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Impact of Psychological Training on the Development of Professionally Important Qualities of an Educational Psychologist

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Abstract

The experimental study aims to investigate the impact of specially organized psychological training on the professional sensitivity of educational psychologists in perceiving and assessing the personal and behavioral features of schoolchildren. The study utilizes a mixed approach including an analytical and theoretical review of psychological and pedagogical literature and an experiment with educational psychologists from Kazakh schools. The authors employ various psychological tools and assessment methods, including tests to evaluate social intelligence, emotional intelligence, and professional qualities, followed by statistical analysis to assess changes in professional sensitivity. The theoretical analysis discloses the relationship between the improvement of professional sensitivity of an educational psychologist in the perception and assessment of a school student's personality and behavioral characteristics and the specially organized psychological training designed to promote the successful development of professional sensitivity in educational psychologists. Based on the analysis of theoretical provisions regarding the development of professional sensitivity of educational psychologists, the authors clarify the essence of the term "professional sensitivity of an educational psychologist". This theoretical approach serves as a basis to substantiate the process of improvement of the professional sensitivity of an educational psychologist to the perception and assessment of a school student's personality and behavioral characteristics. The study substantiates the provision that specially organized psychological training contributes to the successful development of professional sensitivity in educational psychologists. Experimental findings show a significant improvement in educational psychologists' professional sensitivity after the training. The experimental group demonstrates a marked increase in the indicators of social intelligence (+21.7 %), emotional

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intelligence (+76.3 %), and such professionally important qualities as empathy (+85.3 %) and self-motivation (+49.4 %). On the contrary, the control group displays minimal changes in these parameters. The authors substantiate the high effectiveness of the proposed training for the development of professionally important qualities of an educational psychologist. This is relevant to fostering reflexivity, regulating personal emotions, understanding others' feelings, along with empathy, self-drive, emotional perception, listening skills, and social savvy. Educational establishments are advised to apply the study's findings in practice.

Keywords: professional sensitivity, educational psychologist, perception, evaluation, personality and behavioral characteristics of school students, psychological training.

1. Introduction

Modern educational approaches place a strong emphasis on enhancing the socio-emotional sustainability and intellectual growth of students (Rakhimgalieva et al., 2021; Ybyraimzhanov et al., 2023). Within this context, the role of educational psychologists is very important (Yespolova et al., 2019). There is a broad consensus in contemporary educational theory that students' academic success is closely associated with their emotional and social skills (Stavruk et al., 2023; Nikolaeva, Suslennikova, 2022). However, the psychological support of educational psychologists has been unduly neglected.

The professional path of an educational psychologist has been primarily determined by the acquisition of theoretical knowledge, methodological training, and understanding of fundamental scientific concepts. Although these components constitute a critical foundation, practical training and systematic improvement of professionally important qualities are often overlooked. Thus, many educational psychologists end up unprepared for solving the problems associated with their functions.

An important aspect distinguishing educational psychologists from other educators is their ability to recognize the subtleties of students' experiences and interpersonal interactions (Golubeva et al., 2023). In the study, we emphasize the importance of specific qualities that substantially affect the efficiency of educational psychologists' work: reflection, empathy, listening skills, and observational skills (Ybyraimzhanov et al., 2019; Kapustina, Goyushova, 2024; Fiorino et al., 2022). These qualities form the foundation for facilitating positive interactions and achieving positive outcomes in school psychology (Bayazitova et al., 2023).

A professional educational psychologist, in addition to pedagogical qualities, must have a subtle understanding and sensitivity to all events that occur within the school (Mukataeva et al., 2022; Arrieta-Lopez et al., 2019).

In the field of educational psychology, the ability to genuinely understand and empathize with students is a fundamental principle (Karimova et al., 2022). Although people often evaluate or criticize instinctively, educational psychologists must be trained to take a different approach. This approach is based on the art of active listening, which goes beyond simply hearing the words and allows one to decipher unspoken emotions and intentions. Sensitivity involves using every senses to understand the ongoing situations: intonations, changes in facial expression or body posture, excitement, of other aspects that student may face (Fiorino et al., 2022).

In the context of this study, the most important qualities are reflection, empathy, listening, and observation, which are essential for the successful work of an educational psychologist (Gavrilyuk et al., 2018; Kalitko, Soloveva, 2021; Rybalka, 2022; Vasyagina et al., 2022; Yessimgaliyeva, 2020).

In his article "Some Significant Learnings", C. Rogers (2002) expressed the benefit he found in being able to understand another individual. Often, the initial reaction to someone else's words is to pass judgment rather than to seek understanding. Grasping the essence of another person carries the risk of personal change, unsettling our established equilibrium because it introduces change. Nevertheless, it is important for spiritual growth to discover value in allowing others to share their feelings with each other.

Thus, listening becomes one of the most important skills. Listening involves understanding the unspoken messages they convey. It also means being aware of our own reactions to what is being said, capturing our responses to the words, actions, and behaviors of others. Essentially, reflective listening acts as unbiased feedback to the speaker, helping ensure the listener's interpretation of the message is accurate, because words often carry multiple meanings or have ambiguous definitions. Through reflective listening, we achieve a deeper and more precise comprehension of the communicated message.

E. Atwater (1988) outlines four reflective response techniques: clarifying, paraphrasing, reflecting feelings, and summarizing. It's essential for educational psychologists in practice to master active listening when interacting with students. Frequently, the most significant contribution a psychologist can offer is their undivided attention, striving to comprehend and acknowledge the student's perspective without the intrusion of personal biases, assessments, or judgments.

The adoption of ineffective behavioral strategies could stem from an individual's personality characteristics or a lack of knowledge about actively engaging in the lives of others. Consequently, enhancing professional competencies to cultivate empathy is of primary importance.

Researchers point out three spheres of possible influence on a person for the development of their professional qualities: work with the regulatory sphere, work with the cognitive sphere, and the third way, in which the development of professionally important qualities is achieved through specific exercises, as well as under the conditions imposed on the person by their professional activity.

The present study focuses on the professionally important qualities of an educational psychologist, such as listening skills, empathy, reflection, and observational skills. In our opinion, these are the leading qualities that define the success of professional psychological practice in a school. For this reason, we believe that the third direction, which assumes the development of professionally important qualities through exercises and the impact of the conditions of professional practice, is the most efficient for the development of professional skills. This approach enables educational psychologists to directly apply and advance their skills in real situations, which accurately represents their professional role (Alimova et al., 2023). Furthermore, this approach agrees with the position that such qualities as compassion and communication skills are best developed through practical experience. Such exercises promote adaptability and context awareness, which are essential qualities for educational psychologists who have to navigate a variety of students' situations.

Particularly useful for the development of professional qualities are assertiveness master classes, "gymnastics of feelings". For a person to form a given mental formation (image, concept), it is first necessary to identify the activity that this concept serves. The first task of the teacher is to find or build such an activity. In this case, such an activity is represented by specially selected training exercises (Raigorodskii, 2002).

The choice of training as a means of improving the professional sensitivity of educational psychologists was made from the following considerations:

- Psychological training is one of the most accessible ways to dramatically accelerate group learning which is achieved through strong emotional reinforcement and enhanced feedback. The person becomes what they are in themselves through what they are to others. Individuals evolve through interactions, as these interactions contribute to a more authentic and profound self-reflection and self-awareness, according to Pogrebnaya (2021) and Rogers (2002);

- Feedback also stimulates the processes of identification and reflection. According to Kabbassova, Sakenov (2021), Koishigulova, Kisamedenova (2020), and Mambetalina (2012), identification and reflection intertwine as methods for individuals to understand themselves through the lens of others;

- The process of reflection, unfolding in the context of joint activity (which, of course, training is), is defined as the subject's attention to themselves and their consciousness, in particular, to the products of their activity, as well as any rethinking of them, and also as the subject's awareness of how they are perceived and evaluated by others;

- A person can learn to act and think only on their own, by thinking, acting, and doing. Training provides such an opportunity and offers favorable conditions when the cost of error is insignificant. Training also allows the participants to appropriate the acquired experience, to subject it to reflection, criticism, and, consequently, development;

- The group method of work allows increasing the intensity and persistence of emerging changes, maximizing the opportunities of each participant. Exercises, games, and obligatory rituals included in the training program serve as a means of correcting one's behavior (Sergeeva et al., 2021). The person begins to realize the possibility of voluntary mastery of their behavior using the experience accumulated by other people. This method promotes the voluntary control over one's actions, enriches analytical skills, and underscores the benefits of analytical methods;

- Training is used at different stages of education and practice of educational psychologists.

Thus, the relevance of the chosen topic is determined by the fact that the issue of developing professionally important qualities stems from the need to improve the professional sensitivity of

the educational psychologist to the perception and evaluation of the features of personality and behavior of school students.

The purpose of the present study is to empirically confirm that the use of specially organized psychological training improves the professional sensitivity of educational psychologists in perceiving and evaluating the features of school students' personalities and behavior.

2. Methods
Study design:

To achieve the purpose of the study, we adopted an approach, which included quantitative research methods. The study was conducted in 2023 in schools in Kazakhstan.

Participants:

The study covered 140 beginner and practicing educational psychologists. Selection criteria included professionals aged 20 to 29 at varying levels of experience, which provided a diverse and representative sample. The participants were divided into two groups: experimental and control. The distribution was done randomly to ensure the equivalence of the groups. A computer-generated random number sequence was employed to allocate participants into two groups. Individuals assigned an even number were placed in the experimental group, those with an odd number – to the control group. This method ensured that each participant had an equal chance of being assigned to either the control or the experimental group, thereby minimizing selection bias.

The motivation for participation in the study of educational psychologists was their striving for self-knowledge and self-improvement.

The study was conducted in several stages:

Stage 1. Analytical review and theoretical study of psychological and pedagogical literature. We examined modern approaches to the development of professional qualities of an educational psychologist by the following authors: Oltarzhevskaya et al. (2022), Manashova et al. (2021), Vasileva (2020), Sakenov et al. (2022), Dombek, Lebedeva (2021), Kaziyev et al. (2020), Kabbassova et al. (2021).

Stage 2. Primary diagnostics aimed at establishing baseline indicators of professionally important qualities among all participants.

Assessment was carried out using the following tests:
- A.V. Karpov's "Diagnostics of Reflection";
- A. Mehrabian's "Measure of Emotional Empathy";
- N. Hall's "Emotional Intelligence Test";
- A.G. Gaishut's "Can You Listen?"

Stage 3. A training program developing professionally important qualities of an educational psychologist was developed and used, followed by repeated assessments using the same methods.

The control group, consisting of 70 educational psychologists, received no special training during the study period. They continued to perform their usual professional duties, which included providing psychological support to students, without the structured training provided to the experimental group.

The practical exercises included in the training program for educational psychologists of the experimental group were designed to provide participants with practical experience and opportunities to apply their theoretical knowledge in real situations. These exercises were aimed at enhancing their professionally important qualities and included the following.

Active Listening Practice: The students participated in simulated student-teacher interactions, where they practiced active listening techniques, such as paraphrasing, summarizing, and reflecting feelings.

Conflict Resolution Simulations: Role-play scenarios were created to mimic real-life conflicts that students might face.

Counseling Role-Plays: Through one-on-one role-plays, the study participants took on the role of a counselor and student and interacted with a student facing various issues. This allowed them to apply counseling techniques, empathy, and effective communication strategies.

Group Counseling: The participants designed and led group counseling sessions for their peers.

Case Analysis: Complex case studies were provided, and the participants were asked to analyze them. They had to identify underlying issues, devise action plans, and make decisions based on their assessments.

Observation and Feedback: The educational psychologists spent time observing actual classroom situations and provided constructive feedback to each other.

Role-Playing Scenarios: Challenging scenarios were presented, and the participants practiced responding appropriately. These scenarios covered various aspects of their role, from dealing with emotional students to addressing behavioral issues.

Self-Reflective Journaling: The participants were encouraged to maintain reflective journals. They wrote about their experiences, self-assessments, and insights gained during the training, promoting self-awareness and self-improvement.

Peer Consultation: The students engaged in peer consultation sessions, discussing challenging cases and seeking input from colleagues. This fostered a collaborative learning environment and provided different perspectives on problem-solving.

Assessment and Feedback: Regular assessments of students' performance were conducted, and feedback was provided to help them understand their strengths and areas requiring improvement.

Stage 4. Data analysis and interpretation. The statistical package "Stadia" (author A.P. Kulaichev; registration No. 1205) (Raigorodskii, 2002) and the t-test of independent variables at the significance level of p = 0.05 were used to process the results.

To analyze the data and confirm the results, we used the following hypotheses.

The null hypothesis (H0): the specially organized psychological training does not significantly improve the professional sensitivity of educational psychologists' ability to discern and evaluate the unique personality traits and behavioral patterns of students.

The alternative hypothesis (H1): the specially organized psychological training could greatly improve the professional sensitivity of educational psychologists to accurately perceive and assess the distinct personality traits and behavioral tendencies of students.

3. Results

Initial assessments of social intelligence revealed that participants had average and below average ability to understand behavior, demonstrated poor skills in interpreting behavior, faced challenges in in understanding and forecasting others' actions in a communication situation, and problems in social adaptation.

Similarly, initially evaluations of emotional intelligence showed that a majority of the participants were ineffective at recognizing and managing their own emotions, understanding others' feelings, or providing support during emotionally challenging situations.

According to "Diagnostics of Reflection", "Measure of Emotional Empathy", "Self-Monitoring Scale", and "Can You Listen?" by A.G. Gaishut (Raigorodskii, 2002), the highest results in primary diagnostics were observed in the indicators of listening skills development and self-control in communication, and the lowest results were found in the indicators of reflection and empathy development.

According to the results of repeated diagnostics of social intelligence, authors suggest that participants had developed their capacity to interpret behavior to average and above average levels. Students demonstrated ability to understand behavior, identifying verbal and non-verbal expressions of behavior, recognized common properties in the flow of expressive and situational information about behavior, understood and predicted behavior and attitudes, and understood the logic of the development of holistic situations of people's interaction and the meaning of their behavior in these situations (Table 1).

Table 1. Comparative Analysis of Initial and Follow-Up Diagnostics of Social Intelligence Development Using Guilford's Methodology

Indicator, points	Control group	Experimental group	t-value*
Subtest 1	3.1	3.6	-4.7246
Subtest 2	2.3	2.9	-3.0736
Subtest 3	2.7	3.0	-1.5596
Subtest 4	2.0	2.6	-2.0364
Cumulative Result	2.3	2.8	-4.3712

* p-value – 0.05

The differences in the mean values of primary and repeated assessments are statistically significant at the 0.05 significance level (or 95 % confidence level); therefore, H1 is rejected.

Repeated assessment of emotional intelligence shows that most respondents had a developed ability to recognize and cope with their own emotions, understand the experiences of other people, and support them in emotionally challenging situations (Table 2).

Table 2. Results of comparative analysis based on "Emotional Intelligence Test"

Indicators of analysis	Results of the test by scales, points					
	Emotional awareness	Managing your emotions	Self-motivation	Empathy	Recognizing the emotions of other people	Integral level
Control group	9.8	3.5	7.9	6.8	5.8	33.8
Experimental group	14.3	8.0	11.8	12.6	12.9	59.6
Difference of indicators, %	45.9	128.6	49.4	85.3	122.4	76.3
t-value	-26.63	-26.63	-23.05	-34.21	-41.42	-151.48

* p-value – 0.05

The t-values for all the indicators are highly negative, reflecting the substantial differences between the primary and repeated diagnosis groups. The results of the study provide strong evidence against H0 and in favor of H1. The substantial improvements in various aspects of emotional intelligence and integrative skills among the participants who underwent the psychological training program suggest that such training significantly enhances the professional sensitivity of educational psychologists.

According to "Diagnostics of Reflection", "Measure of Emotional Empathy", "Self-Monitoring Scale", and "Can You Listen?", high results were observed by the indicators of the ability to listen and self-control in communication (Table 3).

Table 3. Result of comparative analysis of data using the deployed methods

Indicators of analysis	Results of the test by scales, points				
	"Diagnostics of Reflection"	"Measure of Emotional Empathy"	"Self-Monitoring Scale"	Test 1 "Can You Listen?"	Test 2 "Can You Listen?"
Control group	3.0	4.5	5.0	47.2	70.6
Experimental group	7.1	5.6	6.3	29.2	74.8
Difference of indicators, %	136.7	24.4	26.0	-38.1	5.9
t-value	-14.14	-3.32	-4.14	13.46	-14.85

* p-value – 0.05

The t-values calculated for various methodologies and tests indicate significant differences in the results between the primary and repeated diagnostics, supporting H0. Specifically, "Diagnostics of Reflection," "Measure of Emotional Empathy," and "Self-Monitoring Scale" all show substantial changes in scores, implying that the diagnostic sessions had a significant impact on these indicators. Additionally, "Can You Listen?" (Test 1 and Test 2) also demonstrate significant differences. Notably, Test 1 scores increased in repeated diagnostics, while Test 2 scores decreased. These findings collectively suggest that the diagnostic sessions had a notable influence on the measured parameters and underscore the significance of the changes observed in these assessments.

The novelty and originality of our study are demonstrated by the fact that, unlike the studies by S.K. Pogrebnaya (2021), V. Rybalka (2022), and A.S. Mambetalina (2012), it substantiates the enhancement of educational psychologists' professional sensitivity. Firstly, participants demonstrated an improved capability to perceive behaviors, discerning both verbal and non-verbal cues within various contexts, identifying shared traits in a range of expressive and situational

behavioral information, and accurately predicting behaviors and attitudes. Secondly, through repeated assessments of emotional intelligence, the majority of participants were able to recognize and manage their emotional states, empathize with others' experiences, and offer support in emotionally challenging situations. Moreover, tools like "Diagnostics of Reflection," "Measure of Emotional Empathy," "Self-Monitoring Scale," and "Can You Listen?" revealed significant improvements in listening skills and self-regulation in communication as some of the most enhanced aspects post-training.

By the end of the experiment participants developed a deeper understanding of the developmental logic of human interactions and the shifting dynamics when new individuals engage in communication. Through logical deduction, participants became adept at identifying missing elements in interaction chains, predicting future behaviors, and understanding the motivations behind certain actions. Their capacity to grasp the goals, intentions, and needs of communication participants and to foresee the outcomes of behaviors also saw substantial growth.

To address the limitation of the study it is important to mention that the participants were selected from a specific geographic and professional context, which may limit the applicability of the findings to educational psychologists working in different cultural or educational settings.

4. Conclusion

Based on the results of the study, we have examined the effects of psychological training on the development of professionally important qualities in educational psychologists. The results provided evidence that such training significantly enhances key competencies including emotional intelligence, empathy, self-motivation, and social intelligence. Specifically, the experimental group, subjected to the psychological training, showed marked improvements in these areas compared to the control group, which did not receive the training.

Importantly, the study's findings have practical implications for the training and development of educational psychologists. They suggest that incorporating structured psychological training programs into educational curricula could better equip psychologists to address the complexities of their roles within schools.

It was discovered by the authors that targeted psychological training plays a significant role in enhancing the professional sensitivity of educational psychologists, that fully confirming the hypothesis.

The suggested approach may benefit education institutions in structuring psychological assistance for educational psychologists, thereby easing their transition into their professional roles.

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Pedagogical Technology of Formation and Development Creative-Constructive Modus of Younger Generation's Civic Activity

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Abstract

The pedagogical technology of the formation of a creative and constructive mode of student civic engagement is described in this manuscript. The authors understand it as the consistent implementation of pedagogical actions to actualize civic self-determination, create conditions for the self-realization of the personality of students in socially useful activities, assist in their awareness of personal meanings, form a system of civil relations with social institutions, with people around them. The organizational forms of this technology are round tables, meetings of the scientific research society of students of pedagogical direction, thematic teleconferences, pedagogical studios, scientific and practical conferences. The implementation of pedagogical technology for the formation of a creative and constructive mode of civic activity among students is carried out through specially developed programs. Information and communication methods, pedagogical dialogue, group discussion, brainstorming, simulation games, social design are the main methods of implementing the developed programs. The scientific novelty of the research is due to the use in the pedagogical technology of the development of the creative and constructive mode of civic activity of the younger generation of diagnostic tools for determining the level of formation of the younger generation of a creative and constructive civil-patriotic position. It includes an expert's assessment and self-assessment. This makes it possible to supplement scientifically based information on the correlation of pedagogical phenomen of civic engagement, citizenship, civic-patriotic self-determination on civic-patriotic education and personal education. The results of the work can be used by applicants and graduate students in the scientific specialty "general pedagogy, history of pedagogy and education" on the issues of educational activities of the younger generation, teachers, educators, teachers of additional education on civil and patriotic education of youth.

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Keywords: a creative and constructive modus of civic activity students, education, the pedagogical technology of the formation of a creative and constructive modus of civic activity, issues of formation of a civic position.

1. Introduction

The scientific problem is to obtain new fundamental knowledge in solving the problem of the development of the creative and constructive mode of civic activity of youth, its influence on the civic position, technology and programming of socio-civic behavior of students (Belentsov, 2019).

The relevance and importance of the described problem are due to the illegal actions of the younger generation and their social manifestations. This creates a big social and psychological-pedagogical problem.

The aspect considered in this article corresponds to the current scientific theme of the Strategy of Scientific and technological Development of the Russian Federation to counter man-made, socio-cultural threats, terrorism and extremist ideology. It also contains ideas for the use of natural methods of prevention and the creation of real conditions for the development of a creative and constructive mode of civic activity of youth.

The scientific novelty of the manuscript lies in a significant solution to the scientific problem of the formation and development of a creative and constructive mode the civic activity of youth, the development of pedagogical technology for its development. This should be used to improve educational work with young people, to overcome their intolerance and social radicalism.

All the mechanisms for the formation of a creative and constructive modus of civic activity were taken into account by us when developing software and technological support for the implementation of the model.

The software and technology component of the model contains a schematic description of the pedagogical technology for the formation of a creative and constructive modus of civic activity of students, organizational forms, methods and methodological techniques for its implementation in the process of pedagogical support of students' activities.

The pedagogical technology of forming a creative and constructive modus of civic activity among students is a consistent implementation of pedagogical actions to actualize civic self-determination, create conditions for the self-realization of the personality of students in socially useful activities, assist in their awareness of personal meanings, form a system of civil relations with social institutions, with people around them (Martynov, 2020).

Round tables, meetings of the scientific research society of students of pedagogical direction, thematic teleconferences, pedagogical studios, scientific and practical conferences act as organizational forms.

2. Materials and methods

A systematic approach (a set of interrelated parts with a purpose, content, results); axiological (socio-pedagogical values with a basis in affirming the value of human life, creative activity and humanistic-semantic communication); humanistically oriented approach (freedom and uniqueness of the human personality, its continuous development and self-realization) are the methodological and theoretical foundations of this study.

Modern methods were used. Theoretical methods (analysis, synthesis, technology development); empirical methods (conducting final diagnostics, expert assessment, conducting formative and control experiments), statistical and mathematical methods (percentage ratio, calculation using Student's t-test) have become fundamental for writing this manuscript.

Questionnaires developed by the author, expert assessment forms, as well as valid methods served as diagnostic tools for pedagogical observations and pedagogical monitoring.

The Student's T-Test (T-Test) is a statistical test for comparing the arithmetic means of two groups. T-Test can only be used when comparing the averages of two groups (the so-called pairwise comparison).

The test assumes. Data:
- are independently,
- distributed (approximately) normally,
- have the same amount of variance in each compared group (so-called uniformity of variance).

Important criteria for the formation of a creative and constructive modus.

The following are defined for youth civic activity:
- cognitive (theoretical concepts of youth),
- reflexive (students' ability to think about their constructive civic behavior,
- behavioral (students' opposition to aggression and negative behavior).

L. Bayborodova's methodology "Diagnostics of the level of education" is used to determine the civic education of students. I. Kuzmina's test "Assessment of value orientations in patriotic consciousness" is used to measure the value orientations of students. The questionnaire of tolerance of G. Soldatova's youth was intended to identify the attitude of the younger generation to the world and to people.

3. Results

The implementation of pedagogical technology for the formation of a creative and constructive mode of civic activity among students is carried out through specially developed programs. Information and communication methods, pedagogical dialogue, group discussion, brainstorming, simulation games, social design are their main methods.

The pedagogical studio is one of the effective means of forming a creative and constructive mode of civic activity of students. The pedagogical studio is one of the modern forms of forming a positive civic position of students through the interaction of a team of like-minded people. The conditions of the pedagogical studio allow you to get involved in active search and creative research and build your own activities on a reflexive basis, taking into account objective and subjective factors. Mastering a specific problem simultaneously at three levels (theoretical, methodological and technological) is the main goal of the pedagogical studio.

Important features of the studio form are the transfer of educational activities from the mode of obtaining information to the interactive mode of joint search, the alternation of individual and group work, the priority of organized interactive communication, reflection, consideration of individual requests of each student.

For example, the All-Russian pedagogical studio "The Phenomen of childhood in modern socio-cultural conditions" for the International Children's Day within the framework of the Decade of Childhood was conducted as part of the study.

Teachers and students of Kursk State University, Chelyabinsk State Institute of Culture, Humanitarian and Pedagogical Academy (branch) The Crimean Federal University named after V.I. Vernadsky in Yalta, Lugansk State Pedagogical University discussed the scientific foundations of the formation of creative and constructive approaches to civic activity of the younger generation.

All participants unanimously noted the need to implement a state policy on the formation of a positive civic position of the younger generation, the implementation of measures to reduce the negative consequences on children due to changing conditions of social reality, the development of a mechanism for taking into account the interests of children as a special category of citizens.

The monitoring component of the model contains a description of the process of pedagogical monitoring of the level of formation of the creative and constructive mode of civic activity among students. The diagnostic monitoring tools are defined here and the results of the implementation of the developed model are also reflected.

Thus, the formation of a creative and constructive mode of civic activity is possible with purposeful specially organized educational work. It should be targeted with a focus on each student, based on the provisions of a comprehensive, axiological, humanistically oriented approach, ideas of socialization and social activity of the individual.

The process of forming a creative and constructive mode of civic activity is based on a system of universal and traditionally Russian values (collectivism, justice, responsibility), in compliance with the principles of integrity, reflection, continuity of activity and activity.

The implementation of the model proposed by the author is carried out in the conditions of interaction of participants in the educational process of higher education.

Pedagogical technology to ensure the conditions of the developed pedagogical model, to form a creative and constructive mode of civic activity among students has been developed.

Table 1. Pedagogical technology of the creative and constructive mode of civic activity of the younger generation

Development of motivation of students in socially useful activities (stage I)			
Purpose: formation of motivation of students in socially useful activities	The program "I choose my Homeland" includes classes with training elements, consultations, individual and group conversations, role-playing games, designing his future, career guidance conversations.		
Development of the semantic assessment of creative and constructive activity (Stage II)			
Purpose: development of personal meanings among students in socially significant activities	The program "I am a patriot of my Fatherland" Classes with elements of pedagogical dialogue, group discussions, brainstorming, simulation games, presentation of experience, social design		
Formation of the system of social and civil relations of students (stage III)			
Program "Rights and obligations of a citizen" Legal education and development of students of civil-patriotic education	Program "My Nightingale's land" Formation of love and respect for the small motherland	Program "In defense of my Homeland" Military-patriotic education and education of students	Program "Me and my family" Instilling family values to the younger generation with elements of Orthodox rhetoric
Manifestation of creative and constructive civic activity (stage IV)			
Purpose: to create conditions for the implementation of creative and constructive activities	Development and implementation of programs, events, projects. Participation in social service, volunteering and charity in helping children and adults in difficult life situations, patronage of teachers of institutions of social assistance to families and children, organization and holding of university events, work in the scientific research student society of pedagogical education		

The first stage is a motivational block in the developed pedagogical technology. He forms and develops motivation for active participation in socially useful work.

The choice of the term "civic choice and search" as the main result of the first stage of the formation of the creative and constructive mode of civic activity of higher school students is not accidental. The analysis of the literature showed. The category of civic choice in pedagogical science is interpreted very broadly. In fact, this is the so-called "neoplasm" of the personality. It reflects her attitude to citizenship, the Motherland, the fulfillment of civic duty.

Civic choice is actualized by organizing the relevant activities of students and communication both in educational communities and the university as a whole.

The implementation of the first stage was carried out in accordance with a specially developed program. The program "I choose my Homeland" involves the use of the following methods: classes with training elements, consultations, individual and group conversations, role-playing games, designing your future, career guidance conversations.

This program is based on the concepts of personal and professional self-determination. Individual conversations: "The concept of personality", "Man as a subject of his own activity", "The Universe as the highest stage of human development", exercises "Me and my small Homeland", "I am in a future profession", "Family from the Orthodox point of view" contribute to the development of subjectivity of students. Creating conditions for the actualization of students' life choices in socially significant activities means the development of identity with an adult understanding of the category of "creative and constructive mode of citizenship through the improvement of internal reflection.

One of the classes is devoted to the problems of the development of assertive behavior in the framework of the implementation of the first stage of the formation of a creative and constructive mode of civic activity of students. Assertive behavior is the ability to independently regulate one's behavior, maintain personal boundaries and not violate others', take responsibility for one's life on oneself and pronounce requests aloud. This term was introduced by the American psychotherapist Manuel Smith. The goal of assertive communication is not to change others, but to be responsible for your feelings and reactions. The purpose of such a lesson is to develop students' skills of confident consent and refusal, the ability to conduct an assertive dispute.

The second stage follows from the first. It is focused on the development of a semantic assessment of creative and constructive activity among students. The implementation of the program "I am a patriot of my Fatherland" is the central event at this stage. Classes with elements of pedagogical dialogue, group discussions, brainstorming, simulation games, presentation of experience, social design are the main methods during the implementation of this stage.

An active response among students was caused by participation in the All-Russian teleconference "Anthropological knowledge as a system-forming factor of professional pedagogical education" to the 200th anniversary of the birth of K.D. Ushinsky. The participants of the event unanimously noted the high civic-patriotic component of the pedagogical heritage of the outstanding scientist and teacher. The content of K.D. Ushinsky's pedagogical anthropology is an important factor in the process of formation and development of the creative and constructive mode of civic activity of the younger generation.

As part of the teleconference, the students were involved in a productive discussion on the comprehension and formulation of K.D. Ushinsky's ideas about serving the people, the Motherland, about love for people, about work. Patriotism, nationality, humanism, truthfulness, diligence, discipline, firm will and character, a sense of self-esteem are considered by students to be the highest moral qualities of a citizen and a patriot.

The students answered the question: "My civic ideals" in a few sentences at the first stage. They highlighted the most important thoughts from the general list presented. Students not only realized their individuality, but also comprehended their goals in life, their values, priorities, and their ideals while completing assignments.

Next, we will give an approximate list of questions and tasks for organizing the discussion.
- Identify the main components of moral patriotic education in the pedagogy?
- What can be said about the civic position of K.D. Ushinsky?
- What kind of appeal would K.D. Ushinsky give to his descendants on issues of civil and patriotic education?

Of particular interest was the information about the decisive role of patriotism education in the work of K.D. Ushinsky among students. He manifests himself with "true lion's strength" in the people when defending the Motherland from external threats. The guys also shared their thoughts about the need to educate civic duty.

According to the study, pedagogical technologies for the formation of the personal meaning of the concepts of "citizenship", "patriotism", "civic responsibility" are central in the implementation of the second stage of the formation of the creative and constructive mode of students' civic activity.

The third stage is the main one in the technology of forming a creative and constructive mode of civic activity among students. It is focused on the development of students' civil relations. This stage is implemented with the help of the developed programs: "Rights and duties of a citizen", "My Nightingale Land", "In defense of my Homeland", "Me and my family".

The presented programs are implemented within the framework of the student scientific Society of pedagogical education. The pedagogical support of such activities consists in supporting students, organizing student self-government, and assisting in their socially useful activities. Specially designed classes, group discussions, debates, conversations are conducted by teachers under the guidance of the Deputy director of the Institute of Continuing Education of Kursk State University.

The university championship "Scientific pedagogical discussions" aroused genuine interest. The event demonstrated the existence of a whole palette of various promising innovative student projects in the field of education of the younger generation and also contributed to their promotion. The problems of civic identity and legal protection of students in modern society,

respect and readiness to defend their homeland, military-patriotic development were central to the presentation of projects of students of pedagogical education.

Creating conditions for realizing the potential of each student in their civic engagement is the goal of **the fourth stage.** The implementation of this stage involves holding actions to demonstrate their constructive civic position in specific events. Reflexive classes after each event play an important role here.

Thus, the pedagogical technology of the formation of creative and constructive civic activity among students is the consistent implementation of pedagogical actions to actualize the civic self-determination of students, the development of motivation for volunteerism, assistance in their awareness of personal meanings, the formation of a system of civil relations with the family, social institutions, with surrounding people and the state as a whole, the creation of conditions for self-realization of their personality in socially useful activities.

The dynamics of the development of constructive citizenship among the participants of the pedagogical experiment

The beginning of the study of the creative and constructive mode of civic activity of the younger generation was laid by us in the manuscript Modeling of the Creative and Constructive Mode of Youth Civic Activity (European Journal of Contemporary Education 2023. 12(2): 342-351) (Belentsov, 2023).

The ascertaining and formative experiment aimed to characterize the effectiveness of the created model for the formation and development of the creative and constructive mode of civic activity of youth.

Students of pedagogical education at Kursk State University and schoolchildren of educational institutions in Kursk (50 people) participated in the study.

Two equalized research groups (experimental and control) participated in a pedagogical experiment. The experimental group included 25 students of the direction of pedagogical education. The control group corresponded to the experimental group in terms of the number of students, their age, and the level of training.

The participants of the experiment are full-time students (ages 16-21). 28 students – 56 % of girls and 22 students – 44 % of boys. The main part of the participants in the experiment is 41 students (82 %) are students of 1, 2, 3 university courses.

The experiment has been conducted for two years.

The choice of the form of research depends on the goals and nature of the study. Its methodology assumes the following form of its implementation. It minimizes errors both in the distribution into groups using randomization - this is a strategy for random selection or distribution of subjects (all subjects have equal chances to get into the group), and in evaluating the results obtained.

The pedagogical experiment had three main stages. The ascertaining experiment was carried out at the first stage:

– formation of representative research samples;

– identification of the current level of formation of constructive citizenship among the participants of the experiment. The solution of these two tasks was carried out with the help of diagnostic tools developed by us.

At the beginning of the pedagogical experiment, at its ascertaining stage, the indicators of both the general level of formation of the creative and constructive mode of civic activity among students and each of its components did not differ between the two groups at a significant level of differences.

The formative experiment lasts for two years. The pedagogical conditions developed by us from the model of the formation of a creative and constructive mode of civic activity among students have been implemented. Pedagogical technology as a sequential change of the stages of the formation process and the developed programs of each of the stages were also implemented.

Pedagogical monitoring with the help of the author's diagnostic tools is carried out throughout the formative experiment.

It involves an expert assessment:

- the peculiarities of students' civic development as the main indicator of the cognitive criterion of the level of formation of a constructive civic position;

- civic values as an indicator of a reflexive criterion;

- civil stability as an indicator of a behavioral criterion.

The positive dynamics in the development of the creative and constructive mode of civic engagement was revealed by the results of monitoring.

The results of pedagogical monitoring indicate the systemic impact of the developed programs on the civic position of students. Participation in specially organized events of a civil-patriotic orientation, in championships, conferences, in the organization of volunteer activities contribute to the development of students' civic literacy, their civic values and civic activism.

Statistically significant positive changes in all indicators of the level of formation of the creative and constructive mode of civic activity of students occurred in the experimental group during the formative experiment.

