D. 28. L. 396-396ob.).

Thus, I.S. Ul'yanov can be identified here as a manifestly unreliable narrator. At the same time, for the most part his narrative is unverifiable, as it is focused on a microhistory (the life of a

particular little-educated Cossack family) and there are virtually no other sources available to us covering it (except for the family correspondence stored in the State Archive of Rostov Oblast; however, these letters belong to a later period (GARO. F. 243. Op. 1. D. 33, 34, 35)). On the other hand, the actual errors and wrong estimations by this Don public figure are of interest inasmuch as the general picture of traditional Cossack education he attempts to provide in his reminiscences comes into collision with facts and even some of his own estimations. This picture is of interest as an expression of the views of an 1860s “Cossackomaniac” with regard to a peculiar Cossack pedagogy – even where it clearly comes into collision with facts.

The present article, which will predominantly employ the historical-descriptive and historical-comparative methods, will be focused on juxtaposing the facts and estimations provided by I.S. Ul'yanov with one another and with those from some other sources (where possible). At the same time, of importance also is the use here of the historical-biographical method, which is to help gain insight into the influence of specific elements of I.S. Ul'yanov's biography and the constitution of his character on his reminiscences, and the microhistorical method, as the present work does not profess to express the pedagogical views of the bulk of Cossackdom but is focused on a detailed analysis of such views within one specific Cossack family.

### **3. Discussion**

Education in the Don region has been the subject of research among Russian scholars for many years. The first texts on this emerged back in the mid-19th century (Robush, 1859: 151-192). Prior to 1917, the subject of local education was one of importance to local amateur authors; however, their research tended to be mainly focused on the history of educational institutions. The most prominent in terms of scale and quality was ‘An Essay on the History of Novocherkassk Host Gymnasium’ by I.P. Artinsky (Artinskii, 1907). During the Soviet period, this topic faded into the background in terms of regional research – it was almost not investigated in a dedicated manner, while most of the summarizing works on regional history painted the picture of an extremely imperfect and ineffective system of education (including via a lopsided choice of documents dealing exclusively with serious issues in local education (Nash krai, 1963: 464-467)). During the post-Soviet period, on the contrary, the number of research studies covering prerevolutionary Don education increased sharply – however, it now was being idealized (Donova, 2008: 133-138). There also emerged works of a more general nature that placed little premium on specific facts in interpreting Cossack education as a sort of exemplar of Russian pedagogy (Lukash, Tatarintsev, 2020: 16-20). However, most of the works on the history of education in the Don region either overlook the early-19th-century period altogether or describe it in a most general manner. What also remains a little-researched subject is the home education of common Cossacks.

It is also worth noting that historians have researched the actual figure of I.S. Ul'yanov as well. This appears to be associated not with his significance in the history of the Don region (I.S. Ul'yanov's was a relatively minor role in it; he was a recognizable official and public figure, but nothing more) but with a unique situation source-wise – the archive of the Ul'yanov family having survived to this day. The most in-depth study of I.S. Ul'yanov has been conducted by O.M. Morozova, but the researcher has provided little to no insight into his childhood years (Morozova, 2008: 298-318).

### **4. Results**

#### *I.S. Ul'yanov's family and his character*

I.S. Ul'yanov's childhood unfolded during a rather peculiar time – when a large number of Don men were off fighting the wars against Napoleon, the Turks, and the Swedes. According to I.I. Krasnov, who describes the same period in his reminiscences about his grandfather, “it has become so rare to encounter in the stanitsas a Cossack capable of serving nowadays”. Indeed, it was pretty common for Cossacks not to return from the war for many years, with the exception of those wounded and maimed (Vospominaniya..., 1873: 364). Nevertheless, there was someone who remained with the Krasnov family in the Don region – his grandfather, General I.K. Krasnov, who had fallen from grace (Vospominaniya..., 1873: 364-365). I.I. Krasnov's father had somehow managed to retire at the age of 18 and never served after that (Vospominaniya..., 1873: 377). On top of that, the Krasnov family was a fairly wealthy one (I.K. Krasnov had inherited a fortune) (Vospominaniya..., 1873: 369). Hence, in his reminiscences I.I. Krasnov describes a pretty large and rich Cossack family (the grandfather had his son, two daughters, and 15 grandchildren living with him) (Vospominaniya..., 1873: 365), whose way of

life was, in a sense, close to that of a noble one. This family was not affected by the war so badly as to experience social problems and become dysfunctional.

By contrast, I.S. Ul'yanov's reminiscences reveal the dire social circumstances of a small hard-up Cossack family in a climate of men having gone off to war. There was only one grown-up male left for the three manors of the Ul'yanovs (descendants of one grand-grandfather) (GARO. F. 243. Op. 1. D. 28. L. 383). It is hard to tell precisely how many people were there in I.S. Ul'yanov's family, as the initial part of his notes, which may have enumerated them, is missing, although the text initially lists just five individuals as members of the family – besides I.S. Ul'yanov himself, there were his unnamed older sister (GARO. F. 243. Op. 1. D. 28. L. 391ob.), his mother Matrena Semenovna (GARO. F. 243. Op. 1. D. 28. L. 380), his grandmother Agaf'ya Matveyevna (GARO. F. 243. Op. 1. D. 28. L. 369ob.), and his grandfather Nikita Ul'yanovich (GARO. F. 243. Op. 1. D. 28. L. 390ob.). Thus, I.S. Ul'yanov was being raised not in a traditional, large, family but a small one and virtually fatherless. According to his description, in the absence of men, most Cossack females had to work real hard to provide for their families (GARO. F. 243. Op. 1. D. 28. L. 387ob-388ob.). As clear from the context, the Ul'yanov family was struggling back then already, although, according to I.S. Ul'yanov, things got worse for them starting in 1814, with their physical problems getting compounded by moral ones (GARO. F. 243. Op. 1. D. 28. L. 384ob.).

During that time, his father returned from service – he did not even know what his son looked like (he had left for the war shortly after the birth of I.S. Ul'yanov) (GARO. F. 243. Op. 1. D. 28. L. 391). The imperfect father-and-son relationship was compounded by his father not bringing back much money from the war, which was a disappointment to the family (of interest is the fact that I.S. Ul'yanov devoted several pages of his manuscript to the necessity of bringing back spoils of war, while his grandfather, Nikita Ul'yanovich, was so upset about it that he developed a condition that eventually led to his death) (GARO. F. 243. Op. 1. D. 28. L. 389-391). The family soon had another two children, a boy and a girl, born into it (GARO. F. 243. Op. 1. D. 28. L. 392). The father had to acquire a family of serfs, but overall the financial circumstances of their growing family got worse – to the point where they even were “experiencing food insecurity” (GARO. F. 243. Op. 1. D. 28. L. 392). Consequently, during the winter of 1816–1817, the burden of running the Ul'yanovs' farmstead was shouldered by I.S. Ul'yanov and his sister, two teenagers living on a stringent budget (GARO. F. 243. Op. 1. D. 28. L. 392-393ob.). Of note is the fact that his younger contemporaries gave I.S. Ul'yanov's birth year as 1803 – i.e., he was 13 at the time (Dontsy..., 2003: 480). His sister was about 2 years his senior (GARO. F. 243. Op. 1. D. 28. L. 391ob.). In 1819, this quite young Cossack went off to service in the Kingdom of Poland, accompanying his father (GARO. F. 243. Op. 1. D. 28. L. 393ob.).

It is for a reason that we have not mentioned the name of his father – I.S. Ul'yanov's does not refer to him by name in his reminiscences, but does to his mother. While it is possible to determine it based on his family tree, the other sources have it as Samoyla Nikitich (Morozova, 2008: 299). It is known that one of I.S. Ul'yanov's sisters was named Anna, but we don't know if that was his older sister (Morozova, 2008: 306). The very lack of attention to the names of his family members in the reminiscences may serve as a testimony to the Ul'yanov family being a dysfunctional one – in the text, the family members seem to be treated as mere performers of social roles (mother – housewife and father – warrior), rather than individuals who love children. While we already know about I.S. Ul'yanov's imperfect relationship with his father, I.S. Ul'yanov has the following to say about his mother: “My mother was by nature not a very affectionate person” (GARO. F. 243. Op. 1. D. 28. L. 391ob.).

Thus, compared with I.I. Krasnov's, I.S. Ul'yanov's reminiscences paint a completely different Cossack family of the Napoleonic Wars period – one experiencing acute social problems and being dysfunctional as a result, where the father works hard and the mother works hard and is not very affectionate to her children; the father meets the son when the latter is older than 10 and fails to build a proper relationship with him; the grandfather dies as a result of being upset about his son not bringing back enough spoils of war (!). The only manifestation of some sort of tenderness within that family described in the reminiscences is fairly peculiar and demonstrates this dysfunctionality perfectly – when I.S. Ul'yanov falls seriously ill, his father declares that he would rather that it be his daughter than that it be his son who dies (GARO. F. 243. Op. 1. D. 28. L. 393ob.). I.S. Ul'yanov describes his emotions from that as follows: “I surely liked that; I did not know *her* opinion, though” (GARO. F. 243. Op. 1. D. 28. L. 393ob.). The way of life practiced by that family was close to that of a peasant one – both the parents and children working hard.

Thus, despite the fact that I.S. Ul'yanov's father was an officer and he himself subsequently rose to the rank of general, the family's financial circumstances were rather tight – seemingly worse than those of the average well-to-do Cossack family. Consequently, the education he received could hardly be considered high-caliber – although his parents might have been better financially fit to be able to provide their son with quality education than most common Cossacks, they did not take advantage of that potential. Of interest in this context is the following happening that took place when I.S. Ul'yanov and his father were serving. His father had promised that in Poland he would arrange for I.S. Ul'yanov to receive instruction in French, German, and dancing (possibly regarded as prestigious competencies at the time, with French and dancing known to have typically been taught to the children of regiment commanders) (GARO. F. 243. Op. 1. D. 28. L. 397-397ob.). However, in actuality, his father had been throwing money about in company with a friend of his, a man named Ageyev. As a result, he not only did not have money for his son's education but was even exposed to the possibility of returning to the Don region penniless (GARO. F. 243. Op. 1. D. 28. L. 397ob.). Thus, there is reason to believe that prior to joining service I.S. Ul'yanov had received an education close to what the children of most common Cossacks would, as opposed to those of officers who did care about the education of their offspring.

At the same time, it is worth noting I.S. Ul'yanov's distinctiveness as a person, which may well have been associated with his childhood and youth in a dysfunctional family. Many of his writings reveal his pronounced emotional callousness. For instance, in a small manuscript that I.S. Ul'yanov devoted to a poem by N.A. Nekrasov, 'A Moral Man', he confronts the poet, expressing his indignation at the latter sympathizing with the persona's daughter and the girl's death following her forced marriage to a person she did not love (GARO. F. 243. Op. 1. D. 28. L. 196-200). To living love, which I.S. Ul'yanov condemns, he counterposes abstract "morality" (GARO. F. 243. Op. 1. D. 28. L. 199ob.).

In describing his education in his reminiscences, I.S. Ul'yanov also exhibits emotional deafness – he speaks of its outer face but says nothing about his emotions and thoughts regarding it. Instead, he evaluates particular facets of his education based on a-priori notions of some abstract ideal of education without thinking about how feasible that ideal is and how well it is aligned with his own evolution resulting from such education. Note that I.S. Ul'yanov gets clearly more emotional in describing certain other topics – those that may have been more intimate to him. However, in the context under consideration here, he provides a purely outward picture, which, nevertheless, holds plenty of interest for us.

What is communicated by I.S. Ul'yanov with regard to education can be subsumed within three groups: 1) books available in the family home; 2) education received outside of the family home; 3) reasonings of a more general nature about Cossack nurture as a whole. Note that he writes nothing about the nurture and education he was given in his family home. While this might have been covered in some form or another in the missing part of the text, the surviving part is sufficiently large and detailed and contains a lot of information regarding the instruction I.S. Ul'yanov received at the hand of third-party persons. Therefore, it may be concluded that by and large the dysfunctional Ul'yanov family failed to fulfill its obligations with regard to his nurture and education. Our detailed description of the family provided above offers an answer to the question as to why that happened – in a climate of lacking spiritual affinity between the family members, having to work hard, and living regularly on a stringent budget, I.S. Ul'yanov's parents, who were fairly indifferent to education, simply did not deem it necessary to devote attention to engaging in special educational activities with their son.

#### *Books in the Ul'yanov family*

Another factor that I.S. Ul'yanov attributed problems in his development to is the limited set of books in his family home (GARO. F. 243. Op. 1. D. 28. L. 376ob.). According to Ul'yanov, they had just two books, both of ecclesiastical content. One was "entitled 'A Road to Salvation'", while the title of the other he did "not remember" (GARO. F. 243. Op. 1. D. 28. L. 377). The first of these appears to be 'A Road to Salvation, or a Set of Spiritual Reflections Constituting a Part of Theology for Which It Is Vital to Be Commonly Known', a well-known book by F.A. Emin (Emin, 1780). However, the child was not allowed to use those books for the intended purpose – according to I.S. Ul'yanov, they were regarded as "sacred items" and were kept next to the icons; one was allowed to touch them only when doing the dusting (GARO. F. 243. Op. 1. D. 28. L. 377). In addition, I.S. Ul'yanov mentions another book he read as a child that had an influence on him.

However, there is no description of that influence in the text, which may be due to his peculiar emotional deafness. Nor does he remember the book's title and how he first got hold of it half a century before (GARO. F. 243. Op. 1. D. 28. L. 377). We only know that it was a book devoted to the life of Jesus. The book seems to have impressed the young I.S. Ul'yanov significantly, which is reflected in the following words: "Had I come at that time across a meek monk, I would not have hesitated for a moment to become a novice" (GARO. F. 243. Op. 1. D. 28. L. 377). To summarize, the Ul'yanov family only had printed books of religious content, and those were used for ceremonial-religious purposes exclusively, rather than for the purpose of educating the children.

I.S. Ul'yanov uses his peculiar style to share with us that in the absence of books he would satisfy his need to "fill his head" (with knowledge?) via "handwritten creations" (GARO. F. 243. Op. 1. D. 28. L. 377). In one of our previous articles, we noted that during the reign of Nicholas I (1825–1855) it was a common practice among Don Cossacks that literary writings by local authors existed in the form of manuscripts (Peretyatko, 2018: 40-43). According to I.S. Ul'yanov, the Cossack tradition of writing out extracts from books went back to the late 18th century at least. He had access to his grandfather's and father's notebooks containing excerpts from various texts both in poetry and prose (GARO. F. 243. Op. 1. D. 28. L. 376ob-377). However, unfortunately, it is the peculiar nature of I.S. Ul'yanov's narration that seems to most complicate the analysis of the facts he communicates – instead of providing some form of integrated characterization of those notebooks, he furnishes small and unrelated excerpts from various texts from them (GARO. F. 243. Op. 1. D. 28. L. 376ob-377).