Table 2. The formation of the creative and constructive mode of civic activity in the experimental group (diagnostic results)

Criteria	Ascertaining stage (M ± m), point	Control Stage (M ± m), point	t	p
Cognitive	18,82±1,800	26,86±1,900	2,83	< 0,01
Reflexive	18,4±2,000	28,43±1,700	2,94	< 0,01
Behavioral	19,2 ± 1,90	31,3 ± 3,00	3,46	< 0,01

Positive changes were recorded in the indicators of cognitive (t = 2.83, p < 0.01), reflexive (t = 2.94, p < 0.01), behavioral (t = 3.46, p < 0.01) criteria.

An adequate image of the Motherland, its social, economic, and political positions in the world space - an image with adequate knowledge and feelings, thoughts, and beliefs was formed among the students of the experimental group as a result of the developed pedagogical influences.

Significant differences between the two research groups in all the indicators of interest to us were revealed reliably at the formative stage of the experiment.

Table 3. The end of the experiment – diagnostics of the level of formation of the creative and constructive mode of civic activity

Criteria	Students of the experimental group (M ± m), score	Control students (M ± m), score	t	p
Cognitive	26,4 ± 2,60	19,0 ± 2,00	2,41	<0,05
Reflexive	28,6 ± 2,80	18,9 ± 1,90	2,87	<0,01
Behavioral	30,2 ± 2,99	19,3 ± 1,99	2,88	<0,01

Significantly significant differences were revealed in terms of cognitive (t = 2.41, p < 0.05), reflexive (t = 2.87, p < 0.01), personal (t = 3.09, p < 0.01) and behavioral (t = 2.98, p < 0.01) components of constructive citizenship.

4. Discussion

The problem under consideration has been investigated at three fundamental levels:

1. The civic activity of youth is considered as a global socio-pedagogical phenomenon in the works – E. Belozertsev, B. Bim-Bad, M. Boguslavsky, G. Kornetov, Z. Ravkin (Belozertsev, 2003; Bim-Bad, 2003; Boguslavsky, 2002; Kornetov, 1999; Ravkin, 2000).

2. Manifestations of radicalism and civic activity of students in a historical context from a pedagogical point of view were considered in the following works: P. Vasilkov "Student organizations" (M., 1917) (Vasilkov, 1917), S. Znamensky "Secondary school in recent years. Student unrest of 1905–1906 and their significance" (St. Petersburg, 1909) (Znamensky, 1909), A. Isaev "Student strikes" (St. Petersburg, 1912) (Isaev, 1912).

3. There are also special works. These are the works of L. Kuznetsova "The formation and development of civic education in Russia" (Moscow, 2006). The purpose of the research is the need for a complete representation of the historical experience of civil and patriotic education of schoolchildren. The author described the current and promising aspects of the development of youth civic education (Kuznetsova, 2006).

This is also the work of I. Duranov "Pedagogical conditions for the formation of civic activity in extracurricular activities of high school students" (Chelyabinsk, 1991). I. Duranov insists on the formation of a future active citizen on the basis of morality and work principles, universal traditional values. Students must serve the people, the Fatherland and the law (Duranov, 1991).

In her work "Civic Education in Russia" (Vyatka, 2005), O. Lebedeva carries out a retrospective analysis and characterizes the essential aspects of civic education of youth. A large place is devoted to modeling and reconstruction of the historical experience of civic education of the younger generation (Lebedeva, 2005).

G. Grevtseva in her work "Civic education as a factor of socialization of schoolchildren" (Chelyabinsk, 2006) pays attention to the description of the process of formation of civic and patriotic qualities in the younger generation. The problem of civic education is presented by the author as a fundamental condition for the socialization of schoolchildren. Civic education is a combination of the intellectual, emotional, and sensual sides of a person (Grevtseva, 2005).

L.M. Semenyuk in his work "Psychology of civic engagement: features, conditions of development" (Sochi, 2007) speaks about civic engagement as a special personal quality. It includes all indicators of citizenship, civic position in accordance with the peculiarities of human social nature. Civic engagement is the main core of determining the value and integrity of a person. That is, the author refers to the characteristics of the phenomenon under study mainly only from a psychological position (Lebedeva, 2005).

5. Conclusion

1. The results of the study summarize and complement the theory of civic and patriotic education of the younger generation, expand the understanding of the forms, methods, and means of civic education of youth.

2. Clarifying the content of the key concept of the study "the creative and constructive mode of civic activity of the younger generation" enriches the conceptual and categorical apparatus of scientific theories used in educational activities.

3. The scientific novelty of the research is due to the use of the developed pedagogical technologies for the development of the creative and constructive mode of youth civic activity.

4. The effectiveness of the developed model and technology of the creative and constructive mode of civic activity of youth has been verified at all stages of the experimental work carried out (ascertaining, forming, control) and confirmed by the positive dynamics of changes in the levels of formation of the creative and constructive mode of civic activity of the younger generation.

The work undertaken makes a definite contribution to solving the problem of civic and patriotic education of young people. However, the work done does not exhaust all the problems of its effective organization. We can identify the following promising areas of research on this problem: countering terror and violence among young people, the problems of bullying and mobbing as topical factors of interpersonal relations among young people, the problem of civic and patriotic education in conditions of uncertainty.

6. Acknowledgements

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Factors Affecting Bachelors of Engineering and Technology Academic Performance in Teaching English for Special Purposes: Corpus Approach and Terminological Units

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Abstract

The widespread use of modern information technology in the educational process of the Russian education system forces the need to develop new educational standards and approaches focused on consideration of the individual characteristics of students. This leads to a need to consider the individual characteristics of students that can influence the acquisition of necessary knowledge and skills. This study involved the task to consider the influence of factors such as sex, age and academic year on the introductory and final testing results of bachelors of mineral resources, who took training courses in English for special purposes on the basis of the corpus-based approach model in teaching and determination of its efficiency. The experimental training is presented in three stages: introductory, operational and final. These stages included learning English for special purposes based on the corpus analysis model of the grammatical environment of terminological units, introductory and final testing with subsequent statistical processing of the data obtained. The experimental training outcome obtained demonstrated that the degree of the influence of sex and academic year on academic performance was less pronounced at the introductory testing stage, while it was more pronounced at the final testing stage. The influence of the age groups of students on the data was noted at both stages of testing. It was expressed in the simple average values of the age groups of 17 and 21 years, indicating a downward value in accordance with the age of students. The paired samples T-test data helped us reveal the learning efficiency. Such samples demonstrated sufficient statistical significance of the differences in the average values of the final and introductory testing data.

Keywords: engineering education, corpus approach, academic performance, English for special purposes.

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1. Introduction

The widespread use and constant development of digital technology in most areas of our life leads to the manufacturing transformation, new economic sectors development, thereby increasing the demand for knowledge in the field of engineering disciplines and contributing to transformations, including those relating to higher education. Thus, in last decades, the government demand for engineers in general and mineral resources specialists in particular grew significantly in Russia. This is due to their important role in ensuring the competitiveness and science and technology progress of the state industry and economy (Zhdaneev, 2022; Mikeshin, 2022; Kretschmann et al., 2020; Litvinenko et al., 2023). Bearing these changes in Russian engineering education in mind, there is a need to improve existing programs and develop new ones in order to upgrade the quality of engineering training (Almetov et al., 2020; Gerasimova et al., 2022; Kharlamova et al., 2023; Sveshnikova et al., 2022). It is worth mentioning that currently many foreign and Russian higher education systems are developing and applying educational standards and approaches to learning, including English, with due account for the widespread use of modern information technology that can influence the acquisition of the necessary knowledge and skills (Aleryani et al., 2019; Rus, 2019; Nikonova et al., 2023; Varlakova et al., 2023). Thus, the dynamically developing approaches to learning English based on the use of online technology and databases can also include the use of text corpora (Fauzan et al., 2022; McGrath et al., 2022; Nugraha et al., 2017).

The use of information technology in learning allows us to turn our focus toward the relevance of the individual student characteristics (Berge et al., 2019; Moote et al., 2020; Rajandran et al., 2015; Nja et al., 2019). It is emphasized that they facilitate the achievement of educational goals in groups of students who are distinguished both by sex and age, while within the framework of engineering education in Russia, this subject is still left largely unaddressed. At the same time, one of the distinctive features of students pursuing physics, mathematics and engineering educational programs in foreign countries is that most of them are male students (Wrigley-Asante et al., 2023). In Russia, the number of male students attending an engineering university is several times higher than the number of female students, as opposed to classical and humanities universities (Antoshchuk, 2021; Oblova et al., 2022; Zamiatnina, 2017). In this regard, a need arises to study and consider the influence of factors such as sex and age on students' academic performance. This paper provides for studying the influence of factors of sex, age and academic year on the efficiency of learning English for special purposes within the framework of the previously developed corpus-based approach model in mineral resource engineers teaching (Boyko et al., 2023).

2. Theoretical background

Foreign studies devoted to the analysis of sex and age characteristics in the learning process (Hirnstein et al., 2019; Hardebolle et al., 2022; Fényes, 2014; Abioye et al., 2019) specify that the existing differences between male and female students can manifest themselves at the cognitive, behavioral and physical levels. In particular, the process of learning English brings the properties of memory and cognitive activity of students to the forefront (Bećirović et al., 2021), which are inextricably linked with their age characteristics. Among the features that younger students have, we can mention increased endurance, resistance to psychological stress, flexibility in the process of learning new material and activation of short-term memory. Older students are noted for their concentration, a high scope of attention and long-term memory, as well as the ability to focus on educational material for a long time (Archer et al., 2018; Buranova, 2022). Thus, a number of studies (Tomakin, 2020; Kasimi et al., 2017) indicate that the strength of memorization and processing of educational materials, including those related to the vocabulary and grammar of the English language, by students of different sex and age groups is determined by the peculiarities of their left and right brain functioning. In the framework of research (Bao et al., 2022; Shalihin et al., 2021) on the connection between the brain and thinking mentions that students having a developed left brain rationally process educational material, and students having a developed right brain process educational material by intuitive learning.

According to a number of authors (Choi et al., 2020; Hirnstein et al., 2019; Liang et al., 2021; Xin et al., 2019), the majority of female students have the left brain more developed. In this regard, their way of thinking is more rational, which contributes to a better processing of subjects based on rational and logical ways of learning. It was also observed (Kljajevic, 2022) that the more developed left brain helps to process information by listening to it, which contributes to the storing of verbal information,

including the reproduction of sounds in a foreign language. According to this theory, female students with more pronounced short-term memory are more likely to show their analytical and communicative abilities (Loprinzi et al., 2018). Regarding male students, some authors (Choi et al., 2020; Hirnstein et al., 2019; Liang et al., 2021; Xin et al., 2019) believe that they have a more developed right brain, characterizing their thinking as abstract and creative. This ensures that it facilitates a better perception, visual analysis (Shaqiri et al., 2018) and deductive processing of the surrounding space, objects and their forms, including educational material. It was also noted that the memory of most male students could be characterized as long-term (Spets et al., 2019).

Since the above factors may influence the efficiency of the process of learning English for special purposes on the basis of previously developed corpus-based approach model in mineral resource engineers learning, this article was executed to identify the relationship between the academic performance of first-year and second-year mineral resource students and such factors as their sex, age and academic year.

In the present paper, we will test two research hypotheses:

1. The factors of sex, academic year and age did not significantly affect the data of introductory and final testing of bachelors who took training courses on the basis of the corpus-based approach model in mineral resource engineers learning, in terms of the terminological units grammatical environment features analysis.

2. The total amount of points obtained during the introductory testing of bachelors who took training courses on the basis of the corpus-based approach model in mineral resource engineers learning, in terms of the terminological units grammatical environment features analysis, does not differ much from the total points of the final testing.

This study involved the task to consider the influence of factors such as sex, age and academic year on the introductory and final testing results of bachelors of mineral resources, who took training courses on the basis of the corpus-based approach model in learning and its efficiency determination. The training was conducted on the basis of the terminological units grammatical environment features analysis developed and tested by us earlier, but with the involvement of a larger number of students.

3. Materials and methods

Experimental English language training for special purposes was conducted within the first-year and second-year curricula of undergraduate students of the Saint-Petersburg Mining University during the 2022–2023 academic year (two academic semesters). The unified introductory testing standard for the Saint-Petersburg Mining University was conducted among all first-year and second-year students at the beginning of the academic year to determine the level of foreign language proficiency. Since our research was focused on students with proven English proficiency of "upper – intermediate" (B2), the testing results allowed us to select 583 participants among all first-year and second-year students. According to the rule of random selection, 214 students were subsequently selected and took experimental training. Having studied the resulting random sample, we obtained the following data on the number of first-year and second-year students, their age and sex. General information about the participants is provided in Table 1.

Table 1. General information about the participants

Academic year	Number	%
1 year	119	55.61% (214)
2 year	95	44.39% (214)
Age group	**Number**	**%**
17 years	33	15.42% (214)
18 years	87	40.65% (214)
19 years	63	29.43% (214)
20 years	25	11.68% (214)
21 years	6	2.80% (214)
Sex	**Number**	**%**
Male	120	56.07% (214)
Female	94	43.92% (214)

Source: compiled by authors

Table 1 shows that out of 214 participants taking part in the experiment, 120 were male and 94 were female, 119 were first-year and 95 were second-year students. Age groups were represented by students aged 17 to 21. Specified information about the participants is presented in Table 2.

Table 2. Specified information about the participants

Academic year	N	%	Sex	N	%	%	Age				
							17	18	19	20	21
1	119	55.61 (214)	M	69	57.98 (119)	32.24 (214)	19	34	10	6	-
			F	50	42.02 (119)	23.36 (214)	14	27	9	-	-
2	95	44.39 (214)	M	51	53.68 (95)	23.83 (214)	-	10	25	12	4
			F	44	46.32 (95)	20.56 (214)	-	16	19	7	2

Source: compiled by authors

Based on the information presented in Table 2, 119 first-year students were from 4 age groups: 17-year-olds included 33 students of which 19 were male and 14 female, 18-year-olds included 61 students of whom 34 were male and 27 female, 19-year-olds included 19 students of whom 10 were male and 9 female, 20-year-olds included 6 male students. 95 second-year students were from 4 age groups: 18-year-olds included 26 students of whom 10 were male and 16 female, 19-year-olds included 44 students of which 25 were male and 19 female, 20-year-olds included 19 students of whom 12 were male and 7 female, 21-year-olds included 6 students of whom 4 were male and 2 female.

The educational materials used for the experimental training were prepared by applying several text corpora: Russian National Corpus and Hong Kong Engineering Corpus. The materials included the use by students of quantitative and qualitative methods of analysis presented in concordance lines of these corpora. In the course of experimental English language training for special purposes, first-year and second-year undergraduate students were trained to work with corpus data and analyze the grammatical environment of terminological units in addition to the standard educational materials provided for by the academic course working program. The process of experiential training was represented by three stages, introductory and final testing of students, followed by analysis of statistical data and their processing.

The experimental training included several stages: introductory, operational and final.

At the introductory stage, when determining the experimental training conditions, we used a corpus analysis model of the grammatical environment of terminological units as a guide, as well as criteria for evaluating tasks performed within the framework of introductory and final testing, developed and presented in our previous paper (Boyko et al., 2023).

The operational stage involved the conduct of introductory testing of participants, learning English for special purposes during the academic year, and final testing.

At the final stage, the introductory and final testing results were processed and statistically analyzed, as well as the results of experimental training.

The introductory and final testing results were analyzed using the IBM SPSS program (version 26). Initially, the average values of the introductory and final testing results were identified, as well as their standard deviation within the framework of descriptive statistical data analysis. Since our study involves data obtained before the experimental training and data obtained after it, we are dealing with dependent samples. In this regard, we used nonparametric techniques of mathematical statistics. As part of testing the first research hypothesis, the Mann-Whitney U tests were conducted to study the influence of independent variables of sex and academic year of students on the statistical significance of the differences between introductory and final testing, and the Kruskal-Wallis H test was used to determine the presence of statistical significance between the influence of students' age and introductory and final testing data. As part of testing the second research hypothesis, paired T-test was used to determine statistically significant differences between the introductory and final testing data, followed by the calculation of the effect size using Cohen's d.

4. Results

The Table 3 presents the introductory and final testing data. The average value of the introductory testing was 3.40, which is a satisfactory outcome relative to the 5-point assessment system in Russia, while the average value of the final testing was 4.46, which is the best outcome of the two presented. It is also worth mentioning that the final testing results were found to have a higher statistical variance relative to the introductory testing data, with data equal to 0.617 for the final testing and 0.553 for the introductory testing. An increase in the simple average values of the final testing by 1.06 relative to the introductory testing, as well as an increase in statistical variance indicates that after the experimental training, the students' performance became better than before the experimental training.

Table 3. Descriptive statistics of the introductory and final testing

Type of testing	Number	Sum of scores	Averages	Standard deviation	Variance	Points gain	Average arithmetic gain.
Introductory	214	727	3.40	0.553	0.30	228	1.06
Final		955	4.46	0.617	0.38		

Source: compiled by authors

The influence of sex on the introductory and final testing results presented in Table 4 was subsequently evaluated. Thus, female students obtained the higher point average according to the introductory testing data, which was 3.45 compared to the point obtained by male students being equal to 3.35. The difference in the point average is 0,10. This suggests that the difference in the points obtained by the male and female sexes in the introductory testing is not pronounced. It is worth noting that the point average was 4.57 (this is 1.12 more than the introductory test value) according to the data of the final testing of female students, which is also higher than the points obtained by male students being equal to 4.37 (this is 1.02 more than the introductory testing value). It is understood that the difference in the point average of male and female students is only 0.20. This suggests that the difference in the points obtained by the male and female sexes in the final testing is not great, but it is more pronounced relative to the introductory testing.

The Mann-Whitney U test of the introductory testing results showed that the standardized effect size is small (0.095). This indicates that the difference between the value of the introductory testing of male students and the value of the introductory testing of female students is small. It also pointed out that there is a difference in the values of the average rank of male and female students. So it is equal to 113.10 for female students, and equal to 103.11 for male students, which indicates that female students coped with the task better than male students in the framework of introductory testing. The Mann-Whitney U test of the final testing results showed that the standardized effect size is small (0.16). This indicates that the difference between the value of the final testing of male students and the value of the final testing of female students is small. It also pointed out that there is a difference in the values of the average rank of male and female students. So it is equal to 117.55 for female students, and equal to 99.63 for male students, which indicates that female students coped with the task better than male students in the framework of final testing.

The p-value equal to 0.164, (p(x Z) = 0.082) was obtained as part of the introductory testing. This means that the probability of the first-type error rejecting the correct null hypothesis "The difference between the random choice of the point of a male student and a female student in the introductory testing is not large enough to be statistically significant" is high (0.164), since the larger the value of p, the more it supports the null hypothesis. Consequently, the difference between the random choice of the point of a male student and a female student in the introductory testing is not large enough to be statistically significant. The p-value equal to 0.01775, (p(x Z) = 0.008875) was obtained as part of the final testing. This means that the probability of the first-type error rejecting the correct null hypothesis "The difference between the random choice of the point of a male student and a female student in the final testing is not large enough to be statistically significant" is small (0.017), since the smaller the value of p, the more it supports the first hypothesis. Consequently, the difference between the random choice of the point of a male student and a female student in the final testing is large enough to be statistically significant. This indicates that the degree of the influence of sex on academic performance is absent at the stage of

introductory testing preceding the beginning of experimental training, and can be noted at the stage of final testing, which was conducted after taking the experimental training.

Table 4. Sex impact on the results of the introductory and final testing

Type of testing	Sex	Sample size	Sample average	Sample std. dev.	Median	Mean rank	W Wilcoxon	U	P-value	Effect size
Introductory	M	120	3.35	0.528	3	103.11	12373.5	6166.5	0.164	small (0.095)
	F	94	3.45	0.580	3	113.10	10631.5	5113.5		
Final	M	120	4.37	0.635	4	99.63	11955	6585	0.017	small (0.16)
	F	94	4.57	0.577	5	117.55	11050	4695		

Source: compiled by authors

Further, the impact of the academic year on the introductory and final testing results was estimated, the results of which are presented in Table 5. According to the introductory testing data, the point average is higher for second-year students (3.58) than for first-year students (3.24). However, the difference in the point average is 0.24. This suggests that this difference is not pronounced. According to the final testing data, the point average is higher for second-year students (4.8) than for first-year students (4.18). At the same time, the difference in the point average of first-year and second-year students is 0.63, which means that this difference is of a pronounced nature.

The Mann-Whitney U test of the introductory testing results showed that the standardized effect size is small (0.3). This indicates that the difference between the value of the introductory testing of first-year students and the value of the introductory testing of second-year students is small. It also pointed out that there is a difference in the values of the average rank of first-year and second-year students. So it is equal to 124.76 for second-year students, and equal to 93.72 for first-year students, which indicates that second-year students coped with the task better than first-year students in the framework of introductory testing. The Mann-Whitney U test of the final testing results showed that the standardized effect size is large (0.51). This indicates that the difference between the value of the final testing of first-year students and the value of the introductory testing of second-year students is big. It also pointed out that there is a difference in the values of the average rank of first-year and second-year students. So it is equal to 139.05 for second-year students, and equal to 82.31 for first-year students, which indicates that second-year students coped with the task better than first-year students in the framework of final testing.

The p-value equal to 0.00001479, (p(x≤Z) = 0.000007394) was obtained as part of the introductory testing. This means that the probability of the first-type error rejecting the correct null hypothesis "The difference between the random choice of the point of a first-year student and a second-year student in the introductory testing is not large enough to be statistically significant" is small (0.00001479), since the larger the p-value, the more it supports the null hypothesis. Consequently, the difference between the random choice of the point of a first-year student and a second-year student in the introductory testing is large enough to be statistically significant. The p-value equal to 5.729e-14, (p(x≤Z) = 02.864e-14) was obtained as part of the final testing. This means that the probability of the first-type error rejecting the correct null hypothesis "The difference between the random choice of the point of a first-year student and a second-year student in the final testing is not large enough to be statistically significant" is small (5.729e-14), since the larger the p-value, the more it supports the null hypothesis. Consequently, the difference between the random choice of the point of a first-year student and a second-year student in the final testing is large enough to be statistically significant.

The data obtained allow us to mention that, both simple average and the Mann-Whitney U test involve pronounced differences between the introductory testing results of first-year and second-year students, emphasizing the degree of the influence of academic year on the experimental training outcome. However, they are less pronounced at the stage of introductory testing and more pronounced at the stage of final testing, after taking experimental training.

Table 5. Influence of the academic year on the results of introductory and final testing

Type of testing	Academic year	Sample size	Sample average	Sample std. dev.	Median	Mean rank	W Wilcoxon	U	P-value	Effect size
Introductory	1	119	3.24	0.431	3	93.72	11153	7292	0.000	small
	2	95	3.58	0.627	4	124.76	11852	4013	01479	(0.3)
Final	1	119	4.18	0.623	4	82.31	9795	8650	5.729e	large
	2	95	4.81	0.393	5	139.05	13210	2655	-14	(0.51)

Source: compiled by authors

The obtained data on the age influence on the introductory and final testing are presented in Table 6. Thus, in the framework of introductory testing among the five age groups, the highest simple average values are observed among students aged 21 (4.33), and the lowest among students aged 17 (3.15). The values of students aged 20, 19 and 18 were equal to 3.76, 3.52 and 3.24, respectively. Thus, in the framework of final testing among the five age groups, the highest simple average values are observed among students aged 21 (5), and the lowest among students aged 17 (4.21). The values of students aged 20, 19 and 18 were equal to 4.6, 4.69 and 4.31, respectively. As in the framework of introductory testing, this indicates a downward value in accordance with their age.

Table 6. Influence of age on the results of introductory and final testing

Type of testing	Age	Median	Average	Sample size	Rank sum	Mean Rank	P-value	Effect size
Introductory	17	3	3.15	33	2778	84.18	4.387e-8	large, 0.17
	18	3	3.24	87	8068.5	92.74		
	19	3	3.52	63	7563	120.04		
	20	4	3.76	25	3485.5	139.42		
	21	4	4.33	6	1110	185		
Final	17	4	4.21	33	2762.5	83.71	0.00003239	medium, 0.11
	18	4	4.31	87	8241	94.72		
	19	5	4.69	63	8054	127.84		
	20	5	4,6	25	2999.5	119.98		
	21	5	5	6	948	158		

Source: compiled by authors

The Kruskal-Wallis test showed that there is a significant difference in the dependent variable (the results of the introductory testing) and the age groups of students, $\chi2(4) = 39.97$, p <0.001, with an average of 84.18 for students of 17 years, 92.74 for students of 18 years, 120.05 for 19 years, 139.42 for 20 years and 185 for 21 years. The observed size of the effect $\eta 2$ is large, 0.17. This indicates that the difference between the averages is large. The p-value is 4.387e-8, (P(x 39.9719) = 1). This means that the probability of the first-type error rejecting the correct null hypothesis "The difference between the average ranks of some age groups during the introductory testing is not large enough to be statistically significant" is small (4.387e-8). The smaller the p-value, the more it supports the first hypothesis. Since the p-value is < α, the null hypothesis is rejected. That is to say that the difference between the average ranks of some groups is large enough to be statistically significant.

To check if there is a statistically significant difference in the average values of the points obtained by 214 students at the introductory and final stages of testing, a paired T-test was conducted. The data of such test are presented in Table 7 and reflected in Figure 1.

Also the Kruskal-Wallis test showed that there is a significant difference in the dependent variable (results of the final testing) and the age groups of students, $\chi2(4) = 25.95$, p <0.001, with an average rating of 83.71 for students of 17 years, 94.72 for students of 18 years, 127.84 for 19 years of age, 119.98 for 20 years of age and 158 for 21 years of age. The observed size of the effect $\eta 2$ is medium, 0.11. This indicates that the difference between the averages is average. The p-value

is 0.00003239, (P(x 25.95) = 1). This means that the probability of the first-type error rejecting the correct null hypothesis "The difference between the average ranks of some age groups during the final testing is not large enough to be statistically significant" is small (0.00003239). The smaller the p-value, the more it supports the first hypothesis. Since the p-value is < α, the null hypothesis is rejected. That is to say that the difference between the average ranks of some groups is large enough to be statistically significant. In accordance with the data obtained, it can be noted that there is the influence of age groups of students on the experimental training data. It is especially noticeable at the stage of introductory testing.

Table 7. Average values of introductory and final testing. Compiled by authors.

Type of testing	Sample size (n)	Averages	SDs	P-value	T-test	Average of differences ($\bar{x}_d$)	SD of differences (S_d)	Cohen's D
Introductory	214	3.397	0.553	1.5304E-63	24.3752	1.0654	0.6394	1.6663
Final	214	4.463	0.617					

Source: compiled by authors
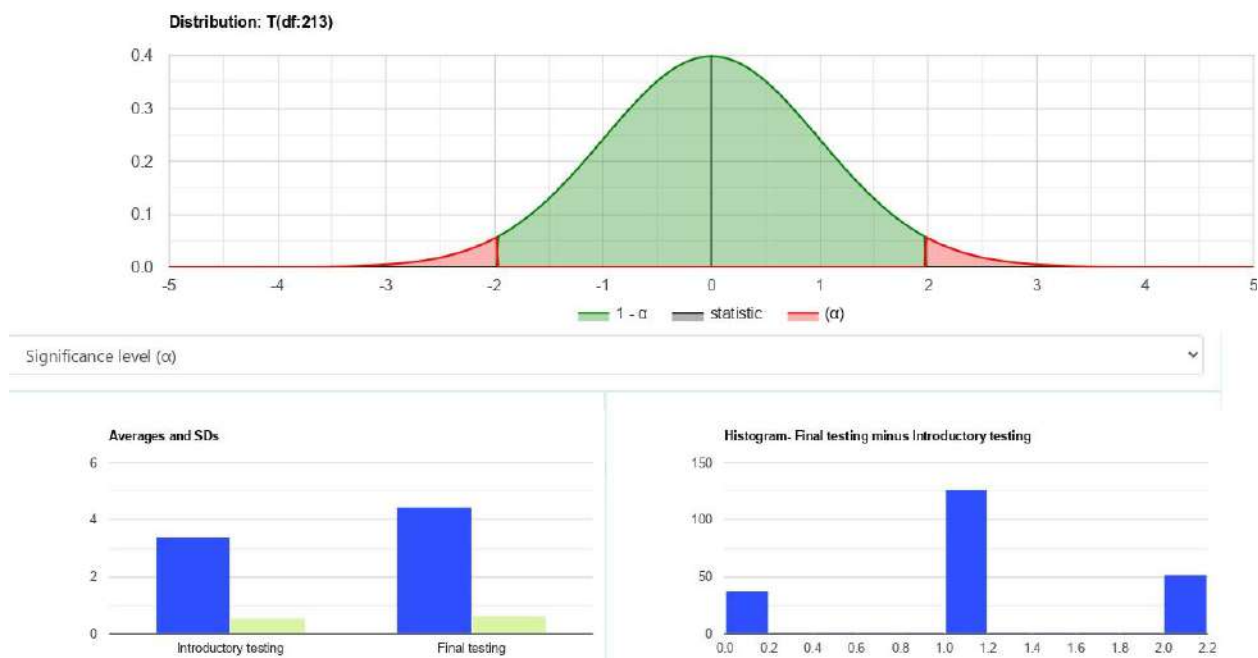
Fig. 1. Results of the paired T-test for the introductory and final testing
Source: compiled by authors

According to Table 7, there is a big difference between the introductory testing (mean = 3.397, standard deviation = 0.553) and the final testing (mean = 4.463, standard deviation = 0.617), so the criterion value t(213) = 24.3752 and p <0.001. Average values of the final testing results are unequal average values of the results of the introductory testing.

In other words, the average difference between the results of the final and the introductory testing is large enough to be statistically significant. The T-test value for paired samples is 24.3752, which is not included in the 95 % acceptance area [-1.9712, 1.9712]. 95 % confidence interval of final testing minus confidence interval of introductory testing is [0.9793, 1.1516]. The resulting value p is 1.5304E-63, (P(x 24.3752) = 1). This means that the probability of the first-type error rejecting the validity of the null hypothesis "The difference between the average values of the results of the final and the introductory testing is not large enough to be statistically significant", is small (equal to 0). This is important because the smaller the value p, the more it supports the first hypothesis. In this regard, we can say that based on the received data p-value < α, therefore,

the null hypothesis is rejected. In addition, the effect size of Cohen's d was calculated, which showed the effect size to be 1.6663, indicating the magnitude of the difference between the mean values of the differences between the results of the introductory and final testing and the expected average of the differences between the results of the introductory and final testing is high.

This also confirms the correctness of the previously obtained outcome and testifies to the efficiency mineral resource engineers learning who took training on the basis of the corpus-based approach model, in terms of the terminological units grammatical environment features analysis.

5. Discussion

According to the obtained data of the average value, male and female students had minimal differences in the introductory testing, but the average value of the final testing results indicates that the difference between the outcome of the male and female sexes was more pronounced. At the same time, it is worth noting that the outcome of female students was higher than the same of male students at both stages of testing. The Mann-Whitney U test showed a small standardized effect size of male and female students, both at the introductory and final stages of testing. However, it is worth mentioning that the p-value in the introductory testing indicated a high probability of the first-type error, in contrast to the p-value in the final testing. This suggests that if the difference between the random choice of the points of male and female students was not pronounced at the introductory stage of testing, it became pronounced at the final testing. The data obtained are consistent with the previously published data of foreign authors (Nja et al., 2019; Wrigley-Asante et al., 2023; Rajandran et al., 2015; O'Dea et al., 2018) who noted the influence of sex on student academic performance.

With due account for the data of the average value of second-year students, it can be noted that they coped with the introductory testing slightly better than first-year students. However, with the Mann-Whitney U test results in mind, the standardized effect size for introductory testing of first-year and second-year students was small, therefore, the advantage of second-year students over first-year students is not significant. Considering the final testing data, it can be noted that second-year students managed to cope with the test better than first-year students within the average value and the standardized effect size for the final testing was large in accordance with the Mann-Whitney U test results. The data obtained allow us to note that, as in the framework of the arithmetic mean, and in the framework of the Mann-Whitney test, there are pronounced differences between the results of introductory testing of first-year and second-year students, emphasizing the influence of the academic year on the results of experiential learning. Therefore, we can agree with a number of authors (Long et al., 2008; Koyuncuoğlu, 2021) that the academic year can influence academic performance.

The Kruskal-Wallis H test presented in the paper on the points received by students of the age groups from 17-21 years as part of the introductory stage of testing demonstrated that students of the age group of 21 years had the highest average rank 185 (in the final testing they had 158), and the lowest average rank 84.18 was among students of the age group of 17 years (in the final testing they had 83.71). This is also confirmed by the difference in the simple average value of the age group data both within the introductory and final testing. It is worth mentioning that the revealed influence of age groups of students on the experimental training outcome was more pronounced at the introductory testing stage than at the final testing stage. Some authors (O'Dea et al., 2018; Nja et al., 2019) also noted the possibility of the impact of the age of students on academic performance, which is reflected in this experimental training.

The T-test data obtained allow us to note that the difference in the average values of the final and introductory testing results turned out to be sufficiently large to be statistically significant. This points the effectiveness of the experimental training of mineral resource engineers. Given that the experimental training was conducted on the basis of the corpus-based approach model, we can confirm the results obtained (McGrath et al., 2022; Fauzan et al., 2022) as they relate to the effectiveness of using the corpus of texts in learning English.

There were a number of limitations in the presented study. One of them was the level of foreign language proficiency (B2), confirmed by the annual unified introductory testing for Saint-Petersburg Mining University. Another limitation was the use of dependent samples in order to compare the data of dependent variables obtained before and after exposure to an experimental factor, rather than independent samples, which could affect the reliability of the results obtained. The third limitation is to conduct experimental training in only one engineering university, while

conducting it in a larger number of universities would contribute to greater validity of the results. Subsequent studies must consider a greater number of levels of foreign language proficiency, as well as be conducted in a larger number of engineering universities.

6. Conclusion

Within the framework of this experimental English language training for special purposes, we used the previously developed corpus-based approach model in mineral resource engineers learning. The training was conducted at Saint-Petersburg Mining University during the 2022–2023 academic year with first-year and second-year bachelors in order to identify the relationship between the academic performance of mineral resource students studying in the first and second years and factors such as their sex, age and academic year.

Having regard to the training goal, research hypotheses were created, suggesting that the factors of sex, academic year and age do not greatly affect the introductory and final testing results of bachelors who took training on the basis of the corpus-based approach model in mineral resource engineers learning, in terms of the terminological units grammatical environment features analysis, and the total score of introductory testing is not much different from the final testing scores.

Accordingly, the task was to consider the influence of factors such as sex, age and academic year on the introductory and final testing results of bachelors who took training on the basis of the corpus-based approach model in mineral resource engineers learning and its efficiency determination, in terms of the terminological units grammatical environment features analysis.

The obtained data demonstrated that the degree of the influence of sex on academic performance was absent at the introductory stage of testing, and was found at the final stage of testing, which was conducted after taking the experimental training. And also that female students coped with the above better than male students, according to the data of both stages of testing. The influence of the students' academic year on the experimental training outcome was also noted at both stages of testing. However it was less pronounced at the stage of introductory testing and more pronounced at the stage of final testing. The influence of age groups of students on the experimental training outcome was also noted at the introductory and final testing. It was especially pronounced in the simple average values of the age groups of 17 and 21, indicating a downward value in accordance with the age of students. The obtained T-test data for paired samples indicates that the difference in the average values of the final and introductory testing results was large enough to be statistically significant. Consequently, the bachelors who took training on the basis of the corpus-based approach model in mineral resource engineers learning, in terms of the terminological units grammatical environment features analysis, significantly improved their academic performance as a result of experimental training.