Only one time does I.S. Ul'yanov provide the name of a book that his father wrote out excerpts from, expressing regret that the actual book was not available to him. It's the famed textbook of Russian grammar by N.G. Kurganov (GARO. F. 243. Op. 1. D. 28. L. 377). However, in that particular case I.S. Ul'yanov, by contrast, neither provides any specific quote from it nor a clue as to which part of the book the extracts were from. The textbook consisted of the following sections: 'Grammar', 'Collection of Russian Proverbs', 'Fancy Short Stories', 'Ancient Apothegms: Corrected and Augmented', 'Various Educational Discourses', 'Collection of Poems', 'General Taxonomy of Sciences and Arts', and 'Explanatory Dictionary of Russian' (Kurganov, 1769). Hence, extracts from this book could provide I.S. Ul'yanov with some initial knowledge in a variety of sciences – but we do not know what exactly had been written out from it by Samoyla Nikitich. Nevertheless, the very fact that the only textbook used by I.S. Ul'yanov was the one by N.G. Kurganov, which must have been in more-or-less common use among the Cossacks, certainly does merit note.

I.S. Ul'yanov also describes in his reminiscences the process of how his family obtained new manuscripts. His father brought back from his service a whole raft of copied texts, which included N.M. Karamzin's 'Sophisticated Solomon's Wisdom' (left uncommented on I.S. Ul'yanov) and odes by two local Don poets, Dmitrov and Katel'nikov (referred to by him as 'poor' (GARO. F. 243. Op. 1. D. 28. L. 392)). Of interest is the fact that Ye.N. Katel'nikov was one of the first Don amateur historians and a sectarian mystic, who was imprisoned at the Solovki for heresy (Mininkov, 2011). Thus, manuscripts circulating among the Cossacks included texts by local authors too as early as 1800–1810.

We can only concur with I.S. Ul'yanov when he says that the books and manuscripts that were available in the family home did little to help his intellectual development. Although he represented at least the third literate generation in the family and his grandfather and father even had a little manuscript library (notebooks containing extracts from various texts), they do not seem to have been keen on the idea of collecting educational books for inclusion in their library, with extracts from the textbook by N.G. Kurganov eventually being the only such material available. Of interest in this context is what I.S. Ul'yanov's father did – having spent many years in military service and aware of the fact that he had a son and a daughter, in 1814 he, however, brought back extracts from various poems – not textbooks. As a consequence, essentially the Ul'yanovs' library was represented by a collection of absolutely random texts that were of little use for those trying to learn about and explore the world. In the context of that library, I.S. Ul'yanov does not mention a single academic book and does not cite a single excerpt of academic content. The bulk of the library must have been made up of subpar literary writings – it is known for certain that the library contained only one text by a famed writer – the one by N.M. Karamzin. Things in the family were even worse with printed books, with the ones they had used only as ritual objects.

Thus, the Ul'yanov family did not strive to make deliberate and extensive use of books for the purpose of educating the children. At the same time, the children had access to handwritten extracts from books and even read them, but eventually I.S. Ul'yanov was influenced only by excerpts from the textbook by N.G. Kurganov and some book about Jesus, obtained outside the family home.

#### *Education received outside the family home*

Of note is the fact that the stanitsa of Ust'-Medveditskaya, where I.S. Ul'yanov resided, had an uyezd school in it. The school was attended by a friend of his named Sergey Zotov, but not by himself (GARO. F. 243. Op. 1. D. 28. L. 376). Instead, he had to be educated at local administrative institutions, serving as an assistant to the officials there.

Initially, I.S. Ul'yanov attended a course of study with the stanitsa administration. However, most of the material about it in the manuscript was lost (GARO. F. 243. Op. 1. D. 28. L. 369). We only know now that classes were held at the office of the stanitsa administration (i.e., there was no separate space for the young assistants) and that he was taught by a man named Yakov Grigor'yevich (GARO. F. 243. Op. 1. D. 28. L. 369). His education there was cut short when Yakov Grigor'yevich went off to service circa 1812 (GARO. F. 243. Op. 1. D. 28. L. 369). As limited as it is, this information provides us with a chronology of his extra-familial education – I.S. Ul'yanov enrolled in school with the stanitsa administration when he was fairly young – under 10 years old.

Subsequently, I.S. Ul'yanov took up a course of study with the Ust'-Medveditskaya district administration (GARO. F. 243. Op. 1. D. 28. L. 369). Unfortunately, he provides no accurate chronology for this. However, it is pretty obvious that I.S. Ul'yanov began his course of study no earlier than 1812, when Yakov Grigor'yevich went off to service, and finished it no later than 1819, when he went off to service himself. It appears that handwriting was the main subject there – I.S. Ul'yanov even ironically refers to the facility as a “higher handwriting institution” (GARO. F. 243. Op. 1. D. 28. L. 369). The institution enrolled “many” Cossack children. It may be derived from his account that their education was essentially confined to their service there (GARO. F. 243. Op. 1. D. 28. L. 369). I.S. Ul'yanov had a mentor, senior clerk Vasily Gerasimovich Popov. Popov wrote fast, if illegibly, but his tutelage of the boy boiled down to sitting in a chair provided as a gift by the latter's grandmother, Agaf'ya Matveyevna (GARO. F. 243. Op. 1. D. 28. L. 369). Similarly, other mentors there did not seem inclined to put in very much effort to teach their students either (GARO. F. 243. Op. 1. D. 28. L. 369). According to I.S. Ul'yanov, consequently the children there would “naturally adopt the practice of educating each other”, of which he, however, provides no specific details (GARO. F. 243. Op. 1. D. 28. L. 369). To make things worse, this dubious schooling was interrupted more than once by him having to do work around the farmstead – and the further his schooling progressed the more frequently he was distracted from it (GARO. F. 243. Op. 1. D. 28. L. 369).

It is pretty clear now why at the time of joining service he was a rather intellectually “underdeveloped” person. No matter how capable, hungry for knowledge, and industrious he might have been, he simply did not have the opportunity to learn something substantial, except for some basic knowledge – either at home or in school. The Cossacks represented a special military estate at the time, and a number of contemporary authors have written of certain ways of teaching military science to their young that were more exotic than books and schooling. For instance, A.V. Yarovoy notes that the Cossacks' martial games (“shermitsias”) are “mentioned in the accounts of all explorers and travelers who dealt with the Cossacks in the 18th century” (Yarovoi, 2018: 16-18). So, might I.S. Ul'yanov's intellectual underdevelopment have been made up for by a military upbringing or some special military training?

I.S. Ul'yanov speaks of nothing of the kind in his reminiscences. He provides a detailed account of his everyday life and play, in which there is little of the peculiarly Cossack. Specifically, his description of the games played by Cossack children mentions the national Russian games knucklebones, lapta, and svaika (GARO. F. 243. Op. 1. D. 28. L. 371ob.). I.S. Ul'yanov never uses the term “shermitsias”. It is only in the chapter covering the joining of service that he tells us about how Cossack boys were influenced by war stories told by older Cossacks and used to “divide into Cossacks and Turks or Circassians and so on and engage in spirited battles” (GARO. F. 243. Op. 1. D. 28. L. 396). However, mock war battles of this kind appear in I.S. Ul'yanov's reminiscences to have normally been initiated by Cossack children themselves, being something adults had little control over and hardly ever encouraged purposefully. Nor do his reminiscences provide any



examples of young Cossacks being deliberately trained for service (e.g., trained in using a firearm or a sword). The exception is instruction in horseback riding; yet even this is presented as a natural consequence of a focus on livestock farming among the Cossacks rather than something deliberate – Cossack children were often sent somewhere with horses, so it was natural for them to try to ride them (GARO. F. 243. Op. 1. D. 28. L. 373). Thus, while I.S. Ul'yanov had certain military traditions present early in his life, he seems to have received no proper military upbringing and is certain to have received no military training prior to joining service.

It is time now to summarize the competencies acquired by I.S. Ul'yanov in the course of living and studying in the stanitsa. What is helpful here is his own reflections with regard to that, and that is notwithstanding the fact that he uses a peculiar style – paying excessive attention to trifles and leaving out important details. I.S. Ul'yanov makes no mention of any military skills. As regards general physical ones, at the time of joining service he was good at swimming and horseback riding (using quiet horses only) (GARO. F. 243. Op. 1. D. 28. L. 373ob.). In terms of moral qualities, I.S. Ul'yanov limits himself to the frank confession that he was “too cowardly to be able to pull off a cheeky prank” (GARO. F. 243. Op. 1. D. 28. L. 373ob.). The only discipline studied I.S. Ul'yanov mentions is penmanship, and that is where he excelled more than his peers (GARO. F. 243. Op. 1. D. 28. L. 373ob.). Thus, I.S. Ul'yanov did not have any special achievements in his physical, martial, and moral development that could make up for his intellectual underdevelopment.

Thus, it is a predictable conclusion that the education received by I.S. Ul'yanov, which appears to have been similar to that of many common 19th-century Cossacks, provided him with limited knowledge and skills. These competencies were enough to serve as a clerk in the stanitsa or to join service in company with his father, but nothing more.

#### *Cossack nurture as evaluated by I.S. Ul'yanov*

One comes across an interesting contradiction here. In describing his own education, I.S. Ul'yanov does acknowledge that it was limited. Moreover, he appears to justify his father's estrangement from him by the fact that he indeed was unable to find about his son “anything that could make him feel affection for him” (GARO. F. 243. Op. 1. D. 28. L. 392). Yet I.S. Ul'yanov's estimation of Cossack education is totally different – it is strictly positive.

Specifically, he asserts regarding the physical nurture of Cossacks through play and daily routine that it is this kind of nurture that “helps turn them into healthy, adroit, agile, quick-witted, and brave individuals with a good sense of direction and location” (GARO. F. 243. Op. 1. D. 28. L. 373). What makes this enumeration particularly ironic is that I.S. Ul'yanov, who was raised exactly this way, considers himself neither particularly quick-witted nor particularly brave. On top of that, he appears to mythologize to an even greater extent the discourses of older Cossacks concerning combat and battle: “Through such schooling, a man will always be proud of his rank, no matter how much you mistreat him, and will always be true to the flag that his ancestors used to honorably carry; he will set a high valuation on his forefathers' contributions to the weal of their country and will cherish their glory, customs, and truth. He will not apostatize from these and will not turn on or sell out any of these treasures for personal gain” (GARO. F. 243. Op. 1. D. 28. L. 373). Here again this rosy picture comes into collision with facts. Positioned here as the guardians of Cossack traditions are his older comrades-in-arms who fought in the Patriotic War of 1812 and who told him about their regiment commander, whom I.S. Ul'yanov appears to have sought to emulate (GARO. F. 243. Op. 1. D. 28. L. 373). However, the same text mentions another Cossack from an older generation, a friend of his father's named Ageyev (who has already been mentioned above). All of a sudden, this man appears to have been an embezzler of public funds and a profligate (GARO. F. 243. Op. 1. D. 28. L. 397-397ob.). Ageyev is said to have been a “disruptive influence” on I.S. Ul'yanov's father, arguably nurtured in the same traditions as his son (GARO. F. 243. Op. 1. D. 28. L. 397).

A closer analysis of I.S. Ul'yanov's praise of traditional Cossack education reveals two distinct characteristics thereof. Firstly, it lacks concreteness – he provides no examples or illustrations of how the Cossacks' lofty qualities were manifested in practice, and secondly, he tends to laud traditional education in the context of the present and in support of the effectiveness of Cossack traditions. More specifically, he counterposes his observation that the essential qualities are developed in Cossack children through play and daily routine to the views of “out-of-touch jurists”, whom he describes as those who “know nothing about real life, lead an aimless life, and act based on pure speculation” (GARO. F. 243. Op. 1. D. 28. L. 373). As claimed in the further text, “out-of-

touch jurists” dared to argue that the Don Cossacks had “lost their traditions”, whereas the Polish Insurrection of 1863–1864 actually appears to have shown the opposite (GARO. F. 243. Op. 1. D. 28. L. 373). Yet it is based on the outcomes of the above insurrection that the Russian press criticized the Don Cossacks, accusing them of not exhibiting at all times the combat efficiency expected of them (this was even discussed in *Voyenny Sbornik*, the mouthpiece of the War Ministry of the Russian Empire (I.K., 1865: 79)). Thus, I.S. Ul'yanov's narrative contains two dubious themes that seem to substantiate one another – 1) that traditional Cossack play and daily routine facilitated the development in Cossack children of qualities essential for military service being substantiated by the Cossacks' military successes; 2) those military successes (in actual fact, disputable) being more convincing in the context of the allegedly effective ancient tradition of Cossack military nurture (although I.S. Ul'yanov himself did not become a brave person and did not acquire essential military skills as a result of that kind of nurture). It appears that, by voicing those themes to the reader, I.S. Ul'yanov was actually not so much communicating to them information about the state of affairs in 1800–1810 but imposing on them his own interpretation of events contemporary to the period in which he was writing his reminiscences, trying to prove that the belief about the Cossacks having lost their traditions was wrong.

Similarly, the assertion that older Cossacks' discussions were facilitative of the development in Cossack youth of lofty moral qualities was offered by I.S. Ul'yanov in the context of the activity of a certain unvirtuous group of people, allegedly descended from creep joint owners, who rose to riches that way and then seized control of the lands of the Don Host using their wealth” (GARO. F. 243. Op. 1. D. 28. L. 396ob.). Here I.S. Ul'yanov is alluding to a public debate that took place in the Don region in the 1860s, when one part of the local elite advocated for liberal reforms in the Don Host, and the other insisted on preserving its traditional ways of life (Krasnov, 1863: 231). I.S. Ul'yanov was a member of the second group, the so-called “Cossackomaniaes” (Dontsy..., 2003: 481). Thus, this part of the text contains a combination of two themes that look dubious when considered separately from one another yet seem to be supportive of one another – traditional Cossack nurture being seen as an exemplar of morality and opponents of Cossack traditions being made out as highly unvirtuous individuals. In a deep sense, the text seeks not to describe some remote past events but to discredit I.S. Ul'yanov's immediate opponents.

At the same time, it would be wrong to connect I.S. Ul'yanov's idealization of traditional Cossack education with a short-term public debate exclusively. Many texts by Don authors produced between the second half of the 19th and the early part of the 20th centuries speak of an idealized past, a sort of “golden age”, that simultaneously serves as a guide for the present. For instance, V.Ya. Biryukov, who was a member of a local commission tasked with determining the causes of the impoverishment of the Cossacks and finding ways to tackle them, describes the early 19th century, i.e. the very period in which I.S. Ul'yanov's tough childhood took place, as a time of exuberance – a time that one must at least try to have again (Protokoly..., 1899: 113). Other authors push the “golden age” further back into the past. For instance, according to the founder of Don nationalism, Ye.P. Savel'yev, the era of the ideal, freedom-loving Don Host ended with the start of the 18th century (Savel'ev, 2010: 373-378). Thus, we may be dealing here with a peculiar treatment of the past on the part of some Don Cossacks implying the existence of an ideal society in their native land in the past and its subsequent degradation. This chronotope is what I.S. Ul'yanov's narrative seems to fit with – it antithesizes his observation about ancient Cossack traditions with the views of contemporary “out-of-touch jurists” and members of a certain socio-political “group” in the Don region. However, it inevitably distorts one's perception of reality, and that can be clearly seen in I.S. Ul'yanov's text – emotionally deaf and not very well-educated, he speaks of the Cossacks' ideal, effective, and highly moral nurture, whereas the specific facts described by him reveal that the real education of a common early-19th-century Cossack was extremely limited – even in the military area.