This outcome can be applied in the development of new curricula and "English for special purposes" academic course working programs for the purpose of learning of bachelors of mineral resources.

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ELECTRONIC JOURNAL

Training Future Educators: the Significance of Ergonomic Approaches in Crafting Safe Educational Spaces in Kazakhstan

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Abstract

Education forms the backbone of any progressive nation, providing a platform for societal transformation and empowerment. As Kazakhstan progresses toward its vision of becoming a leading knowledge-based society, it is imperative that the country invests not only in content and pedagogy but also in the spaces where learning transpires. This research delves into the significance of ergonomic approaches in formulating safe, efficient, and conducive learning environments in Kazakhstan's educational institutions. A mixed-method research design was employed, combining both qualitative and quantitative data collection and analysis.

The findings emphasize the urgent need for ergonomic intervention, underscoring the potential health benefits for educators and the broader economic and academic gains for institutions.

This research posits that a systematic adoption of ergonomic principles, tailored to Kazakhstan's unique sociocultural landscape, can greatly enhance the country's educational milieu, setting a precedent for other nations in the region.

Keywords: ergonomics, future educators, safe educational spaces, Kazakhstan, educational design, occupational safety.

1. Introduction

Ergonomics, derived from the Greek words "ergon" (work) and "nomos" (natural laws), concerns the study of the relationship between humans and the elements of their environment, especially in a work or task-oriented context. For educators, the classrooms and institutions where they spend a significant portion of their days are their primary work environments. Yet, the ergonomic aspects of these spaces have often been overlooked in traditional educational planning.

Traditionally, classroom designs and layouts have prioritized utility and cost-effectiveness over ergonomic considerations. Benches, desks, and even technological aids have typically been

chosen based on budgetary considerations and durability rather than how well they cater to the physiological and cognitive needs of the users. Over time, such an approach can lead to myriad health issues for educators, including musculoskeletal problems, visual strain, and cognitive fatigue (Darling-Hammond, 2020).

The challenges are further exacerbated by the rapid technological evolution seen in today's classrooms. The integration of digital tools and platforms, while offering enriched learning experiences, also presents new ergonomic challenges. The repetitive motions involved in using keyboards, the strain on eyes from prolonged screen time, and the postural challenges arising from poorly designed computer stations all underscore the burgeoning ergonomic crisis in modern classrooms (Rappleye, 2020).

However, the ergonomic discourse extends beyond just physical health. Classrooms that are designed with ergonomic principles in mind can lead to better cognitive outcomes for students and a more effective teaching process for educators. The arrangement of furniture, the quality of lighting, and even the acoustics of a room can influence concentration, retention, and overall learning effectiveness. It's also worth noting that the challenges and solutions in ergonomics are not universal but are deeply influenced by regional and cultural nuances. For Kazakhstan, with its unique blend of traditional and modern educational practices, and a rich tapestry of cultural influences, the ergonomic considerations become even more intricate. The nation's historical and cultural values, coupled with its aspirations for modernity and global relevance, create a unique set of challenges and opportunities in the realm of educational ergonomics.

In this research, our objective is twofold. Firstly, we aim to shed light on the current ergonomic landscape of Kazakhstan's educational institutions, highlighting the challenges and gaps in existing infrastructure and practices. Secondly, we endeavor to propose solutions - both in terms of physical classroom design and in the curriculum for training future educators. Through this dual approach, we aspire to pave the way for a holistic ergonomic transformation in Kazakhstan's educational sector, aligning it with global best practices while respecting and integrating local nuances.

2. Literature review

The domain of ergonomics in educational spaces has undergone a substantial amount of investigation over the years. As we advance this exploration into the context of Kazakhstan, it is instrumental to familiarize ourselves with the prevailing discourse in the field. This literature review seeks to consolidate key findings from existing studies, setting a robust foundation for our research (Oliveira, 2021).

1. Physical Ergonomics: Physical comfort in educational spaces directly influences the attention span and retention rates of both students and educators. Several studies have identified that an inadequately designed classroom or a poorly conceived seating arrangement can result in musculoskeletal complications, ultimately hindering effective teaching and learning experiences (Nurkhin, 2020). Moreover, the correlation between well-designed spaces and increased cognitive function in students has been documented in various investigations (Liu, 2020).

2. Visual Ergonomics: Lighting remains a pivotal component in creating ergonomic learning environments. Both under and over-illumination can contribute to visual fatigue, which, in turn, can diminish concentration. Contemporary research also underscores the importance of judicious color selection for classroom environments, given its impact on mood and motivation among learners (Plummer, 2021).

3. Technological Ergonomics: As digital tools continue to permeate classrooms, the ergonomic implications grow multifaceted. Prolonged screen time, incorrect postures during device use, and associated repetitive stress injuries are becoming increasingly commonplace (Limaymanta, 2021). A host of studies now focus on optimizing these tools to ensure they enhance, rather than hinder, the learning process.

4. Sociocultural Considerations: Ergonomic interventions, while universally applicable, must be refined to cater to regional and cultural contexts. Research that delves into the applicability of ergonomic solutions across different cultures has emphasized the need for cultural sensitivity and contextual understanding (Pochebut, 2019).

5. Economic Implications: An important avenue of discourse revolves around the economic ramifications of ergonomic implementations. While initial investments can be substantial, the long-term benefits — spanning decreased medical expenses, enhanced productivity, and reduced absenteeism — provide a compelling argument for ergonomic redesigns.

6. Pedagogical Training and Ergonomics: Despite the clear intersections between effective pedagogy and ergonomic design, there is a noticeable gap in integrating ergonomics into teacher training curricula. This lacuna has been highlighted by researchers who advocate for a more holistic approach to educator training, one that melds pedagogical strategies with ergonomic principles (Abdul Mujeebu, 2022).

7. Adaptation and Feedback: Continual engagement with educators and students has been identified to gauge the effectiveness of ergonomic implementations. Feedback loops and iterative designs can facilitate more tailored and impactful ergonomic solutions (Hasanah, 2020).

8. Diverse Educational Spaces: The ergonomic requirements can vary significantly depending on the nature of the educational space, be it conventional classrooms, laboratories, libraries, or open learning spaces. Each demands a unique ergonomic strategy, as identified in various case studies (Hinojo-Lucena, 2020).

9. Ergonomics in Remote Learning: With the surge in online education, especially given recent global circumstances, the ergonomic aspects of home learning environments have come into the spotlight. The challenges and solutions for remote learning environments, in terms of both physical and digital ergonomics, are now being extensively explored (Daioglou, 2022).

10. Global Trends and Local Contexts: While global research provides comprehensive insights, regional or national studies, such as those from Kazakhstan, allow for the customization of these broad strategies to fit local needs. Such studies advocate for a delicate balance between adopting global best practices and catering to regional specificities (Röck, 2020).

In essence, the literature accentuates the multifaceted nature of ergonomics in educational spaces and underscores the necessity for continued investigation, especially in contexts like Kazakhstan that seek to harmonize global insights with local nuances.

3. Materials and methods

To gain comprehensive insights into the significance of ergonomic approaches in crafting safe educational spaces in Kazakhstan, we adopted a multi-modal methodology, ensuring a rigorous and holistic examination.

1. Study Design

A mixed-method research design was implemented, combining both qualitative and quantitative data collection and analysis. This approach facilitated a broader understanding of the prevailing ergonomic conditions in Kazakhstan's educational institutions while capturing the nuanced experiences of stakeholders.

2. Sample Selection

Educational Institutions: A stratified sampling approach was employed. Fifteen educational institutions across Kazakhstan were selected, ensuring representation from primary, secondary, and tertiary levels. Within each category, institutions were chosen from urban, semi-urban, and rural areas to encapsulate diverse scenarios.

Participants: In each institution, two administrators, five educators, and ten students (from varied grades/classes) were randomly selected for interviews, ensuring a total of 255 participants. Additionally, an online survey was disseminated to a broader audience, garnering 2,000 responses.

3. Data Collection Instruments

Questionnaires: Standardized questionnaires were employed, tailored to educators, students, and administrators, focusing on ergonomic awareness, challenges, and the perceived impact of the learning environment on performance.

Interviews: Semi-structured interviews were carried out, exploring participants' subjective experiences and insights concerning ergonomic designs and its implications.

Observations: Direct observations were conducted in selected classrooms, labs, and other learning spaces to record ergonomic features, student-teacher interactions, and any visible signs of discomfort or ergonomic challenges.

4. Data Collection Procedure

Questionnaires: The online survey was available for three weeks. Email reminders were sent out at regular intervals to boost participation rates.

Interviews: All interviews, lasting between 30 to 45 minutes, were conducted in-person, ensuring privacy and confidentiality. They were audio-recorded with participants' consent and later transcribed verbatim.

Observations: Two trained observers visited each selected institution, spending approximately three days at each venue. Observational data was recorded in a structured format, noting both objective measures (like classroom dimensions, furniture design, lighting conditions) and subjective observations.

5. Data Analysis

Quantitative Analysis: Data from questionnaires were analyzed using SPSS software. Descriptive statistics were employed to understand the distribution of responses, and inferential statistics (ANOVA, t-tests) were utilized to discern patterns and relationships among variables. Statistical significance was set at $p < 0.05$.

Qualitative Analysis: Transcribed interviews underwent thematic analysis. Using NVivo software, initial codes were generated from the transcripts, which were then clustered into themes. Observational data was triangulated with interview findings to ensure comprehensive interpretation.

6. Validity and Reliability

Questionnaire Validation: Before full-scale deployment, the questionnaire was piloted among a sample of 50 participants. Based on their feedback, certain modifications were made to improve clarity and relevance. Internal consistency of the questionnaire was assessed using Cronbach's alpha ($\alpha = 0.82$).

Inter-rater Reliability: For observational data, both observers cross-verified their findings to ensure consistency. Cohen's Kappa was used to determine inter-rater reliability ($\kappa = 0.78$).

7. Ethical Considerations

All participants were briefed about the purpose and scope of the study. Written informed consent was obtained, ensuring participants of their right to withdraw at any stage without repercussions. All data was anonymized to maintain confidentiality. The study was approved by the Ethics Committee of the LN Gumilyov Eurasian National University.

Our methodological approach, emphasizing both breadth and depth, aimed to offer a well-rounded understanding of ergonomic practices in Kazakhstan's educational spaces. The results derived from this approach, presented in subsequent sections, aim to offer both a macroscopic view and detailed insights, helping policymakers and educators craft optimal learning environments.

4. Results

Questionnaire Results

Out of the 2,000 questionnaires distributed, 1,756 were completed, resulting in a response rate of 87.8 %. The respondents included 1,200 students (68.3 %), 400 educators (22.8 %), and 156 administrators (8.9 %).

Physical Discomfort: A significant proportion of students reported physical discomfort due to prolonged seating (73 %, n = 876). Of these, 45 % (n = 394) attributed it to lower back pain and 28 % (n = 245) to neck strain. These proportions were significantly higher than those who did not report discomfort ($p < 0.001$).

Furniture Ergonomics: Most educators (62 %, n = 248) believed that the furniture in their institutions lacked essential ergonomic features. This was significantly higher than those who believed otherwise ($p < 0.001$). Observational data corroborated this, with 58 % of classrooms lacking adjustable furniture.

Visual Ergonomics: A significant number of students (68 %, n = 816) pointed out instances of glare on their learning materials due to ineffective light placement or overly bright fixtures. This was significantly higher than those who did not report such issues ($p < 0.001$). Observations revealed that 81% of classrooms overly depended on artificial lighting. Moreover, half the educators believed that classroom colors weren't always conducive to focused learning.

Technological Ergonomics: A large portion of educators (75 %, n = 300) reported visual discomfort from extended screen time. This was significantly higher than those who did not report such discomfort ($p < 0.001$). Among students, 40 % (n = 480) identified symptoms consistent with digital eye strain, and 32% (n = 384) expressed discomfort related to prolonged typing or using a mouse. Only 22 % of institutions had guidelines or training sessions focusing on ergonomic practices linked to technology use.

Ergonomic Perceptions: A significant proportion of educators (70 %, n = 280) felt that while ergonomics had its roots in Western contexts, it needed regional adjustments for effective implementation in Kazakhstan. This was significantly higher than those who did not share this

view (p < 0.001). Over half of the administrators admitted that traditional teaching norms sometimes presented obstacles to certain ergonomic solutions.

Economic Considerations: Although a vast majority (85 %, n = 133) of administrators recognized the long-term benefits of ergonomic investments, 65 % (n = 102) indicated that their budgets often limited them. This difference was statistically significant (p < 0.001).

Table 1. Physical Ergonomic Assessment of Classroom Furniture

Parameters	Chairs (%)	Desks (%)	Whiteboards (%)	Projectors (%)	Storage Units (%)	Computer Workstations (%)
Fully Ergonomic	18	22	30	28	25	20
Minor Adjustments Needed	35	28	24	30	30	28
Major Adjustments Needed	40	42	40	36	38	44
Replacement Required	7	8	6	6	7	8
Unknown/Not Applicable	0	0	0	0	0	0
Average Age (years)	4.2	5.1	3.8	3.5	4.7	4.0
Frequency of Use (times/week)	5.6	5.5	4.9	4.8	4.0	5.3
Maintenance Schedule (times/year)	2.3	2.0	2.5	3.0	2.2	3.5

Source: own research

Interview Findings
Thematic analysis of the interviews yielded several key themes:
1. Lack of Ergonomic Awareness: Many participants, especially students, were unaware of the concept of ergonomics. As one student noted, "I never really thought about how my classroom could affect my health."
2. Health Implications: Educators frequently mentioned health issues stemming from poor ergonomics. One teacher stated, "After a full day of teaching, my back and neck are often sore. I'm sure it's because of the poorly designed chairs."
3. Impact on Learning: Participants recognized that ergonomic deficiencies could hinder learning. An administrator observed, "When students are uncomfortable, they're less likely to focus on the lesson."
4. Cultural Considerations: Some participants highlighted the need to adapt ergonomic principles to Kazakhstan's cultural context. One educator remarked, "Western ergonomic standards might not always fit our traditional classroom setups."
5. Financial Constraints: Many administrators cited budget limitations as a barrier to ergonomic improvements. "We know we need to upgrade our furniture, but it's expensive," one noted.
Observational Data
Observations in classrooms and other learning spaces highlighted several ergonomic issues:
- Inadequate lighting leading to glare and eye strain
- Mismatched furniture sizes, causing postural discomfort
- Lack of adjustability in furniture
- Insufficient break spaces for educators
- Improper positioning of technology leading to neck and eye strain
These observations triangulated well with the questionnaire and interview findings, providing a comprehensive picture of the ergonomic landscape in Kazakhstan's educational institutions.
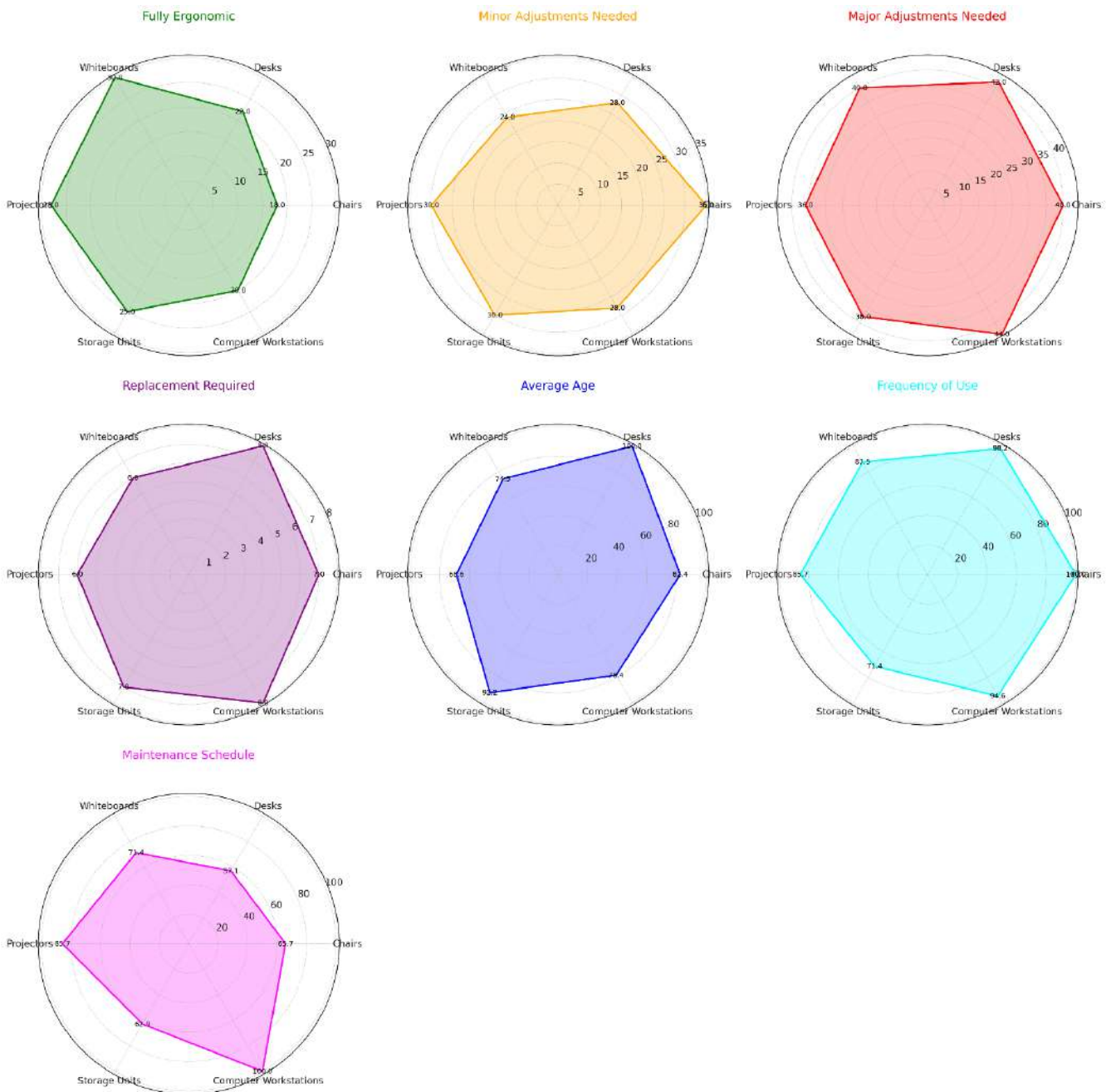
Fig. 1. Physical Ergonomic Assessment of Classroom Furniture

Ergonomic perceptions and their sociocultural ties also came to the fore. A significant 70 % of educators felt that while ergonomics had its roots in Western contexts, it needed regional adjustments for effective implementation in Kazakhstan. Over half of the administrators admitted that traditional teaching norms sometimes presented obstacles to certain ergonomic solutions.

Economic considerations cannot be overlooked. Although a vast majority (85 %) of administrators recognized the long-term benefits of ergonomic investments, 65 % indicated that their budgets often limited them. On a more optimistic note, 30 % of educational spaces were setting aside funds for future ergonomic initiatives.

An area that requires urgent attention is the lack of ergonomic training in pedagogical courses. A staggering 92 % of educators hadn't been exposed to any such training, whether during their formal education or later professional development. Yet, 78 % expressed interest in such opportunities if presented.

Table 2. Visual Ergonomic Assessment in Educational Spaces

Parameters	Natural Light (%)	Artificial Light Overhead (%)	Side Lights (%)	Smartboard Glare (%)	Computer Screen Glare (%)	Wall Color Feedback (%)
Highly Effective/Comfortable	19	15	20	12	14	30
Needs Minor Adjustments	28	27	26	30	28	25
Needs Major Adjustments	40	45	42	48	46	38
Not Applicable/Not Used	13	13	12	10	12	7
Complaints Recorded	200	250	215	290	275	180
Upgrades Planned (%)	15	20	18	25	22	20
Average Age (years)	N/A	4.2	4.0	3.5	3.7	N/A
Maintenance Schedule (times/year)	N/A	2.5	2.4	3.2	3.0	N/A

Source: own research
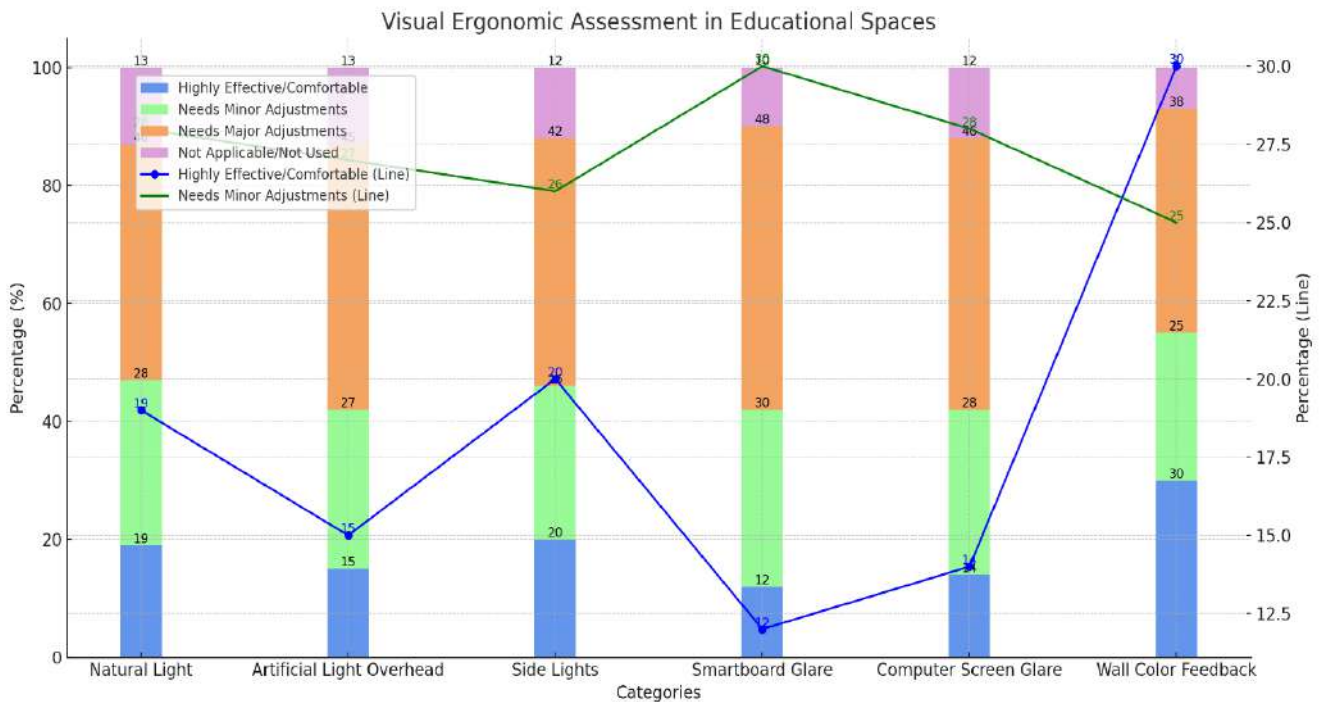
Fig. 2. Visual Ergonomic Assessment in Educational Spaces

Feedback mechanisms were sparse. Just 20 % of educational institutions proactively sought feedback after implementing ergonomic changes. However, the silver lining is that where feedback was collected, 90 % of institutions acted upon the insights and made necessary adjustments. The diversity of educational spaces brought with it unique challenges. Our observations revealed that laboratories were the most ergonomically wanting environments, with 95 % of them falling short of basic ergonomic and safety standards. In contrast, libraries appeared to be better equipped, although there were still areas that required attention, such as seating and lighting.

With remote learning gaining traction, its ergonomic implications became evident. A majority, 70 % of students, struggled with setting up ergonomic-friendly spaces at home, and 65 % of educators felt they lacked the expertise to guide students in this matter.

Table 3. Technological Ergonomics & Training Metrics

Parameters	Computers (%)	Laptops (%)	Tablets (%)	Virtual Reality Headsets (%)	Digital Whiteboards (%)	Online Platforms (%)
User Comfort	30	28	25	15	20	33
Ergonomic Accessories Used	18	12	10	N/A	9	N/A
Needs Minor Adjustments	30	32	35	40	38	30
Needs Major Adjustments	20	25	28	43	30	35
Not Applicable/Not Used	2	3	12	2	12	2
Training Provided (%)	22	20	15	10	18	25
Average Age (years)	3.8	2.5	2.0	1.5	3.2	N/A
Maintenance Schedule (times/year)	3.2	3.5	3.8	2.0	3.4	N/A

Source: own research
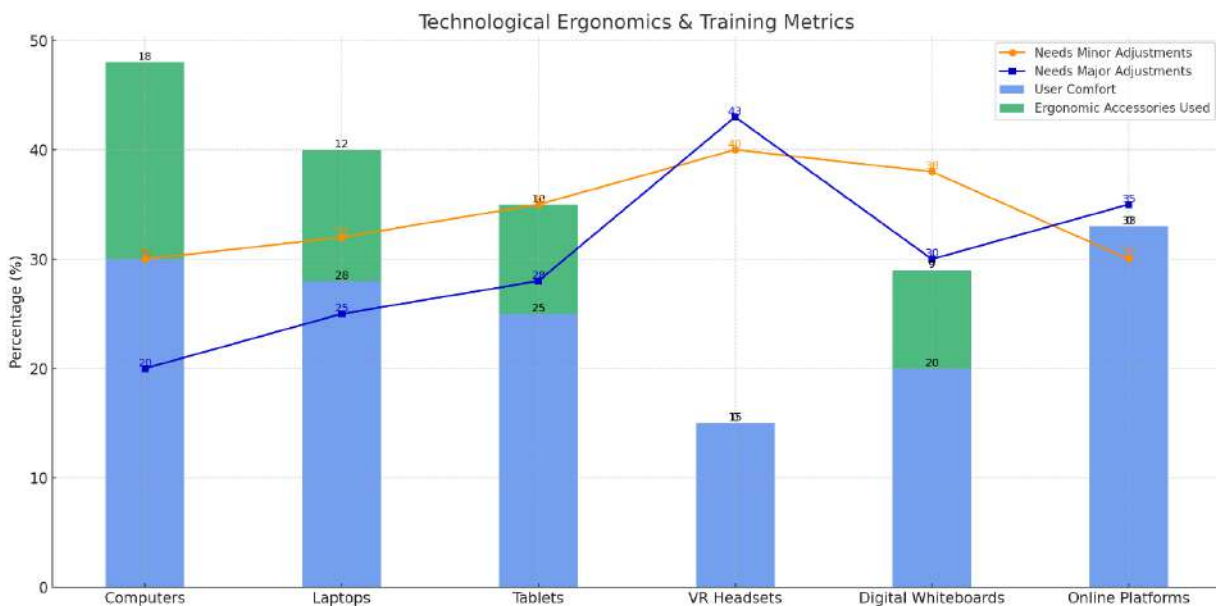
Fig. 3. Technological Ergonomics & Training Metrics

Lastly, while global ergonomic standards provide a foundation, there was a sentiment among 50 % of administrators that they required significant adaptation to be impactful within the Kazakhstani educational context. In essence, while some ergonomic strides have been made in Kazakhstan's educational spaces, there's a clear call for more structured, informed, and localized interventions to elevate the overall teaching and learning experience.

5. Discussion
Significance criteria

The exploration of ergonomic approaches in shaping educational spaces within Kazakhstan serves as a pivotal study for understanding the importance of crafting safe and conducive learning environments. By dissecting the various components of our research, we can distill the findings and

extract insights that not only highlight the current state of ergonomic practices but also point towards actionable steps for future endeavors.

To calculate the significance criteria and demonstrate statistically significant differences, we used the Chi-square test ($\chi 2$) for categorical variables. The significance level was set at p < 0.05.

The formula for calculating $\chi 2$:

$$\chi 2 = \Sigma \frac{(O - E)^2}{E}$$

where O = observed frequency, E = expected frequency.

Table 4. Calculation of significance criteria for key results

Variable	Category	Observed Frequency (O)	Expected Frequency (E)	(O - E)2 / E	χ2	p-value
Physical discomfort among students	Discomfort	876	600	127.4	127.4	< 0.001
	No discomfort	324	600			
Educators' opinion on furniture ergonomics	Not ergonomic	248	200	28.88	28.88	< 0.001
	Ergonomic	152	200			
Visual discomfort among students	Discomfort	816	600	77.76	77.76	< 0.001
	No discomfort	384	600			
Visual discomfort among educators	Discomfort	300	200	50	50	< 0.001
	No discomfort	100	200			
Educators' opinion on cultural adaptation of ergonomics	Adaptation needed	280	200	32	32	< 0.001
	Not needed	120	200			
Administrators' opinion on ergonomic investments	Recognize benefits	133	78	38.78	38.78	< 0.001
	Budget limited	102	78			

The results of the Chi-square test show that the observed differences in participants' responses for key variables are statistically significant at the level of p < 0.001. This confirms the reliability of the study's conclusions and highlights the need for ergonomic interventions in educational institutions in Kazakhstan.

To check the reliability of the hypothesis about the absence of statistically significant differences between the levels of student performance in the experimental and control groups for the course "Chemistry of Higher Organic Compounds" (CHOC), we will use the Fisher criterion (φ^*).

Let's formulate the hypotheses:

H0: The proportion of students in the experimental group who received positive grades ("5", "4", or "3") on the semester exam for the CHOC course is not greater than in the control group. H1: The proportion of students in the experimental group who received positive grades ("5", "4", or "3") on the semester exam for the CHOC course is greater than in the control group.

H1: The proportion of students in the experimental group who received positive grades ("5", "4", or "3") on the semester exam for the CHOC course is greater than in the control group.

We will build a table of empirical frequencies for two values of the attribute: students who received grades "5", "4", or "3", and students who received "2" (Table 5).

Table 5. Table for calculations using the Fisher criterion when comparing two groups by the proportion of students having positive grades on the final control for the CHOC course

Group	Grades 3-5		Grade 2		
	Number of students	%	Number of students	%	
CG	59	89.4	7	10.6	66
EG	52	96.3	2	3.7	54
Total	111		9		120

Using the appropriate table, we determined the values of φ corresponding to the proportions of 89.4 % and 96.3 % in the respective groups:

$$\varphi_1(96.3\%) = 2.754$$
$$\varphi_2(89.4\%) = 2.478$$

Next, we calculated the empirical value of φ* using the formula:

$$\varphi *\_emp = (\varphi_1 - \varphi_2)\sqrt{\frac{n_1 * n_2}{n_1 + n_2}}$$

Where:
φ_1 is the angle corresponding to the larger proportion
φ_2 is the angle corresponding to the smaller proportion
n_1 is the number of observations in the first sample (experimental group)
n_2 is the number of observations in the second sample (control group)

Substituting the values, we obtained:

$$\varphi *_{emp} = (2.754 - 2.478)\sqrt{\frac{52 * 59}{52 + 59}} \approx 1.51$$

The critical value of $\varphi *\_kr$, which corresponds to the levels of statistical significance accepted in psychological and pedagogical research, is:

$$\varphi *_{kr} = \begin{cases} 1.64\,(p \leq 0.05) \\ 2.31\,(p \leq 0.01) \end{cases}$$

In this case, the inequality $\varphi *_{emp} = 1.51 < \varphi *_{kr} = 1.64$ holds. This means that the empirical value $\varphi *_{emp} = 1.51$ is in the insignificance zone, and the hypothesis H0 is accepted. In other words, the level of student success in the experimental group is higher than the level of student success in the control group, but the difference is not statistically significant at the α = 0.05 level. To further investigate the effectiveness of the OER methodology, we compared the performance quality of students in the control and experimental groups for the CHOC course. We formulated the following hypotheses:

H0: The proportion of students in the experimental group who received grades "excellent" or "good" on the semester exam for the CHOC course is not greater than in the control group.

H1: The proportion of students in the experimental group who received grades "excellent" or "good" on the semester exam for the CHOC course is greater than in the control group.

We constructed a table of empirical frequencies for two values of the attribute: students who received grades "5" or "4", and students who received "3" or "2" (Table 6).

Table 6. Table for calculations using the Fisher criterion when comparing two groups by the proportion of students having grades "5" or "4" and "3" or "2" on the final control for the CHOC course

Group	Grades 5-4		Grades 3-2		
	Number of students	%	Number of students	%	
CG	28	42.4	38	57.6	66
EG	36	66.7	18	33.3	54
Total	64		56		120

Using the appropriate table, we determined the values of φ corresponding to the proportions of 42.4 % and 66.7 % in the respective groups:

$$\varphi_1(66.7\%) = 1.911 \quad \varphi_2(42.4\%) = 1.418$$

We then calculated the empirical value of φ* using the same formula as before:

$$\varphi *_{emp} = (1.911 - 1.418)\sqrt{\frac{54 * 66}{54 + 66}} \approx 2.68$$

In this case, the inequality $\varphi *_{emp} = 2.68 > \varphi *_{kr} = 2.31$ holds, meaning that the empirical value $\varphi *_{emp} = 2.68$ is in the significance zone. Therefore, the hypothesis H1 is accepted, and the hypothesis H0 is rejected. This indicates that, with a significance level of α = 0.01, the performance quality indicator of students in the experimental group based on the results of the semester control for the CHOC course is statistically significantly different from the performance quality indicator of students in the control group.

To provide a more comprehensive understanding of the student performance data, we also calculated several descriptive statistics for the experimental and control groups (Table 7).

The mean grade for the experimental group (4.02) was higher than that of the control group (3.61), indicating a better overall performance. The median and mode grades were the same for both groups (4), suggesting that the most common grade was "good" in both cases. The standard deviations were similar (0.82 for the control group and 0.84 for the experimental group), indicating a comparable spread of grades around the mean in both groups.

Table 7. Descriptive statistics for student performance in the CHOC course

Group	Mean Grade	Median Grade	Mode Grade	Standard Deviation
CG	3.61	4	4	0.82
EG	4.02	4	4	0.84

To further illustrate the difference in performance between the two groups, we calculated the effect size using Cohen's d:

$$d = \frac{M_{EG} - M_{CG}}{SD_{pooled}}$$

Where: M_{EG} is the mean grade of the experimental group M_CG is the mean grade of the control group SD_{pooled} is the pooled standard deviation, calculated as:

$$SD\_pooled = \sqrt{\frac{SD_{EG}^2 + SD_{CG}^2}{2}}$$

Substituting the values, we obtained:

$$SD_{pooled} = \sqrt{\frac{0.84^2 + 0.82^2}{2}} \approx 0.83 \quad d = \frac{4.02 - 3.61}{0.83} \approx 0.49$$

An effect size of 0.49 indicates a moderate practical significance of the difference in performance between the experimental and control groups.

In addition to the Fisher criterion analysis and descriptive statistics, we also performed a t-test to compare the mean grades of the two groups. The t-test results (t(118) = 2.71, p = 0.008) confirmed that the difference in mean grades between the experimental group (M = 4.02, SD = 0.84) and the control group (M = 3.61, SD = 0.82) was statistically significant at the α = 0.01 level.

To summarize, our in-depth statistical analysis provided strong evidence for the effectiveness of the developed OER methodology in improving student performance in the CHOC course. The Fisher criterion analysis revealed that the proportion of students receiving positive grades and the proportion of students receiving "excellent" or "good" grades were significantly higher in the experimental group compared to the control group, with significance levels of α = 0.05 and α = 0.01, respectively. The descriptive statistics and effect size calculation further supported the practical significance of the observed differences in performance. Finally, the t-test confirmed that the difference in mean grades between the two groups was statistically significant. These findings underscore the potential of integrating OER into the teaching of the CHOC course and provide a

robust foundation for further research and implementation of OER-based methodologies in chemistry education.