In conclusion, it is to be noted that there are certain members of Russian society who seem to have embraced a chronotope that is close to the one described above (the belief in the existence of an ideal society in the native land in the past, one that is definitely worth emulating, and its subsequent degradation). Certain Russian scholars have propounded the idea of a productive Cossack pedagogy grounded in local traditions and directed to the past (rather than the future). According to S.N. Lukash, a major contributor to the development of this subject, “the ideal of man in Russian national culture” is predicated on “the educative values, ideals, and discourses of Cossack culture” (Lukash, Tatarintsev, 2020: 18). S.N. Lukash construes “the man of Russian

culture” as “the inheritor and continuator of Russian civilization and its Eurasian essence” (Lukash i dr., 2023: 37). Thus, what appears to substantiate the view about Cossack pedagogy being productive is not so much student successes but this pedagogy being vital to the “development and strengthening of Russian civilization”, “formation of Russian national identity in the past, present, and future”, etc. (Lukash i dr., 2023: 37). With that said, an idealized past of “Russian civilization” is clearly contrasted with a sad present – the period 1990–2000, when Russian education was oriented toward not traditional local but universalist European templates put forward by the Bologna Process (Lukash, Epoeva, 2021: 274). I.S. Ul'yanov's reminiscences are also helpful in that they reveal what the real education of poor Cossacks in Don stanitsas might have looked like in the early 19th century.

## 5. Conclusion

I.S. Ul'yanov's reminiscences about his childhood enable us to reconstruct in a most detailed manner the picture of the education of a 19th-century child from a poor Cossack family. While this way of educating one cannot be regarded as universal, it must be argued, given certain implicit facts (e.g., the fact that both I.S. Ul'yanov's grandfather and father were literate individuals), that this family cannot be regarded as having been among the least educated and cultured in Cossack society.

Summarized below are the findings from the study.

1) The deliberate education of a child in the Ul'yanov family was so limited that virtually no mention is made of it in the reminiscences. This could be regarded as a manifestation of the peculiar way of life of the Cossacks as a military estate – for many years, I.S. Ul'yanov's mother looked after the family by herself, with his father serving the whole time and subsequently meeting his son only when he was an adolescent. As a result, neither of his parents paid enough attention to his development, with the Ul'yanov family being a fairly dysfunctional one.

2) The Ul'yanovs did have printed books in their home, but one was not allowed to read them, as they served as articles of ecclesiastical use. I.S. Ul'yanov's father and grandfather maintained some notebooks, to which he had access but which contained no pedagogical texts that could be used to educate him (his father did not procure such texts, even though he had two adolescents waiting for him at home). The bulk of the content of those notebooks was constituted by extracts from literary works of dubious quality. The writings that influenced I.S. Ul'yanov the most were the extracts from a textbook of Russian grammar by N.G. Kurganov and some book about Christ, whose title he could not recall.

3) Despite the fact that there was an uyezd school in the stanitsa, I.S. Ul'yanov did not attend it. Instead, the boy was first placed with the stanitsa administration and later with the district one, where his mentor provided him with very little instruction. Nevertheless, the institution enrolled many children, who eventually found themselves compelled to engage in instructing one another.

4) I.S. Ul'yanov's everyday life and play activities were similar to those of a Russian peasant. The only peculiarly Cossack elements were mock battles between Cossack children and regular horseback riding for domestic purposes. However, even these elements were of a spontaneous nature and not controlled by adults.

5) As a result, at the time I.S. Ul'yanov was going off to service he had fairly limited knowledge and skills, as he was a person with no special military training and very little education. Little to redeem that came from being brought up as a warrior – I.S. Ul'yanov describes himself as “cowardly”.

6) Nevertheless, half a century later, in describing his childhood years, I.S. Ul'yanov criticized his own education and lauded traditional Cossack education as a whole as being facilitative of the development in Cossack children of useful moral and physical qualities. This was associated with I.S. Ul'yanov trying to substantiate his position on certain social issues topical in the 1860s, and also with another more fundamental reason – being keen on idealizing the past, as has been done by some Don Cossacks, claiming there was a “golden age” once that was a paragon to be emulated.

7) Certain figures of contemporary Russian pedagogical science have, likewise, idealized local-tradition-based Cossack pedagogy. However, I.S. Ul'yanov's reminiscences vividly demonstrate that it was possible for common Cossacks not to have any proper pedagogy whatsoever, with many Cossack children receiving no proper training in the stanitsas even for military service.

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## The System of Public Education in Semirechenskaya Oblast (1867–1917)

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### Abstract

This work examines the system of public education in Semirechenskaya Oblast in the period 1867–1917, i.e. from the formation of this territorial unit to the collapse of the Russian Empire.

The principal sources for this study are relevant documents from the Russian State Historical Archive (Saint Petersburg, Russian Federation) and a vast body of statistical information for the prerevolutionary period gathered by the Semirechenskaya Oblast Statistics Committee. The archival materials are represented by relevant documents from Holding No. 733 ('Department of Public Education at the Ministry of Public Education'), while the statistical materials are derived from *The Semirechenskaya Oblast Review*, *The Memorandum Book for Semirechenskaya Oblast*, and *The Address Calendar for Semirechenskaya Oblast*.

The study's findings revealed that during the imperial period, the development of the system of public education in Semirechenskaya Oblast was governed by a regional factor – the majority of the region's population being Muslim. It was difficult to overcome the reluctance of members of the region's Muslim community to have their children attend secular schools, so the Russian local administration set itself the objective of having as many children in the region's ethnic-Russian community as possible attend school. In the period from 1867 to 1917, Semirechenskaya Oblast saw the creation of an entire network of secondary and lower educational institutions, which included male and female gymnasiums and progymnasiums, higher primary schools, parochial schools, primary schools under the purview of the Ministry of Public Education, and lower vocational

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schools (those of horticulture, forestry, and gardening). There also was a teacher's seminary, which helped address the need for qualified teachers in the region.

**Keywords:** Semirechenskaya Oblast, Russian Empire, public education, period 1867–1917, Ministry of Public Education.

### 1. Introduction

Semirechenskaya Oblast was formed in 1867. Its capital was the city of Verny. In 1869, its population had the following religious composition: Orthodox Christians – 32,000, Muslims – 495,000, and pagans – 11,000 ([Statisticheskie svedeniya..., 1870: 24-25](#)). At the start of the 20th century, Semirechenskaya Oblast was part of the West Siberian Educational District, formed in 1885. Besides the oblast, the educational district incorporated Tomsk and Tobolsk Governorates and Akmolinsk and Semipalatinsk Oblasts. At the end of the 19th century, Semirechenskaya Oblast had a population of about 990,000 (531,000 males and 458,000 females) ([Cherkasov, 2023: 1690](#)).

### 2. Materials and methods

The principal sources for this study are relevant documents from the Russian State Historical Archive (Saint Petersburg, Russian Federation) and a vast body of statistical information for the prerevolutionary period gathered by the Semirechenskaya Oblast Statistics Committee. The archival materials are represented by relevant documents from Holding No. 733 ('Department of Public Education at the Ministry of Public Education'), while the statistical materials are derived from *The Semirechenskaya Oblast Review*, *The Memorandum Book for Semirechenskaya Oblast*, and *The Address Calendar for Semirechenskaya Oblast*.

Methodologically, use was made of the historical-statistical and content-analysis methods. The use of these methods helped conduct an objective analysis of the subject based on carefully selected and systematized materials on public education in Semirechenskaya Oblast in 1867–1917.

### 3. Discussion

The historiography on public education in Semirechenskaya Oblast is relatively thin, and that is for a couple of reasons – one being that during the Soviet period it was not encouraged to extol the successes of the public education sector in the Russian Empire and the authorities advanced a discourse that depicted prerevolutionary Russia as having had high illiteracy rates; plus, during the post-Soviet period the region came to be divided between Kazakhstan and Kyrgyzstan, with many historians in these two countries coming to associate the imperial past with the colonial policy of Tsarism and it becoming customary to view it in a negative light or just keep quiet about it, as during the era of Soviet power.

Particularly notable in the last respect is the work by M.Ye. Abdrakhim, which explores colonial education in Semirechenskaya Oblast in the prerevolutionary period ([Abdrakhim, 2023](#)). It is focused on the education of the indigenous population exclusively, with little to no attention given to that of other ethnic groups in the region. The subject of Kazakh translators in Semirechenskaya Oblast is explored in the work by G.S. Sultangaliyeva and M.Ye. Abdrakhim ([Sultangaliyeva, Abdrakhim, 2020](#)). (Translator courses were offered at a male gymnasium in the city of Verny beginning in the 1870s.) The operation of particular educational institutions in the city of Pishpek, Semirechenskaya Oblast, is examined in the work by Y.B. Sabirova ([Sabirova, 2016](#)). Records management practices in Semirechenskaya Oblast in the imperial period are investigated in the work by F.N. Miymanbayeva and her colleagues ([Miymanbaeva et al., 2020](#)).

Research consideration has also been given to a number of other aspects of the history of Semirechenskaya Oblast. For instance, the work by V.A. Skopa investigates the subject of statistical surveys of the Governor-Generalship of the Steppes in the period between the late 19th and early 20th centuries ([Skopa, 2020](#)), the one by T.T. Syrdybayev examines the making of the polyethnic populated localities in the oblast in the mid-19th century ([Syrdybaev, 2020](#)), and the one by S.Ch. Zhumaliyeva and S.I. Tokobayev explores employment in Semirechenskaya Oblast based on findings from the First All-Russian Census of 1897 ([Zhumaliyeva, Tokobaev, 2019](#)).

Given the fact that the bulk of the population of Semirechenskaya Oblast, an Asian territory, was made up of members of non-ethnic-Russian ethnicities, this historiographical review is primarily focused on the systems of public education in regions with similar population compositions in the Caucasus and Central Asia. More specifically, the system of public education in Amur Oblast is explored in the work by N.A. Shevchenko and her colleagues ([Shevchenko et al.,](#)

2023); the ones by T.A. Magsumov and his colleagues examine the development of the system of public education in the territory of the Orenburg Cossack Host (Magsumov, Zulfugarzade, 2020; Magsumov et al., 2020); the one by A.M. Mamadaliyev and his colleagues discusses the system of public education in the Caucasus's Sukhumi District (Mamadaliyev et al., 2022); the ones by G. Rajović and his colleagues are focused on the system of public education in another Caucasus region, Dagestan Oblast (Rajović et al., 2022; Rajović et al., 2022a; Rajović et al., 2022b). Parochial education across the Russian Empire is investigated in the work by A.A. Cherkasov and M. Šmigel' (Cherkasov, Smigel, 2016).

#### **4. Results**

Virtually from the moment Semirechenskaya Oblast was formed, the Ministry of Public Education, the Ecclesiastical Department, and the Ministry of Arable Farming and State Properties were each engaged in building networks of educational institutions of their own there.

##### *Educational institutions the Ministry of Public Education*

The network of educational institutions under the Ministry of Public Education was created taking into account the region's following distinctive characteristic – its overwhelmingly large Kirghiz-Kazakh population there. Besides gymnasiums, the Ministry of Public Education also established there educational institutions such as urban, parish, and Russo-indigenous schools.

On July 1, 1876, the oblast's capital, Verny, became home to a four-grade male gymnasium. In 1881, the facility was reorganized as a six-grade gymnasium, and in 1901 – as an eight-grade one. In 1904, the gymnasium had an enrollment of 321 students, with 46 % of these being children of nobles and functionaries, 19 % – children of urban commoners, 15 % – children of Cossacks, and 9 % – children of persons of ecclesiastical status. Kirghiz boys began to enroll in the gymnasium as soon as it opened up. By 1905, the facility had just a few students who had completed the entire program, with the rest failing out after fourth or fifth grade (Pamyatnaya knizhka..., 1905: 249). In 1911, the gymnasium had an enrollment of 347 students, with 241 of these being residents of the city of Verny and 106 – residents of the region's uyezds (Obzor..., 1911: 105). By 1913, the size of the student body at the gymnasium had increased just a little – to 361. The social-estate composition of the student body remained virtually unchanged. As at 1913, the gymnasium enrolled 13 Kirghiz children (Obzor..., 1915: 105).

On March 1, 1877, Verny became home to a three-grade female gymnasium. As early as 1879, the facility was reorganized as an eight-grade gymnasium. In 1904, the gymnasium had an enrollment of 317 students, with 66 % of these being children of nobles and functionaries, 17 % – children of urban commoners, 6 % – children of persons of ecclesiastical status, 5 % – children of Cossacks, and the rest – members of other groups. Kirghiz girls began to enroll in the gymnasium only in 1900 (Pamyatnaya knizhka..., 1905: 252). In 1910, the facility had an enrollment of 471 (Obzor..., 1911: 106). In 1913, the figure was 476 students (Obzor..., 1915: 106).

In 1911, the city of Przhhevsk became home to a female four-grade progymnasium. In 1914, the facility had an enrollment of 86 (Obzor..., 1915: 107).

In 1912, the city of Pishpek became home to a male four-grade gymnasium. In 1914, the facility had an enrollment of 100 students, with 35 of these being children of nobles and functionaries, 27 – children of peasants, 20 – children of urban commoners, seven – children of persons of ecclesiastical status, and the rest – members of other groups (Obzor..., 1915: 106).

On October 5, 1913, Verny became home to a teacher's seminary with a preparatory grade and a first grade in it (Obzor..., 1915: 105).

By 1905, the region had seven lower educational institutions (urban schools) – one four-grade urban school in Przhhevsk and six three-grade schools (the ones in Verny, the stanitsa of Bolshe-Almatinskaya, Pishpek, Kopal, Dzsharkent, and Lepsinsk). Each of the schools offered instruction in hand-work. In 1904, the schools had a combined enrollment of 1,175 boys, with these distributed by social estate as follows: urban dwellers – 57 %, Cossacks – 19 %, nobles – 9 %, peasants – 7 %, indigenes – 4 %, and the rest – members of other groups (Pamyatnaya knizhka..., 1905: 253).