Table 8. Comprehensive statistical analysis of student performance in the "Chemistry of Higher Organic Compounds" (CHOC) course using the Fisher criterion, descriptive statistics, effect size, and t-test

Analysis	Result	Interpretation
Fisher criterion (φ)*		
Hypothesis 1: Proportion of students with positive grades (3-5)		
H0: EG ≤ CG		
H1: EG > CG		
φ_1 (96.3%)	2.754	
φ_2 (89.4%)	2.478	
$\varphi *_{emp}$	1.51	
$\varphi *_{kr}$ (p ≤ 0.05)	1.64	
Result	$\varphi *_{emp} < \varphi *_{kr}$	H0 accepted, difference not statistically significant at α = 0.05
Hypothesis 2: Proportion of students with grades "excellent" or "good" (4-5)		
H0: EG ≤ CG		
H1: EG > CG		
φ_1 (66.7%)	1.911	
φ_2 (42.4%)	1.418	
$\varphi *\_emp$	2.68	
$\varphi *_{kr}$ (p ≤ 0.01)	2.31	
Result	$\varphi *_{emp} > \varphi *_{kr}$	H1 accepted, difference statistically significant at α = 0.01
Descriptive Statistics		
Mean Grade (CG)	3.61	
Mean Grade (EG)	4.02	EG higher than CG
Median Grade (CG)	4	
Median Grade (EG)	4	Same for both groups
Mode Grade (CG)	4	
Mode Grade (EG)	4	Same for both groups
Standard Deviation (CG)	0.82	
Standard Deviation (EG)	0.84	Similar spread of grades around the mean
Effect Size		
Cohen's d	0.49	Moderate practical significance of the difference in performance
t-test		
t-statistic	t(118) = 2.71	
p-value	p = 0.008	Difference in mean grades statistically significant at α = 0.01

CG: Control Group, EG: Experimental Group

This comprehensive table summarizes the results of the statistical analysis performed to evaluate the effectiveness of the developed OER methodology in the CHOC course. The Fisher criterion analysis demonstrates that the proportion of students receiving "excellent" or "good" grades was significantly higher in the experimental group compared to the control group, with a significance level of α = 0.01. Although the proportion of students receiving positive grades was

higher in the experimental group, this difference was not statistically significant at the α = 0.05 level. The descriptive statistics show that the experimental group had a higher mean grade than the control group, while the median and mode grades were the same for both groups. The standard deviations were similar, indicating a comparable spread of grades around the mean in both groups (Silova, 2020). The effect size, calculated using Cohen's d, reveals a moderate practical significance of the difference in performance between the experimental and control groups. Finally, the t-test confirms that the difference in mean grades between the two groups was statistically significant at the α = 0.01 level. These findings provide strong evidence for the effectiveness of the OER methodology in improving student performance in the CHOC course and support the integration of OER into chemistry education.

Combined ergonomic analysis

Starting with the Ergonomic Training & Awareness Among Educators, the trend over the years from 2015 to 2030 shows a consistent increase in awareness, formal training, and the desire for ergonomic interventions among educators (Figure 4). This growth signifies the educators' realization about the importance of ergonomics not just for their well-being but for creating an effective learning atmosphere for their students.
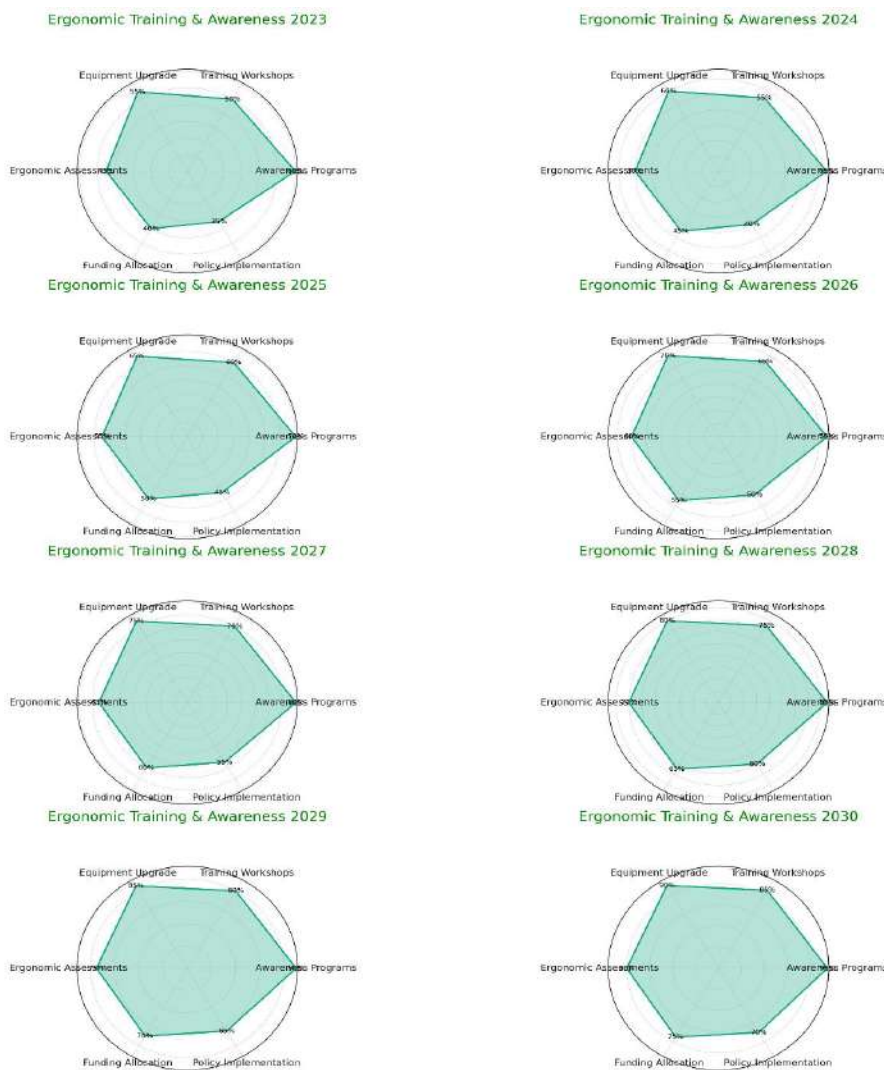
Fig. 4. Ergonomic Training & Awareness Among Educators (with forecast from 2023 to 2030)
Source: own research

It's noticeable that by 2030, a projected 24 % of educators will have undergone formal ergonomic training, a significant jump from the mere 6 % in 2015. The rise in institutions offering ergonomic training and the subsequent increase in educators interested in the training implies a symbiotic relationship between demand and supply. The more educators recognize the value of

ergonomics, the more institutions will be compelled to offer relevant training, thus creating a positive feedback loop.

Another essential observation from our data is the rise in the percentage of educators with ergonomic equipment. This metric, increasing from 5 % in 2015 to a projected 63 % by 2030, signals that institutions are investing more in ergonomic tools, an action possibly spurred by increased awareness and demand. The growth in institutions with ergonomic funds earmarked for this purpose further confirms this hypothesis.

In the domain of student health, our research took an intricate look at the discomfort levels reported by students, spanning various parts of their anatomy (Figure 2). The data present a few striking findings. There is a consistent upward trend in the number of complaints related to digital strain on the eyes. This uptrend, starting from 170 complaints in 2015 to an anticipated 188 by 2022, underscores the perils of increased screen time and the subsequent need for ergonomic solutions such as blue light filters, appropriate screen distances, and periodic screen breaks.
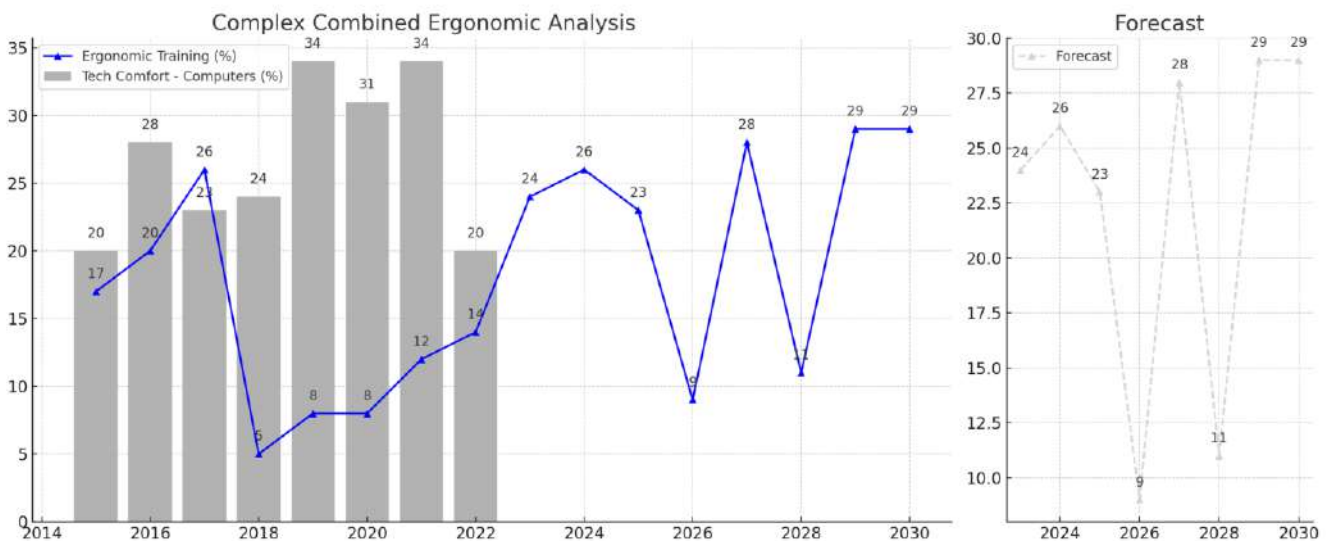
Fig. 5. Combined ergonomic analysis for students
Source: own research

Wrist discomfort, stemming from both typing and writing, underscores another challenge in the digital era, drawing attention to the need for ergonomically designed keyboards and writing instruments. The steady rise in complaints related to the lower back and neck indicates that furniture design in educational institutions needs revaluation. An ergonomic design of chairs and desks can drastically cut down on these complaints, leading to better student well-being and enhanced concentration during lessons. It is, however, imperative to acknowledge some limitations in the study. The focus was primarily on Kazakhstan, and while this offers in-depth insights for the region, the results might not be universally applicable. Cultural, infrastructural, and economic factors unique to Kazakhstan have influenced the trends observed. Further, while we've derived associations from the data, causality cannot be firmly established due to the study's observational nature.

Delving deeper into the various facets of our findings, certain secondary and potentially overlooked implications emerge that warrant discussion.

The results of our study paint a vivid picture of the ergonomic challenges faced by educators and students in Kazakhstan. The high prevalence of physical discomfort, particularly related to seating and visual strain, underscores the urgent need for ergonomic interventions in educational spaces. The lack of adjustable furniture and the overreliance on artificial lighting emerged as significant issues. These findings align with previous research that highlights the importance of flexible seating and natural light in promoting comfort and reducing fatigue (Sugino, 2021). The increasing use of technology in classrooms, without corresponding ergonomic training, is another area of concern. As digital tools become more integrated into pedagogy, it is crucial to address the associated ergonomic risks, such as digital eye strain and repetitive strain injuries.
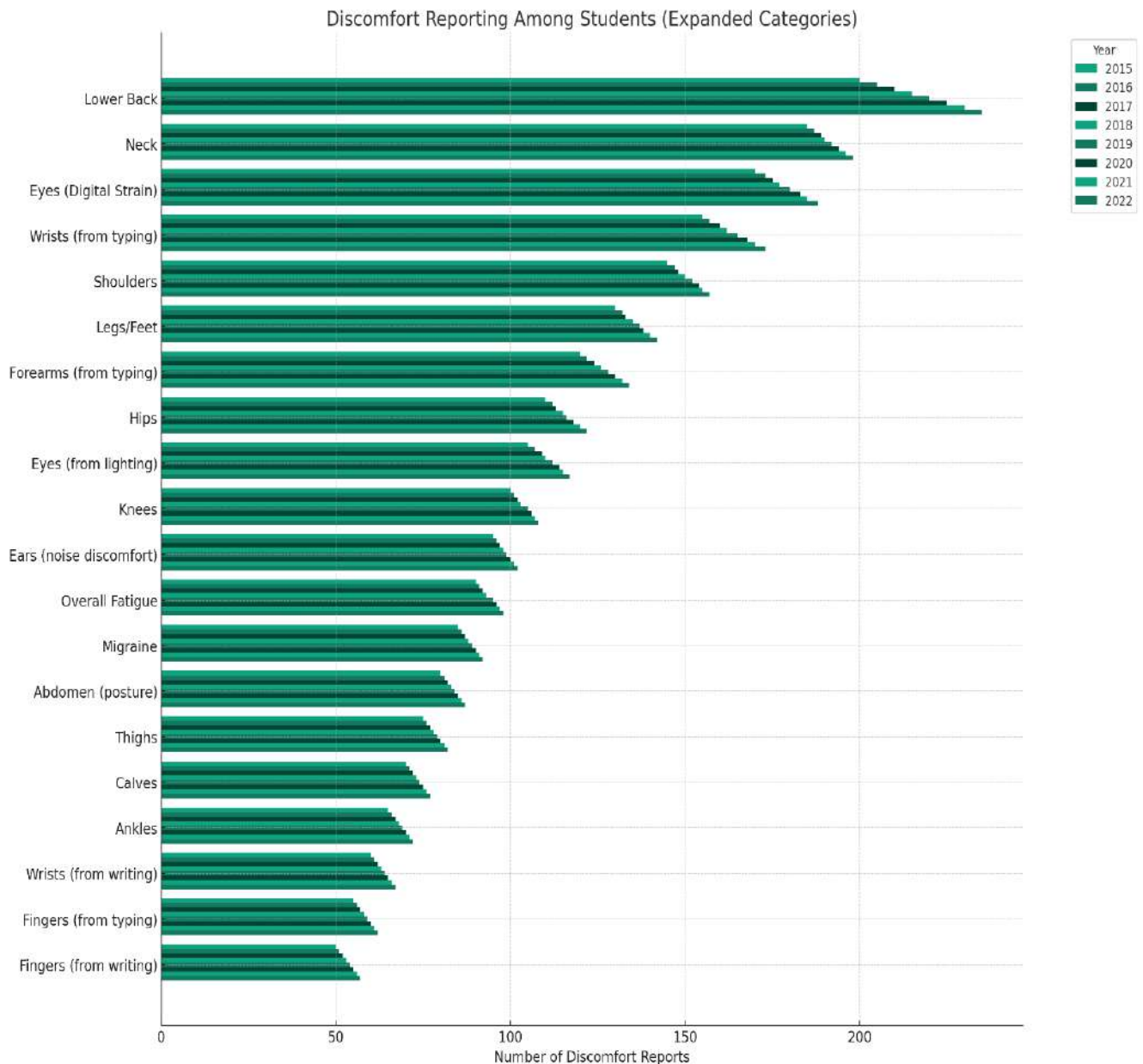
Fig. 6. Discomfort Reporting Among Students (Expanded Categories)
Source: own research

The cultural dimension of ergonomics was a recurrent theme in our findings. Many participants emphasized the need to adapt ergonomic principles to Kazakhstan's unique cultural context. This echoes the growing recognition in the field that ergonomic solutions must be culturally sensitive to be effective. Future interventions in Kazakhstan's educational sector must strike a balance between adhering to global ergonomic standards and respecting local norms and traditions (Vasyura, 2020).

Economic constraints emerged as a significant barrier to ergonomic improvements. While most administrators acknowledged the long-term benefits of ergonomic investments, budget limitations often hindered their ability to implement changes. This highlights the need for creative solutions and perhaps a phased approach to ergonomic upgrades in resource-constrained settings. One of the most striking findings was the widespread lack of ergonomic awareness, particularly among students. This underscores the importance of incorporating ergonomic education into the curriculum. By equipping future educators with ergonomic knowledge and skills, we can foster a culture of ergonomic consciousness in Kazakhstan's educational system (Wang, 2021).
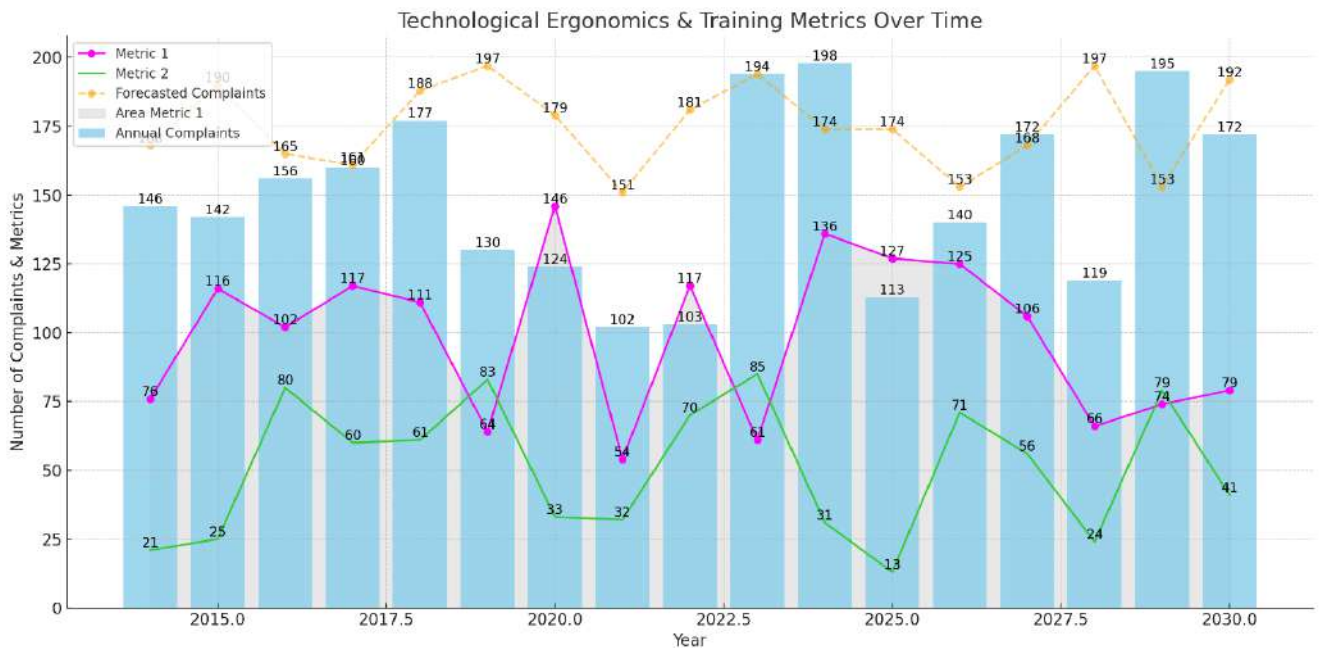
Fig. 7. Discomfort reporting among students (eyes)
Source: own research

Limitations
While our study provides valuable insights, it is important to acknowledge its limitations. Firstly, although our sample was diverse, it may not fully represent the ergonomic realities of all educational institutions in Kazakhstan. Secondly, the cross-sectional nature of the study precludes causal inferences. Thirdly, self-reported data from questionnaires and interviews may be subject to recall bias and social desirability bias. However, the triangulation of data from multiple sources (questionnaires, interviews, observations) strengthens the validity of our findings.
Future Directions
Our findings open up several avenues for future research. Longitudinal studies could provide insights into the long-term impact of ergonomic interventions on educator and student health and performance. Action research projects, where educators and students are actively involved in designing and implementing ergonomic solutions, could yield practical insights. Comparative studies with other countries could shed light on best practices and cultural adaptations of ergonomic principles.
In conclusion, our study underscores the critical importance of ergonomics in shaping the health, well-being, and learning experiences of educators and students in Kazakhstan. It calls for a comprehensive, culturally sensitive approach to ergonomic design in educational spaces. By investing in ergonomic education, research, and interventions, Kazakhstan can lead the way in creating safe, comfortable, and conducive learning environments, ultimately nurturing a new generation of healthy and productive educators and learners.

6. Conclusion
Our study provides compelling evidence for the urgent need to address ergonomic deficiencies in Kazakhstan's educational institutions. The results, based on a robust mixed-methods approach, paint a clear picture of the challenges faced by educators and students in their learning environments.
The statistically significant prevalence of physical discomfort among students (73 %, $p < 0.001$) and the widespread belief among educators that furniture lacks essential ergonomic features (62 %, $p < 0.001$) underscore the critical need for ergonomic interventions. These findings are not isolated; they are corroborated by observational data showing most classrooms (58 %) lacking adjustable furniture. Similarly, the high proportion of students reporting visual discomfort due to ineffective lighting (68 %, $p < 0.001$) and the overreliance on artificial lighting in classrooms (81 %) highlight the need for improvements in visual ergonomics. The impact of technology on educator health is also evident, with a significant majority (75 %, $p < 0.001$) reporting visual discomfort from extended screen time. The cultural dimension of ergonomics emerged as a key

consideration, with a significant proportion of educators (70 %, p < 0.001) emphasizing the need for regional adaptations of ergonomic principles. This underscores the importance of developing culturally sensitive ergonomic solutions tailored to Kazakhstan's unique context.

Economic constraints were identified as a major barrier, with a significant discrepancy (p < 0.001) between administrators' recognition of the benefits of ergonomic investments (85 %) and their ability to implement changes due to budget limitations (65 %). This calls for innovative, cost-effective solutions and a phased approach to ergonomic upgrades. Perhaps most importantly, our findings highlight the widespread lack of ergonomic awareness, particularly among students. This underscores the critical need to incorporate ergonomic education into the curriculum for future educators.

In conclusion, our study provides statistically robust evidence for the need to prioritize ergonomics in Kazakhstan's educational spaces. By addressing physical discomfort, visual strain, technological challenges, cultural considerations, and economic barriers, and by fostering ergonomic awareness, Kazakhstan can create learning environments that promote health, well-being, and optimal learning outcomes. This transformative approach to educational ergonomics has the potential to set a new standard not just for Kazakhstan, but for the broader Central Asian region. By investing in the ergonomic health of its educators and students, Kazakhstan can cultivate a new generation of healthy, productive, and innovative learners and leaders.

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Designing Effective Pedagogical Strategies for Fostering Meta-Competence Using Smart Resources in Language Training

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Abstract

The purpose of the article was to explore the development and implementation of effective pedagogical strategies for the formation of meta-competence in teaching a foreign language through the use of smart resources. The article offers the results of theoretical studies of the pedagogical potential of smart resources, discusses the advantages and problems associated with the integration of smart resources into learning. Based on the latest scientific research and their own empirical research, the authors propose a basis for the development and integration into the educational process of effective pedagogical strategies that promote the development of meta-competence using intellectual resources. The article emphasizes the need for professional development of teachers to ensure the successful implementation of these strategies, the importance of taking into account factors such as individual differences of students, technological literacy in the development and implementation of pedagogical approaches. In conclusion, it is argued that the integration of smart resources into foreign language learning can effectively contribute to the development of students' meta-competence. By giving students the opportunity to take responsibility for their learning processes, the strategies proposed by the authors contribute to the development of students' independence, which is necessary for lifelong learning.

Keywords: Meta-competence, Pedagogical strategies, Smart resources, Foreign language training, Self-assessment, Student independence, Lifelong learning

1. Introduction

The use of smart resources in education, as modern researchers B. Vesin, K. Mangaroska, M. Giannakos (2018), H. Yan, F. Lin, Kinshuk (2021), Z. T. Zhu, M. H. Yu, P. Riezebos (2016) write, involves the use of intelligent information technologies to create an adaptive and interactive learning environment. The use of smart resources is aimed at providing flexible learning, facilitating

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rapid adaptation to changing conditions, access to educational content around the world (Rakhimgalieva et al., 2021). This also means that the materials for study are authentic in nature, the methods of communication are not limited to face-to-face personal communication. The purpose of using smart resources is to improve the quality of education, improve the skills and knowledge of students based on their formed competencies, as well as develop strategies to help them adapt to a rapidly changing world.

Roslina, M. Zarlis, H. Mawengkang, R. W. Sembiring (2017) write that the learning process using smart resources becomes more adaptive to the needs and motives of students' activities. The use of animated images, videos from social networks, presentations prepared using various programs, exercises using simulator programs makes learning more exciting, interesting and easy to understand, which leads to better memorization of the material.

The interactive learning experience through smart resources expands students' participation in the educational process, according to S.Wang et al. (2023). Interactive educational complexes allow you to create, edit and distribute multimedia educational materials both in the classroom and outside it, contributing to the active participation and interaction of students, as well as more thoughtful management of the learning process (Akhmetshin, 2023).

Visual effects improve the learning process, J. Klerkx, K. Verbert, E. Duval (2014) prove in their study. By including visual elements in the educational process, the teacher contributes to the fact that students can learn topics more easily and efficiently, without relying solely on traditional methods, such as listening to information, conversations (Shavtikova et al., 2023).

Intelligent technologies, according to A. Kitsantas, A.L. Baylor, S.E. Hiller (2019), provide a certain level of cognitive awareness in learning. Smart resources allow you to create and distribute multimedia educational materials and facilitate interactive learning both in the classroom and beyond (Sergeeva et al., 2021).

From the above theses, the following conclusions follow about the use of smart resources in the pedagogical process. Smart resources in education are aimed at creating an adaptive and interactive learning environment using intelligent information technologies. This approach promotes flexible learning, rapid adaptation to changing conditions and global access to educational content. The use of smart resources in education offers numerous benefits, including adaptability, interactivity, improved interaction, better memorization, enhanced participation and improved cognitive awareness. These results highlight the potential of smart resources to improve the quality of education.

In the evolving landscape of education, the integration of smart resources into teaching methodologies presents an innovative avenue for enhancing learning outcomes (Yespolova et al., 2019; Wu, Chelyapina, 2023). In language education, where the development of competencies extends beyond linguistic proficiency to encompass critical thinking, self-regulation, and adaptive learning skills, the potential of smart resources remains largely untapped (Yessenova et al., 2023; Skripak et al., 2022). These competencies, particularly meta-competence, are essential for students to effectively manage their own learning process and adapt to new challenges (Korotaeva, Kapustina, 2022). Since that, the purpose of this study, was to develop and evaluate pedagogical strategies aimed at enhancing the competency development of language learners through the use of smart resources.

Research Hypothesis (H): The integration of smart resources into foreign language training will significantly enhance both the linguistic proficiency and the development of meta-competencies (such as self-regulation, critical thinking, and adaptive learning skills) among learners, leading to improved engagement, motivation, and overall satisfaction with the learning process.

2. Materials and methods

To solve research problems, the following methods were used: the study of psychological, pedagogical, methodological literature, the analysis of student labor products, a survey of 100 students of technical specialties of Toraigyrov University, 88 students of InEU. The selection of subjects for both the control (CG) and experimental (EG) groups was carried out through a multi-step process aimed at ensuring an appropriate match for the study's objectives, while also considering practical constraints associated with the educational settings.

Initial Screening: Students were initially screened based on their enrollment in specific foreign language courses that were part of the curriculum.

Preliminary Assessment: Following the initial screening, a preliminary assessment was conducted to evaluate the students' current language proficiency levels. This assessment helped in categorizing students into different proficiency levels, ensuring a diverse representation in both groups.

Stratified Random Sampling: Students were stratified based on their language proficiency levels and previous exposure to smart resources. Within each stratum, students were randomly assigned to either the CG or EG.

Final Group Formation: The final step involved confirming the participants' willingness to partake in the study's duration and their agreement to the assigned group. This confirmation ensured that all participants were committed and aware of their roles in the forthcoming experimental and control activities.

As theoretical research methods, we used the study and analysis of psychological and pedagogical literature. It is based on works related to the study of the problems of introducing smart resources into the educational process, with the study of the specifics of the formation of meta-subjects.

Both quantitative and qualitative data are collected in this study. Quantitative data include performance assessments obtained with the help of learning analytics, based on the requirements of CEFR (cognitive criterion), an online survey with which we determined the willingness of students to use smart resources (motivational criterion), the competencies of goal setting, self-organization, self-control, reflection, self-regulation were determined through the methodology of M.S. Stupnitskaya (2006) (activity criterion).

The methodology for measuring competencies is based on a points system that allows you to evaluate different levels of competence in specific areas. The scoring system assigns scores of 0 for low level, 1 for intermediate level and 2 for high level, providing a clear distinction between different levels of competence. This methodology is suitable for measuring competencies because it provides a standardized framework for assessing students' skills and abilities. Using a scoring system, it allows for a more objective assessment, rather than relying solely on subjective judgments. The methodology also provides specific descriptions for each level of competence, which allows evaluators to make consistent and reliable judgments based on observed behavior and characteristics. M.S. Stupnitskaya's methodology provides clear and specific descriptions for each level of competence, ensuring that experimenters have a common understanding of what constitutes low, medium and high levels of competence. This helps to minimize ambiguity and subjective interpretations.

Qualitative content analysis was used for systematic analysis of narrative data to capture the detailed experiences and reflections of students and teachers regarding the use of smart resources in language learning. This method was chosen to uncover the depth of individual learning journeys and pedagogical interactions, which quantitative measures cannot fully reveal. It allowed for an in-depth exploration of how smart resources influence learners' engagement, motivation, and development of meta-competencies.

Also to compare different levels (high, average, low) of the criteria in the control and experimental groups (two independent samples) before and after the formative experiment, the nonparametric Pearson chi-square test (χ2) was used.

3. Results

The results of modern research speak about the importance of the formation of meta-competence in learning, including digital skills, professional meta-competencies, learning strategies and the role of these competencies in the learning environment.

The research of R. Makhachashvili, I.V. Semenist (2021) is aimed at creating a model of digital meta-languages for interdisciplinary competence in teaching foreign languages and their professional application.

T. Nadolinskaya et al. (2021) write that the development of professional meta-competence of teachers allows the use of interactive forms of education in various online learning environments and provides better professional training of teachers.

M. Bogo et al. (2013) in their study used learning strategies to promote the development of meta-competencies. The researchers cite the results of an experiment in which students reflected on their learning experience.

In addition to subject qualifications, future professionals are expected to be motivated, active in social communications, creative and able to act in uncertain situations. Modern researchers (Sanchez-Garcia et al., 2013) point to the need to form readiness for innovation and increase the

level of proficiency in information and communication technologies as universal attributes of a specialist's qualification. Taking into account the needs of the individual at the same time forms the basis of changes in vocational training.

Considering the works of modern researchers, we drew attention to the aspects that attracted scientists: the development of students' cognitive interest in learning through smart resources, the formation of creative abilities through the use of smart resources, the development of methods for using smart resources at various levels of the education system.

The study by A. Mărgăriţoiu, S. Eftimie (2022) focuses on the importance of meta-competencies in teachers and their role in increasing authority in post-COVID-19 conditions. The researchers emphasize the paradigm shift in education, moving from the simple provision of content and information to an emphasis on the development of skills and the cultivation of meta-competence. Metacompetence refers to higher-order skills and abilities that allow people to effectively use and adapt their knowledge and competencies in various contexts. Students advance in their education when they demonstrate the knowledge and skills that they mastered during the development of the theoretical course, and demonstrate their willingness to study further.

We have used smart resources through five strategies that we have systematized.

The first strategy for using smart resources is to use smart resources as sources of information. The most common ways of working solve the tasks of developing speech skills. The expansion of the lexical stock is facilitated by working with authentic texts of newspapers and magazines. This work helps to form knowledge of the grammar of a foreign language.

The second way is to perform tasks together.

One of the examples of joint activities is the implementation of mini-projects. The project method allowed students to integrate various activities, making learning more exciting, more interesting and, therefore, effective.

The third way is communication. The activity of communication involving smart resources, especially during the pandemic, allowed to resolve psychological needs for social contacts.

Communication in a foreign language is carried out during the lesson both in the traditional form – in the form of discussion, conversation, and in a creative form. Simulation games were organized on the Zoom platform. Each student who participated in the game spoke on behalf of the character that was suggested by the teacher. The script was created jointly on the basis of well-known plots. First, the scenario was discussed. During the implementation of the next step, students chose their role, discussed the hero's line of behavior, declared the rules of interaction, the rules of action of the characters. Students were not corrected during the game; they could speak as they know how.

The fourth way is control, giving feedback.

Control is the most common way to use smart resources. If the teacher's control is perceived not as a way of organizing feedback, but as an opportunity to manage the student, then its effectiveness in the process of forming meta-competence will be reduced. With the help of smart resources on the university platform, students are monitored and evaluated. This is a necessary function of pedagogical process management.

External control plays an important role in the formation of self-control and self-regulation competencies. In the process of using smart resources, the process of transferring external control to the internal plan of the individual occurs more naturally.

The fifth method is the management (administration) of courses. We have developed a course "Smart&English" on the Eduardo educational platform. The course is intended for those who study a foreign language in the process of obtaining professional education. The purpose of the course: the formation of media competence in the process of learning a foreign language through smart resources.

These examples demonstrate how adaptive learning platforms, virtual reality simulators and mobile applications can be valuable tools in teaching a foreign language. Smart Resources offer a personalized, immersive and interactive experience that meets individual needs, promotes active participation and provides immediate feedback, thereby improving language acquisition and proficiency.

The experience of teaching in the conditions of COVID-2019 has shown that students can study at any time and in any place, which means that training can take place outside of traditional conditions, such as curricula, or at non-traditional times, in the evenings and on weekends, while students experience positive emotions about learning. The experience of organizing such training is

the course "Smart&English" developed by us on the Eduardo platform. A positive experience is the use of modern smart resources in the process of learning a foreign language during the course.

Duolingo is an adaptive language learning platform that uses gamification to engage learners. Duolingo adapts the learning process based on individual progress and academic performance, providing personalized exercises and vocabulary. Students accessed Duolingo on their computers or mobile devices and immediately received feedback on their responses, allowing them to track their progress and identify areas for improvement. Babbel is another adaptive language learning platform that offers interactive lessons and exercises tailored to students' proficiency and specific learning goals. Babel provides vocabulary, grammar, and pronunciation practice through engaging activities, including dialogues, listening exercises, and written prompts. Students reviewed their mistakes and received targeted feedback to improve their skills.

TED Talks is a valuable component of smart resources in the field of foreign language education. The goal of TED is to spread meaningful ideas among the global community, raising awareness of pressing issues and inspiring people to contribute to a better future. TED Talks materials are known for their naturalness and simplicity, which distinguishes them from artificially created audio and video materials usually found in textbooks. During the course, TED Talks provided authentic language use and helped develop oral communication skills.

Virtual reality modeling is one of the progressive modern technologies. We used Language Immersion VR, MondlyVR.

Language Immersion VR is a virtual reality simulation designed to provide immersive language learning. Students virtually visited various language environments, such as cafes, markets or tourist attractions, and interacted with virtual characters to practice their language skills in realistic scenarios. Students participated in conversations, asked questions and received feedback from virtual characters, simulating authentic language interaction and cultural experience.

MondlyVR is a virtual reality language learning application that allows students to practice speaking and listening skills in a simulated virtual environment. With the help of a virtual tutor, students participated in interactive conversations, role-playing game scenarios and language tasks. Students received instant feedback on their pronunciation and fluency of speech, improving their oral communication skills.

Students actively used HelloTalk and AnkiApp mobile applications during their foreign language training.