In 1910, the stanitsa of Sofiyskaya, Verny Uyezd, became home to a four-grade urban school (Obzor..., 1911: 107). In 1911, urban schools began to be transformed into higher primary schools in the region. In 1913, the region had nine such schools, with a combined enrollment of 1,075 boys and 60 girls. The social-estate composition of the student body was as follows: 439 – children of



urban dwellers, 347 – children of peasants, 196 – children of Cossacks, 113 – children of nobles and functionaries, and the rest – members of other groups (Obzor..., 1915: 107).

By 1905, the region had 49 one- and two-grade parish schools, with two of these being two-grade female schools, 38 – one-grade male schools, six – one-grade female schools, and three – public schools. The schools had a combined enrollment of 3,112 students (2,245 boys and 867 girls). The social-estate composition of the student body was as follows: 41 % – children of peasants, 28 % – children of Cossacks, 25 % – children of urban dwellers, 3 % – children of nobles and functionaries, and the rest – members of other groups (Pamyatnaya knizhka..., 1905: 253-254). In 1910, the region became home to another nine parish schools, with the combined enrollment in this sector reaching 6,388 students (4,759 boys and 1,629 girls) (Obzor..., 1911: 108).

In the late 19th century, the region became home to Russo-indigenous schools as well (Abdrakhim, 2023: 129). In 1905, Semirechenskaya Oblast had 12 Russo-indigenous schools, of which only one educational institution, the one in Tokmak, had a student body of a decent size – 55 students (52 Muslims and four Orthodox Christians), with the remaining 11 schools having a combined enrollment of just 177. The schools situated close to ethnic-Russian populated localities had enrollments of at least 30 students, whilst those situated far from them did not even enroll 10 students in 1905 (Pamyatnaya knizhka..., 1905: 254-256). In 1910, no new Russo-indigenous schools were opened, with the total figure being 23 schools (Abdrakhim, 2023: 131), with a combined enrollment of 789 boys (Obzor..., 1911: 109). In 1913, the region became home to six new Russo-indigenous schools (three male and three female). The previously opened schools had a combined enrollment of 1,190 students (1,084 boys and 106 girls) (Obzor..., 1915: 108). With there being a shortage of qualified teachers in the region, it was expected that the region's network of primary schools would develop more briskly via recruiting fresh graduates from the teacher's seminary.

#### *Educational institutions under the purview of the Ecclesiastical Department*

The opening of educational institutions under the purview of the Ecclesiastical Department in Semirechenskaya Oblast began as soon as *The Rules on Parochial Schools* was signed into law on June 13, 1884.

In 1905, the region had 44 parochial schools, with three of these being two-grade, 28 – one-grade, and 13 – literacy schools. As at 1903, the schools had a combined enrollment of 1,980 students (1,044 boys and 936 girls) (Pamyatnaya knizhka..., 1905: 259-260).

In 1913, the region became home to another six parochial schools, with the total figure reaching 72 (three two-grade schools, with the rest being one-grade schools). The schools had a combined enrollment of 4,243 students (2,189 boys and 2,054 girls) (Obzor..., 1915: 108).

#### *Educational institutions under the purview of the Ministry of Arable Farming and State Properties*

In 1871, the region became home to Verny School of Horticulture. Initially, the facility had the following aims: 1) train professional horticulturists; 2) promote effective horticulture practices, including by way of distribution of free fruit-tree and shrub seedlings to residents. However, over time the school's focus shifted to training professional horticulturists exclusively. In addition, in 1894 the region became home to four agricultural schools (the ones in Pishpek, Kopal, Dzharkent, and Przhevalsk). These schools had an average enrollment of 25 students and offered instruction in horticulture, gardening, apiculture, livestock farming, and some other disciplines (Pamyatnaya knizhka..., 1905: 262-263).

In addition to the above-mentioned educational institutions, by 1913 the region had become home to a forestry school. Focused on training rangers, it was opened on October 1, 1909 (Obzor..., 1915: 109; Obzor..., 1911: 110).

Despite all the effort put by the Russian administration into spreading secular education among the region's Kirghiz residents, it was unable to achieve this objective in the imperial period. In 1915, Semirechenskaya Oblast had 113,349 school-age children (ages 8 to 11), of whom only 12,239 (10.8 %) were going to school (RGIA. F. 733. Op. 207. D. 39. L. 1). Consequently, in the early 20th century the local administration modified its objectives – the focus was now on spreading primary education among the region's ethnic-Russian population. Eventually, much success was achieved in this area.

Table 1 displays the numbers of educational institutions and students in the territory of the Semirechenskoye Cossack Host in 1891–1914.

**Table 1.** Numbers of Educational Institutions and Students in the Territory of the Semirechenskoye Cossack Host (1891–1914) (RGIA. F. 733. Op. 207. D. 30. L. 1)

Year	Population	Number of educational institutions	Number of students	Number of residents per student
1891	29,612	18	865	35
1901	36,688	19	1,413	26
1910	53,646	47	2,801	20
1914	55,716	46	3,008	18

As evidenced in Table 1, in the period 1891–1914 the Cossack population in the area increased 90 %, whereas the numbers of schools and students there increased 300 % and 340 %, respectively. Furthermore, the figure for the number of students against the number of Cossack residents there in 1914 (18 residents per student) was close to the average among the country's Cossack hosts (17 residents per student) (RGIA. F. 733. Op. 207. D. 30. L. 1). These data clearly indicate that in that period the system of public education in the region developed at a rate that outstripped the population increase and that the aim of having the overwhelming majority of children in the ethnic-Russian population of Semirechenskaya Oblast attend primary school was likely to be achieved in the near future.

## 5. Conclusion

During the imperial period, the development of the system of public education in Semirechenskaya Oblast was governed by a regional factor – the majority of the region's population being Muslim. It was difficult to overcome the reluctance of members of the region's Muslim community to have their children attend secular schools, so the Russian local administration set itself the objective of having as many children in the region's ethnic-Russian community as possible attend school. In the period from 1867 to 1917, Semirechenskaya Oblast saw the creation of an entire network of secondary and lower educational institutions, which included male and female gymnasiums and progymnasiums, higher primary schools, parochial schools, primary schools under the purview of the Ministry of Public Education, and lower vocational schools (those of horticulture, forestry, and gardening). There also was a teacher's seminary, which helped address the need for qualified teachers in the region.

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## **About the Organization of Librarianship in the Soviet Russia in the early 1920s**

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### **Abstract**

The work examines the organization of librarianship in the Soviet Russia in the early 1920s. There were used as materials the specialized literature on the organization of librarianship in the Soviet Russia during the early 1920s. For the most part, this literature was published in Moscow through the People's commissariat for education.

The research methodology is presented by the traditional historical methods. One of them, the chronological method allowed authors to analyze the organization of librarianship, taking into account the historical situation. Using the method of objectivity and relying on facts, the authors were able to consider the organization of librarianship in its real state, in conjunction with the post-revolutionary situation. In turn, the civilizational approach made it possible to study the organization of librarianship in Soviet Russia in the early 1920s, in view of the accumulated experience in the pre-revolutionary period.

In conclusion, the authors state that in the early 1920s, librarianship in the USSR was formed taking into account the accumulated pre-revolutionary experience and international traditions. The Bolsheviks used the well-established American system of organizing librarianship and made only some additions and changes to it, bearing in mind the specifics of the proletarian state. The Bolsheviks also did not prohibit the decimal classification of books proposed by the Brussels International Bibliographic Institute. Nevertheless, there were special features in the training of personnel for libraries in Soviet Russia. Thus, the staff of librarians was trained on the principle of workshops for beginners, and hobby group activities for people who already had work experience.

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**Keywords:** librarianship, out-of-school activities, Soviet Russia, 1920s, functioning of libraries.

### **1. Introduction**

In Soviet Russia, library work was important in educational activities. It included everything related to printed publications (book, journal, newspaper) and it was an integral part of out-of-school activities of students. In the early 1920s, librarianship included not only the organization of book exhibitions, readings, the distribution of recommendation posters, but also the organization of oral retelling of newspapers, the organization of reference work, circles, including young readers, etc. On this basis, the librarian's functionality expanded to a large size and required him to have certain competencies. In this work, we would like to consider the functionality of the librarian and the features of his training.

### **2. Materials and methods**

There were used as materials the specialized literature on the organization of librarianship in the Soviet Russia during the early 1920s. For the most part, this literature was published in Moscow through the People's commissariat for education.

The research methodology is presented by the traditional historical methods. One of them, the chronological method allowed the authors to analyze the organization of librarianship, taking into account the historical situation. Using the method of objectivity and relying on facts, the authors were able to consider the organization of librarianship in its real state, in conjunction with the post-revolutionary situation. In turn, the civilizational approach made it possible to study the organization of librarianship in Soviet Russia in the early 1920s, in view of the accumulated experience in the pre-revolutionary period.

### **3. Discussion**

In the historiographical review, we would like to include works devoted to librarianship in the USSR in the period from the establishment of Soviet power to the end of the new economic policy.

Among such works, it is necessary to mention the one of L.M. Luchka on librarianship in the territory of the Yekaterinoslav region during the civil war (Luchka, 2020), E.K. Ivanova touched on the organization and state of librarianship in the territory of Chuvashia in the 1920s. (Ivanova, 2022), E.T. Golovina addressed the problems of librarianship on the example of the Stavropol village in the 1920s (Golovina, 2011). The author noted that in the early 1920s the librarianship in the Stavropol village was unsatisfactory, most libraries were closed, and in those that functioned librarians received such low wages that they had to look for additional work on the side (Golovina, 2011: 308). In turn, T.V. Badlaeva addressed the topic of librarianship in the territory of the Baikal region during the civil war (Badlaeva, 2009), and N.N. Mukhina studied book and library business in the territory of the Simbirsk province from the moment of the revolution until the end of the NEP (Mukhina, 2015).

In fairness, it should be noted that librarianship continued to be studied in subsequent periods. So, librarianship about the country's scale was studied by M.N. Glazkov for example, the second and the third Soviet five-year plans (Glazkov, 2009), A.V. Sozonova considered a similar case in the Yamal-Nenets Autonomous district during the second half of the XX century (Sozonova, 2000), P.T. Maksimenkova applied to the study of librarianship in the Kaluga region in the period 1940-1950-ies (Maksimenkova, 2019).

### **4. Results**

The personal composition of librarians was divided into two categories: persons without library experience and persons with it. In this regard, when preparing the first category of persons, it was assumed to organize a workshop, that is, a system of regular classes, according to a schedule and at certain hours. At the same time, the duration of the workshop should have been at least 1-1.5 months with daily classes of 4 hours a day (lectures, interviews and group classes) (Slukhovskii, 1924: 18).

Practical classes of librarians were held in factory clubs, in sponsored villages and other places. Librarians with relevant experience acted as the leaders of such classes.

Those who had already gained some experience in librarianship studied in a slightly different way. A library circle was specially created and operated for such people to acquire new

competencies and skills. Such a circle was supposed to be created not with its own organization, but at the level of the city, the district center, and the garrison. The thematic areas of the library circle's activities took into account the prevailing historical situation in the regions. So, in 1921, under conditions of starvation, library circles operated in Chuvashia, in which agricultural knowledge was actively studied and promoted (Ivanova, 2022: 15).

The library circle functioned by holding meetings at which the participants of the circle had to prepare and make presentations. Besides the reports on topics related to librarianship at each meeting, reports on the activities of libraries were also heard, and at the end of the meeting, the agenda of the future meeting was necessarily planned and approved. It should be added that the topic of the speeches was not strictly fixed, the librarians had the opportunity to independently choose the topic of the future report. Therefore, one time the theme could be a library poster, another time – a circle at the library, the third – holding a holiday, etc. Thus, the main work here did not lie with the head (as with beginners), but in professional and friendly meetings, where librarians jointly updated and deepened their knowledge of librarianship. At the same time, it was considered very useful to pay attention and devote meetings to experimental and demonstration events – an oral newspaper, a literary court, an agitation evening, and so on (Velinkin, 1923: 57).

Protocoling was an important part of the library club meeting. Thus, all meetings had to be recorded, and the minutes were required to be read out at regular meetings. It was also highly desirable that the position of chairman should be transferred to other members of the circle – this was how the individual's managerial skills were formed. Meetings of the library circle were open events and anyone interested in this topic could attend it.

However, the professional development of librarians was not limited to meetings. Conferences on library science played an important role in their professional development. Such conferences were usually short-lived, no more than 2-4 days, but the number of participants in them was significant, and their geography was quite wide. Conferences were usually prepared in advance and were associated with a number of material and economic costs, so they were entrusted to administrative and political associations.

In the development of curricula, course managers for both beginners and experienced librarians had to take into account local peculiarities – the level of training of students and the goals of librarianship for each region individually.

M.I. Slukhovskii noted: “In the USSR, librarianship is organizationally and technically built partly on the model of the American system, but differs in a number of unique features and achievements. All libraries are national property, which is natural for a proletarian state. They are generally available and, in principle, free of charge” (Slukhovskii, 1924: 27). In Soviet Russia, libraries were connected via single library network. The supply of provincial and county libraries with literature was carried out according to the state free program. While the libraries of the enterprises made purchases of books at their own expense. In the early 1920s, all library work in the USSR was led by the People's Commissariat of Education, and organizational issues were solved by the Central Interdepartmental Library Commission.

Now a little bit about libraries. Apart from permanent stationary libraries, there were also mobile libraries. The purpose of the latter was to cover remote and sparsely populated areas (villages, factories) with libraries and attract a mass reader. To do this, a selection of books in demand in the area was prepared and taken to the destination along with the necessary service personnel, books were distributed there until the demand for literature began to fall. After the drop in demand, the mobile library returned back to its stationary location. In the early 1920s, libraries allowed the form of issuing a significant number of books, according to the so-called collective subscription. A collective subscription was provided to an organization, and its representative took books in compliance with preferences of his team. As the team read these books, the representative returned the books to the library and took new ones. If the representative stopped returning books, then the librarian himself went to the enterprise, took the previously issued books and issued new ones (Trainin, 1923: 61).

The acquisition of libraries took into account the intellectual level of the average reader and specifically the historical situation in the country and in the region. Thus, in the 1920s, according to the experts, political enlightenment, socio-political issues, mathematics, history and professional knowledge were important for workers and peasants. In this case, fiction played an important role for moral education.

A special body was important in the library's activities – the Library Council (Smushkova, 1922: 58), which included not only librarians themselves, but also representatives from the readership. Regular meetings of this council provided a link between the library and the reader, solved problems that arose and prepared a work plan.

The library's activities were regulated by numerous rules, without which the library was unable to carry out mass educational work. One of these rules was the classification of literature, which divided all books into various departments, sub-departments, etc., taking into account their content. In the USSR, from the early 1920s and later, the decimal classification system (Morozov, 1923: 68), proposed by the Brussels International Bibliographic Institute, was used.