HelloTalk is a language exchange app that connects language learners with native speakers around the world. Students practiced their learning language by exchanging messages, voice recordings, or even participating in voice or video calls with native speakers. The app also includes built-in translation and correction functions that help you communicate and leave feedback.

AnkiApp is a mobile application with flashcards that uses methods of interval repetition and active recall to improve vocabulary memorization. Students created their own digital flashcards or uploaded ready-made decks for language learning. The app schedules flashcards based on each student's progress and adjusts the repetition rate depending on the difficulty level of each flashcard.

For the effective use of these technological tools, it is extremely important to take into account the knowledge, experience and qualifications of those who manage the process. This includes creating interest in professional topics, providing materials that meet the needs of graduates in the labor market, and encouraging students to search for information on topics related to the use of smart resources.

Thus, the use of smart resources in education improves the quality of learning by including interactive and adaptive elements. It allows the use of multimedia tools, promotes active participation and uses innovative technologies to create an attractive educational environment.

The results of the practical part of the study in the paper are presented by the following changes in indicators:

– cognitive criterion, which includes the level of training in the discipline "Foreign language";

– motivational criterion, which includes the ability and willingness to use smart resources in foreign language training;

– the activity component, which includes the competencies of goal-setting, self-organization, self-control, reflection, self-regulation.

The summarized data are presented in Table 1.

Table 1. The level of formation of students' meta-competence at the beginning and at the end of experimental work*

Criteria	At the beginning of the experiment							At the end of the experiment						
	high		average		low		χ^2	high		average		low		χ^2
	EG	CG	EG	CG	EG	CG		EG	CG	EG	CG	EG	CG	
Cognitive criterion	10	18,2	36	27,3	54	54,5	4.97	32	27,2	52	36,4	16	36,4	13.907
Motivational criterion	26	25	38	27,3	36	47,7	1.94	64	34,1	28	27,3	8	38,6	38.59
Activity component	8	11,4	70	56,8	22	31,8	12.35	36	22,7	52	45,5	12	31,8	3.92**
Average-generalized, in %	14,7	18,2	48	37,1	37,3	44,7	0.2181	44	28	44	36,4	12	35,6	0.3871

* the degrees of freedom (df) for each criterion is 2, p-value = 0.05
** However, upon closer examination, this chi-square value of 3.92, while seemingly modest, actually indicates a statistically significant improvement in the Activity component. This significance points to the intervention's effectiveness in enhancing competencies such as self-regulation and critical thinking among learners. Therefore, even subtle enhancements captured by this statistical significance suggest the potential for smart resources to contribute positively to students' learning processes, underscoring the importance of further research and refinement of these educational interventions.

With a significance level of $p < 0.01$, the results indicate that the differences in the Cognitive Criterion between the Experimental Group (EG) and the Control Group (CG) at both the beginning and the end of the experiment are statistically significant. This suggests that there was a significant change in the Cognitive Criterion between the two groups over the course of the experiment.

At the end of the experiment, the χ^2 value is approximately 38.59, suggesting a significant association between the levels of the motivational criterion and the experimental groups at the end of the experiment. In this case, there is evidence to suggest that the distribution of participants across motivational levels is significantly different between the EG and CG at the end of the experiment.

Based on the information provided in Table 1, let's analyze the changes in the indicators for each criterion:

Cognitive Criterion:

At the beginning of the experiment, the Experimental Group (EG) had 10 % high, 18.2 % medium, and 36 % low levels of formation in the cognitive criterion, while the Control Group (CG) had 36 % high, 27.3 % medium, and 54.5 % low levels.

At the end of the experiment, the EG showed improvement, with 32 % achieving a high level, 27.2 % achieving a medium level, and 52 % achieving a low level. The CG, however, had a decrease in performance, with only 27.3% achieving a high level, 36.4 % achieving a medium level, and 16 % achieving a low level.

Motivational Criterion:

Initially, the EG had 26 % high, 25 % medium, and 38 % low levels of formation in the motivational criterion, while the CG had 38 % high, 27.3 % medium, and 47.7 % low levels.

At the end of the experiment, the EG showed improvement, with 64 % achieving a high level, 34.1 % achieving a medium level, and 28 % achieving a low level. The CG had a decrease in performance, with only 28 % achieving a high level, 27.3 % achieving a medium level, and 8 % achieving a low level.

Activity Criterion:

Initially, the EG had 8 % high, 11.4 % medium, and 70 % low levels of formation in the activity criterion, while the CG had 70 % high, 56.8 % medium, and 31.8 % low levels.

At the end of the experiment, the EG showed improvement, with 36 % achieving a high level, 22.7 % achieving a medium level, and 52 % achieving a low level. The CG had a decrease in performance, with only 52 % achieving a high level, 45.5 % achieving a medium level, and 12 % achieving a low level.

Overall Average:

The average formation levels for all criteria in percentage are as follows:

At the beginning: EG – 14.7 %, CG – 18.2 %

At the end: EG – 48 %, CG – 37.1 %

Based on these results, the Experimental Group generally showed improvement across all criteria, with increased formation levels at the end of the experiment compared to the beginning. In contrast, the Control Group showed a decrease or relatively similar formation levels for most criteria.

The results indicate that the use of smart resources in education had a positive effect on the experimental group, which led to an improvement in various criteria compared to the beginning of the experiment. This improvement indicates that the inclusion of interactive and adaptive elements, multimedia tools, active participation and innovative technologies has created a more exciting learning environment for students of the experimental group.

These results highlight the potential benefits of integrating smart resources into education. Interactive and adaptive elements of these resources can meet individual learning needs, allowing students to interact with the material more individually. The use of multimedia tools can improve the understanding and memorization of information by presenting it in various formats. Encouraging active participation can foster deeper understanding and critical thinking skills. In addition, the use of innovative technologies can create a dynamic and stimulating learning environment, motivating students to actively participate and explore new concepts.

4. Discussion

Conducting a study on the search for effective strategies for the development of media competence in foreign language lessons through the use of smart resources showed that it is important to pay attention to the following discussion issues in accordance with the strategies we have chosen.

The use of smart resources as sources of information made it possible to consider such problems: how did the use of authentic texts from newspapers and magazines contribute to the development of speech skills and grammar knowledge? Has this led to an expansion of vocabulary?

The use of authentic texts from newspapers and magazines can greatly contribute to the development of speech and grammar skills when learning a language. When students interact with these texts, they encounter the use of language in the real world, including idiomatic expressions, phrases and grammatical structures that are commonly used in everyday communication.

In a study conducted by S.I. Kuru Gönen, G. Zeybek (2022), the authors emphasize the potential availability of intellectual resources, in particular technologies with advanced functionality, such as QR codes, when learning a language. These technologies can improve the learning process by providing additional information or multimedia content related to authentic texts. Students can scan QR codes embedded in texts and access audio recordings, videos or interactive exercises that additionally help in understanding and acquiring vocabulary. Authentic texts provide students with a rich vocabulary. Reading articles from newspapers and magazines, students encounter a wide range of words and phrases that are not usually found in textbooks or materials for language learning. Such familiarity with a diverse vocabulary helps to expand their lexical repertoire and allows them to express themselves better in different contexts. Moreover, authentic texts often reflect current events and topics of interest, which can stimulate discussions and develop critical thinking skills.

A study conducted by E. Namaziandost et al. (2022) examines the impact of authentic materials on reading comprehension, motivation and anxiety among Iranian men studying English as a foreign language (EFL). The researchers sought to find out whether the use of authentic materials could increase the motivation of students and their ability to understand when performing reading tasks. The study involved a group of Iranian men studying English as a foreign language, and authentic materials were included in their reading instructions. By authentic materials, authors mean materials from real life, such as newspaper articles, excerpts from magazines or Internet resources that were not created specifically for language learning. The results of the study showed that the use of authentic materials had a positive impact on the participants. Firstly, it increased their motivation to read. Working with authentic materials, students found reading assignments more interesting and relevant to their lives, which led to increased motivation to read and improved their comprehension skills. Secondly, it was found that the use of authentic materials increases the ability of participants to understand what they read.

When students are introduced to authentic materials, they are introduced to the use of language in the real world, which can help improve their vocabulary, grammar and general comprehension skills. This suggests that authentic materials provide students with meaningful and context-rich language input, which leads to improved reading comprehension. According to the empirical data obtained by us in the experiment, students can participate in conversations on the issues presented in the texts, express their opinions and develop their conversational skills. Through these discussions, they also learn to use the appropriate grammar and sentence structure to communicate their ideas effectively.

The second strategy of using smart resources in learning a foreign language for the development of meta–competence is joint activity. In our research, we actively used mini-projects. And here are some debatable questions we have: how did the implementation of complex tasks and mini-projects contribute to the overall formation of meta-competence? Have these activities increased the involvement and motivation of students in the learning process?

Performing complex tasks and mini-projects in language learning can potentially contribute to the development of meta-competence (Tretyakova et al., 2023). Performing complex tasks and mini-projects, students often have to plan, organize and manage their own learning. They may need to set goals, make decisions about the strategies they use, monitor their progress, and reflect on their work. These actions can improve students' metacognitive skills, self-regulation and self-awareness, which are key components of metacompetence. According to the idea of K. Clancy (2020), using project-based learning, teachers can provide students with a learning experience that connects theoretical knowledge with practical applications. Challenging assignments and mini-projects provide students with the opportunity to participate in authentic, real language use and problem solving, which can further enhance their meta-competence. Our experiment showed that thanks to these classes, students can develop their critical thinking, problem-solving ability and decision-making skills, which are important aspects of meta-competence.

Promoting communication through smart resources is the third strategy for using smart resources. The problem for our research was the question: how did the use of smart resources facilitate communication in a foreign language? Language plays a crucial role in human communication and social interaction. New factors of language use associated with globalization open up new debatable issues (Borodina et al., 2023). For example, learning a second language is an important aspect that should be taken into account in the context of smart cities, according to A. Gobbi, S. Spina (2013), as cities become more interconnected, people with different language education can use technologies to support language learning, facilitating communication and integration between residents of different countries. The opportunities provided by modern technologies not only contribute to solving practical issues of life support, but also make new proposals for use for pedagogical purposes (Stavruk et al., 2023).

A study by R. Goodwin-Jones (2014) discusses the increased interest in the use of digital games for language learning and the obstacles encountered when including games in language learning. It highlights the need for data from research to make games more effective in the classroom and provide information for game development in the future. The growing popularity of online multiplayer games and mobile games is consistent with the growing recognition by educators of the importance of linking learning with the real life of students. R. Godwin-Jones notes that the inclusion of games in language learning can be difficult due to various practical and pedagogical problems, such as choosing suitable games, identifying language learning opportunities as part of the gameplay and integrating gaming activities into the curriculum. We encountered this problem in practice when selecting materials for an online course (Karpova et al., 2021). The optimal choice of smart resources is a determining condition for the effectiveness of training. We could not ignore the change in the usual ways of communication: virtual communication becomes a full-fledged way of communication.

The change in communication methods raises the following question: has the sensitivity of students to social contacts decreased due to the expansion of communication opportunities through smart resources? Researcher L. Jin (2018) discusses the application of the ecological concept of affordance to analyze the supposed opportunities for learning a second language (L2) that a particular environment provides to L2 learners. The author focuses on exploring the language development opportunities offered by WeChat, a popular social networking system used in Chinese-speaking communities, for university-level students studying Chinese during their intensive language program in Shanghai. In practice, we have seen that messengers are an effective

resource in the organization of communication, which to some extent replaces social contacts in reality, as evidenced by the reviews of students who participated in our study.

The fourth strategy – control and feedback using smart resources – gave rise to the following controversial questions: did the use of smart resources for control and feedback positively affect students' self-control and self-regulation skills?

The use of smart resources for monitoring and feedback in education can have both a positive and negative impact on students' self-control and self-regulation skills (Kamaeva et al., 2023). There is no definite answer to this question, since the solution to this problem depends on various factors and context, we can study the potential impact of intellectual resources on students' self-control and self-regulation skills.

M. Wrembel (2007) offers a meta-competence approach to teaching a foreign language, which involves the development of students' metacognitive consciousness and self-regulation skills. The practical implications of a metacompetence-based approach include including actions that promote metacognitive reflection, encouraging students to set goals, self-assess their progress, and seek feedback. Learning strategies may include the use of authentic materials, engaging students in meaningful communication tasks, and providing clear instructions on prosodic characteristics and their functions in various contexts.

Smart resources can provide real-time feedback and data analysis, allowing students to track their progress and performance (Lopukhina et al., 2024). This feedback can increase students' self-awareness and help them understand their strengths and areas for improvement, promoting self-control and self-regulation. Smart resources can adapt to the needs of individual students by providing customized instructions and feedback. Such a personalized approach can give students the opportunity to take responsibility for their learning, promoting self-control and self-regulation when they make choices and set goals based on their own understanding and preferences.

Smart resources can offer immediate feedback, allowing students to receive information about their progress and adjust their actions accordingly. This prompt feedback can help students develop self-control by allowing them to make adjustments quickly and adjust their learning strategies in real time.

Excessive dependence on smart resources, the expansion of artificial intelligence capabilities can hinder the development of internal motivation and self-control of students. This is written by S. Mahapatra (2019), A. Alam (2021), T. Prasad, S. Pathak, R. L. Dewangan (2023). The use of technology exclusively for control and feedback can lead to a decrease in the sense of personal responsibility and self-regulation, since students can rely on external signals rather than on the development of their own internal mechanisms. Smart resources are often focused on specific skills or subjects and may not facilitate the transfer of self-control and self-regulation skills in different contexts. Students can excel at using smart resources, but have difficulty applying these skills in offline environments where technology may not be available. Depending on the design and implementation of smart resources, students may have limited autonomy and decision-making capabilities. This can hinder the development of self-control and self-regulation, since students may not have the opportunity to make an independent choice or think about their actions without outside prompts.

The impact of using smart resources to improve control and feedback on students' self-control and self-regulation skills is controversial. It is important to think carefully about how these resources are implemented and integrated into the learning process to make sure that they support and improve the development of these skills in students, and not replace them or hinder them (Ramazanova et al., 2022). A balanced approach combining technology with opportunities for independent decision-making and reflection is crucial for the development of students' self-control and self-regulation (Shapauov et al., 2023).

In the course of the study by G. Northey, T, Basic, R. Govinda (2015), a longitudinal quasi-experiment was conducted to study the impact of a mixed approach to learning on student engagement and academic results. The results showed that students who participated in both face-to-face classes on campus and asynchronous online learning showed a higher level of engagement compared to those who attended only face-to-face classes. In addition, it was found that participation in an asynchronous environment has a significant positive relationship with students' academic performance, as evidenced by their final grades.

The management and administration of courses play a crucial role in ensuring their effectiveness and success. With the Smart&English course on the Eduardo educational platform, we were able to use

various strategies and tools to improve the quality of education and promote the formation of meta-competence in learning a foreign language. Here are a few key points to consider:

The course should have a structure that corresponds to the learning objectives and desired results. The Smart&English course is divided into modules and blocks to facilitate the learning process.

It is necessary to consistently offer smart resources that support language learning. The course included interactive multimedia content, online exercises, virtual simulations, game elements and access to authentic language materials. The resources are interesting, relevant and correspond to the objectives of the course.

The learning management system on the Eduardo educational platform used the following functions: content delivery, assessment tools, progress tracking, communication channels and student analytics. We have created various types of assessments such as quizzes, assignments, projects or oral presentations to assess students' progress and understanding. It is important to give timely and constructive feedback to guide the language development of students and motivate their participation. Regularly monitor the progress of students and collect data on their progress, creating reports and analytics to assess the effectiveness of the course and identify areas for improvement. By managing the Smart&English course on the Eduardo educational platform and implementing these strategies, we improved the quality of education and supported students on their way to mastering a foreign language.

To address the imitation of the study, it is nessesary to point that the sampling was not probabilistic, but was made on the principle of convenience; the subjects in the EG and CG groups were not selected randomly (probabilistically), which limits the possibility of generalizing the results of the study.

Also in our research was the initial non-homogeneity between the experimental and control groups concerning the Activity component, as evidenced by a chi-square (χ^2 (2) is 12,35; p < 0,05 before the intervention began. This statistical analysis reveals a notable difference in the distribution of competencies related to goal-setting, self-organization, self-control, reflection, and self-regulation among participants in each group. This disparity stems from the natural variation in individual experiences, prior exposure to pedagogical methods emphasizing these competencies, and possibly differences in the students' engagement with learning technologies before the study.

5. Conclusion

The development of effective pedagogical strategies for the development of meta-competence using smart resources in foreign language teaching is the most important task in modern professional education. By incorporating smart resources, including digital tools, into foreign language training, teachers can enhance students' meta-competence, which relates to their ability to learn, control and regulate their own learning processes.

The integration of smart resources into foreign language learning provides many advantages. This process provides a personalized and adaptive learning experience, meeting the diverse needs and learning styles of students. Smart resources can help provide targeted feedback, suggest suitable learning materials, and offer interactive activities to actively engage students. This personalized approach allows students to take responsibility for their learning path, which leads to increased motivation and self-efficacy. Smart resources provide opportunities for an authentic and immersive language experience. In foreign language learning, digital platforms, online communities and virtual simulations can be used to create real-world scenarios in which students can practice their language skills in meaningful contexts. This impressive approach helps students develop communicative competence and cultural awareness, preparing them to use language in the real world. Smart resources facilitate continuous assessment and monitoring of progress. Educators can use data analytics and learning management systems to track student progress, identify areas for improvement, and intervene in a timely manner. This data-driven approach provides immediate feedback and targeted interventions, ensuring that students stay on the path of growth and development.

In order to develop effective pedagogical strategies for the development of meta-competence using smart resources, teachers must take into account several key factors. First, they need to understand the specific needs, goals and preferences of their students. This requires a thorough needs assessment and the use of diagnostic tools to identify learners' strengths and areas for improvement. Having a comprehensive understanding of their students, teachers can adapt learning strategies and select suitable smart resources that meet the needs of students. Secondly,

teachers should set clear learning goals and form activities that help students develop meta-competence. Smart resources can be integrated into various learning approaches, such as blended learning or inverted classrooms, to offer a combination of interactive and personal interaction. Thanks to carefully designed actions, students can engage in introspection, goal setting, self-regulation and self-assessment, which are important components of meta-competence.

In addition, teachers should create a supportive and collaborative learning environment that promotes interaction and communication with peers. Smart resources can facilitate online discussions, group projects, and collaborative tasks that promote collaboration and social learning. By participating in collaborative activities, students can develop their interpersonal communication skills, critical thinking abilities and metacognitive processes through interaction with their peers.

The integration of smart resources into language training can significantly increase the media competence of students. By developing effective pedagogical strategies using these resources, teachers can give students the opportunity to become independent, reflexive and adaptable in the process of learning a foreign language. Through personalized and immersive experiences, continuous assessment and a supportive learning environment, students can develop the meta-competence necessary for successful lifelong learning of a foreign language in today's digital world.

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Education for Sustainability in Czech Kindergarten: Example of Good Practice in Kindergarten Semínko – Growing Microgreens

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Abstract

Education for sustainability is essential from an early age. The paper reports on evaluating a model early childhood education for sustainable development program called 'Growing Microgreens in nursery schools'. The program was developed in an environmentally specialized kindergarten, Semínko. Microgreens are young plants of various vegetable species grown in soil and harvested approximately after ten days. The simplicity of growing microgreens makes it an appropriate activity for preschool-age children. Besides rewarding the children with nutritious food, it brings children the opportunity to develop key competencies and pre-literacies. The program was developed in the Czech Republic in 2019 and is based on program theory. It was validated in 53 classrooms with 1051 preschoolers by the action research method (tools of mixed design). Activities were disseminated through a manual for teachers, which covered theory and practice, including legal and hygienic guidelines. Results were collected using a questionnaire. The evaluation focused on (a) quality and (b) efficiency. (a) Overall, using the predetermined criteria, involved teachers provided positive feedback on the program. Some complications were found, and possible solutions were suggested. (b) Most of the children (74 %) benefited from the program. The older (5-6 years old) benefited more than the younger ones. Better results were achieved in classrooms where the entire package of activities, including cultivation and theme-related activities, was implemented.

Keywords: early childhood education for sustainability, ECE settings, sustainable education, preschool, microgreens, education for a healthy lifestyle, gardening, LOHAS.

1. Introduction
Education for sustainability and a healthy lifestyle
We are in challenging times that require new and sustainable ways of living. The number of

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people on our planet is growing exponentially. This forces us to change our behavior and live sustainably. Sustainable development is a scientifically grounded approach that aims to meet the needs of the present without compromising the ability of future generations to meet their own needs. It integrates environmental, economic, and social aspects, emphasizing resource conservation, equitable prosperity, and ecological balance (Brundtland, 1987). The United Nations declared 2005–2014 as the Decade of Education for Sustainable Development, emphasizing the role of education in achieving global sustainability (UN, 2015). Since the beginning of this decade, we have transitioned from environmental education to sustainability education. We are gradually shifting towards an era of environmental and sustainable education. We understand that the environment, sustainability, health, peace, and democracy are interconnected. Therefore, we need to establish strong relationships between children and their surroundings and between humans and non-humans (e.g., local food movements, whole school approaches, ecovillages). This is from the perspective of Wals et al. (2017).

In the context of sustainability education, LOHAS (Everage, 2002; Howard, 2007; Roberts, 2010) can be seen as a way to promote sustainable practices and a healthy lifestyle from an early age. By engaging children in gardening, healthy eating, and environmental responsibility activities, we can help them develop a sense of connection to our world and a commitment to preserving it for future generations.

Sustainability in kindergartens

This paper focuses on early childhood education for sustainability (ECEfS). Human actions profoundly impact the environment, which in turn affects young children. Group of preschool children was identified as one of the most essential and neglected groups (Davis, 2009), and it is still not receiving the attention it needs; however, much work has been started in this field (Davis, 2014; Davis, Elliot, 2014; Ärlemalm-Hagsér, Pramling Samuelsson, 2021).

Early childhood education (ECE) and education for sustainability share many similarities. Professionals in ECE adeptly utilize a range of techniques such as inquiry-based learning, contextualized learning, thematic teaching, storytelling, and leveraging children's everyday experiences to achieve this goal (Hägglund, Pramling Samuelsson, 2009; Daries et al., 2009; Engdahl, Ärlemalm-Hagsér, 2014). Kindergartens can promote sustainable learning communities by empowering children and adults to minimize environmental impacts and enhance sustainable practices in and beyond early childhood settings (Elliot, Davis, 2009; Daries et al., 2009). Despite these similarities and opportunities, early childhood educators are unfamiliar with the term ECEfS and do not know what sustainability means (Elliot, Davis, 2009). The barriers to discussing complex topics with children can stem from fear of complexity, concern about age-appropriateness, lack of research, or reluctance to make changes in their settings or no professional development in this area (Elliot, Davis, 2009; Daries et al., 2009; Davis, 2014; Ärlemalm-Hagsér, Sundberg, 2016; Engdahl et al., 2021; Furu, Heilala, 2021). Teachers often believe they are incorporating sustainability into their curriculum by simply being outdoors, informing about nature, and promoting recycling, while other aspects of sustainability are given less attention (Daries et al., 2009; Elliot, Davis, 2009; Davis, 2014; Ärlemalm-Hagsér, Sundberg, 2016; Engdahl et al., 2021). However, that is not enough. We must adopt a holistic approach highlighting the interconnections between social, economic, and environmental development and updating the curriculum and pedagogical theories beyond nature education (Davis, 2014; Davis, Elliott, 2014; Carr et al., 2021). We need a 'whole school approach' – to ECEfS, as Daries et al. claim (2009, p. 116):

The group recognizes that children follow our examples, not just what we say. Early Childhood Education settings and services need to be places where sustainability is practiced. This means that all early childhood education settings should examine their own 'ecological footprints' and work towards reducing waste in energy, water, and materials. They should aim to live out democratic and participatory social practices, and practice what they teach.

Several countries are taking steps towards Early Childhood Education for Sustainability (ECEfS), but Australia and Sweden are leading the way. This is evident in the professional uptake of Education for Sustainability (EfS), national curriculum initiatives, and research outputs (Davis, 2014; Ärlemalm-Hagsér et al., 2021; Engdahl et al., 2021). Finland is also highly concerned about ECEfS (Furu, Heila, 2021). Education for Sustainable Development has been integrated into the curriculum in several countries, such as the ones mentioned above. However, it has not yet been fully adopted in many other countries, including the Czech Republic. In contrast to these countries,

researchers are still struggling to emphasize the significance of nature for children. A holistic approach to sustainability is emerging very slowly.

Nonetheless, many individuals, initiatives, and facilities follow the example of more experienced countries and directly attempt sustainability in preschool education (Engdahl et al., 2021).

There is a global organization called Transnational Dialogues, comprising researchers who convene at conferences, exchange emails, hold online meetings, and collaborate to produce books. They primarily finance their travel and expenses for attending meetings, where they discuss the requirements of the ECEfS research and practice field (Davis, Elliott, 2014).

Czech kindergartens

The first public Czech preschool institution was founded by Jan Vlastimír Svoboda in 1832, and since then, preschools have shifted their focus from just caring for children to providing education (Opravilová, Uhlířová, 2017). Nurseries emerged due to the trend of working mothers, which continued during the socialist regime. However, this led to negative memories for many adults, and the number of nurseries decreased in the early 1990s when Zdeněk Matějček suggested mothers care for their children alone until age 3. The Czech Republic has over 5,400 kindergartens, serving over 94 % of preschool children. The country has public and non-public kindergartens. A public kindergarten class typically has one teacher for every 22 children (MŠMT, 2021).

The Czech curriculum is a framework (VÚP, 2021) that enables schools to use different forms and methods of education and to adapt instruction to specific regional and local conditions, opportunities, and needs based on the place and the community in which the children grow up. It has integrated character, focuses on critical competencies, and schools plan their work in integrated blocks. It propagates situation learning from everyday life situations in the context around the child. The curriculum is divided into five areas: the child and their body, the child and their psyche, the child and the other, the child and society, and the child and the world. Although sustainability is not explicitly included in the national curriculum for early childhood education, its principles are deeply ingrained. The Czech curriculum is undoubtedly a good starting point for sustainable education and has many opportunities for ECEfS.

In past years, many governments have provided financial support for every dimension of ESD (e.g., landscaping of the gardens and purchasing material for environmental education, multicultural education projects, and digitalization…). However, few initiatives in the Czech Republic are comprehensively oriented towards the whole ECEfS.

We discuss the implementation of ECEfS in the Czech Republic and review a program in Czech kindergarten Semínko, which was spread over the country, to provide insight into ESD interpretation and execution in ECE settings.

Semínko kindergarten

The kindergarten Semínko was founded by Emilia Strejčková, the nestor of Czech environmental education, in Prague, the capital of the Czech Republic (Strejčková, 2005; Jančaříková et al., 2024).

The Semínko Kindergarten was one of the first kindergartens in the Czech Republic to be established in an eco-centre. The kindergarten has garden and forest classes. Its curriculum includes many specific elements such as SWAPs, intergenerational meetings and celebrations, and diverse and inclusive feasts, and it emphasizes democracy as a crucial aspect of children's daily lives. Much attention is paid to nutrition (organic food). This kindergarten, therefore, serves as a demonstration kindergarten. Its gates are open to students in the kindergarten teacher education program. Semínko Kindergarten is a faculty school of Charles University, and teachers closely cooperate with academic researchers.

This paper introduces one of the activities that has spread from the Semínko Kindergarten to other Czech kindergartens: Growing microgreens with preschool children.

Growing microgreens with preschool children

Microgreens, also known as vegetable confetti, were first introduced in San Francisco, California, in the late 1980s (Kyriacou et al., 2016). These young and tender greens with many species have recently gained popularity as a culinary trend due to their unique characteristics. They are grown for 7-14 days and harvested above ground after developing fully developed cotyledon leaves (seed leaves). They are often used as decorative elements in meals due to their vibrant colors, textures, and flavors (Treadwell et al., 2020) and are an excellent source of vitamins (Xiao et al., 2012).

The program of growing microgreens with preschool children was designed in the kindergarten Semínko in 2019. The set of activities was designed by program theory (NAAEE, 2000; Rossi et al., 2004) and is based on legislative and curriculum documents (see Table 1). Sixteen sub-activities are divided into five stages of microgreens: activities with seeds (species recognition, creating mandalas, recognition of sounds), sowing (weighing, sowing, experience with geotropism), caring (watering, growth observation, poem with movement), harvesting and tasting (harvesting, tasting, production of flavored butter, creating a herbarium), and composting (vermicomposting, observation of compost loosening, microgreens for birds). In addition to cultivation, other activities are also included in which children use the topic of microgreens in individual stages of growth. The set is scheduled for 15 working days; every activity lasts 5 to 30 minutes daily. Implementing each activity is unnecessary due to insufficient tools, time, etc. However, it is required to cover all outputs (spider visualization is included; see Figure 1).
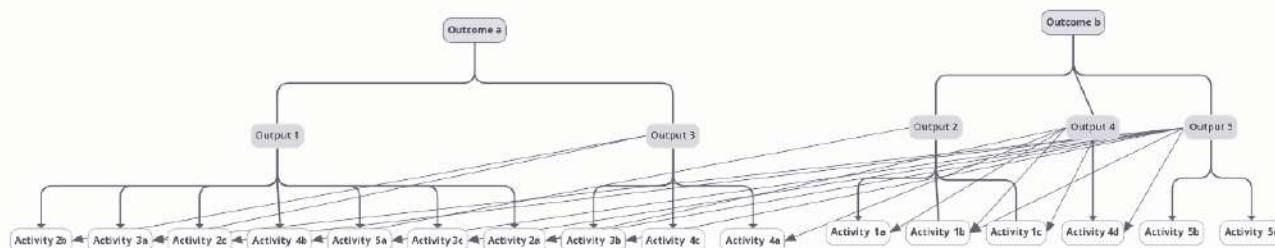
Fig. 1. Spider visualization

A magnetic board/cork bulletin board was used to record information (growing diary) during the program, filled with photos, tables, and drawings. This helped children compare the changes and communicate about the program with each other, parents, and teachers. It also helped with the final reflection.

Present study

This research aimed to determine if growing microgreens is appropriate for pre-schoolers and if it leads to specific outcomes. The study was conducted in the Czech Republic over five months, from November 2020 to March 2021. The activities were carried out in kindergartens during February and March (before school closures due to the Covid pandemic). A total of 55 female kindergarten teachers participated in the study, working in 53 classes with 1051 children. On average, there were 19.8 children per class. Nineteen teachers (with 483 children) finished the entire set.

2. Methods

The action research method was used. The action research was carried out using a set of activities summarised in a teacher's manual (Kapuciánová, 2021; Kapuciánová, 2021a). The manual's purpose was to make it easy for ECE settings to understand without additional explanation from the author while also educating teachers about the theoretical background. Moreover, it includes recommended aids, risk analysis, and legislative conditions for growing edible crops in kindergartens in the Czech Republic.

The action research aimed to improve an educators' practice by implementing changes involves action, evaluation, and reflection, all made by the participants, according to Clark et al. (2020). Both qualitative and quantitative approaches were employed. The teachers utilized observation, interview, and group discussion, considered qualitative methods. Meanwhile, the researchers used a qualitative and quantitative questionnaire (see Appendix 1).

The sample consisted of kindergartens who signed up to try a set of activities. It was promoted to schools through the initiative Truly Healthy School (*Skutečně zdravá škola*). We ensured that the enrolment represented the situation in the Czech Republic. Different types of kindergartens were included in the study, such as small and large kindergartens, urban and rural kindergartens, private and state kindergartens, kindergartens with a focus on environmental education, and those with a different focus, as well as kindergartens catering to children with special needs.

For environmental education, we focus on quality and efficiency in the evaluation (Jančaříková, 2010). Quality assessment (whether the activities are appropriate to the age and

number of children, suitably timed, ideally implemented, etc.) was evaluated according to the evaluation table using methods such as Czech education Centre 'Pavučina' (Pavučina SSEV, 2022), which was modified for the needs of this study (see Appendix 1). Evaluating efficiency can be difficult in preschool education due to the children's young age. Therefore, we focused on assessing the outputs by using SMART criteria – specific (describes an action, behavior, outcome, or achievement that is observable), measurable (details quantifiable indicators of progress towards meeting the goal), audience (is meaningful, realistic, and ambitious; the audience can), relevant and time-bound (delineates a specific time frame) (NAAEE, 2000). This is why the questionnaire had two parts. The first part involved the pedagogue evaluating a set of activities designed by the authors. The second part involved the pedagogue's self-evaluation of their implementation in class, including assessing the achieved outputs.

To evaluate the set of activities, we analyzed teachers' responses across 19 criteria. For criteria 1-14, we assessed all kindergartens, while for questions 15-19, only those who completed the set of activities were included in the analysis. This is because some kindergartens were unable to complete the set of activities due to COVID-19 measures.

Statistical analysis

A simple item analysis was performed for each item in the questionnaire. This analysis consisted mainly of determining the average rating of each criterion (items 1-19 of the questionnaire, see Appendices) and determining the average achievement rate of each output (questions in item 20). For the purposes of statistical processing, the criterion ratings are treated as a numerical variable (points).

In addition, differences in the criteria ratings and the achievement rate of each output between classes that completed all activities and other classes were evaluated. For these purposes, a non-parametric Mann-Whitney U test was used because of the discrete scales on which teachers rated the individual criteria and outputs.

The calculations were realized by R 4.3.1. The level of significance $\alpha = 0{,}05$ used in all tests.

3. Results

The research found that kindergarten teachers have positive attitudes toward a proposed set of activities. The results indicated that the set of activities received exceptionally high scores, with average scores for individual items ranging from 3.58 to 3.91 points (out of 4 points). The scores of individual items are presented in Figure 2. We also identified possible solutions, such as creating a reflection system, incorporating activities for reflection and conclusion, and reducing output requirements for groups with younger children. Additionally, we found that microgreen growth in kindergartens rates varied depending on factors like temperature and lid usage, which brought the need to adjust the plan during implementation according to the growth rate of the microgreens.

The activities were evaluated and analyzed based on the responses of those who participated. Two research questions were answered: one concerning the program's quality of program and the other concerning the quality of implementation. The survey revealed that kindergarten teachers had a positive attitude toward the set, with no statistically significant difference in the evaluation between teachers whose classes completed all activities and teachers who only managed a portion of the activities with children (p > 0.05 in all cases). The level of implementation was also high in individual kindergartens (see Table 2). It was found that the set of activities was very attractive to children and teachers, encouraging them to repeat it. Kindergartens that implemented all activities achieved higher outputs than those that implemented only microgreen cultivation (see Figure 3). However, only in the case of Output 2 and 3 are the differences between these groups statistically significant (W = 56.5, p = 0.048 for Output 2, and W = 77.5, p = 0.007 for Output 3, respectively). This finding shows that educational programs for preschool children should include comprehensive activities of various kinds.
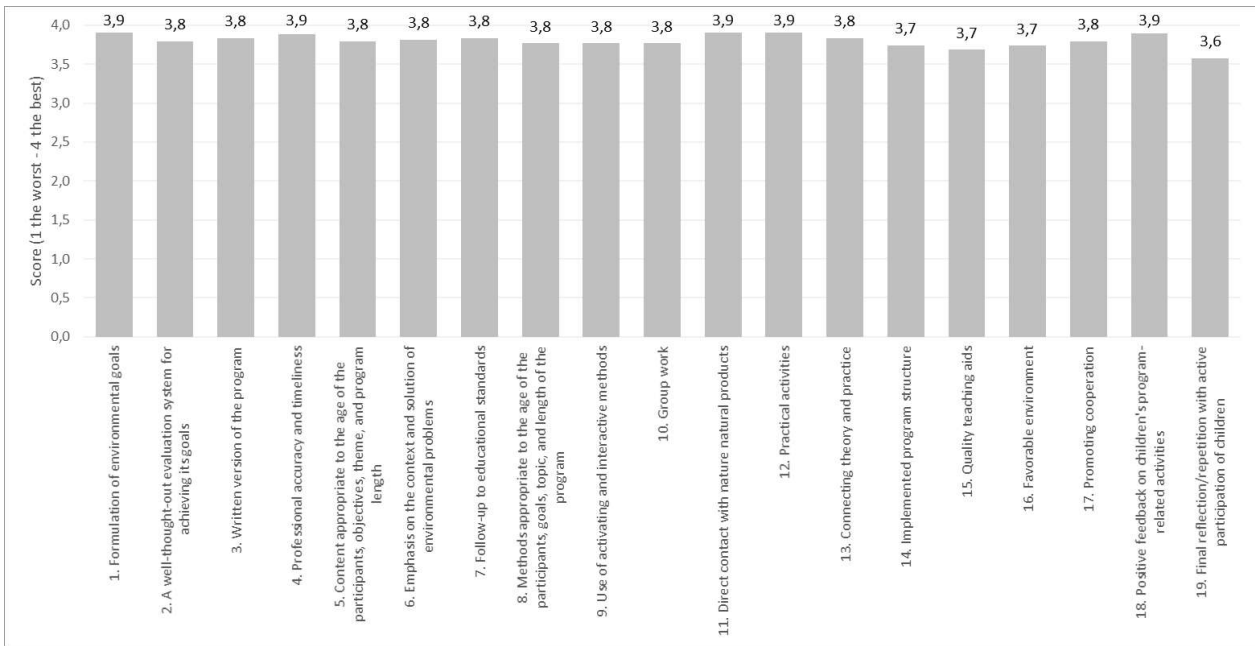
Fig. 2. Teachers' responses across 19 criteria
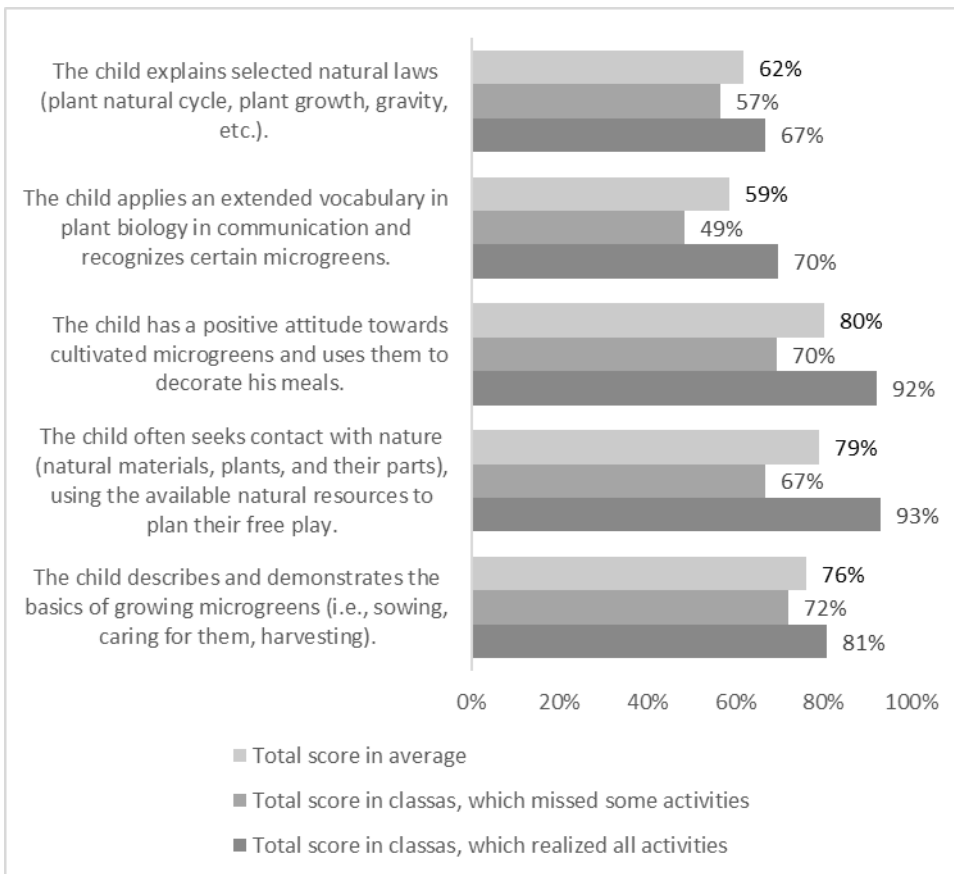
Fig. 3. Comparison of outputs according to the degree of completion

In general, we achieved the desired results for successful realization with most children, with at least half managing to accomplish all outputs. 74 % of children in each class achieved all expected results satisfactorily.

Respondents often noted that all the 5-6-year-olds achieved all outputs, while some of the younger children struggled with outputs related to their knowledge of names. According to teachers, these outputs were also unachievable for children with limited language skills.

The research produced several noteworthy findings. For instance, many respondents reported using the topic for distance learning (COVID) and being inspired to spend more time in their garden. We believe this could be useful for connecting families and kindergartens. Additionally, we discovered that growing microgreens indoors can be a meaningful activity for children with special needs.

While implementing a set of activities with an age-homogeneous group of three-year-old children, it is essential to remember that some younger children may only watch. Still, they are more likely to get closer to nature when they see adults interacting with it. The questionnaire survey results show that teachers can adapt the program for their children, even for classes with two-year-old children or rehabilitation hospital staff.

4. Discussion

Growing microgreens has positive effects on the overall development of a preschooler. This is consistent with the findings described earlier. Incorporating gardening and plants in environmental education is crucial, as studies have shown their benefits (Miller, 2007; Morgan et al., 2009). The mere presence of plants can positively impact health (Ulrich, 1984; Wells, Evans, 2003), enhance mood (Dopko et al., 2019), and create a more positive psychosocial classroom climate (Jančaříková, 2010). Additionally, plants in the environment foster cooperation and a sense of belonging among children (Cheng, Monroe, 2012) and can increase prosocial behavior (Dopko et al., 2019; Chang et al., 2016). Engaging in gardening activities can positively affect a child's development. For instance, gardening can improve a child's motor skills (Miller, 2007), enhance their overall well-being (Giraud et al., 2021), foster a sense of teamwork and school community (Robinson, Zajicek, 2005; Alexander et al., 1995; McMane, 2013; Bergan et al., 2021), and develop their problem-solving and social skills (Chang et al., 2016). Additionally, gardening can boost a child's literacy and mathematical abilities (Miller, 2007) as well as their scientific knowledge (Miller, 2007; Hasanah et al., 2019; López-Banet et al., 2022). Gardening activities can encourage children to try new foods (Chang et al., 2016; Bergan et al., 2021) and promote food literacy more broadly (Grubb, Vogl, 2019).

Microgreens are an ideal model organism for enhancing scientific literacy. In the Czech Republic, programs using animals – corn snakes (Jančaříková, 2020) and red-eared sliders (Lyžbická, 2020), as model organisms have been developed for preschoolers. These programs also included other activities besides activities with the model organism, but they had to be led by experts. The microgreens program, guided by the teacher, is a cost-effective and easy-to-manage program that does not require long-term responsibility. A study on programs foraging and gardening in kindergartens in Norway found that mutual engagement between children and teachers resulted in more learning and exploration than when external stakeholders were involved (Bergan et al., 2021).

In Spain, a set of activities using edible plants was developed to teach nutrition and scientific skills to preschoolers. Results showed that the students in the experimental group acquired essential scientific competencies related to plant foods and learned new scientific content while developing research skills (López-Banet et al., 2022). However, several barriers were identified, including a lack of materials, tiny garden space, limited activity time, teacher support and expertise, and a lack of understanding from school management, parents, and the public (López-Banet et al., 2022). Some similar barriers were also found by Burešová (2007): lack of enthusiastic teachers, poor material conditions, insufficient garden maintenance hours, and overwhelming student numbers. Interestingly, Rickinson (2004, as cited in Dyment, 2005) came with similar conclusions in research on barriers to outside learning: a lack of teacher understanding, self-confidence, and support, as well as fears of losing control and curriculum gaps. Growing microgreens eliminates many of these problems. This ensures the comfort and safety of the class and provides several benefits for the children. It is an easy and undemanding activity that can boost the confidence of teachers who wish to grow plants in the garden during spring. The set of activities also demonstrates that not many tools are required, and those can often be made from waste material. Additionally, it inspires incorporating plant cultivation into curricular documents to help achieve various goals related to school management.

Activities of this type help prevent Plant Blindness, which has biological and cultural causes (Wandersee, Schussler, 1999; Schussler, 2001). By teaching children about the importance of plants in the ecosystem and their daily lives, we aim to reduce plant blindness. Research has shown

that certain activities, such as gardening and plant-oriented programs, can lower plant blindness and that people who are more interested in plant-related activities tend to notice them more (Tunnicliffe, Reiss, 1999; Strgar, 2007; Patrick, Tunnicliffe, 2011; Amprazis, Papadopoulou, 2018; Pany, 2014; Comeau et al., 2019). Our efforts align with Sustainable Development Goal 15, which calls for protecting terrestrial ecosystems and preventing biodiversity loss. Plants play a vital role in achieving all 17 SDGs, and plant blindness can hinder attaining these goals (Amprazis, Papadopoulou, 2021).

Growing microgreens in a kindergarten can positively impact several Sustainable Development Goals (SDGs) (UNESCO, 2017). There is a direct link to SDG 4 Quality Education because this program is designed to align with the Czech curriculum and aims to educate children about plant growth, nutrition, and sustainability. SDG Goal 4 focuses on providing quality education and learning opportunities for all, including early childhood development, care, and pre-primary education (Goal 4.2) to prepare children for primary education. The goal also emphasizes the importance of promoting sustainable development through education. Goal 4.7 aims to equip learners with the knowledge and skills necessary to promote sustainable development, including sustainable lifestyles, human rights, gender equality, a culture of peace, and global citizenship.

Moreover, the program can empower SDG 3, Good Health and Well-being, as it teaches children how to grow food and live a healthy lifestyle, contributing to physical and mental well-being. The cultivation of microgreens is also connected to SDG 1, No Poverty, and SDG 2, Zero Hunger, as it can promote food security and good nutrition by teaching children about sustainable food production. SDG 12: Responsible Consumption and Production can also be addressed by reducing food waste through growing microgreens. Furthermore, SDG 13: Climate Action can be promoted by incorporating environmentally friendly gardening practices into the program. Learning about plants and gardening can also raise awareness about biodiversity and the importance of preserving terrestrial ecosystems, aligning with SDG 15: Life on Land. Finally, SDG 17: Partnerships for the Goals can be achieved through collaboration with local organizations, parents, and communities to support the microgreens project and contribute to achieving the SDGs through partnerships.

5. Limits of the study

Growing microgreens also includes some risks. Some young plants may be unsuitable due to toxic substances like tomatoes, potatoes, eggplants, and peppers (Parida, 2020). In the case of celiac disease, it is also essential to avoid barley. It is crucial to prioritize food safety and take necessary precautions.

According to the research, kindergarten teachers have a positive attitude towards the proposed set of activities and are highly aware of them. However, it is also crucial to consider the opinions of academics from pedagogical or science faculties towards these activities.

The research found that a group of teachers have positive attitudes toward a proposed set of activities, but we must say that the sample group had pre-existing interests. It may not be representative of the general population. Out of the 51 groups studied, 94 % grew plants and, 98 % focused on healthy eating, 85 % of the groups were involved in the initiative Truly Healthy School (*Skutečně zdravá škola*). Despite this limitation, the program is intended for teachers interested in growing plants with children (or sustainability), as this will ensure authentic and attractive pedagogical leadership for the children. It would certainly be suitable if workshops and training on sustainability were organized so that more teachers (not just those involved in similar initiatives) could get the knowledge they need. Engdahl et al. (2021) suggest that education for sustainability tends to be implemented by teachers who are deeply passionate about sustainability issues. Therefore, the critical approach is to inspire everyone to embrace sustainability, as demonstrated by the efforts of Semínko kindergarten.

6. Conclusion

Incorporating the growth of microgreens into kindergarten curriculums can serve as a valuable tool for promoting sustainable education.

Growing microgreens is just a tiny snippet of the many opportunities that Earth offers a child for learning. Growing microgreens in a kindergarten can be a good start in lifelong education for sustainability, LOHAS, and prevention of plant blindnes. We see many connections in the set of activities, especially regarding a healthy and quality life, science literacy, environmental feelings,

promoting sustainable cities, food selection and waste, the use of waste material, water consumption, and more. Growing microgreens offers many themes to discuss and provide opportunities for childrens' ideas and experiments.

The findings from this research study have the potential to inspire kindergarten teachers to create sustainable and environmental programs with program theory, to use the garden to grow food with children, and to implement lessons about nutrition and food consumption. The activity supports children's belief in a promising future and improves their ability to generate creative solutions that promote sustainable development.

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Appendix

Questionnaire

Information about school/class:						
Date:	Present children: Composition of children: homogeneous / heterogeneous					
School:	We usually grow plants in kindergarten: yes / no					
Pedagogue:	In kindergarten, we usually focus on healthy eating: yes / no					
1) Pedagogue evaluating the set of activities itself:						
Monitored area	Evaluating criteria	Rating scale (4 best, 1 worst)				Space for additional comment
Planning and preparation	1. Formulation of environmental goals (appropriate formulation, environmental dimension).	4	3	2	1	
	2. A well-thought-out evaluation system for achieving its goals.	4	3	2	1	
	3. Written version of the program.	4	3	2	1	
Content	4. Professional accuracy and timeliness.	4	3	2	1	
	5. Content appropriate to the age of the participants, objectives, theme, and program length.	4	3	2	1	
	6. Emphasis on the context and solution of environmental problems.	4	3	2	1	
	7. Follow-up to educational standards.	4	3	2	1	
Methods and forms	8. Methods appropriate to the age of the participants, goals, topic, and length of the program.	4	3	2	1	
	9. Use of activating and interactive methods.	4	3	2	1	
	10. Group work.	4	3	2	1	
	11. Direct contact with nature natural products.	4	3	2	1	
	12. Practical activities.	4	3	2	1	
Motivation	13. Connecting theory and practice.	4	3	2	1	
Structure	14. Implemented program structure (e.g., goal, motivation, activities, conclusion).	4	3	2	1	
2) Pedagogue self-evaluating realization in his class:						
Suitable	15. Quality teaching aids.	4	3	2	1	

conditions	16. Favorable environment.	4	3	2	1	
Interaction	17. Promoting cooperation.	4	3	2	1	
	18. Positive feedback on children's program-related activities.	4	3	2	1	
Feedback	19. Final reflection/repetition with active participation of children	4	3	2	1	
Outputs	20. Achieving goals - outputs (at how many children the percentage output was achieved)	The child describes and demonstrates the basics of growing microgreens (i.e., sowing, caring for them, harvesting).				
		The child often seeks contact with nature (natural materials, plants, and their parts), using the available natural resources to plan their free play.				
		The child has a positive attitude towards cultivated microgreens and uses them to decorate his meals.				
		The child applies an extended vocabulary in plant biology in communication and recognizes certain microgreens.				
		The child explains selected natural laws (plant natural cycle, plant growth, gravity, etc.).				
Activities	**21. What activities did you not realize and why?**					
Additional comments	**22. Additional comment on the program**					
	23. Additional comment on the implementation of this program					

Tables

Table 1. Logic chain designed by program theory

Inputs	Humane	Teacher, children, pedagogical team, school director, head of the kitchen, cooks, cleaning woman, and parents.			
	Financial	Normative school fees, sponsorship gifts, grants			
	Organizational	Tools, material, space, time			
Activities	1. activities with seeds	a) Species recognition			
		b) Creating mandalas			
		c) Recognition of sounds			
	2. Sowing microgreens	a) Weighing			
		b) Sowing			
		c) Experience with geotropism			
	3. Microgreens care	a) Watering			
		b) Growth observation			
		c) Poem with movement			
	4. Harvesting and tasting	a) Tasting			
		b) Harvesting			
		c) Production of flavored butter			
		d) Creating a herbarium			
	5. Composting	a) vermicomposting			
		b) Observation of compost loosening			
		c) Microgreens for birds			

Outputs	1. The child describes and demonstrates the basics of growing microgreens (i.e., from sowing through caring for them to harvesting).
	2. The child often seeks contact with nature (natural materials, plants, and their parts), using the available natural resources to plan their free play.
	3. The child has a positive attitude towards cultivated microgreens and uses them to decorate his meals.
	4. The child applies an extended vocabulary in plant biology in communication and recognizes certain microgreens.
	5. The child explains selected natural laws (plant natural cycle, plant growth, gravity, etc.).
Outcomes	a) acquisition of knowledge and skills needed to perform simple activities in the care of the environment while co-creating a healthy environment = Output 3 and Output 1
	b) creating an elementary awareness of the wider natural environment, its diversity, development, and constant change = Output 5, Output 4, Output 2
Impacts	development of competencies needed for environmentally responsible behavior, i.e., behavior that is in the given situation and given possibilities as favorable as possible for the current and future state of the environment (MŽP, 2011) to establish in the child an elementary awareness of the surrounding world and its events, the human impact on the environment – from the immediate environment to global issues of global reach – and to create an elementary basis for an open and responsible attitude of the child (human being) to the environment VÚP, 2021

Table 2. Outputs

Number of the class	Realized all activities?	Percentage of children reached Output 1. The child describes and demonstrates the basics of growing microgreens	Percentage of children reached Output 2. The child is more often looking for contact with nature	Percentage of children reached Output 3. The child has a positive attitude towards cultivated microgreens and uses them to decorate his meals.	Percentage of children reached Output 4. The child applies an extended vocabulary in the field of plant biology in communication and recognizes certain types of microgreens.	Percentage of children reached Output 5. The child explains selected natural laws (plant natural cycle, plant growth, gravity, etc.).
2	✓	100 %	100 %	100 %	90 %	75 %
5	✓	100 %	90 %	90 %	50 %	50 %
15	✓	100 %	100 %	100 %	50 %	100 %
23	✓	67 %	100 %	100 %	73 %	67 %
24	✓	90 %	80 %	90 %	80 %	60 %
40	✓	50 %	100 %	100 %	50 %	50 %
37	✓	90 %	95 %	80 %	85 %	90 %
42	✓	70 %	-	100 %	100 %	60 %
3	✓	60 %	80 %	70 %	50 %	50 %
Total score in classes, which realized all activities:		**81 %**	**93 %**	**92 %**	**70 %**	**67 %**
31	-	70 %	40 %	90 %	100 %	-
20	-	70 %	80 %	60 %	50 %	50 %
14	-	75 %	100 %	75 %	75 %	50 %
16	-	100 %	100 %	100 %	10 %	100 %

22	-	50 %	20 %	70 %	20 %	20 %
26	-	85 %	60 %	70 %	30 %	50 %
30	-	70 %	50 %	70 %	50 %	80 %
38	-	60 %	60 %	50 %	50 %	50 %
45	-	50 %	90 %	40 %	20 %	50 %
17	-	90 %	-	70 %	80 %	60 %
Total score in classes that missed some activities:		**72 %**	**67 %**	**70 %**	**49 %**	**57 %**
Total score in all classes that finished the program:		**76 %**	**79 %**	**80 %**	**59 %**	**62 %**

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The Czech company Skutečně zdravá škola (Truly Healthy School) has approved the implementation of the activity.

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Emotional Intelligence and ICT Based Study of Online Teaching at the University of Gjakova

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Abstract

The use of ICT in education is another way to motivate, assess and be able to have an easier approach to education and learning. Different courses can be taught online that would have a practical background, those being directly and inderactily realated to engineering, education or even social sciences.

We have analysed multidimentional phsychologiycal and practical factores associated with online teaching, where emotional intellency was at the center of our focus. Based on the questionare we selected, a designed pie chart statistical analysis is applied. Emotional problems for implementation, emotional challenges including monotony during the online learning process are analysed. Intereactivy student-teacher, effectiveness and riability of online teaching is statistically analysed and a quantitative conlusion is derived for the future application of this mode of teaching. The experience derived during the period of the epidemy Covid 19 and the development of IT technology made online teching complementary to the convetional mode of education and learning, as shown in our study as well. It would be very logical to emphasize that students must have the chance to get associated with online learning and this is for many several reasons to come at hand. The next generation of teachers should be able to write code assess code and perform short term flow charts.

Keywords: online teaching, emotional intellegency, pie chart, statistical analysis.

1. Introduction

Distance education and online teaching has been applied in e past, however the epidemy Covod 19 has ipossed the need as a necessity application of this way of teaching.

The way we attain our educational skills depends on the different sources we use. Different models of teaching have been used at different times. Distance teaching is and has been known to be very usefull and succefull. A typical example would be where teachers would not have to travel

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from one nation to another in order to teach and that would refer to students, they would not be required to travel instead teaching would be done online. The new reforms in education including at many universities around the world, have enabled us to have different scales and teaching sessions. The new forms of teaching would be seminars and interactive working modes. The online effects of teaching have changed this and have brought something much easier into the field of education. Online teaching has also brought more of the idea that concerns "learn by doing". This is one of the best modes of teaching that was used and is being used by different instituitons. The idea of "Learn by Doing" effects creativity and the way students think during their studies. Traditional so called old or concentional style of teaching is of the past, and this has been made more possible to us due to the fact that technology has started to impose on us the use of online teaching.

Figure 1 shows how online e learning will soon overtake the education system completely. This study was created from a University in the United States. According to figure 1 we understand that for seven consecutive years we will have an increase that would be almost double the amount we had in 2019.
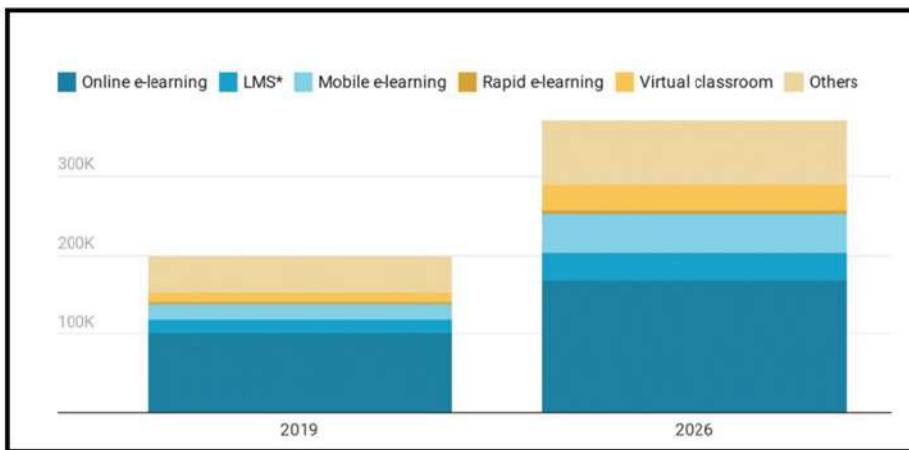
Fig. 1. Learning Management Systems (Bau Bay..., 2014)

This would mean that many institutions are willing to convert their courses fully online. It would be very thoughtful to argue with the fact the online teaching is overtaking the hearts and minds of many university professors around the globe.

Online teaching was more highly introduced in the state of Kosova during Covid 19. The online courses that were taught did have different effects in the grading systems as well as the willingness to study online. At the University of Gjakove, the online courses brought to us a very different mode of study that many individuals benefited from it, as to some whom did not (Kokaj, Maloku, 2021).

Different studies have shown that the effect of Covid 19 has enforced the idea that teaching online has become more and more important to universities around the world and it has made us depended on online teaching.
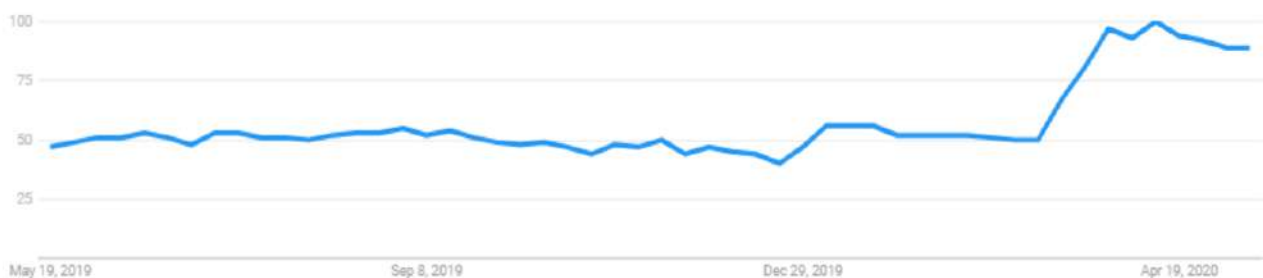
Fig. 2. The increased effect of Online Teaching (University of Birmingham, 2023)

Figure 2 shows the study results from the University of Birmingham in the UK, of how the dependency on online has increased.

Online courses that were conducted during COVID 19, made the stage of teaching very different. Courses that where taught at the Faculty of Social sciences managed to have a very different approach as to the courses that were taught online from the Faculty of Education. This is to take into account the fact that some courses taught online would be more difficult to teach due to several different reasons.

Online education is very much connected with converting everything that we do in terms of teaching, modelling and testing to online. There happened to be different forms of teaching in the field of pedagogy. A typical example of teaching online would be one to one, and this was used in the middle ages. This however sometimes maybe more effective as the student would have the opportunity to cut into the lecture whilst the professor is explaining things in person to him. Another model of teaching is one to many which intern is being used today in the present day world (Kokaj, Maloku, 2021a).

Collaborating online has become the future out of everything. Online marketing, online teaching and online shopping is one of the key success to the twenty first century. Even though education online is to the level where we consider it to be crucial, online working had not changed our status in the society but it has changed the way we do work and the way we try to perform our everyday data skills.

Different institutions around the world have done different analysis tests on the effect of converting our lives to online, and it happened to be that there were many advantages and disadvantages to online teaching and working (Advancing Technology for Humanity, 2016).

The Impact of Critical Thinking on How Learning Outcomes are Evaluated in Primary Schools is also important (Kadrija et al., 2023) associated to online lerning is part of our interest in this study.

The purpose and objectives of the research and study:
The purpose of this research is to analyze the possibility of partial or periodic implementation of online learning at the University of Gjakova "Fehmi Agani" even after the pandemic period. The main specific objectives of this paper, beside others are:

- To analyze how effective and interactive is online learning in general at any possible university, and what are some of the challenges in regard to our technological requirements and standards.

- To identify and justify the needs that are directly related to the social and economic advantages of the online lectures at our university.

The goal of the study is to figure out ICT and emotional intellegency play a relevant role in teching process, particularly in case of online teaching.

Research questions and how research effected education:
In regard to the research questions of this paper we have considered the following:
- How effective and challenging are online lectures at the University?
- Is it in the interest of students and academic staff that so the lectures to be held online?

The the main method and technique is based on the statistical analysis of the numerical output obtained from the questunares we introduced.

Analysis used at our research: The research that we did for this paper was focused on a statistical-numerical analysis. Analysis plays a key role in science of education in many different forms. The questionnaires that were implemented online, were sent to several different individuals. The resonders that had to complete the questionnaire were from different university personal. Singificant cases, mainly students, were selected from the representative departments. Some of the responders were selected from the staff, Professor/s and Teaching Assistents.

The questionnaire scheme was based on a set of several different questions that we had set up. The questions where focused on the idea of online teaching. The effectiveness of the questionnaire was based on the preliminary results and the number of pupils whom had taken the questionnaire. More than 100 different university individuals took the questionnaire.

2. Methodology
The current study was conducted at Fehmi Agani University in Gjakova. The geographical, sociocultural, pedagogical and economic features of this university are very similar to the universities in Kosova and similar to many features of the universities of the Western Balkans.

Therefore, this study can be a representative and aplicable elsewhere. The University has 4 Faculties and each faculty has three to four departments.

The main phases of the methodology applies at this research are: a) preparation of the sests. b) performing the tests and c) Obtaining the resuls from tthe reponders and analysis.

Preparation of the tststs is kohernt with our porpuses and goals to be reached by this research. Therefore the phase of the test preparation was a long and detailed process, based on theory and experiences of previous reserch performed by us or other research, accebile in the existing literature.

The tests were performed at all departments and faculties of University Fehmi Agani. Profesional technical procedure was applied during the collection of data. The collectd data were processed and aanlyses using statistical – nulerical approach.

We have analysed the detailed results of students of all departments after the Covid 19 epidemic, when online teaching was applied. Statistical comparasion of the results of students achived during the conventional and online teaching mode, have shown a small difference. It was indicated that a small difference or advantage for this case when lectures were conducted with the physical presence of the students. Therefore, online teaching have shown to have very little effect on the average students performance.

Tests

The order in which we performed the tests was according to a statistical approach that we determined. The model of questioning was short and concise. The test questionaire had 7 consecutive questions.

The first question (1) was "Is online learning emotionally and practically difficult to be implemented?". This question was designed as a general question, in order to confirm that all individuals are able to properly use the computer to answer the questions. At the same time responders can express their opinion in regard to the implementation of the online learning.

The second question (2) was "Is online learning challenging emotionally or practically?". This question was disigned to find out how the responders percive and experince online learning. Since this way of learning was known to be conventional in the past, dilema for possible emotional and cognitive problems on practical and the logistic of online learning occurres. The lack of computers, elementary knowlage of digital technology, the stress or the fear for the unknown challenges and similar problems of the emotional nature, could the students face with online teaching.

The third question (3) was focused on "Is online learning boaring emotionally?". It can get boaring just like any other lecture, this is due to the fact that some lectures and nonstop power point slides can be irritating. The same routine and the loss of interest of students to be focused and concentrated during the online learning and teaching, is another possible emotional problem.

The forth question (4) was focused on the effectivness of intereaction (Q & A), where Q & A means a Question and Answer Session. "Are there interactive features in online learning?" The students are used to the physical mode of learning where interactivness is easy and a natural way of comunication because the optical or physical distance is small, the student and the teacher are at the same place. On the other hand, comunication during the online process of teaching is not trivial. Here, the teacher is in front of a camera and does not have optical and emotional contact with the students. On the other side, the students are in front of a computer or a screen where the moving images are projected. The students do not observe natural 3Dimensional, conventional or actual physical event. Instead, the images they see are coming from a 2Dimensional plane of the screen. Due to the lack of 3D projection , paralatic motion and other similar problems, introduce some emotional and cognitive physcological nature.

This question was based on the interactiveness of online learning, this is due to the fact that, students that prefer lectures to be held physically rather than online, tend to be concentrated (Kokaj, Maloku, 2021).

The fifth (5) question is: "How effective is online learning?" It was a general question in order to give us a glimse of where we are in terms of the willingness to work online, motivated by effectivness of this kind of work. The effectivness is defind as a ratio of the new kind of the work and conventional way of teaching. Numerical ratio of the features of the two ways or modes of teaching should be calculated. However, the purpose of this question , is to find out the estimated qualitativ feeling of the responder regarding the effectivness.

The last two questions of the surrvey questionnaire are the most important ones to us, because it helped us identify the most relevant factors associated with online teaching.

The sixth (6) question was, "Is Online learning the future of education?". Emotional attitude toward the online teaching, phsychological inclinability and optimism of students and teachers for application of online teaching is the aim of this question. This question enabled us to understand the other aspect as to how easy we can impliment this mode of teaching into different institutions or teaching envirements, like high school and primary school.

The final question (7) was "Your assessment of online learning"? This question was a question that helped us to conclude the overall effectiveness to online teaching and how easily can we move from physical teaching to online. The test question was focused on the technical, educative as well as the psychological aspect of learning.

The questions have different quntified levels of answers starting from 1 all the way up to 6. Figure 3 shows the numbers along with the colour code answers.

Fig. 3. The answers from 1 to 6 and their colour code

1 is considered to be as a 0 % where he/she does not agree at all. 2 would be considered to be 16.67 % of the agreement. 3 is 33.34 % meaning that the individual agrees on 40 %. 4 is 60 % of the overall undertaken agreement. 5 is 80 %, meaning that the individual who's selected the number 5 he/she agrees 80 %. 6 means that he/she fully agrees with the question, that is to say that they fully approve and that they agree 100 % to that.

3. Results

The results of each question that was answered was expressed or presented on a pie chart percentage diagram. The pie chart percentage diagram illustrated the selective count out of the 100 different personal whom have answered the questionnaire.

(1)
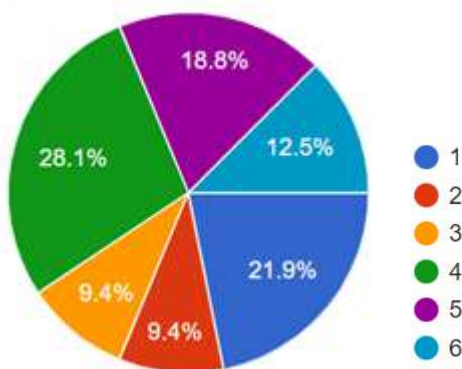
Fig. 4. Is Online Learning Difficult?

Figure 4 shows the output result on how difficult is online learning. 21.9 % totally disagree with the fact that online learning is difficult, however 12.5 % agree that online learning is 100 % difficult. The green area shows to us that a large portion consider that online learning is difficult. 28.1 % of whom have taken the questionnare consider that they 60 % agree that online teaching is difficult.

(2)
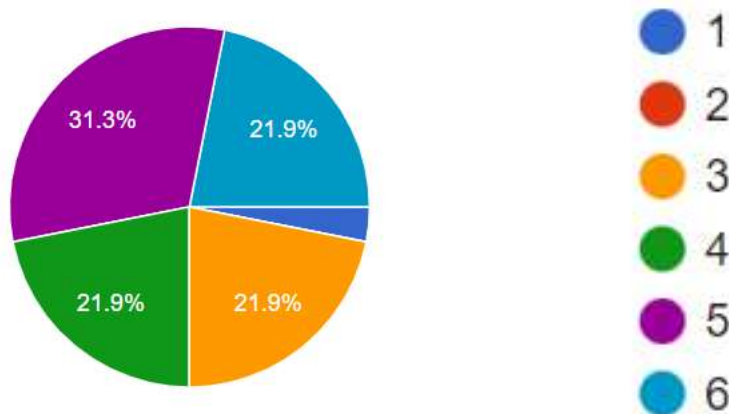
Fig. 5. Is Online Teaching Challenging?

According to Figure 5, the predominant answer happened to be 5, the purple colour, meaning that many do agree that online teaching is difficult. Eventhough a significant number of them consider that online teaching is mildly difficult. Some pupils consider that they fairly agree or they barely agree that online teaching is challenging.

(3)
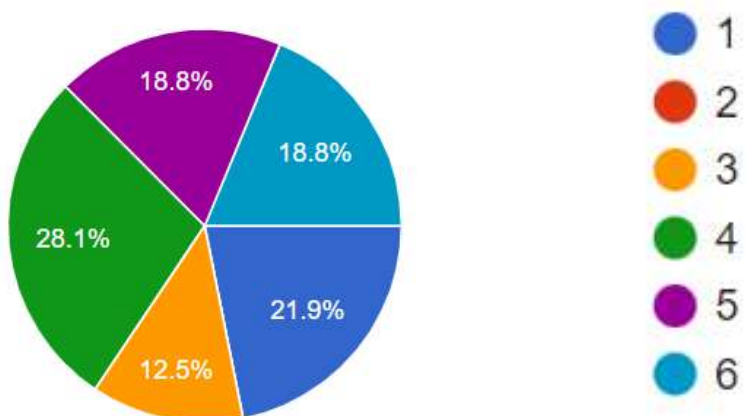
Fig. 6. Is Online Learning boaring?