For the accounting and use of books in libraries, the compilation of card catalogs or the maintenance of a notebook was used. For the reader, the card system was the most convenient form, but for librarians, cataloging required a lot of work. In the 1920s, libraries often combined both forms: information about inventory and subscribers was filled in notebooks, and catalogs and subscription were on cards.

The inventory was a special notebook in which all books coming to the library were marked. Here the book received an individual number, which was called a cipher, and was entered into the general register of the library. According to this cipher, the book could easily be found in the library. This one became available to the reader after librarians added the corresponding publication card to the catalog.

The catalogs, in turn, were also different. In small libraries, one systematic catalog was enough. If there was a significant book fund, an alphabetical catalog was also compiled, in which books were listed alphabetically. And finally, in libraries with a large book collection, in addition to systematic and alphabetical catalogs, there was also a subject catalog (it touched on various issues of social and economic life of society). All these catalogs were necessary only for a fairly prompt issuance of books. At the same time, there were also several book issuance systems. One of them was a card, which was divided into two-card (with subscriber and book cards) and one-card (either subscriber's or book card). However, if it was impossible to keep card records, it was allowed to transfer the accounting system to a non-card system. The introduction of the subscription system required the librarian to be very careful, attentive and accurate in filling out the data (Khavkina, 1918: 36).

The last noteworthy aspect of the library's activities was reporting. According to the results of a certain period, librarians compiled reports and sent them to the governing bodies. Such reporting was necessary for the proper management of the library business in the size of the state. For the librarian, there were two types of reporting: daily (in fact, current statistics on the results of work for one day) and time-based (for a known period of time). The daily reporting was reduced to a daily count of the number of books issued, newly signed up subscribers, etc. Time-based reporting could be monthly or annual. Besides the statistical material, such a report also included the librarian's explanations to the text (Shtein, 1923: 96).

## **5. Conclusion**

So, in the early 1920s, the librarianship in the USSR was formed taking into account the accumulated pre-revolutionary experience and international traditions. The Bolsheviks used the well-established American system of organizing librarianship and made only some additions and changes to it, taking into consideration the specifics of the proletarian state. The Bolsheviks also did not prohibit the decimal classification of books proposed by the Brussels International Bibliographic Institute. Nevertheless, there were special features in the training of personnel for libraries in Soviet Russia. Thus, the staff of librarians was trained on the principle of workshops for beginners, and hobby group activities for people who already had work experience.

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### **Cherkas Global University's Academic Projects: Eastern European Scientific Information Agency (2018–2023)**

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#### **Abstract**

This paper is dedicated to the fifth anniversary of the Eastern European Scientific Information Agency (EESIA) – a functional unit within the private research organization Cherkas Global University. It provides insight into the mechanics of the Agency's operation and the nature and structure of information materials offered to readers through it.

EESIA's primary mission is to inform members of the academic-pedagogical community of new research findings in the study of various aspects of the history of Central-Eastern Europe.

The main source base for this work is open-access academic journals' electronic resources that contain the findings of research studies covering the topic in question that are published on EESIA's website.

The prospects for the Agency's further development are pretty sound – this can be substantiated by statistics on the popularity of materials published on the website, which continues to grow.

**Keywords:** Eastern European Scientific Information Agency, Cherkas Global University, scientific information, education, education policy, education reform, female employment, gender segregation, democracy, armed conflict, civil conflict

#### **1. Introduction**

In October 2023, the Eastern European Scientific Information Agency (EESIA) celebrated a milestone birthday, turning 5. Since its foundation in 2018, the Agency has been headed by Doctor of Historical Sciences Sergey Degtyarev, who is a member of the staff of Cherkas Global University (Washington, DC, USA) and is a professor at Sumy State University (Sumy, Ukraine). EESIA is a

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functional unit within Cherkas Global University (whose President is Aleksandr Cherkasov) functioning as part of the Department of Scientific Information.

The Agency's primary objective is to familiarize members of the academic-pedagogical community and anyone interested in the subject with the latest developments in research on the history of Central-Eastern Europe.

## 2. Materials and methods

The principal sources drawn on during the writing of this paper were the following electronic resources:

- Cherkas Global University's website (<https://cherkasgu.net/>);
- Eastern European Scientific Information Agency's website (<https://eesiag.com/>);
- websites of a number of academic journals that serve as a platform for covering the latest developments in research on the history of Central-Eastern Europe.

Of particular mention is the collection of documents released in 2022 – it serves as a sort of documentary chronicle of Cherkas Global University's 30-years' work ([Cherkas Global University..., 2022](#)). The publication also contains materials covering different units within the university, including EESIA.

Methodologically, use was made of the retrospective, problem-historical, and statistical methods. The use of these methods helped gain insight into the origins and mechanics of the operation of EESIA as a functional unit within Cherkas Global University, establish the thematic focus of information materials offered by it, and analyze quantitative figures in the work of the Agency.

## 3. Discussion

EESIA is the direct outcome of the development of Cherkas Global University as a research institution. While the thematic domain of informing the academic community is confined with EESIA to Central-Eastern Europe, the primary objectives for the work of the Agency and Cherkas Global University are absolutely correlated. Above all, these are extensive popularization of historical science and promotion of short- and long-term collaboration among historians and pedagogues for the purpose of producing new objective and relevant historical knowledge.

In conjunction with the above, the paper's historiographical basis is the research by Cherkas Global University staff and other researchers. Above all, these are the summarizing articles about Cherkas Global University itself ([Tarakanov, Ponomareva, 2019](#); [Taran, 2021](#)), its international activity ([Cherkasova, 2023b](#)), and its functional units, such as Cherkas Global University Press and the P.A. Cherkasov Fundamental Electronic Library ([Cherkasova, 2022](#); [Cherkasova, 2023a](#)). Some of the information used in this study was derived from the article devoted to the academic and pedagogical work of the head of Cherkas Global University, Doctor of Historical Sciences Professor Aleksandr Cherkasov ([Tarakanov, Ludwig, 2019](#)).

## 4. Results

From April to the beginning of October 2018, EESIA operated in test mode. In that period, a mere 19 information materials appeared on the website. In October of the same year, the Agency began to work in active mode, informing its audience of an average of 10–15 research findings by scholars around the world monthly (Table 1). By the end of October 2023, the total number of such materials was nearly 900.

**Table 1.** Dynamics of the Uploading of Information Materials to EESIA's Website (2018–2023)

Year	Number of information materials
2018	61
2019	174
2020	187
2021	170
2022	146
2023	129 <sup>1</sup>

<sup>1</sup> Data as at the end of October 2023

Information materials for EESIA are searched for on the websites of open-access academic journals. While some of these publications are little-known across the wider international academic community, they are fairly good sources to tap for original research (e.g., *City History, Culture, Society, Czech-Polish Historic and Pedagogical Journal, Sumy Historical and Archival Journal, and Res Gestae. Historical Journal*).

Over the period it has been in operation, the Agency has had 77 academic journals (as at the end of October 2023) serve as sources for filling its resource base. The geographical affiliation of these journals is fairly diverse. Most are published in Europe (e.g., Croatia, Ukraine, Czechia, Poland, Slovakia, Russia, Belarus, Moldova, Romania, and Serbia), with some produced in Turkey and the US as well. The intensity of the use of content from these journals varies too. [Table 2](#) displays the numbers of information materials derived from them.

**Table 2.** Quantitative Figures for EESIA as at the End of October 2023

	Source name	Number of information materials derived
1	<i>Anali Zavoda za Povijesne Znanosti Hrvatske Akademije Znanosti i Umjetnosti u Dubrovniku</i>	7
2	<i>Ancient Sumy Land</i>	38
3	<i>Annales. Series Historia et Sociologia</i>	2
4	<i>Annales Universitatis Paedagogicae Cracoviensis. Studia Politologica</i>	4
5	<i>Antiquities of Lukomorie</i>	26
6	<i>Anthropological Measurements of Philosophical Research</i>	4
7	<i>Arkhivy Ukrayiny</i>	15
8	<i>Arts</i>	13
9	<i>Brukenthal. Acta Musei</i>	5
10	<i>Bylye Gody</i>	80
11	<i>Central European History</i>	7
12	<i>Central European Papers</i>	6
13	<i>City History, Culture, Society</i>	21
14	<i>Consensus</i>	2
15	<i>Contemporary European History</i>	6
16	<i>Crusader</i>	3
17	<i>Culture and Arts in the Modern World</i>	4
18	<i>Czasopismo Prawno-Historyczne</i>	8
19	<i>Czech-Polish Historic and Pedagogical Journal</i>	23
20	<i>East European History</i>	7
21	<i>East European Historical Bulletin</i>	24
22	<i>Eminak</i>	34
23	<i>Ethnography. Practices, Theories, Experiences</i>	3
24	<i>European Historical Studies</i>	14
25	<i>European Journal of Contemporary Education</i>	19
26	<i>European Researcher</i>	1
27	<i>Gardarika</i>	7
28	<i>Historical and Political Researches</i>	13
29	<i>History and Historians in the Context of the Time</i>	4
30	<i>History Notebooks</i>	10
31	<i>History of Science and Technology</i>	14
32	<i>History Pages</i>	8
33	<i>History Studies. International Journal of History</i>	16
34	<i>Ideology and Politics</i>	5
35	<i>Intermarum: Istoriya, Polityka, Kul'tura</i>	19
36	<i>International Journal of Slavic Studies</i>	1
37	<i>Journal of Ancient History and Archeology</i>	21
38	<i>Journal of the Belarusian State University. History</i>	7

39	<i>Journal of Humanities, Culture and Social Sciences</i>	1
40	<i>Journal of International Network Center for Fundamental and Applied Research</i>	6
41	<i>Journal of the Institute of Croatian History</i>	1
42	<i>Judaica Ukrainica</i>	4
43	<i>Kwartalnik Historyczny</i>	9
44	<i>Kyiv-Mohyla Humanities Journal</i>	21
45	<i>Manuscript and Book Heritage of Ukraine</i>	4
46	<i>Media Education (Mediaobrazovanie)</i>	3
47	<i>NaUKMA Research Papers</i>	3
48	<i>Propaganda in the World and Local Conflicts</i>	10
49	<i>Res Gestae. Historical Journal</i>	9
50	<i>Revista Arheologică</i>	10
51	<i>Romanian Journal of History and International Studies</i>	10
52	<i>Rusin</i>	8
53	<i>Russkii Arkhiv</i>	6
54	<i>Russkaya Starina</i>	5
55	<i>Scholarly Works of the Faculty of History, Zaporizhzhia National University</i>	12
56	<i>Scientific and Theoretical Almanac Grani</i>	18
57	<i>Scientific Bulletin of the Nikolaev National University named after V.O. Sukhomlinsky. Historical Sciences</i>	3
58	<i>Slavery: Theory and Practice</i>	8
59	<i>Slověne. International Journal of Slavic Studies</i>	14
60	<i>Social Evolution &amp; History</i>	1
61	<i>Stratum Plus</i>	4
62	<i>Striy</i>	8
63	<i>Sumy Historical and Archival Journal</i>	58
64	<i>Terra Sebus. Acta Musei Sabesiensis</i>	12
65	<i>The Research Papers of Kamianets-Podilskyi National Ivan Ohienko University: Historical Studies</i>	2
66	<i>Tomsk State University Journal of History</i>	8
67	<i>Transylvanian Review</i>	1
68	<i>Ukrainian Historical Journal</i>	16
69	<i>Ukrainian Historical Review</i>	2
70	<i>Ukrainian Peasant</i>	18
71	<i>Vestnik of Saint Petersburg University. History</i>	3
72	<i>Vestnik Volgogradskogo Gosudarstvennogo Universiteta. Serija 4, Istorija. Regionovedenie. Mezhdunarodnye Otnoshenija [Science Journal of Volgograd State University. History. Area Studies. International Relations]</i>	27
73	<i>V.N. Karazin Kharkiv National University Bulletin 'History of Ukraine. Ukrainian Studies: Historical and Philosophical Sciences</i>	9
74	<i>Voprosy Istorii</i>	1
75	<i>Zaporizhzhia Historical Review</i>	8
76	<i>Zhurnal Ministerstva Narodnogo Prosveshcheniya</i>	2
77	<i>Zograf</i>	10

Owing to EESIA, many researchers and members of the wider public have had the opportunity to familiarize themselves with the latest works that explore the history of Central-Eastern Europe spanning from early times to the present day.

The criteria for selecting information materials for publication on the website are as follows:

- originality of the research idea;
- novelty of the research idea;
- social significance of the research idea.

The popularity of EESIA's resource base is attested by the fact that more than 510 materials (59 %) therein have between 1,000 and nearly 8,000 views. The most popular article currently is "Dead Men Attack" (Osovets, 1915): Archive Sources Approach', published in *European Researcher* in 2011 (Cherkasov et al., 2011). The number of such materials and their popularity continue to grow.

Let us take a look at what an information material posted on EESIA's website looks like (Figure 1). First there is the material's headline. Normally, it is the same as the name of the article. The page then displays the following: 1) name of the resource (academic journal) that carries the full version of the material; 2) thematic illustration; 3) abstract to the material; 4) full bibliographical description of the material; 5) link to the online resource that contains the full-text version of the article.

Eastern european Scientific Information Agency

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04 June 2020

## IT ALL STARTED IN 1989: BREAK-UP OF YUGOSLAVIA AND KOSOVO'S STRUGGLE FOR NATIONHOOD

Ideology and Politics

The fall of the Berlin Wall, three decades ago, set in motion democratic changes and the fall of Communism from the Baltic Sea to the Adriatic Sea. While some countries affected by this wave of change went through transition to democracy and respect for human rights without violence, Yugoslavia was embroiled in internal military conflict fueled by conflicting aims of political elites of the time, aided by international political, diplomatic, and military support. The breakup of Yugoslavia started and finally ended in Kosovo (1989–1999), beginning with the suspension of Kosovo's political autonomy within Yugoslavia, followed by wars in Slovenia, Croatia, Bosnia and Herzegovina, ending the decade of violence with NATO's military air campaign against military targets in Yugoslavia. Compared to the disintegration of the federalism of Czechoslovakia and the USSR, the disintegration of Yugoslavia happened along ethnonational lines because the one-party system in Yugoslavia allowed the political-administrative boundaries of the republics and provinces in the federal country to operate along ethnic national lines, making divisions and clashes inevitable. This paper aims to explain how a movement for human rights, equality, and democracy in Kosovo evolved into a movement for independence. It also aims to explain that the foundations for the idea of a free, independent, and sovereign state of Kosovo were set by events and processes in 1989–1991.

Source: Hamiti U. (2019) It all started in 1989: Break-up of Yugoslavia and Kosovo's struggle for nationhood. *Ideology and Politics*. N13(14): 58-76.

Source web-site: [https://www.ideopol.org/wp-content/uploads/2020/03/ENG\\_2019\\_3\\_5\\_Hamiti-fn.pdf](https://www.ideopol.org/wp-content/uploads/2020/03/ENG_2019_3_5_Hamiti-fn.pdf)

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**Fig. 1.** What a published item looks like on EESIA's website

To make search as convenient as possible for users, EESIA is equipped with a catalogue of keywords and phrases. Arranged in alphabetic order in the 'Topics' section, these help users conduct effective search for materials as per their queries.

Naturally, a great deal of attention is paid to research findings by Cherkas Global University staff, whose academic interests are fairly broad and diverse, inter alia encompassing various aspects of the history of Central-Eastern Europe. Furthermore, sources for filling EESIA's resource base include academic journals produced by Cherkas Global University Press. Above all, these are *Bylye Gody*, *European Journal of Contemporary Education*, *Media Education (Mediaobrazovanie)*, *Gardarika*, *Propaganda in the World and Local Conflicts*, *Slavery: Theory and Practice*, and *History and Historians in the Context of the Time*.

Let us now take a look at some of the thematic areas to which materials offered by the Agency to members of the academic-pedagogical community and all those interested in the history of Central-Eastern Europe are devoted.

The focus of a significant portion of such information materials is on the history of public education. This includes the research focused on the development of university, secondary, and primary education in Austria-Hungary (Degtyarev et al., 2018), in different regions across the Russian Empire (Cherkasov et al., 2021; Lebid, 2022a; Lebid, 2022b; Lebid, Degtyarev, 2023; Voytsekhivs'ka, Paliyenko, 2019), and in other countries (Degtyarev et al., 2019a; Degtyarev et al., 2020; Jędrychowska, 2020; Štěpánek, 2019; Gulczyńska, 2019).

A whole raft of information materials are devoted to the history of the development of various state institutions (Degtyarev et al., 2019b), the bureaucratic apparatus (Bezdrabko, 2019; Degtyarev, 2016; Degtyarev, Polyakova, 2019; Shevchuk, 2020; Degtyarev et al., 2022), and the foreign policies and diplomatic relations of various countries (Degtyarev, Zavorodnia, 2018; Sabanchiev et al., 2017; Papa, 2018; Zavorodnia, Naumov, 2020).

Modern-day society is regularly faced with issues relating to human rights violations, with issues of special concern including infringements on people's liberty and human trafficking. The origins of these issues go back many centuries. There are many historians who have devoted a significant amount of attention to the history of slavery, analyzing the causes and effects of this phenomenon. EESIA, in turn, recognizes the high social significance of such research and strives to ensure as much promotion for it within the academic community as possible and stimulate more research in this area (Cherkasov et al., 2018a; Cherkasov, 2020; Sarfo, 2020; Mamadaliev, 2016; Odrin, 2019; Peretyatko, 2018; Peretyatko, 2020; Peretyatko, 2021; Šmigel', 2020; Stepanenko, 2019; Vozgrin, 2018).

Of no less importance to modern science is research investigating the causes behind conflicts between countries, peoples, and particular social groups. The participants in such conflicts often seek to achieve their goals by means of propaganda, imposing on people ideas that are consistent with the agenda promoted by them. This mechanism has been around for a long time. Research into propaganda conducted for political purposes has lately become a fairly popular field in historical science. The findings from such research will definitely be useful in tackling issues of peace and security, which are among the major concerns for the world community today. Therefore, EESIA has paid particular attention to covering this in the academic periodical press (Crețu, 2017; Czarniecka, 2019; Garazha, 2018; Kutsyk, 2017; Lebid, 2020; Mosienko, 2018; Pylypenko, 2019; Romanko, 2019).

In addition, information materials offered by the Agency cover the findings of research studies in other thematic areas as well (e.g., military history, biographical studies, modern archaeological research, history of human settlements, history of social phenomena (e.g., longevity, alcohol abuse, and prostitution), art history, ethnography, archaeography, and history of science and technology).

## **5. Conclusion**

Since its foundation in 2018, the Eastern European Scientific Information Agency has conducted a large amount of work informing members of the academic-pedagogical community of the latest research findings in the study of various aspects of the history of Central-Eastern Europe. The prospects for the further development of this activity are pretty sound, as it is a fairly broad and multi-aspect subject that is being researched currently by many scholars around the world. Certain aspects of the history of said region are socially significant and concern issues of peace and security, quality education, gender relations, and so on. In addition, the Agency is a platform for popularizing research findings by Cherkas Global University staff. The range of open-access academic publications that are a source of information materials for EESIA is set to expand in the future. This will enable anybody willing to do so to have even greater access to the latest research findings and utilize them in their own research and pedagogical or public work.

## **6. Acknowledgements**

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**European Journal of  
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ELECTRONIC JOURNAL

## Articles

### **Education of Students on Physics and Chemistry with Effects of Water Filtration. Modeling of Water Clusters and Hexagonal Structures**

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#### **Abstract**

In the modern world, water filtration is performed to improve its quality. The most commonly used minerals are zeolite and shungite, as well as filters with nano-sized pores. Due to processes in boundary environments, the resulting waters before and after filtration possess specific properties. Studies after filtration show the structuring of clusters of water molecules. The most stable clusters comprise of two, four, and six water molecules. Hexagonal structures with six water molecules form the basis for the symmetry in the formation of snowflakes. Oleg Mosin (1966–2016) at Moscow State University of Applied Biotechnology conducted research on the modeling of water clusters before and after filtration. Since 2020, the author's team has been studying structuring water clusters using patented Swiss systems called EVOdrop. A program for training students by Mario Iliev is being developed. The students participate in experiments involving the research of Non-equilibrium energy spectrum (NES), Differential non-equilibrium energy spectrum (DNES), pH, oxidation-reduction potential (ORP), and Nuclear Magnetic Resonance (NMR). The knowledge acquired after training is applicable in medical biophysics and nanotechnologies. The effects of water restructuring and changes in its physicochemical parameters are analyzed in applied medicine.

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The parameters of samples of EVOdrop water from the patented device were tested compared to control tap water samples. The device includes an ultra-nano membrane and rotation jet nozzle for water vortexing. The incoming water passes through a rotating turbine, driven by pressure, and rotates through the device. Specific outcomes of such treatment are based on magnetohydrodynamic forces. Investigations were conducted using Non-equilibrium Energy Spectrum (NES) and Differential Non-equilibrium Energy Spectrum (DNES) analysis of hydrogen bonds energy distribution, mathematical models of water molecules clustering,  $^1\text{H}$  NMR, hardness, and pH. Alterations of hydrogen bonds, energy distribution and chemical shifts were measured. They were subsequently interpreted as restructuring of water molecule clusters leading to beneficial health effects. In addition, reduced hardness and unchanged pH levels of treated tap water were also observed.

**Keywords:** filtration, water clusters, EVOdrop device, NES, DNES,  $^1\text{H}$  NMR.

## 1. Introduction

The authors have developed methods for mathematically modeling water molecules in clusters, which are applicable in the teaching methodology for physics and chemistry students. The foundation of these methods lies in spectral analyses, which are also considered applicable in medical education. Peaks in the spectra of water and solutions of medicinal herbs and plants correlate with those of drugs. Comparative analyses can be conducted with inorganic and organic compounds.

Numerous studies have explored the structuring of water molecules and the alterations in hydrogen bonds under the influence of magnetic fields (Cai et al., 2009; Ignatov, Mosin, 2013a; Esmailnezhad et al., 2017; Puzowski, Skoczko, 2020). Furthermore, investigations have detailed the effects of nanomembranes (Thamaraiselvan et al., 2018) on water molecules and clusters (Chen, Ruckenstein, 2014). These clusters can be categorized into positively and negatively charged ionic clusters, represented as  $[\text{H}^+(\text{H}_2\text{O})_n]^+$  and  $[\text{OH}^-(\text{H}_2\text{O})_n]^-$ , as well as neutral clusters with the general formula  $(\text{H}_2\text{O})_n$  (Ignatov, Mosin, 2013a). Theoretical models have been devised to describe the structuring of water clusters with the formula  $(\text{H}_2\text{O})_n$ , emphasizing the importance of hydrogen bonds (Neela et al., 2010). These models have been developed for various cluster sizes, such as  $n = 6-20$ , incorporating five key parameters of water molecules: hydrogen bonding, charge-charge interactions, polarization, intramolecular relaxation, and repulsive forces (Massela, Flament, 1997). Additionally, alternative theoretical models have been established, including tetramer ( $n = 4$ ) and pentamer ( $n = 5$ ) ring structures, and cuboid-shaped clusters for  $n=8, 12, 16, \text{ and } 20$ . Pentameric structures with  $n = 10$  and  $15$  have also been identified (Mahashwary et al., 2001). Density Functional Theory (DFT) has been applied to model water clusters from  $n = 2$  to  $n = 20$ . Hexagonal water clusters have been structurally characterized using DFT (Kelkkanen et al., 2009). A Gaussian distribution model has been proposed to explain the occurrence of a maximum number of clusters with  $n=12$  and  $13$  at  $937\text{ cm}^{-1}$  (Mehandjiev et al., 2022).

Smith, Keutsch, and Saykally et al. have conducted extensive studies on water clusters, exploring the range from  $n=3$  to  $n=50$  (Smith et al., 2005). Infrared spectroscopy studies have successfully identified clusters such as  $\text{H}^+(\text{H}_2\text{O})_{22}$  and  $(\text{H}_2\text{O})_n$  for  $n=6-22$  (Choi, Jordan, 2010). Investigations have also focused on the binary structure of water clusters from *Haberlea rhodopensis* Friv. in a dry state, with  $n=2$  (Kuroki et al., 2019). Moreover, research has been carried out to examine the structuring of water clusters as a function of the number of water molecules, revealing local maxima at  $n=15$  at  $897\text{ cm}^{-1}$  (Ignatov et al., 2022). The nonadditive potential has been employed to optimize the geometry of clusters comprising  $n=3, 4, \text{ and } 6$  water molecules, with these clusters exhibiting dipole moments consistent with those of isolated molecules (Belford, Cambel, 2013). The Quantum Theory of Atoms in Molecules (QTAIM) and functional analysis have been applied to non-covalent bonding clusters with the formula  $(\text{H}_2\text{O})_n$ , considering  $n=2-7$  (Seijas et al., 2023).

In 2022, a theoretical model employing Gaussian distribution was introduced, aligning with results obtained from water filtered using EVOfilter technology beginning (Ignatov et al., 2020). Water filtration is one of the methods that demonstrate changes in physicochemical parameters before and after filtration. Changes in the structuring of water molecules in clusters are also analyzed. After obtaining results with various filters from 2013 to 2020, the authors employed EVOdrop devices from 2020 to 2023. This yields filtered water that undergoes restructuring due to vortex and magneto hydrodynamic forces. The current studies on water treated with EVOdrop technology aim to assess alterations in molecular clustering due to changes in hydrogen bonding,

employing the Non-equilibrium Energy Spectrum and  $^1\text{H}$  NMR. Additionally, observations of changes in hardness and pH are being conducted. The applications for the education of students were shown with goal for the applications of cluster structures for analyses in chemistry, physics and medicine.

The authors educate the laboratory results and analyses in Bulgarian and English with methodology development (Ramankulov et al., 2019). Q-methodology, a reliable method that takes individuals' unique perspectives, was employed to determine students' opinions and perceptions (Servet, 2016). One of the co-authors, Ignatov, performed training with students in secondary schools in Teteven municipality, Bulgaria, with practices for the research of mountain water and digital methods (Soboleva, Karavaev, 2020). In the modern world, the improvement of the methods for online education is necessary. The online learning environment, by changing the students' behavior, improves the quality of the education process (Delen, Liew, 2016). Water processes in the environment are an object of education. University students' education was applied to mobile phones (Valeeva et al., 2019). The basic aim is to make connections for practical applications of the knowledge from physics and chemistry for the processes in the environment for clean water, global warming, and processes of the interfaces between solid-liquid-gaseous media. Especially the students have qualifications for non-equilibrium processes with application in ecology.

## **2. Materials and methods**

### **2.1. Educational practices and specializations**

During the training, network modeling is also applied. Interdisciplinary dependencies are established between results and analyses in the natural sciences (Ignatov, 1989; Traxler, 2022). Iliev takes part in educational project BG051PO001-3.3.07-0001 "SCHOOL PRACTICE with the financial support of the Operational Program "Development of Human Resources," financed by the European Social Fund of the European Union, a project of the Ministry of Education and Science – Bulgaria. Huether developed the systems for the filtration of water from African countries with water salinity of around 4200 ppm. The application is in agriculture and in university studies (Huether et al., 2023).

The municipality of Teteven, Bulgaria, and Ignat Ignatov are co-organizers of the event with training "Days of Mountain Water". The event has been organized since 2010, each year on June 11<sup>th</sup> (Athanasiadis et al., 2023).

Gluhchev makes studies of the analyses of images (Atanasov et al., 2020) and structuring of water clusters (Mehandjiev et al., 2022) with practical application in education. Gramatikov is the author of the textbook for students, Theoretical Biophysics (Basic Problems and Teaching Methodology) (Gramatikov, 1998). Gramatikov participates in the project: Joint supervision of Ph.D. students in Physics. Supervisor: Kanapia M. Arangazin (Kazakh State University, Kazakhstan) and Plamen Gramatikov (Neofit Rilski South-West University – Blagoevgrad). Funding organization: Karaganda State University "E.A. Buketov" (KSU), Kazakhstan. Period: 2014–2019.

### **2.2. Evodrop turbine water purifier**

The investigated device is the EVOfilter with an ultra-nano membrane and a rotating jet nozzle for vortex water. The ultra-nano membrane is a competing device for the reverse osmosis membrane. The rotation jet nozzle for vortex water has three injection nozzles designed with a golden ratio-based algorithm. The proprietary operating principle and the developed geometry of the EVOdrop turbine (Figures 1, 2) allow for highly efficient treatment. Incoming water passes through a rotating turbine, driven by its pressure, and rotated through the device. Specific outcomes of such treatment are based on magneto hydrodynamic forces.

Figure 1 illustrates the EVOdrop device. The details of the numbers of the compounds of the EVOdrop device are shown in (Ignatov et al., 2022).

Figure 2 shows EVOdrop turbine operation principle. The details of the numbers of the compounds of the EVOdrop device are shown in (Huether, 2019).