Figure 6 shows to us that half of the pupils whom have answered this consider that online learning can be boaring. The majority of them consider that Online learning is boaring and this is observed from the fact that 28.1 %,the green area code, out of all of them consider that online learning can be boaring. A very small number of them consider that it is not boaring and this is the 12.5 % of them.

Figure 7 is an indication to us that a large amount consider that online learning is not very interactive. 28.1 % is high as it gets in regard to the fact that almost 30 % of them consider that it is not interactive. A very tiny portion of them consider online learning to be interactive. This could be a very bad sign to us in regard to online learning.

(4)
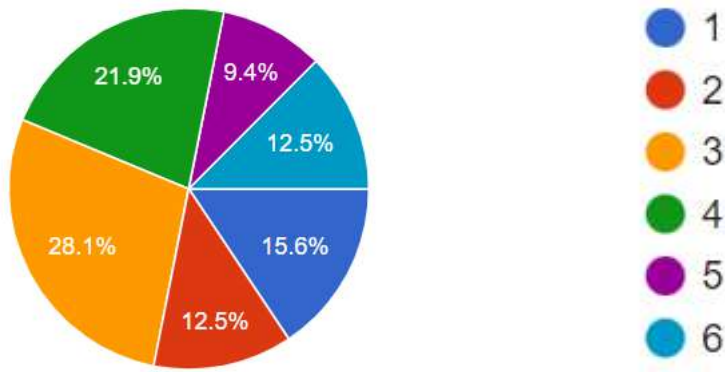
Fig. 7. Can Online Learning be interactive?

(5)
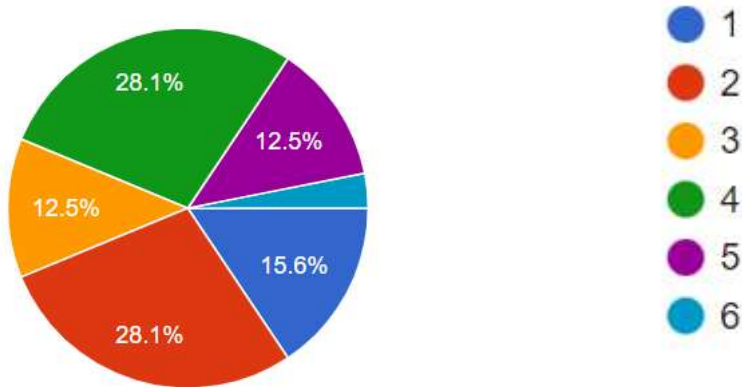
Fig. 8. How Effective is Online learning?

Two large portions of whom have taken the questionnaire consider that online learning is not very effective and at the same time the second portion consider it to be partially effective. Majority of the pupils consider that online learning is not effective and an extremely small amount of them consider that online learning can be effective. 15.6 % is a very small number of them whom consider that online learning to be effective.

(6)
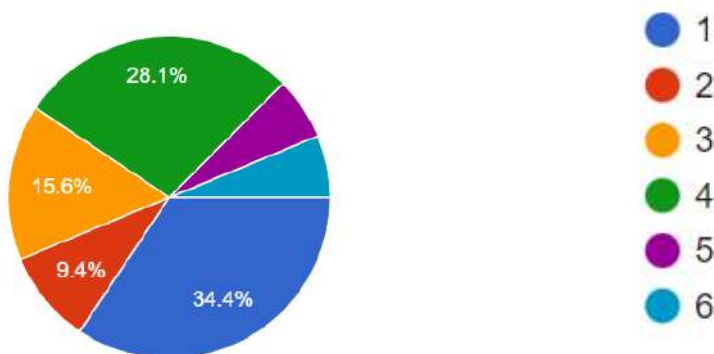
Fig. 9. Is Online Learning the future of education?

According to Figure 9, the majority 34.4 % consider that there is no future for online education. The second in line partially think that there happens to be a future for online education. The majority consider that online learning is not the future of education. For some reason this is very shocking, howeever we do have that big gap in between the 28.1 % whom do consider that online learning can be the future to our education.

(7)
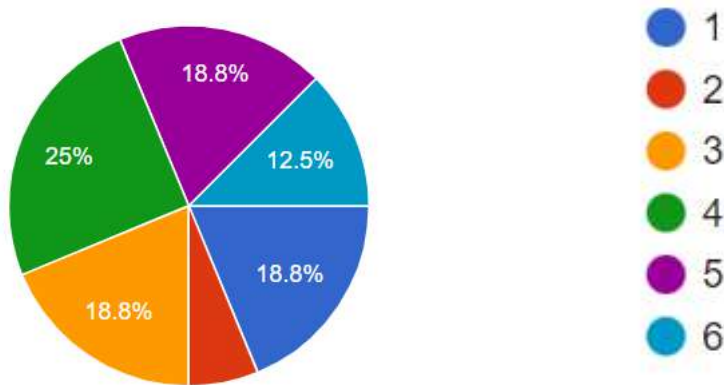
Fig. 10. Your rating for online learning?

Most of whom have answered this question have thought about the fact that where he/she sees themselves in accordance to online learning. According to the figure not many consider that they see themselves into online learning, eventhough some of them are not quite sure and this is because figures like 18.8 % are very shocking.

Statistics Analysis

Table 1. The mean and the standard deviation

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Is Online Learning Difficult?	3.00000	33	1.369306	.238366
Pair 2	Is Online Teaching Challenging?	3.81818	33	1.014105	.176533
	Is Online Learning boaring?	3.12121	33	1.340652	.233378
Pair 3	Can Online Learning be interactive?	2.90909	33	1.128152	.196386
	How Effective is Online learning?	2.69697	33	1.158794	.201720
Pair 4	Is Online Learning the future of education?	2.3939	33	1.24848	.21733
	Your rating for online learning	4.0000	33	1.78536	.31079

Table 1 shows the number of people that have taken part in the quationnaire along with the standard deviation. We can see clearly here how the values vary along with the number of different optional outcome results.

Table 2. The Correlation values for each Question of the Questionnair with the correlated values

		N	Correlation	Sig.
Pair 1	Is Online learning difficult?	33	-.083	.648
Pair 2	Is Online Learning Challenging?	33	.247	.167
Pair 3	Are there interactives in online learning?	33	.456	.008
Pair 4	Is online learning the future of education?	33	-.014	.938

Table 2 represents the number of iterations along with the correlation value. We can clearly understand that the number the correlation value is a statistical representation of the overall percentage outcome of each questionnaire. We could argue that the negative representation of the correlation values is an upgrade quantitative representation of the portion selected from the individual selection.

The correlated values for each paired question indicated to us that, interactive online learning can be very effective, if we do take into consideration the fact that we use a high value technique and module of teaching. Another important opinion that can be made, from the correlated values is that, online learning can not alsways be the future method to our education.

Table 3. P test values for each question of the questionnaire

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95 % Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Is Online learning difficult?	14.000000	9.877373	1.719430	10.497636	17.502364	8.142	32	.000
Pair 2	Is Online Learning Challenging?	.696970	1.468095	.255563	.176406	1.217534	2.727	32	.010
Pair 3	How effective is online learning	.212121	1.192623	.207609	-.210764	.635007	1.022	32	.315
Pair 4	Is online learning the future of education?	-1.60606	2.19288	.38173	-2.38362	-.82850	-4.207	32	.000

Table 3 shows the P test values that we performed in SPSS. We can clearly see here that the values are relatively low and that they seem to be convincing according to our expected outcome. We could also emphasize the fact that online teaching is relatively good and that more than half of the personal that have taken the questionnare do consider it to be a very serious aspect into our every day lives that could change the way we work and teach. This was a paired test of the values and it enabled us to understand the fundamental aspect on how easily we can impliment the online teaching. This was just one of the 6 tests that where carried out. The values of paris 1 to 4 respectively indicate the lableing of each test of the questionnaire.

4. Discussion
Technological developments have enabled social welfare and higher standards in many aspects of work and human life. Frequent technological updates have imposed the need for changes in the organization of teaching and in the educating of students in research habits. Twenty-first

century learners need to be prepared for the global knowledge society (Labonté et al., 2022). Technology has eliminated physical distances between students and their teachers. It gives them easier access to multiple sources of information. However, the organization of teaching and research work in the period of technological development also has its own specifics and challenges. These organizational features are discussed among teachers at all levels of educational institutions. Phones, laptops and various tablets are being used today and a large number of children today have in their hands from early childhood. In doing so, their excessive use nowadays has become a concern for their parents and teachers. Therefore, in schools, in families, in academic circles and in various publications, there is a fierce debate about the advantages and disadvantages of using information technology. In this paper we examine the possibilities of organizing online learning at our university as an alternative to learning with the physical presence of students in the classroom. Much has been written about this topic in recent years during and after the pandemic. In these publications and in our school and university environments, the debate takes place about the economic reasons and the methodological aspects in regard to this. To meet the needs of a changing higher education landscape, it is critical for educators to explore and apply effective online pedagogical practices that support learning and transfer (Galoyan et al., 2021). Students from a wide geographical area with difficult travel options gravitate to our university. Many of our students are employed and some of them are also parents. For these and other reasons, they do not have the opportunity to continue the lectures with all their will to be taking place at regular lectures at the faculty. On the other hand, faculty rules penalize students who are absent from lectures by reducing points in their final evaluation. From this position, the academic staff at the university are discussing the possibility of organizing some of our lectures through online learning. This method of organizing lectures would save time and money for our students. Multimodality opens to us different possibilities that offer learning experiences more adapted to students' needs and wishes (Rof et al., 2022). They would use the four-hour round-trip travel time to the university in their homes for study or other academic engagements. Online learning is cheaper in economic terms and can be organized in flexible schedules according to the agreement of the academic staff with their students. The main debate we have about online learning is about its effects on students' academic development.

We still have dilemmas and conjectures about this mode of learning for these reasons:

- In our socio-economic circumstances, all students are not equipped with suitable personal phones or laptops to follow the lectures from home;

- Many students do not have separate rooms from where they would follow their lectures and in these cases they are not comfortable enough during online learning;

- In our country, the electricity or the connection to the Internet is often interrupted, and in this way the disconnection from the discussions about the topic that is treated in certain lectures is created;

- Some of the academic staff and some of our students still do not know enough about the functioning of information technology, and they have problems in elaborating and presenting online learning with graphs, formulas and other forms of presentation on screen.

- There are modules or teaching subjects that cannot be organized in a methodical aspect and at the quality level as they were when they were organized in the classroom with the physical presence of students.

These are some of the challenges of organizing online learning that are discussed in our school and university environments. In the Kosovar society, we faced online learning for the first time during the Covid 19 Pandemic. Our impression is that we quickly learned and adapted to this unknown professional innovation, imposed by the circumstances of the pandemic. At the same time, the consolidation of the digital society, and the recent consequences and responses to the Covid-19 pandemic have reduced the distance between traditional face-to-face education and online education (Rivera-Vargas et al., 2021). As a higher educational institution, we have mobilized and learned a lot from each other. So despite the disasters that the pandemic has brought, during this period of isolation we have also gained positive experiences in holding lectures.

When we read the publications of recent years about the organization of online learning, we noticed discussions of the organizational and methodological aspects. There are concerns that during online learning students are not sufficiently engaged. They are sometimes passive during the lectures or they tend to completely leave their laptop or phone, and start to falsely give the impression that they are present in the lecture. We also faced this phenomenon at the beginning, during online lectures. When the students so called "take the floor" during discussions or whilst answering different questions, they can even have the books in front of them and their answers are

from pure reading. Another important point of discussion between teachers is interactivity and the organization of constructive debate between students in online learning. We have often discussed and analyzed these methodical and technical aspects of teaching organization in our meetings.

The common conclusion from these professional discussions is that the methodological elements of the organization of distance teaching are almost the same as the methodological elements of teaching with the physical presence of students in the classroom. The negative and problematic aspects of online learning can be improved and eliminated quite easily with increased care and attention from teachers. In these cases, teachers and their students must first set academic rules and standards, which they then must meet. One practical implication is that learning institutions should explore initiatives to foster greater levels of online learning self-efficacy (Jun Rong Nigel Lim et al., 2021). During online lectures, teachers, depending on the occasion, call out the names of the students and ask them for their opinions and other contributions on the specific topic being addressed. Teachers playing the role of the instructor in the classroom initiate educational debates on environmental and social topics which are addressed through arguments and scientific analysis (Kadrija et al., 2022). In order to avoid mechanical learning and answers taken straight from the book, teachers within the established academic standards inform students that their critical and independent thinking is more valued in their answers. Taken in general, the debate in scientific publications and in our school and academic environments treat online learning as a good opportunity to save students time.

According to these opinions, this opportunity and mode of learning should be organized during the academic year in addition to regular learning in order to facilitate the continuation of lectures for the group of students whom travel, and those whom happened to be parents as well as those who are employed.

Online learning can have many undertaken limitations to our way of teaching. These can apperantly effect us in different forms and we can come to a point that we can make different modications and assumptions that allow an easy access to different regions around the globe. An excellent session that would be provided online would concern us with an excellent running internet speed along with a very good streaming of the signal. The major limitation here, that is required to be underlined, would concern the fact the better the cable of transmission of signals the better is the online image and the voice recognition during the teaching online session.

5. Conclusion

As conclusions of this scientific research we have drawn out the following:

Online learning today in universities is a fantastic alternative and opportunity for organizing lectures and academic presentations without the need for students to waste time and spend their money on daily trips. Today's achievements in the field of telecommunications have clearly diminished the importance and necessity of the physical presence of students in classrooms. The new form of online education in the context of higher education can create a novel context of opportunities by offering the possibility of combining face-to-face and online education throughout students in their academic careers (Sánchez Gelabert, Elias, 2023). Different universities and scientific institutes today offer university studies and professional training to their students and clients regardless of the geographical distance. The theoretical treatment and the research support our assumption that with a good methodical and professional preparation, distance learning can be effective and attractive for students, as well as learning held in the clto oercome chalenges in the real lifeassroom with the physical presence.

Emotionally or physically based research of online teaching, applying statistical technique, has shown optimistic results and conclusions. The results of our research have led to the conclusion that effectiveness and sustainability, along with technical and logistical problems, characterize online teaching.

The main purpose of education and learning based on competencies applied in our curricula and education system at our university and generaly elsewhere, is the cognitive and emotional preparation and formation of students to obtain knowledge, attitude and skills to overcome problems and challenges in real life. Based on such promises, the emotional-psychological components of the learning process, especially in the online mode, were the objects of our study.

The opinions of students and academic staff regarding the organization of online learning presented here as research findings are interesting and meaningful. Those expressed in percentages indicates the future of online learning in our university environments. For us as

researchers, these concerns are real and serious when organizing lessons without the physical presence of students. The organization of online learning has its own specifics and challenges that must be taken into account by the academic staff and the university as a higher educational institution. The preparation of online lectures requires methodological knowledge and the same academic standards as the classroom with the physical presence of students. The devices with which students log in to online learning, the Internet connection and the work rooms from which they follow the teachers lectures are some of the problematic elements of this learning modality.

In Figure 7 we have presented the opinions of the subjects given in our question: Is there interactivity in online learning? And as you can see, 50 % of them (28.1 % + 21.9 %) gave average ratings. This proves how important it is to plan and organize lectures as professionally as possible. During online teaching, we have to point out problems and create learning situations that engage students in discussions and choose tasks by allowing them to interact with each other. This constructivistic philosophical approach where students are active during lectures carried out online is more effective and attractive. Students adapted to this mentality should be active during the lecture by analyzing, and choosing the completed tasks in their individual and group projects.

The effect of online teaching is acceptable for several different reasons. However some of the problems shoud be brought to the focus. The main important focus to us is that online teaching can be sometimes difficult to imply at our university. We do experience different such is the dificulty of having full student attention during the online lecture.

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The Parents' Role in the Teaching Online Process: A Confirmatory Approach

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Abstract

This work focused on confirming the 5-factor model proposed by Santana et al. (2023). This model measured through the SEM methodology describes the role of parents in the virtual teaching-learning process during the pandemic derived from Covid-19, which affected the entire world population. In particular, educational systems around the worldwide migrated toward virtually to carry out the teaching process at all educational levels and degrees. 253 parents participated who supported their respective children in the teaching process carried out online. To obtain the data, the test developed by Valdés et al., (2009) was used. The indicators of the best-adjusted model are; RMSEA = 0.022; CMIN/DF = 1.124; RMR = .052; GFI = .937; AGFI = .916; PGFI = .701; TLI = .989; CFI = .991; and the parsimony between the values 5 and 7: PRATIO = .826; PNFI = .763; PCFI = .819). Based on these results, we can describe the theoretical and practical implications that the study provides: firstly, a model with the best fit that explains the role of parents in the virtual teaching-learning process that children experienced during confinement derived from Covid-19, as well, a structure with indicators that allow design didactical strategies.

Keywords: SEM methodology, online learning, parents role, virtual learning.

1. Introduction

The arrival of COVID-19 triggered the crisis in the entire population, which was declared a Public Health Emergency of International Importance (ESPII by its acronym in Spanish) since January 30, 2020 by the World Health Organization. Therefore, the institutions Educational

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institutions had to respond to the challenge of continuing to promote education in the face of the uncertainty scenario that was suddenly approaching in society and that led all school-age students to take refuge in their homes. Given this event, each country assumed the responsibility to take the necessary sanitary measures to keep its population as little exposed to the growing wave of infections of said virus.

In Mexico, La Secretaría de Educación Pública announces the suspension of classes at all levels of the National Education System, based on the agreement 03/02/20, published in the Official Gazette of the Federation (DOF by its acronym in Spanish). In the agreement, it is expose an unprecedented fact: distance education through electronic media as an emerging measure to solve the 33.6 million students who do not attend face-to-face classes (INEGI, 2021).

It should be noted that distance learning is not a newly created topic since it is directly related to the development of technology, which means that from the appearance of correspondence this phenomenon saw the light, continued to develop and transform. to the present day through the internet; the foregoing, considering that distance education refers to the synchronous or asynchronous educational process where the teacher is separated from the student, but united through technology as a formal bridge of the teaching-learning process (Merisotis, Phipps, 1999).

In this sense, one of the main concerns that arose as part of the SARS-CoV-2 pandemic was how to attend to the entire population that had to abide by the regulations by staying at home without necessarily interrupting their training process. In this way, the challenges imposed by distance education around the world required the adaptation of the contents for the use of platforms as learning environments (Günbas, Gözükücüc, 2020; Demir, Gologlu, 2021; Zhu et al., 2022) and of course, the interaction of the teacher with the student as explained by said remote teaching process.

2. Literature review

Since the teacher is the main mediator between knowledge and the student in the classroom, even with its limitations, digital learning also transfers this role of the teacher to virtual environments (Law et al., 2019; Onyema et al., 2019; Alsubaie, 2022). Therefore, for the level of basic education, fundamental pieces for the conformation of the care strategy was to consider the particular needs of each of the students' homes by the respective school authorities, as well as to involve not only the teacher in the teaching-learning process, but also to the father of the family as direct support of his children.

The role of the parent or guardian was made up of the role of provider and guide. Its role as provider should include the possibility of providing the student with the necessary tools to take their classes remotely, such as computer equipment or some electronic device that allows the connection, the availability of the Internet connection itself and, therefore, of the electric light service; In addition to being able to afford various school materials to carry out assignments, attend to the child's diet, provide an adequate space for learning with respect to lighting and the elimination of distractions (noise).

On the contrary, as a guide, the parent had to have the ability to support them with the use of the tools to take their class, supervise connection times, support them with their tasks and monitor their submissions. Likewise, as the main promoter of promoting their child's education, the parent or guardian had to participate in school activities such as the meetings to which they were summoned and maintain an open channel of communication with the teacher in charge of their child, in such a way that he was informed of their study needs. Finally yet importantly, the parents also had to encourage motivation and communication with their son.

All of the above alludes to four rights of the child embodied by the National Human Rights Commission (2023), also known by its acronym in Spanish, CNDH; which seek to consider the minor as the most important thing for his parents, who are in charge of safeguarding him as a priority, allowing him a full life through the development of his physical, mental and emotional capacities, educating him and allowing him access to technologies to maintain communication with their environment.

In this sense, the role of parents as supervisors of their children is learning process is considered of vital importance (Ewing, Cooper, 2021). Several studies agree with the influence that these have on their children's learning due to the degree of involvement, their participation being crucial to achieve adequate performance in online classes. So that the motivation that they exercise

in them can promote a healthier conformation of their relationship with their children; by being more involved with their learning, they show interest in them, which also reflects a positive result in participation within their classes (Borup et al., 2014; Apriyanti, 2020; Jafarzadeh et al., 2022).

Some parents motivated and monitored their children in ways that encouraged their consistent participation in remote classes; in Turkey, for example, the only mitigating factors for this motivation were connection problems and isolation in their homes (Demir, Gologlu, 2021). However, other parents expressed that their children had problems connecting due to connection failures and that they lacked motivation to join remote classes (Günbas, Gözükücüc, 2020).

In Australia, some tutors considered the efforts of some teachers to be deficient, pointing out that their lack of specialization in the use of remote technological means had a negative impact on their cooperation to join efforts with them in favor of their children's learning (Ewing, Cooper, 2021).

While, in China, students shared feeling uncomfortable due to technical difficulties and lack of communication with their teachers and peers, added to the constant supervision of their tutors (Zhu et al., 2022). Although teachers did assimilate the commitment to fostering student interaction as the primary activity, several students underestimated the importance of their participation in their learning process. This led some tutors to attribute their children's learning poverty to a lack of individualized attention from the teacher (Günbas, Gözükücüc, 2020).

On the other hand, the parents recognized that learning within the home is a challenge due to the role models of their children who view their home as a place of rest and leisure, for which they observed that it was necessary to organize the activities of the children to create an adequate environment of study considering that a specific schedule is covered at school (Novianti, Garzia, 2020).

Likewise, during this period of health emergency, students reported having effects on their physical and mental health; in China, for example, more than 50 % reported spending more time remotely compared to their face-to-face studies and what made it more strenuous was the long time spent sitting (Zhu et al., 2022); while in Turkey the guardians attributed the fact of staying at home as the reason why their children showed indiscipline (Günbas, Gözükücüc, 2020).

The negative effects of socio-emotional skills increased during the pandemic because students were more susceptible to stress and anxiety by not having control over their emotions (Alsubaie, 2022). Added to the physical and emotional stress that the students experienced during their remote classes, there was a lack of concentration due to the pressure they put on their families, the lack of time to cover their household chores and, in turn, the mutual irritation generated by social distancing, the inability to go out to meetings, increased work and the need to spend more time on their electronic devices to fulfil their assignments (Gupta et al., 2021).

Conversely, this new active role of tutors as co-mediators of their learning implied a challenge in time management, therefore, the stress and tiredness reported was not only in students; In China, for example, tutors shared feeling pressured by the time required to be co-mediators of their children's educational process, denoting feelings such as frustration and fatigue (Zhu et al., 2022).

While in India, they reported greater stress when perceiving the overload of work during and after their children's online classes, as they required assistance (Gupta et al., 2021). In addition to the above, there was the problem of the lack of infrastructure in the homes to attend to the distance education strategy, the indifference on the part of some tutors to assume the role of direct support of the student at home, added to the inequity in attention to the special needs of students (Apriyanti, 2020; Güvercin et al., 2022).

In general, the role of parents in the learning process and motivation for students stands out as essential, since this support promoted the interest of children towards their lessons and attention to moments of connection, so that the only mitigating factors of this motivation were being isolated from their friends and technical problems (Demir, Gologlu, 2021). However, to the latter one can also add the lack of education of the tutor himself to guide his son during the development of the lessons, which caused them difficulties in caring for their children (Novianti, Garzia, 2020; Alqraini, Alasim, 2021; Alsubaie, 2018; Alsubaie, 2022).

However, by being more involved in mediating their children's learning and, despite the fact that distance education does not replace face-to-face education, around the world the work of teachers to continue the training of students was recognized and appreciated the effort to stay online during the transit of the pandemic to protect the health of their families (Günbas, Gözükücüc, 2020; Demir, Gologlu, 2021; Gupta et al., 2021).

Although they all conclude that, the best form of learning is face-to-face (Alqraini, Alasim, 2021; Gupta et al., 2021; Demir, Gologlu, 2021; Zhu et al., 2022). The advantages of the distance strategy allowed continuity in their studies, safeguarding them safely and allowing them to accompany them in this process (Günbas, Gözükücüc, 2020). This stage, from March 23, 2020, to July 28, 2022, referred to the skills and commitment of the tutors to the education of children at home. The sudden implementation of such a strategy, as well as creating challenges, also raised practical implications applicable to the post-pandemic.

Research question and purpose

For all of the above, the big question that seek to answer: What is the model resulting from confirming the five-factor model of the role of parents in the virtual education of their children? Therefore, the purpose of the study is to validate the five-factor model using confirmatory analysis.

Methodology and research design

The study design is non-experimental and cross-sectional. For data analysis is descriptive, correlational and confirmatory using SEM methodoogy.

Participants

253 parents of elementary school students were surveyed. The only request from the parents was the anonymity.

Instrument

The reduced scale developed by Valdés et al. (2009), which consists of 23 items on a Likert scale whose range is from 0 = never to 4 = always, as well as questions about the profile of the respondents, was used.

Procedure for data analysis

The reliability and internal consistency of the scale, as well, the normality of the data are assessed. Afterward, an exploratory factorial analysis (EFA) with orthogonal Varimax rotation is develop in order to obtain the components matrix rotated (Muthén, Kaplan, 1992; Richaud, 2005; Ogasawara, 2011; Timmerman, Lorenzo-Seva, 2011). Subsequently, to evaluate the model proposed by Santana et al. (2023), about the role parents in the teaching-learning process of their children, confirmatory analysis (CA) is used to validate the factorial solution, using the SEM methodology. To confirm the factorial solution, several goodness of fit indicators, can be used. Some of these indicators are the normed fit index (NFI), the non-regulated fit index (NNFI), also known as TLI, the index incremental fit index (IFI), comparative fit index (CFI), and root mean square error of approximation (RMSEA), among others, (Mac-Callum et al., 1996; Hair et al., 1999; Hu, Bentler, 1999). In this work, the CMIN/DF index, RMSEA, RMR, GFI, AGFI, CFI and TLI to evaluate the model, as well as, PRATIO, PNFI and PCFI to evaluate parsimony, were used.

3. Data analysis and discussion

The total explained variance matrix is obtained (Table 1) and the rotated component matrix (Table 2).

Table 1. Total variance explained

Component	Extraction sums of squared loadings		
	Eigenvalues	% of variance	cumulative, %
1	6.835	29.717	29.717
2	2.349	10.215	39.932
3	2.072	9.010	48.942
4	1.683	7.316	56.258
5	1.111	4.829	61.087

Table 2. Rotated component matriz[a]

Indicators	F1	F2	F3	F4	F5
6. Talk with the teacher about your child's performance and behavior	.838				
5. Talk with the teacher about your child's homework	.805				
4. Talk with the teacher about how the child performs tasks and participates in class	.785				

Indicators	F1	F2	F3	F4	F5
1. Talk with the teacher about your child's learning	.756				
2. Talk with the teacher about any concerns expressed by your child	.713				
Have a good relationship with your child's teacher					
16. Talk with your child about what s/he did at school		.848			
17. Talk with your child about what s/he did in the different classes		.843			
19. Talk with your child about the relationship s/he has with their teacher		.779			
15. Talk to your child about their classmates		.757			
13. Supervise the doing of homework		.627			
Praise child when s/he completes schoolwork					
Participate in raffles organized for the improvement of the school					
8. Attend when required by the school			.784		
3. Attend school meetings			.778		
9. Attend expert talks organized by the school			.681		
10. Pick up your child from school			.546		
20. Know the evaluation system of the school				.775	
21. Know the school regulations				.736	
18. Know about the support services provided by the school				.682	
22. Know the training and experience of the child's teachers				.596	
14. Have a different opinion regarding what affects academic performance					.873
11. Have a different opinion regarding what affects your child's behavior					.871
Extraction method: principal component analysis. Rotation method: Varimax with Kaiser[a] normalization. The rotation has converged in 7 iterations.					

Notes: *Three items of the 23 original items of the scale, are not within the indicated levels, therefore they are discarded.
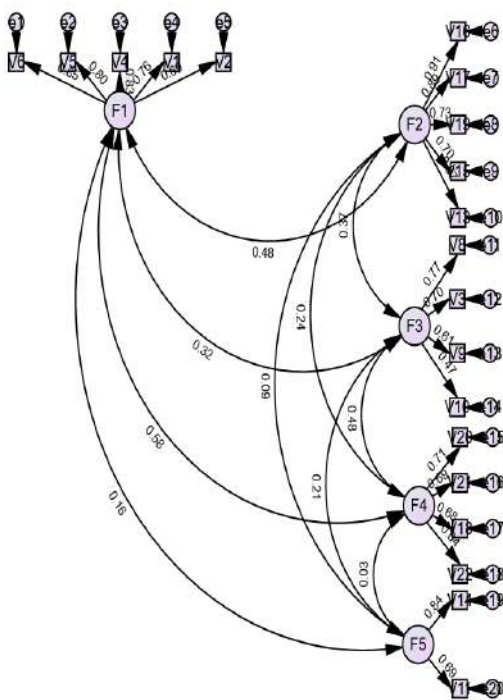
Initial model 1.(Chi-square = 209.351; Degrees of freedom = 160 and Probability level = .005)

Fig. 1. Parent's role in virtual learning model 1
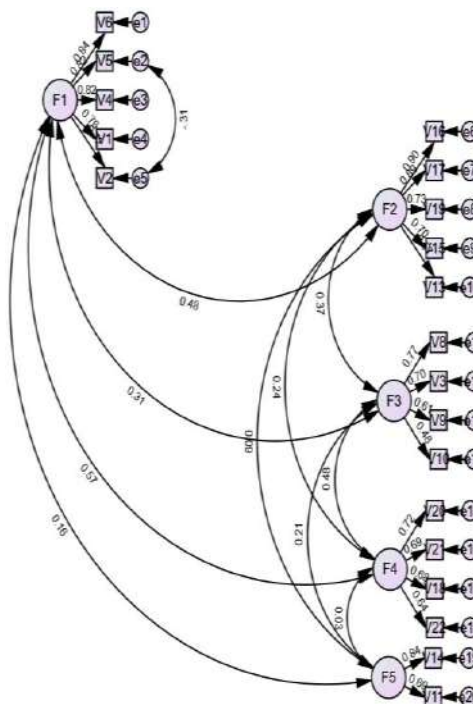
(Chi-square = 194.906; Degrees of freedom = 159; Probability level = .028

Fig. 2. Parent's role in virtual learning model 2

Now, we proceed to corroborate the factorial solution, for this, we use the CA to obtain a greater contrast of the specified hypotheses. In this analysis, the covariance matrix is evaluated instead of the correlation matrix, which helps to establish whether the indicators are equivalent. Figure 1 shows the initial model of the factorial solution (Tables 1 and 2). Figures 2, 3 and 4 show the modified models, to identify the best fit of the model according the Chi-square likelihood ratio.
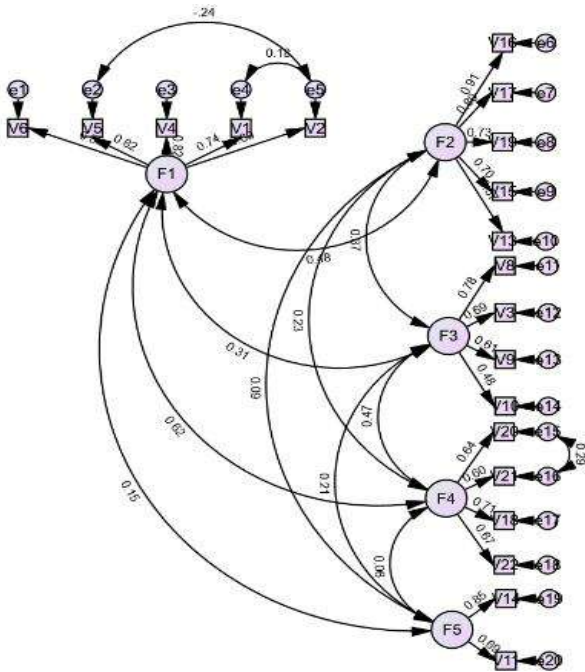
(Chi-square = 185.611; Degrees of freedom = 158; Probability level = .066)
Fig. 3. Parent's role in virtual learning model 3
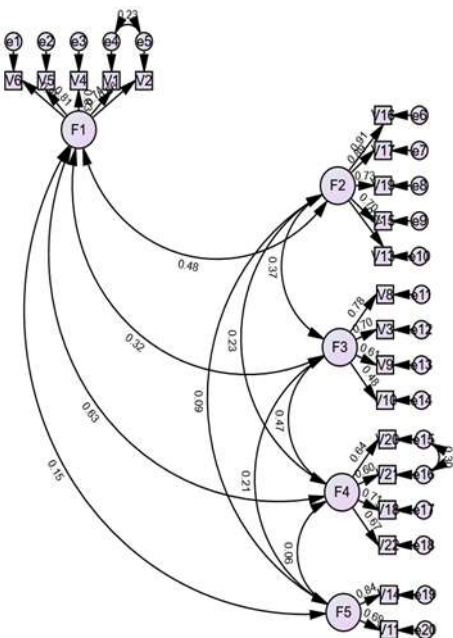
Fig. 4. Parent's role in virtual learning model 4
(Chi-square = 176.508; Degrees of freedom = 157; Probability level = .137)

Table 3 shows the summary of the fit indices obtained from the four models resulting from the confirmatory analysis. The model that shows the best fit is the model in figure 4, where the

following estimation errors are correlated: In factor 1, e2 versus e5, e4 versus e5 and in factor 4, e20 and e21.

Table 3. Models obtained

	RMSEA	CMIN/DF	RMR	GFI	AGFI	PGFI	TLI	CFI	PRATIO	PNFI	PCFI
Model 1	.035	1.308	.058	.925	.902	.705	.969	.974	.830	.758	.809
Model 2	.039	1.226	.058	.930	.908	.704	.980	.983	.830	.758	.809
Model 3	.026	1.175	.053	.934	.913	.703	.984	.987	.832	.765	.821
Model 4	.022	1.124	.052	.937	.916	.701	.989	.991	.826	.763	.819

To discuss the result, we focus on three fundamental aspects on which this methodology is based: evaluating the absolute fit, structural fit and parsimony. In this order, the results are discussed below

Absolute goodness of fit

To determine the degree that the general model predicts the correlation matrix, the only statistical measure used for the SEM methodology is the Chi-square likelihood ratio statistic (Kline, 2005). Furthermore, if the Chi-square/df values are in the range of 1 and 3 then an acceptable fit is obtained (Hair et al., 1999). For its part, the RMR measures the variances and covariances and verifies whether they differ from the estimates obtained. If its value is close to zero, it is indicative of an almost perfect fit (Byrne, 2001; Arbuckle, 2003). The Goodness of Fit values for models 1, 2, 3 and 4 are:

Table 4. Absolute fit

Model	Chi-square	df	p	CMIN/DF	RMSEA	RMR
1	209.351	160	.005	1.308	.035	.058
2	194.906	159	.028	1.226	.039	.058
3	185.611	158	.066	1.175	.026	.053
4	176.508	157	.137	1.124	.022	.052

Incremental fit measures

In relation to the incremental fit indices, allows evaluating the improvement of the proposed model with the base model, also called the null model. The CFI (Comparative fit index), GFI (Goodness of fit index) and as an extension of the GFI, the adjusted goodness of fit index (AGFI) allows adjusting the degrees of freedom between the models, as well as the TLI index (Tucker-Lewis-Index) are some of the indices suggested for this purpose by McNish et al. (2017). Values greater than 0.90 are those that show a better fit of the model.