Fig. 1. EVOdrop device

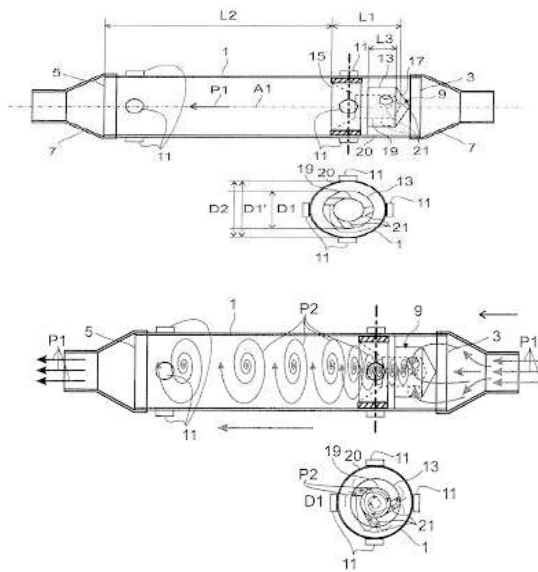


Fig. 2. EVOdrop turbine operation principle

### 2.3. Spectral methods Non-equilibrium energy spectrum (NES) and Differential non-equilibrium energy spectrum (DNES)

Luck considers that water consists of hydrogen bonds between one water molecule's hydrogen atom and another's oxygen (Luck, 1980). Most of them are bound by the energy of the connection (-E), and the remaining are free (E=0). It is accepted that E has a negative value. This is known as the Luck two-state model (Kontogeorgis et al., 2022; Vega, Lovell, 2016). Each water molecule has two hydroxyl groups. The number of hydrogen bonds between the hydrogen atom of one water molecule and the oxygen of another in a specific volume of water The water molecules linked by van der Waals forces and electromagnetic hydrogen bonds considered water an associated liquid. The wetting angle  $\theta$  was measured with a specially designed instrument described in detail in (Antonov et al., 1989). Deionized water drops were evaporated in a sealed chamber with a stable 22°C. The device is working in the range(-E) = 0.08 - 0.1387 eV or  $\lambda=8.9-13.8 \mu\text{m}$ .

During the process, the wetting angle changes in discrete steps and characterizes the average energy of hydrogen bonds as follows:

$$\theta = \arccos(-1+bE), \text{ where } b = I(1+\cos \theta_0)/C\gamma_0,$$

where  $\theta$  is the wetting angle, E is the average energy of hydrogen bonds, and b is a temperature-dependent parameter (Gramatikov et al., 1992). The development of the method is the Non-equilibrium energy spectrum (NES) and Differential non-equilibrium spectrum (DNES) (Todorov et al., 2008; Todorov et al., 2010). They are used to research natural waters. The water droplet distribution on the sandstone surface under different salinities was studied with molecular dynamics simulation. The system equilibrium configuration was used to study the interaction of its

components. The number of hydrogen bonds was calculated (Gao et al., 2021).

The parameter for measuring the energy (E) of hydrogen bonds is electron volts (eV). The energy distribution spectrum is the function  $f(E)$ . A non-equilibrium evaporation process of water droplets characterizes the energy spectrum of water. This non-equilibrium energy spectrum (NES) is measured in  $eV^{-1}$ . DNES is defined as the difference:

$\Delta f(E) = f(\text{water samples}) - f(\text{control water sample})$ , DNES is measured in  $eV^{-1}$  where  $f(*)$  denotes the evaluated energy (Todorova, Antonov, 2000; Mehandjiev et al., 2023)

#### 2.4. Bruker Avance II+ 600 NMR spectrometer

The nuclear magnetic resonance (NMR) spectra were measured on Bruker Avance II+ 600 NMR spectrometer using 5 mm direct detection dual broadband probe. The experiments were performed at a temperature of 293 K.  $^1H$  NMR spectra were acquired with 128K time domain points, spectrum width of 9600 Hz, 16 scans, and a relaxation delay of 60 s. The chemical shifts were referenced to the residual dms $o$ - $d_6$  resonance used as an external reference (2.5 ppm). The dms $o$ - $d_6$  was placed in a coaxial capillary in the sample tube and also used as a lock signal.

### 3. Discussion

The presented research provides a comprehensive overview of water filtration techniques and their effects on the structural properties of water clusters. Utilizing minerals such as zeolite, shungite, and filters with nano-sized pores for water filtration is a common practice to improve water quality. This study highlights the significance of understanding the specific properties of waters before and after filtration, shedding light on structuring water molecules in clusters. From 2020 to 2023 the filtration and structuring of water was made with EVOdrop patented device. The research conducted by Oleg Mosin at Moscow State University of Applied Biotechnology and the subsequent work of the author's team with the patented Swiss EVOdrop system, demonstrates a dedication to advancing the understanding of water clusters. The involvement of students in experiments involving Non-equilibrium energy spectrum (NES), Differential non-equilibrium energy spectrum (DNES), pH, oxidation-reduction potential (ORP), and Nuclear Magnetic Resonance (NMR) reflects a commitment to hands-on, practical learning in the fields of physics and chemistry. The comparison of samples from the EVOdrop device with control tap water samples using spectral analyses provides valuable insights. The observed differences in NES and DNES between EVO drop-treated water and control tap water emphasize the impact of the filtration process. The statistical analysis, supported by the Student's t-test, further strengthens the validity of the results. The mathematical modeling of water clusters, particularly concerning hydrogen bonding and hexagonal structures, enriches the educational experience for students. Visualizing these complex phenomena makes theoretical concepts more tangible, enhancing comprehension and retention. The preference for figures over tables among the students indicates the effectiveness of visual aids in the learning process.

Moreover, exploring different types of water and their respective energy distributions provides a valuable comparative perspective. The variation in local maximums for (-E) across different water sources underscores the diverse structural properties of water clusters influenced by geophysical and environmental factors.

In conclusion, this research contributes to the scientific understanding of water filtration. The cluster structuring is a robust foundation for educational practices in physics and chemistry. The hands-on experiments, mathematical modeling, and visualization techniques offer students a holistic learning experience. Additionally, the implications of this research extend beyond academia, potentially impacting areas such as applied medicine and nanotechnologies. The consistent pursuit of knowledge and innovation in water research exemplified by this study is commendable.

In progress is a preparation of the program for students in medicine for analyses of spectral peaks and structuring of water clusters for biochemical, biological, and medical effects.

### 4. Results

Analyses of the education of education with non-equilibrium process of water were performed with analyses of solid-liquid-gaseous media (Ignatov et al., 2023).

#### 4.1. Visualization of the Gaussian distribution and mathematical modeling of hydrogen bonds between water molecules and structuring of clusters

The authors create with spectral methods NES and DNES mathematical models of clusters of water molecules (Ignatov, Mosin, 2013b; Ignatov et al., 2021). Also, the cluster calculation was

performed with the model of the Gaussian distribution of water molecules (Mehandjiev et al., 2022). The visualization of the structuring of water molecules makes education more attractive and visible for the students.

For the period 2013–2023, 73 students were tested (Table 1). The main questions were:

1. Estimate the mathematical models of water molecules with tables
2. Estimate the mathematical models with figures (Table 1).

The results are similar to the results of the visualization method (Fuchova, Korenova, 2019) for the parts of the human brain. The results with visualization are more extensive than 90 %.

**Table 1.** Results with estimation of water molecules with tables and tables

Which model is more understated for you?		
With tables	5	6.8 %
With figures	68	93.2 %

The education with visualization is for the processes that are not directly visible with the human visual analyzer.

#### **4.2. Training program for measurement of non-equilibrium spectrum and physicochemical parameters of water. Mathematical modeling of water clusters and hexagonal structures**

Our measurements and the studies of the students involve samples with filtered water and control samples of tap water with spectral methods NES and DNES (Todorov et al., 2008; Ignatov et al., 2021; Ignatov, Huether et al., 2022). Both students and doctoral candidates carry out the analyses in the following manner.

Using the NES method, we conduct analyses on various types of water, including tap water, mountain spring water, glacier water, mineral water, and seawater. We also study the parameters after filtration with zeolite (Popova et al., 2022) and shungite (Ignatov et al., 2022). The training showcases the sizes of non-organic chemical particles, with the size of a water molecule measured at 0.27 nm. Analyses are based on the physicochemical composition of peaks in the NES spectra. Calculations are made using ORP (Oxidation-Reduction Potential) and pH formulas to determine the presence of free electrons, positive ions, H<sup>+</sup> ions, and hydroxyl groups (OH<sup>-</sup>). A comprehensive analysis of the properties of the examined waters is conducted. When examining with filtering systems, analyses are conducted using the DNES method on control samples both before and after filtration. DNES is obtained by comparing the NES of samples and control samples. Statistical analysis is employed to demonstrate the reliability of the results. The analysis also delves into the energy distribution between hydrogen bonds in water molecules, involving research conducted using Nuclear Magnetic Resonance (NMR). According to Luck's research, hydrogen bonds exist between the hydrogen atom of one water molecule and another (Luck, 1980). Most of them are bound by the energy of the connection (-E), while the remaining are considered free (E = 0), with E typically having a negative value. This is known as Luck's two-state model. A model involving the Gaussian distribution of water molecules in clusters was described, aligning with the results obtained from NES and DNES spectrums (Mehandjiev et al., 2022). The students are tasked with conducting Gaussian distribution analyses to study the behavior of water molecules and estimate the size of water clusters. For instance, a dodecahedral cluster with 21 water molecules has a size of 0.822 nm (Ignatov et al., 2021).

#### **4.3. Results with spectral analyses of water with spectral methods NES and DNES**

The NES and DNES spectral methods measurements show a significant difference between the EVODrop water and the control sample with tap water. The result for EVODrop water in the NES spectrum is E=-0.1254 eV, while for the control sample water with tap water, it is E=-0.1132 eV. The value of ΔE for EVODrop water measured by the DNES method is (-0.0112 eV).

The results are average between using the device with ten different water samples after treatment with the EVODrop devices and the 10 control samples with tap water. Ten measurements were performed. Student's t-test was applied. A statistically significant difference was proved between the three groups of results with the samples and control samples according to the

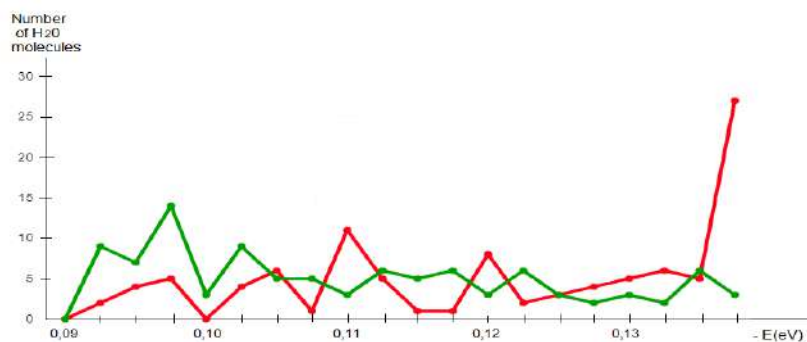
Student's t-test at the  $p < 0.001$  level, t statistic is 27, coefficient of correlation  $r = -0.916$ . There is a strong negative linear relationship.

#### 4.4. Mathematical models of EVODrop water clusters

There was created A mathematical model of water molecule numbers according to the energy of hydrogen bonds in EVODrop water (Ignatov, Mosin, 2013a; Ignatov et al., 2022) has been developed (Table 2, Figure 3).

**Table 2.** Distribution of the number of water (H<sub>2</sub>O) molecules in EVODrop water according to the energy of hydrogen bonds

-E(eV) x-axis	EVODrop® Water (Samples) Number of water molecules	Tap water (Control Samples) Number of water molecules	-E(eV) x-axis	EVODrop® Water (Samples) Number of water molecules	Tap water (Control Samples) Number of water molecules
0.0912	0	0	0.1162	1	5
0.0937	2	9	0.1187	1	6
0.0962	4	7	0.1212	<b>8<sup>2</sup></b>	<b>3<sup>2</sup></b>
0.0987	5	14	0.1237	2	6
0.1012	0	3	0.1262	3	3
0.1037	4	9	0.1287	4	2
0.1062	6	5	0.1312	5	3
0.1087	1	5	0.1337	6	2
0.1112	<b>11<sup>1</sup></b>	<b>3<sup>1</sup></b>	0.1362	5	6
0.1137	5	6	0.1387	<b>27<sup>3</sup></b>	<b>3<sup>3</sup></b>



**Fig. 3.** Distribution of the number of water (H<sub>2</sub>O) molecules in EVODrop (red color) water and tap water (green color)

Water molecules were structured in clusters with a mathematical model.

Notes:

$E = -0.1112$  eV;  $\lambda = 11.15$   $\mu\text{m}$ ;  $\tilde{\nu} = 897$   $\text{cm}^{-1}$  is the local extremum for the conductivity of calcium (Ca<sup>2+</sup>) ions (Soares et al., 2020), (Ignatov, Valcheva, 2023).

$E = -0.1212$ ;  $\lambda = 10.23$   $\mu\text{m}$ ;  $\tilde{\nu} = 978$   $\text{cm}^{-1}$  is the local extremum for anti-inflammatory effect (Ki et al., 2016) (Ignatov et al., 2022).

$E = -0.1387$  eV;  $\lambda = 8.95$   $\mu\text{m}$ ;  $\tilde{\nu} = 1117$   $\text{cm}^{-1}$  is the local extremum inhibiting molecular level tumor cell development.

The local extremum at  $\tilde{\nu} = 1117$   $\text{cm}^{-1}$  exists in the cancer cell spectrum (Lasalvia et al., 2022) (Neshev et al., 2022).



The t-test of Student had the following results –  $p < 0.05$ , t-statistic (-2.04), coefficient of correlation  $r = (-0.168)$  for the results of water clusters with several molecules for group and control group.

Table 3 shows the students' results with a manual calculation of the t-test of Student.

**Table 3.** Results of students with manual calculation of the t-test of Student

Results	
Excellent	22
Very good	5
Good	5

The water molecule has a size of 0.27 nm. Hydrogen bond length is 1.5-2.6 Å or 0.15-0.26 nm. The covalent bond length is 0.096 nm. Hydrogen bond strength between two water molecules is 5-6 kcal/mol or 0.22-0.26 eV.

The results for different types of hexagonal water clusters for the wavenumbers  $\tilde{\nu}$  are 929, 992, 1117, 3072, and 3171  $\text{cm}^{-1}$ . There are wavenumbers of hexagonal water clusters with different combinations of water molecules for  $n=6$  (Table 4) (Heine, 2013).

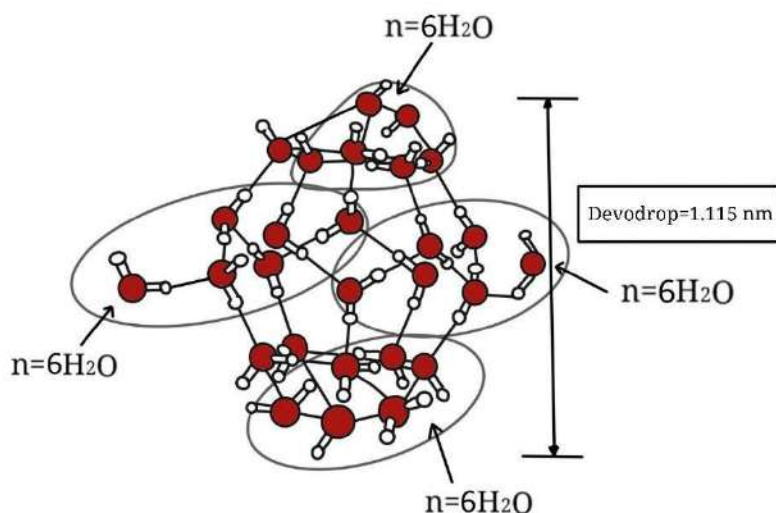
**Table 4.** Wavenumbers of hexagonal water clusters with different combinations of water molecules for  $n = 6$

Combinations Hexagonal water clusters	$\tilde{\nu} (\text{cm}^{-1})$	$\tilde{\nu} (\text{cm}^{-1})$	$\tilde{\nu} (\text{cm}^{-1})$	$\tilde{\nu} (\text{cm}^{-1})$	$\tilde{\nu} (\text{cm}^{-1})$
1st combination	929	992	1117	3072	3171
2d combination	929	992	1117	3072	
3rd combination	929	992	1117		
4th combination	929		1117		
5th combination			1117		

The EVODrop water cluster model comprises 27 water molecules at  $E = -0.1387 \text{ eV}$ ;  $\lambda = 8.95 \mu\text{m}$ ;  $1117 \text{ cm}^{-1}$ . The cluster is structured from 4 hexagonal groups with 6 water molecules and 3 additional molecules (Figure 4).

This represents approximately a circumscribed sphere where the size of the EVODrop cluster is:  $0.822 + 0.293 = 1.115 \text{ nm}$  with a basic frequency of hydrogen bonds  $\nu = 33.56 \cdot 10^{12} \text{ Hz} = 33.56 \text{ THz}$ .

A bigger cluster brings more energy into the water flow of structuring EVODrop water.



**Fig. 4.** The function  $f(E)$  is the spectrum of distribution based on energies of hydrogen bonds of EVODrop water and is measured in  $\text{eV}^{-1}$

The highest local extremum for EVOdrop water is  $128.3 \text{ eV}^{-1}$  at  $(-0.1362 \text{ eV}; 9.10 \text{ }\mu\text{m}; 1099 \text{ cm}^{-1}) - (-0.1387 \text{ eV}; 8.95 \text{ }\mu\text{m}; 1117 \text{ cm}^{-1})$ . The value is responsible for the antitumor effect. The results from NES for E and DNES for  $\Delta E$  show that the wetting angle at the EVO drop water is more significant than that of the tap water (control sample). The present investigation highlights the relationship between the number of water molecules and the energy of hydrogen bonds, which may serve as a starting point for future research.

**4.5. Problem for Students on Hexagonal Cluster Structure of Water Molecules**

The water molecules structure water hexagonal clusters in the liquid phase of water. Six water molecules have stable hexagonal structures in the solid phase of water (Kuo et al., 2001; Ignatov et al., 2013b). Gluhchev, created the following mathematical problem (Ignatov et al., 2022). The regular hexagon is the only regular polygon whose distance from the center to any vertex equals the distance between two adjacent vertices. Let's consider a regular polygon with center point O and points P and Q as two adjacent vertices. We'll denote the side length as R and  $\alpha$  as the central angle ORQ, equal to  $360^\circ/p$ . Let point M be the midpoint of side PQ. From the right triangle OMR, we have

$$MP/OP = R/(2OP) = \sin(\alpha/2) = \sin(360^\circ/2n)$$

$$OP = R/2\sin(360^\circ/2n)$$

For  $OP = R$  the result is

$$R = R/2\sin(360^\circ/2n)$$

or

$$\sin(360^\circ/2n) = 1/2 \text{ or } 360^\circ/2n = 30^\circ \text{ или } n = 6.$$

With this, the theorem has been proven.

Corollary: If  $p < 6$ , then  $\alpha > 60^\circ$ , and  $OR < R$ ; if  $p > 6$ , then  $\alpha < 60^\circ$ , and  $OR > R$ .

Hypothesis: In a planar ring-like structure of a water cluster with  $p < 6$ , having an H atom at the center is impossible due to the limitation of permissible distances between atoms. With  $p > 6$ , the distance from the central atom to the atoms at the vertices is greater than the distance between two adjacent atoms of the polygon, resulting in a weaker bond.

Conclusion: A hexagon is the most stable configuration of a planar cluster, representing a regular polygon with an atom at the center.

Table 5 illustrates the results from the mathematical task of 32 students with estimation of hexagonal structures and the connection of the results that the snowflakes have six vertices.

**Table 5.** Results with a mathematical task for estimation of hexagonal structures

Results/Information about six vertices of the snowflake		
Excellent	18	16
Very good	9	7
Good	5	9

Based on the Mann-Whitney U test, there is no significant difference between the two groups. The base that the snowflakes have six vertices helps with the decision of the mathematic problem, with excellent results from 56 % of the students.

The results of different types of water were studied (Table 6) (Ignatov, Valcheva, 2023).

**Table 6.** Results of different types of water for the value of local maximums for (-E)

Type of Water	Value $\text{eV}^{-1}$ of Local Extremum at $(0.1362-0.1387 \text{ eV})$
Deionized water	$18.2 \pm 1.2$
Mountain water from Vasiliovaska mountain, Bulgaria	$44.9 \pm 2.2$
Northern Rhodope	$59.3 \pm 3.0$
Glacier Rosenlauri, Switzerland	$70.1 \pm 3.5$
Glacier Mappa, Chile	$81.3 \pm 4.1$
Tap water from Zurich before the EVODROP device	$38.3 \pm 1.9$
EVODROP drinking water	$128.3 \pm 6.5$

The parameters from table 5 at (-0.1362 eV; 9.10  $\mu\text{m}$ ; 1099  $\text{cm}^{-1}$ ) – (-0.1387 eV; 8.95  $\mu\text{m}$ ; 1117  $\text{cm}^{-1}$ ) for EVOdrop water are a result of water filtration, vortexing, and magnetic effects (Huether, 2019; Ignatov et al., 2022).

**4.6. Research of hardness of EVOdrop water**

Table 7 illustrates the results with a hardness of water using the EVOdrop device.

**Table 7.** Results with a hardness of water under the influence of the EVOdrop device

Number of samples*	hardness of water (mgeqv.L <sup>-1</sup> ) Tap water	hardness of water (mgeqv.L <sup>-1</sup> ) EVOdrop water	hardness of water difference (mgeqv.L <sup>-1</sup> )
6870; 6869	5.29±0.26	2.71±0.14	2.58±0.13
7064; 7063	2.72±0.14	0.49±0.05	2.23±0.11
average result	4.04±0.20 very hard water	1.60±0.08 moderately hard water	2.44±0.12

Table 7 shows the pH results with the influence of the EVOdrop device

**Table 8.** pH results with the influence of the EVOdrop device

Number of samples*	Water pH Tap Water	Water pH EVOdrop water
6870; 6869	7.83±0.11	7.80±0.11
7064; 7063	7.64±0.11	7.12±0.11
average result	7.74±0.11	7.46±0.11

The data\* are from the accredited Laboratory Eurotest Control, Sofia, Bulgaria.

The hardness of EVOdrop water is 7.02±0.35 mgeqv.L<sup>-1</sup>. The difference 7.82-7.02=0.8±0.04 shows the effect of decreasing the hardness of tap water by the EVOdrop water device.

The difference between the pH of tap water and EVOdrop water is 7.74-7.46=0.28

The external magnetic fields structure and increase the energies of hydrogen bonds between the water molecules. Hydrogen ions (H<sup>+</sup>) increase (Purnami et al., 2020; Mehandjiev et al., 2023). The amount of hydrogen ions (H<sup>+</sup>) in EVOdrop water is 1.91 bigger than in the control sample. The difference is 16477 mM.

Table 9 illustrates the students' results from 32 students with manual calculation of the amount of hydrogen ions (H<sup>+</sup>) in water from pH values.

**Table 9.** Results of students with manual calculation of the amount of hydrogen ions (H<sup>+</sup>) in water from pH values.

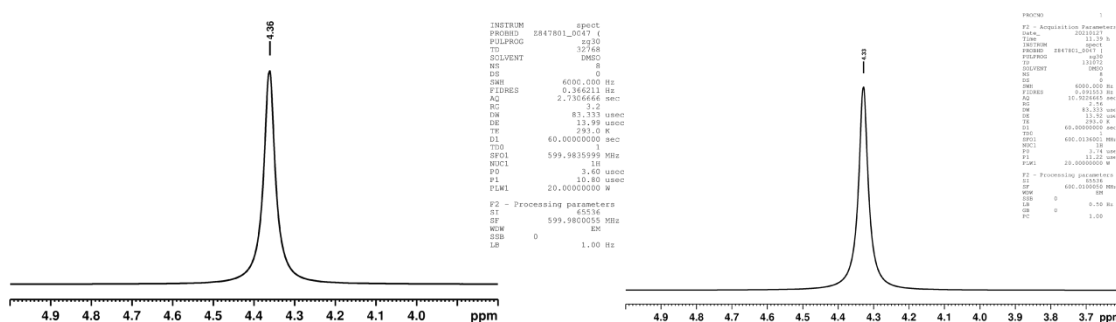
Results	
Excellent	27
Very good	3
Good	2

#### 4.7. Results of EVODrop water with $^1\text{H}$ NMR

Nuclear Magnetic Resonance (NMR) is a physical phenomenon in which a weak, oscillating magnetic field distributes nuclei within a strong, constant magnetic field. In response, they emit an electromagnetic signal with the characteristic of the magnetic field strength at the nuclei.

The  $^1\text{H}$  NMR spectra were measured on Bruker Avance II+ 600 NMR spectrometer using a 5 mm direct detection dual broadband probe (Stroobants et al., 2014). The experiments were performed at a temperature of 293 K.  $^1\text{H}$  NMR spectra were acquired with 128K time domain points, spectrum width of 9600 Hz, 16 scans, and a 60 s relaxation delay. The chemical shifts were connected to the DMSO-d6 resonance used as an external reference (2.5 ppm). The DMSO-d6 was placed in a coaxial capillary in the sample tube and used as a lock signal.

The results of EVODrop water and control samples with  $^1\text{H}$  NMR are shown in Figure 5.



**Fig. 5.** Results of EVODrop water and control sample of tap water with  $^1\text{H}$  NMR

Here we find the following parameters:

EVODrop water Sample – Chemical shift = 4.36 ppm, line widths  $\nu_{1/2} = 17.7$  Hz

Control sample – Chemical shift= 4.33 ppm, line widths  $\nu_{1/2} = 16.9$  Hz

Bigger chemical shifts correspond to bigger clusters (Gruenberg et al., 2004).

The results show that in EVODrop water, more extensive sets are structured compared to the control tap water samples.

Analyses of the structuring of hydrogen bonds between water molecules are performed on students in order to understand the dynamic processes in water.

The signal area determines the number of nuclei of hydrogen atoms and ions (Oka et al., 2019). A larger line width  $\nu_{1/2}$  means faster relaxation of hydrogen nuclei. The increased relaxation rate with NMR is observable in natural water (Elgarbarty, Khaliullin, 2015). Education in physics and chemistry is complementary (Rogach et al., 2018; Gruzina et al., 2020) and has different applications and natural sciences, industry, sport, agriculture, and veterinary medicine. This education develops statistical methods for comparing different scientific results (Sidorov et al., 2018). One of the applications is modeling the water processes with acid rain (Popova et al., 2019).

#### 5. Conclusion

The EVODrop drinking water treatment technology, in addition to reducing hardness and preserving the pH level of treated tap water, has been shown to significantly rearrange water molecule clustering toward greater similarity to, or even superior to, that of high-quality natural waters.

The authors created a model with 27 water molecules in clusters at  $E = -0.1387$  eV;  $\lambda = 8.95$   $\mu\text{m}$ ;  $1117$   $\text{cm}^{-1}$ . This cluster penetrates ion channels with sizes from 5 to 100 nm better than smaller clusters.

The cluster with 27 water molecules is structured from 4 hexagonal groups with 6 and 3 additional molecules.

Therefore, further research could be conducted on scaling up this technology for wastewater treatment. It can be expected that such a development would lead to more effective protection of the environment.

This comprehensive research significantly advances our understanding of water filtration processes and the structural properties of water clusters. The utilization of advanced techniques, including spectral analyses and mathematical modeling, has provided valuable insights into the effects of filtration on water quality and cluster organization. Incorporating students into practical experiments involving Non-equilibrium energy spectrum (NES), Differential non-equilibrium energy

spectrum (DNES), pH, oxidation-reduction potential (ORP), and Nuclear Magnetic Resonance (NMR) exemplifies a commitment to hands-on learning and skill development in physics and chemistry. This educational approach not only enriches the students' academic experience but also equips them with valuable skills applicable in medical biophysics and nanotechnologies.

The comparison of samples from the EVODrop device with control tap water samples, supported by statistical analysis using the Student's t-test, provides robust evidence of the significant impact of the filtration process on water properties. The observed variations in Non-equilibrium Energy Spectrum (NES) and Differential Non-equilibrium Energy Spectrum (DNES) between treated and untreated water samples highlight the effectiveness of the EVODrop system.

The preference for visual aids, particularly figures, over tables among students underscores the importance of visualization in enhancing comprehension. The mathematical modeling of water clusters, particularly in relation to hydrogen bonding and hexagonal structures, serves as a valuable educational tool, making complex concepts more accessible.

Furthermore, the exploration of different water sources and their energy distributions highlights the diverse nature of water clusters, influenced by environmental and geographical factors. This knowledge is crucial in understanding the variability in water properties and lays the groundwork for further research in this field.

### **Directions for Student Education:**

1. **Hands-On Experimentation:** Encourage students to actively participate in experiments involving NES, DNES, pH, ORP, and NMR. Providing opportunities for practical application reinforces theoretical knowledge.

2. **Visualization Tools:** Emphasize the use of visual aids, such as figures and diagrams, to facilitate a deeper understanding of complex concepts related to water clusters and filtration processes.

3. **Mathematical Modeling:** Foster students' skills in mathematical modeling, particularly in areas concerning hydrogen bonding and cluster structures. This will empower them to approach complex problems with confidence.

4. **Environmental Context:** Explore the influence of environmental and geographical factors on water clusters. Encourage students to consider the broader implications of their research in real-world contexts.

5. **Interdisciplinary Learning:** Encourage interdisciplinary thinking by establishing connections between physics, chemistry, and related fields. This approach enhances students' ability to address complex scientific challenges.

6. **Research Opportunities:** Provide avenues for students to engage in independent research projects, enabling them to explore specific areas of interest within water science.

In essence, this research not only contributes significantly to the scientific understanding of water filtration and cluster structuring but also sets a high standard for educational practices in the fields of physics and chemistry. The hands-on approach, coupled with advanced analytical techniques, equips students with practical skills and fosters a deep appreciation for the complexities of water science. The implications of this research extend beyond academia, potentially influencing applied fields such as medicine and nanotechnology. The dedication and innovation demonstrated in this study are commendable and represent a valuable contribution to the field of water research.

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