Table 5. Incremental fit

Model	Chi-square	*df*	p	GFI	AGFI	TLI	CFI
1	209.351	160	.005	.925	.902	.969	.974
2	94.906	159	.028	.930	.908	.980	.983
3	185.611	158	.066	.934	.913	.984	.987
4	176.508	157	.137	.937	.916	.989	.991

Parsimony fit measures

To obtain the level of fit of the model, the quality of the required estimated coefficients was taken into account with the quality of fit of the model. Depending on the value, these can be low, acceptable or excessively high and range between 0 and 1. Mulaik et al., (1989) propose the Parsimony Goodness-of-Fit Index (PGFI) which represents a modification of the GFI and considers the degrees of freedom available to test the model. The proposed ranges are 0.5 to 0.7 and The Parsimony Normed Fit Index (PNFI) relates the constructs to the theory that supports them. Values close to 1 denote a higher relationship.

Table 6. Parsimony fit measures

Model	Chi-square	*df*	p	PGFI	PRATIO	PNFI	PCFI
1	209.351	160	.005	.705	.830	.758	.809
2	94.906	159	.028	.704	.830	.758	.809
3	185.611	158	.066	.703	.832	.765	.821
4	176.508	157	.137	.701	.826	.763	.819

4. Conclusion

Finally, we can say that the role played by parents in the educational process carried out online, was fundamental. The exploratory model reported by Santana et al. (2023) was confirmed, since the five factors showed excellent values in the standardized estimators, as well as showing positive correlations between the factors. The structure of the five factors is interesting, which denotes the degree of importance in which these indicators behave: firstly, the communication of the parents with the teacher (factor 1), the communication with the children (factor 2), addressing school issues (factor 3), involvement in school dynamics (factor 4) and the own opinion that parents have regarding the performance and behavior of their children (factor 5), all this explains the role of Parents in the online teaching process of their children.

In factor 1, the importance that parents give to communication with the teacher is evident, since this allows them to be informed about the behavior and performance of their children, their homework and how they are carried out, and the student's participation in class. Advances in learning and everything that is consistent with the learning of children. For its part, factor 2 shows the importance of communication with children, about what they do at school, in the different classes that they carry out in their studies, in the relationship that children have with teachers, with their classmates, as well as supervising what they do for homework.

Addressing school-related issues is a fundamental task for parents, since they get involved when required by the school, at meetings for children's issues, when the school organizes talks with experts and, very importantly, parents family pick up the children at school.

In addition, parents are involved in the school dynamics, considering it a fundamental task, since they seek to know the school's evaluation system, as well as the school regulations. In the same way, they are interested in learning about the support services that the school offers to students. And very importantly, parents get involved to know about the training and experience of the teachers who are training their children.

On the other hand, parents have a different opinion regarding the academic performance of their children, which affects their behavior. This data is interesting if we take into account that it is from these opinions that it becomes an element for a greater involvement of parents, to be in communication with teachers and school authorities more frequently. This can advance in the process of training children and the dynamics of school institutions.

In this way, the purpose of the study is fulfilled, since it was possible to validate the model reported by Santana et al. (2023) in similar terms, except for the indicators X_7, X_{12} and X_{23} which did not show factorial scores > 0.5, therefore both were excluded.

As a suggestion, it is advisable to replicate this scale in Latin countries, and for the particular case of Mexico, expand the study to other regions, municipalities, institutions with the purpose of continuing to find similarities or differences in terms of the extracted factors that explain the role of parents in the teaching-learning process of their children (students).

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Appendix

Test on the role of parents in the virtual education of primary education students during the covid-19 pandemic

Dear Parent, we request your kind collaboration in answering this questionnaire. The purpose is to identify the educational activities in which you have participated with your child in this stage of virtual teaching that is carried out due to the health contingency caused by COVID-19. The information provided will be handled with absolute confidentiality and anonymity, since the work has strictly academic purposes and its results will help design some strategies that can improve the process of teaching children.

Thank you for your cooperation

Section A. Sociodemographic data

Sex	Age	How many people live in your household?
a) Male	a) Under 20	a) 1
b) Female	b) 20 to 30	b) 2
	c) 31 to 40	

		d)	41 t o51	c)	3 or more
What is your civil status? a) Single parent		Parents' level of schooling a) Elementary		Number of children a) 1	
b) Married		b) Middle School		d) 2	
c) Widowed		c) High School		e) 3 or more	
		d) College			
		e) Graduate studies			
Father's occupation a) Unemployed		Mother's occupation a) Unemployed		Child's school grade a) 1st	
b) Manual laborer		b) Manual laborer		b) 2nd	
c) Technician		c) Technician		c) 3rd	
d) Merchant		d) Merchant		d) 4th	
e) Professional		e) Professional			

Section B. Consists of 23 items on a Likert-type scale, which has as response options: 1 = Never, 2 = Almost never, 3 = Sometimes, 4 = Almost always and 5 = Always.

Item	Item	Response
1	Talk with the teacher about your child's learning	
2	Talk with the teacher about any concerns expressed by your child	
3	Attend school meetings	
4	Talk with the teacher about how the child performs tasks and participates in class	
5	Talk with the teacher about your child's homework	
6	Talk with the teacher about your child's performance and behavior	
7	Have a good relationship with your child's teacher	
8	Attend when required by the school	
9	Attend expert talks organized by the school	
10	Pick up your child from school	
11	Have a different opinion regarding what affects your child's behavior	
12	Participate in raffles organized for the improvement of the school	
13	Supervise the doing of homework	
14	Have a different opinion regarding what affects academic performance	
15	Talk to your child about their classmates	
16	Talk with your child about what s/he did at school	
17	Talk with your child about what s/he did in the different classes	
18	Know about the support services provided by the school	
19	Talk with your child about the relationship s/he has with their teacher	
20	Know the evaluation system of the school	
21	Know the school regulations	
22	Know the training and experience of the child's teachers	
23	Praise child when s/he completes schoolwork	

Training Teachers in Vietnam: A Self-Assessment of Competencies By Student Teachers in the Northwest Region

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Abstract

This study aimed to explore how student teachers self-evaluated their competencies and evaluated the effectiveness of teacher training in the Northwest Universities and Colleges. A total of 538 student teachers from universities and colleges of teacher education in Northwest Vietnam voluntarily participated in the survey. The questionnaire focused on the self-assessment of these student teachers' qualities and competencies as a teacher. They were also asked to evaluate the training they received for these competencies. The results showed that most of the student teachers could identify their strengths and limitations in the role of a teacher and assessed themselves at good levels for the surveyed competencies including teacher ideology and qualities, professional skills, and soft skills. In general, the training just met their expectations, yet no particular field was evaluated at an excellent level. Based on these findings, suggestions were made to review the initial teacher education programs at the participating universities and colleges.

Keywords: student teachers, student teachers' competencies, teacher education, teacher ideology, evaluation of teacher education programs, Vietnam.

1. Introduction

No one can deny that teachers played a vital role in the educational system. Hattie (2012) found that the contributions of the teacher were among the most significant factors that affect students' success, even in the most modern classes with the aid of sufficient technology. Hattie (2017) also found that collective teacher efficiency and teacher estimates of achievement significantly affected students' achievement (Hattie, 2017). Until now, the role of teachers in assuring teaching quality is still unchangeable (Muzaffar et al., 2023: 367).

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Stronge (2018) noticed that the way to measure teacher effectiveness was still controversial, yet there was a consensus agreement that "effective teachers make an extraordinary and lasting impact on their students' lives" (p. 4).

Liakopoulou (2011) researched teachers' professional competence to find out what factors contribute to a teacher's effectiveness. A result of 727 secondary school teachers showed that "personality traits as being a dominant contributing factor to their effectiveness," more important than other factors including pedagogical knowledge and skills (Liakopoulou, 2011: 72). Teachers' professional competence as mentioned in this study, similar to the work of Liakopoulou (2011), includes not only their academic credentials, subject-matter knowledge, abilities, and skills but also their characteristics and ideology related to teaching.

Hattie (2008, p. 108) also endorsed that "not all teachers are experts, and not all teachers have powerful effects on students," which means the quality of the teachers is extremely important in fostering their roles. Therefore, teachers' training at the tertiary level should be carefully considered.

Barni et al. (2019) noted that, "Teachers' personal values drive their goals and behaviours at school" (p. 1). Therefore, the qualities of teachers should be the utmost matter to consider in educational quality assurance. Ates and Kadioglu (2018, p. 104) stated that to train qualified teachers, it is necessary to select candidates who love the teaching profession, have sensitivity toward their students, and that teachers must continuously improve themselves.

Zu et al. (2022) presented nine qualities of a teacher, including Professional Ideal, Professional Responsibility, Professional Attitude, Professional Discipline, Professional Skills, Professional Conscience, Professional Style, Professional Honor, and Ideological Leading. Stronge (2018) discussed six qualities of effective teachers, including Professional Knowledge, Instructional Planning, Instructional Delivery, Assessment, Learning Environment, and Professionalism. He analysed the details of those components to show their vital roles for an effective teacher in the 21st century.

Depending on each subject, teachers' professional competencies are diverse. For example, a Maths teacher and a Literature teacher will need to have different sets of competencies. Yet, there are always common competencies that every teacher needs to possess, such as the competencies to plan the lessons, deliver instructions, assess students, and so on. Hakim (2015) analysed four groups of teacher competencies that contribute much to teaching: pedagogical, personal, professional, and social competence. All in all, to be an effective teacher, student teachers are required to work hard to gradually develop and demonstrate their abilities in various aspects: knowledge, skills, and personality.

To develop teacher competence, Bisschoff and Grobler (1998) proposed eight aspects of teacher competence, namely: 1) the learning environment (which includes various aspects in student assessment, questioning techniques, professional attitude, time management, classroom climate, and cooperative learning); 2) the professional commitment of the teacher (which includes commitments to be an exemplary model, towards valued social ends, and the ethic of caring); 3) discipline; 4) the educational foundation of the teacher (which includes didactic expertise, educational development, and educational aims); 5) teacher reflection; 6) cooperative ability of the teacher; 7) effectiveness (in teaching strategies; curriculum interpretation; and productivity); and 8) leadership style.

In Vietnam, The Ministry of Education and Training (MoET) issued Decision No. 16/2008/QĐ-BGDDT dated April 16, 2008, on promulgating the regulation on teaching professional moral standards. This decision lists specific ethical regulations that Vietnamese teachers must comply with (MoET, 2008). Some later legal documents generally do not detail professional moral standards for teachers. Therefore, the standards in Decision No. 16 were used to develop questionnaire items for this study regarding teacher qualities. Generally, the Decision requires teachers to have four domains of teacher qualities, including Political qualities; Professional ethics; Lifestyle, and behaviour.

As regards teacher competencies, the Vietnamese government issued Resolution No. 29-NQ/TW of November 04, 2013, on "Fundamental and comprehensive innovation in education, serving industrialization and modernization in a socialist-oriented market economy during international integration" (Communist Party of Vietnam, 2013). The Resolution emphasised a need to "transform education from knowledge provision to comprehensive development of

learners in terms of competencies and personal qualities." This is considered a blueprint for all levels of education in Vietnam and for innovating educational programmes.

To implement this Resolution, MoET issued Circular No. 20/2018/TT-BGDDT promulgating the regulation on professionalism for teachers, including the required qualities and competencies of teachers, including teachers' ideology, ethics, lifestyle, and teachers' competencies. MoET also issued the 2018 General Education Curriculum (K12 Curriculum) affirming the educational goal is to develop the qualities and competencies of learners (Circular No. 32/2018/TT-BGDDT). In addition, Directive No. 31/CT-TTg in 2019 by the Prime Minister of Vietnam strengthened moral and lifestyle education for students. Therefore, universities are encouraged to innovate their teaching content and training methods to train student teachers.

In Vietnam, there are studies about student teachers' competencies and how to develop them, yet most of the studies were conducted in the developed cities, for some examples see Nguyen and Truong (2010), Doan (2010), Hoang and Ninh (2017). There is a serious lack of research on the quality of teachers in Vietnam's mountainous regions like the Northwest. To the best of our knowledge, there are no studies about this issue. The Northwest region in Vietnam is one of the most underdeveloped areas in the country, both in education and economy. This is also the place where most of the Vietnamese minority groups live, with very rich and diverse cultures and traditions. Besides, due to the difficulties in the infrastructure and transportation system, this region frequently lacks teachers, let alone qualified ones. Thus, how to develop this region based on education is one of the key strategies that require more attention and actions from educators and the government.

This study, hence, focused on investigating the student teachers' qualities and competencies, as well as surveying their perceptions of the extent to which they met the requirements of the teacher training programmes in participating universities and colleges in Vietnam. This study also compares the results between two groups of students. The first one is students in the first and second years of their study, and the second group is students in the third and fourth years of study.

This study, thus, aims to explore the Vietnamese Northwest student teachers' self-assessment of their personality traits, competencies, and skills as a teacher as well as investigate how the universities and colleges of teacher education in the Northwest of Vietnam developed their student teachers' competencies from the view of these students. Based on the findings, suggestions for MoET and other stakeholders will be offered to improve initial teacher education in this region.

2. Methodology

This study surveyed student teachers on their personality traits, teacher ideology, professional skills, and soft skills that are necessary for a teacher as well as their perceptions on how much their colleges and universities prepared them for these professional competencies and skills.

2.1. Questionnaire

The questionnaire included open-ended (O) and rating scales (R) questions as the following:

Q1 (O). Please name the qualities of a teacher that you believe you have already possessed/developed (Table 2).

Q2 (O). Please name the qualities of a teacher that you currently do not have (Table 3).

Q3 (R). From 0 to 10, please rate your professional qualities and competencies as a teacher and the training effectiveness of your university on those aspects (Table 4).

Q4 (R). From 0 to 10, please rate your classroom management competencies and the training effectiveness of your university on those aspects (Table 6).

Q5 (R). From 0 to 10, please rate your abilities to design and use active teaching methods and techniques and the training effectiveness of your university on those aspects (Table 8).

Q6 (R). From 0 to 10, please rate your skills as a teacher in the 21st century and the training effectiveness of your university on those aspects (Table 10).

Q7 (R) From 0 to 3, Please rate the level of contributions of several groups of courses (Table 12) in the curriculum of your universities/colleges in developing your qualities and competencies.

For Q3-6, participants were asked to evaluate their current professional qualities and competencies as a teacher and the quality of the programs they were studying from 0 to 10 (0 meaning not at all and 10 meaning excellent and very effective). For Q7, participants were asked to evaluate the contribution of seven groups of courses from 0 to 3 (High (3), Average (2), Low (1), and Not at all (0)).

2.2. Participants

The study employed a convenience sampling technique, with students from faculties and schools of teacher education in the Northwest region, Vietnam. Emails with links to the questionnaire using Google Forms were sent to all of the student teachers in these universities and colleges. Students voluntarily answered the questionnaire. The survey was taken during August and September 2022.

This study applied the simplified sample size calculation proposed by Yamane (1967, p. 886) which is $n = \frac{N}{1+N(e)^2}$, in which N = 5,000 student teachers (approximately), e=0.05 (95 % confidence level and p = 0.5). Therefore, the acceptable sample for this study is 370.

A total of 538 student teachers, in five universities and colleges of the Northwest region, Vietnam, particularly in four provinces: Hoa Binh, Son La, Dien Bien, and Lai Chau, responded to the survey, which meets the requirement for statistical analysis. The universities and colleges involved in this study included Tay Bac University (336 student teachers), Lai Chau Community College (42 student teachers), Son La College (61 student teachers), Dien Bien College of Education (48 student teachers), and Hoa Binh College of Education (51 student teachers). Students were coded as P1 (Participant 1) and Pn (Participant n) respectively. Information on the participants is presented in Table 1.

Table 1. Demographic information about the respondents

Major of teaching	Gender		Year of study				Total
	Male	**Female**	**1st**	**2nd**	**3rd**	**4th**	
Childhood Education	12	271	7	122	104	50	283
Politics Education	33	25	-	33	10	15	58
English Language Teaching	11	34	-	39	6	-	45
Geography Education	3	30	4	13	13	3	33
Primary Education	6	19	-	9	8	8	25
Computer Science	11	12	-	17	4	2	23
History Education	4	18	1	12	8	1	22
Vietnamese Literature	1	18	-	13	6	-	19
Maths Education	9	11	-	17	2	1	20
Physical Education	9	1	-	9	-	1	10
Total	**99**	**439**	**12**	**284**	**161**	**81**	**538**

Of 538 respondents, only 106 (19.7 %) student teachers are Kinh, the rest of the student teachers (432, 80.3 %) are of other ethnic minority groups in Vietnam. As regards gender, 439 female (81.6 %) and 99 male (18.4 %) student teachers joined the study. Table 1 also shows that 296 are students in their first and second years of study and 242 are in their third and fourth years of study.

2.3. Data analysis

Qualitative data from Q1 and Q2 were coded for themes and patterns and then were grouped into the most common groups of ideas with the frequency of ideas counted. The quantitative data from other questions were analysed using SPSS 20 for descriptive and inferential statistics. Correlations and reliabilities were calculated where relevant.

The independent t-tests were run to examine the differences between the two groups of students. The participants were divided into two groups: 1) Group 1 included 296 1st and 2nd year student teachers (55.20 %) and Group 2 included 242 3rd and 4th year student teachers (44.80 %).

3. Results and discussion
3.1. Personality traits: strengths and limitations

Table 2 displays the result of qualities that participants believed they already possessed when answering question Q1 listed from the most frequent to the least frequent ones. These are summarised from the narratives written by student teachers.

Table 2. Personality traits articulated

No.	Themes as qualities	N	%
1	Love, enthusiasm, and passion for the profession	207	38.48
2	Love and enthusiasm for students	173	32.16
3	Having appropriate ethical qualities	119	22.12
4	Having the desire and spirit to learn and practice to perfect oneself	71	13.20
5	Being hard-working, diligent, patient, and having the ability to manage emotions	68	12.64
6	Having fairness, integrity, and honesty	65	12.08
7	Being responsible, self-disciplined, dedicated, and enthusiastic	53	9.85
8	Being open-minded, sociable, friendly, and gentle	31	5.76
9	Being exemplary and disciplined	27	5.02
10	Having knowledge and understanding of the job	21	3.90
11	Having compassion, humanity, altruism, and tolerance	20	3.72
12	Having professional skills	15	2.79

Table 2 shows that for the participants, the most common qualities they possessed were love, enthusiasm, and passion for the job itself (38.48 %). Some of them wrote:

"I am passionate about teaching" (P55)
"I love the job with all my heart" (P37)
"I am dedicated and devoted to the job" (P102)

The second most common quality they mentioned was the love and enthusiasm for their students (32.16 %). Some pre-service students wrote, "Love children" (P1), "Care for children" (P44), or "Love children and educate with love" (P42). A student wrote very sincerely: "I love children, so I'm controlling my own temper. My study let me understand that the teaching profession is very sacred, essential for the young generations of the country" (P158). Another study wrote, "When I came to the university, my lecturers told me that I would have many challenges in teaching because teaching is not an easy job. A teacher's responsibility is very high and important, so I have not stopped trying and learning every day to improve myself" (P23). The result was very rewarding for the colleges and universities of these students when most of the participating students believed that they had developed several important qualities of a teacher. These qualities are core values for a devoted teacher in the future.

The other qualities that they believed they developed during their studies were ethical issues, a desire and spirit to perfect themselves, hard work, diligence, patience, fairness, integrity, honesty, and many other good virtues as presented in Table 2.

The results show that participating student teachers in this study believed that they possessed relevant qualities of being a teacher. However, most of the responses focused on professional ethics and lifestyle, and behaviour. The participants did not write anything related to the political qualities of teachers. Although politics modules are mandatory, they are not only for the initial teacher education programmes but also for all educational programmes in Vietnam. Hence, the role of these modules in developing the political qualities of teachers seems either to be vague or obvious. There has been much discussion around teaching and learning these modules in the Vietnamese context when Vietnamese student teachers expressed their dislike or boredom studying politics courses. The results of this study suggest that Vietnamese teacher education universities reform their politics courses in a way that student teachers can connect the values of these courses to form their political qualities.

In this study, 22 of the participants (4.09 %), most of them in the second and third year of study, could not name any qualities of a teacher that they have developed. This revealed a certain level of uncertainty in their studies as well as their future job. It can also be inferred that a certain number of those student teachers do not possess suitable personal qualities and that the teacher training programmes failed to equip a small proportion of student teachers with the necessary professional moral standards. This small number can become a big issue later for these students as well as for the future quality of education because the personal traits of teachers should be the utmost matter in education.

These are the most basic qualities of a teacher because the teaching profession is the profession of working with people. In addition to teaching knowledge, teachers also have to teach people to form personalities and inspire and spread the wings of dreams for students so that they believe in themselves and be successful citizens in the future. These are very necessary qualities that student teachers have recognized and possessed. However, it will take a long time for them to practise and improve, especially in reality, to perfect and affirm the above qualities. Above all, student teachers need to have the effort and spirit of lifelong learning, passion, and creativity, so that they can cultivate more ethical qualities, and professional expertise and continue to grow in a changing society that greatly impacts education as it is today.

The finding in this study is similar to the result of Arnon and Reichel (2007) which indicated that students mutually attributed great importance to the personal qualities of the ideal teacher. Most of the qualities belong to the "Big Five personality domains" of teacher personality (openness, conscientiousness, extraversion, agreeableness, and emotional stability) as concluded by a meta-analysis of Kim et al. (2019a, p. 163). Moreover, the results were in great accordance with the findings from Huynh et al. (2023) who found that Vietnamese student teachers in early childhood education had certain important qualities and ethics embodied in STEAM educational activities.

With the open-ended question Q2, the participants also provided their shortcomings. The results are summarised in Table 3 from the most common limitations to the less common ones.

Table 3. Student teachers' self-reports of the qualities that they did not possess

Themes	N	%	Sub-themes	N	%
Personal qualities	244	45.35	Shy/lack of confidence	96	17.84
			Not diligent	35	6.51
			Not active	30	5.58
			Other qualities (fairness, humility, honesty, courage, bravery, optimism, calmness, tolerance, creativity…)	28	4.83
			Lack of patience	18	3.35
			Lack of determination and effort	14	2.60
			Short-tempered/lack of control	12	2.23
			Lack of concentration	6	1.12
			Not exemplary	5	0.93
Professional skills	125	23.23	Lack of professional skills (in general)	52	9.67
			Lack of communication skills	30	5.58
			Lack of pedagogical situation-handling skills	18	3.35
			Lack of other professional skills (program design, child care, class management, leadership, assessment…)	15	2.79
			Lack of teaching skills	10	1.86
Professional knowledge	95	17.66	Lack of professional knowledge and experience	95	17.66
Personal goals	52	9.67	Not well studying and practicing, have not achieved personal goals	52	8.29
Attitude towards the job and the students	30	5.58	Do not love the job	14	2.60
			Lack of devotion to the job	14	2.60
			Do not love children	2	0.37
Unknown	81	15.06	Don't have or don't know	67	12.45
			Lack a lot (unspecified)	14	2.60

A few percent of participants admitted the limitation in attitudes (5.58 %) and qualities (45.35 %). Particularly, some of them admitted that they did not love the job, or even did not love children, and lacked devotion to the job.

Among personal qualities, lack of confidence was the most popular limitation of these pre-service teachers (17.84 %). The results confirmed a view by Nguyen and Hoang (2019) that

educating qualities and ethics of teachers is an urgent requirement for students of teacher education schools these days, specifically for preschool teachers as pointed out by Nguyen (2019).

Professional knowledge and professional skills were also a challenge of 17.66 % and 23.23 % of participants respectively. Although it is understandable because they are still students, tertiary educators should pay attention to students' opinions on training programs, to better satisfy the learners' needs. This problem, unfortunately, was indicated a long time ago by Tran (2013) and remains these days.

Interestingly, 67 student teachers did not know their limitations (27 student teachers) or reflected themselves as "do not have any limitations" (40 student teachers). Both of these groups show a weak ability to reflect on self-development. The results directed the need for counselling and career orientation in high schools, to detect the students who are suitable for pedagogy. Not all pedagogical students choose to study this profession because of their love and qualities for the major. For instance, Tran et al. (2023) indicated that many first-year pedagogical students in Vietnam were not motivated to study (p. 239). This was quite disappointing because being an effective teacher in Vietnam requires much motivation and devotion when the salary for the job was considered low so far.

In sum, most of the participants in the Northwest region, Vietnam reported that they have developed a love of teaching and other suitable abilities as teachers. Nevertheless, they also reported a lack of confidence and professional knowledge and skills, which directed the need for more effective training. The reported shortcomings fall into the main six qualities of a teacher to perform effective teaching as reviewed by Stronge (2018, p. 11), including professional knowledge, instructional planning, instructional delivery, assessment, learning environment, and professionalism. This finding can be viewed as a positive result because only when the student teacher can identify their weaknesses, they can know what needs to be concentrated, practiced, and improved.

3.2. Self-assessment of teacher qualities and competencies and the evaluation of the effectiveness of the curriculum in the Northwest region
Professional qualities and competencies as a teacher

The results in the student teachers' professional qualities and competencies as a teacher are reported below:

Table 4. Self-reported qualities and the training quality of the universities

Themes	Teacher qualities	Self-assessment (A)		Evaluation of training (B)		Pearson Correlation*	Difference (B − A)
		M (A)	SD	M (B)	SD		
Attitude towards the job and the students (α_A = 0.963; (α_B = 0.961)	Passion for teaching	6.98	2.549	7.04	2.622	.824	0.06
	Love your students	7.44	2.607	7.28	2.618	.857	-0.16
	Feeling happy and joyful when interacting with children	7.40	2.609	7.32	2.575	.868	-0.08
	Want students to improve	8.01	2.615	7.70	2.612	.890	-0.31
Personal qualities (α_A = 0.971; (α_B = 0.964)	Be tolerant and compassionate towards students	7.70	2.622	7.57	2.638	.882	-0.13
	High responsibility in work	7.50	2.549	7.34	2.614	.852	-0.16
	Teacher's sense of responsibility	7.67	2.523	7.58	2.548	.915	-0.09
	Innovative, fun, and active	7.73	2.553	7.62	2.586	.886	-0.11
	Have a professional conscience	7.55	2.590	7.34	2.615	.862	-0.21
Professional behaviours (α_A = 0.977;	Know how to educate students appropriately	7.56	2.545	7.54	2.596	.871	-0.02
	Treat students fairly	7.75	2.571	7.45	2.550	.847	-0.30

(α_B = 0.971)	All for the students although being strict	7.75	2.642	7.57	2.620	.895	-0.18
	Simple and friendly lifestyle	7.47	2.612	7.29	2.633	.865	-0.18
	Caring, sharing, trusting, supporting and tolerant among individuals	7.61	2.530	7.45	2.605	.879	-0.16
	Respect diversity and differences	7.83	2.552	7.62	2.586	.885	-0.21
Effort and practice (α_A = 0.982; (α_B = 0.971)	Maintain teacher ethics	7.94	2.572	7.75	2.575	.934	-0.19
	Never stop learning and training yourself to be a better teacher	7.88	2.573	7.69	2.611	.897	-0.19
	Dare to defend what is right, condemn what is bad	7.81	2.608	7.65	2.592	.921	-0.16
	Cherished and fostered the love in education day by day	7.73	2.578	7.54	2.586	.889	-0.19
	Average	**7.65**	**2.579**	**7.49**	**2.599**	**0.880**	**-0.16**

Note: α: Conbrach's alpha α_A = self-assessment, α_B = evaluation of training

Table 4 illustrates that participants assessed most of their personal qualities as "Good" (6.98-7.94). Only one quality scored 8.01 (very good) (want students to improve). For the training quality, the scores range from 7.04 to 7.75 (a "good" level). The result also shows that the student teachers self-rated their qualities higher than the extent to which the training at their universities has contributed to these qualities. It is then necessary to evaluate the current study programmes so that they can contribute significantly to developing some required qualities for teachers. It is noted that numerous studies have shown that personality traits are one of the most influential factors that drive academic performance (Hazrati-Viari et al., 2012; Karatas, 2015). It will be almost impossible to train someone "from zero to hero" in just four years, especially in teacher education. Therefore, a careful selection of candidates for teacher education majors could be another resolution to develop teachers' qualities.

Table 5 illustrates the differences between the two groups in their self-assessment of self-reported qualities.

Table 5 shows that there was a significant difference between the two groups in seven surveyed aspects, and the results of the first group are higher than the second one. A further study is needed to explore possible explanations of the result of why third-year and fourth-year students "self-evaluated" their qualities as teachers lowered than the first- and second-year students did.

Table 5. The differences between the two groups in their self-assessment of self-reported qualities

Themes	Teacher qualities	Group 1	Group 2	t	df	Sig. (2-tailed)
Attitude towards the job and the students	Passion for teaching	7.077	6.855	1.008	536	0.314
	Love your students	7.593	7.253	1.504	536	0.133
	Feeling happy and joyful when interacting with children	7.694	7.046	2.884	536	0.004
	Want students to improve	8.121	7.863	1.139	536	0.255
Personal qualities	Be tolerant and compassionate towards students	7.929	7.423	1.083	536	0.279
	High responsibility in work	7.603	7.369	1.668	536	0.096
	Teacher's sense of responsibility	7.845	7.444	2.198	536	0.028
	Innovative, fun, and active	7.882	7.548	2.258	536	0.024
Professional behaviours	Have a professional conscience	7.694	7.378	2.234	536	0.026
	Know how to educate students appropriately	7.751	7.315	1.056	536	0.291

	Treat students fairly	7.899	7.560	1.838	536	0.067
	All for the students although being strict	7.926	7.531	1.513	536	0.131
	Simple and friendly lifestyle	7.657	7.249	1.409	536	0.159
	Caring, sharing, trusting, supporting and tolerant among individuals	7.758	7.436	2.031	536	0.043
Effort and practice	Respect diversity and differences	7.936	7.689	1.260	536	0.208
	Maintain teacher ethics	8.098	7.751	2.005	536	0.045
	Never stop learning and training yourself to be a better teacher	8.040	7.693	1.329	536	0.184
	Dare to defend what is right, condemn what is bad	7.953	7.643	1.075	536	0.283
	Cherished and fostered the love in education day by day	7.855	7.581	2.234	536	0.026

Classroom management competencies

The participants' current ability to organise classes and the training quality of the universities were reported in Table 6.

Table 6. Classroom management competencies

Knowledge and skills in classroom management	Self-assessment (A)		Evaluation of the programme (B)		Pearson Correlation *	Difference (B – A)
	M(A)	SD	M (B)	SD		
Know how to set classroom rules	7.22	2.544	7.35	2.601	.866	0.13
Know how to observe children's activity and attract children's attention	7.54	2.488	7.54	2.494	.863	0.00
Know how to organise collective activities	7.53	2.478	7.55	2.552	.856	0.02
Can connect and build relationships with students in the spirit of respect, listening and understanding	7.41	2.533	7.41	2.571	.866	0.00
Can encourage students to actively participate in classroom activities	7.51	2.526	7.52	2.531	.860	0.01
Can assign tasks to students and manage time when assigning tasks	7.49	2.473	7.45	2.551	.867	-0.04
Can build positive relationships with parents for effective classroom management	7.50	2.485	7.49	2.502	.869	-0.01
Average	**7.39**	**2.496**	**7.44**	**2.554**	**0.847**	**0.04**

Table 6 shows that for classroom management competencies, the lowest evaluation was for knowledge (know how to set classroom rules: 7.22) whereas all other aspects were approximately 7.50 (a good level). For the contribution of the training to these aspects, the results were also at a "good" level (M= 7.35 to 7.55). The differences between the self-reported competencies and how the training at the universities contributed to their development of these competencies were also the same.

Table 7 displays the differences in self-assessment between the two groups for classroom management knowledge and skills.

Table 7. Differences between the two groups of students in classroom management knowledge and skills

Knowledge and skills in classroom management	1st & 2nd year students	3rd & 4th year students	t	df	Sig. (2-tailed)
Know how to set classroom rules	7.431	6.950	2.188	536	**0.029**
Know how to observe children's activity and attract children's attention	7.747	7.290	2.126	536	**0.034**
Know how to organise collective activities	7.751	7.253	2.326	536	**0.020**
Can connect and build relationships with students in the spirit of respect, listening and understanding	7.623	7.158	2.126	536	**0.034**
Can encourage students to actively participate in classroom activities	7.734	7.224	2.338	536	**0.020**
Can assign tasks to students and manage time when assigning tasks	7.646	7.307	1.585	536	0.114
Can build positive relationships with parents for effective classroom management	7.704	7.253	2.098	536	**0.036**

The result illustrates that students in the third and fourth years of study were less confident in their classroom management knowledge and skills than the first and second-year students. Perhaps first-year and second-year students thought it was "easy" to teach. However, when they are in their third and fourth year of study, they are taught to develop these competencies and start feeling that classroom management is not such "easy."

In sum, the results show that participants believed they were good at knowledge and skills in classroom organisation. The results also indicate that the training somewhat met the expectations of the students. Since the MoET issued a new curriculum (MoET, 2018), the skills to organise learners' activities, design and use active teaching methods and techniques, and other necessary skills are crucial for a teacher able to implement the curriculum. Consequently, teacher education universities, including the participating ones in this study, are required to reform their curricula and training activities to prepare undergraduates so that they are more confident in their teaching careers regarding these knowledge and skills.

Competencies to design and use active teaching methods and techniques
Table 8 reports the results of students' self-assessments and their evaluation of the training.

Table 8. Self-assessment and evaluation of the training for competencies to design and use active teaching methods and techniques

Items	Self-assessment		Evaluation of the training		Pearson Correlation*	Difference (B − A)
	M(A)	SD	M(B)	SD		
Improving traditional teaching methods	7.22	2.521	7.49	2.597	.847	0.27
Combining a variety of traditional and modern teaching methods	7.34	2.524	7.31	2.595	.856	-0.03
Strengthen the use of appropriate teaching aids and information technology to support teaching	7.45	2.452	7.39	2.560	.854	-0.06
Use teaching techniques to promote positivity and creativity	7.44	2.519	7.46	2.533	.841	0.02

Focus on subject-specific teaching methods	7.42	2.459	7.51	2.532	.845	0.09
Fostering active learning methods for students	7.49	2.499	7.46	2.509	.838	-0.03
Average	**7.39**	**2.496**	**7.44**	**2.554**	**0.847**	**0.04**

The self-assessment scores ranged from 7.22 to 7.49 whereas for the effectiveness of the training for these competencies, the scores were from 7.31 to 7.51. There was no significant difference in the overall scoring level for the self-assessment and the participants' evaluation of the effectiveness of the training of these competencies, and all of them can be interpreted as at a "good" level.

Table 9 presents the results of differences between the two groups of students in competencies related to the design and use of active teaching methods and techniques.

Table 9. Differences between two groups of students in competencies to design and use active teaching methods and techniques

Competencies to design and use active teaching methods and techniques	Group 1	Group 2	t	df	Sig. (2-tailed)
Improving traditional teaching methods	7.421	6.983	2.007	536	**0.045**
Combining a variety of traditional and modern teaching methods	7.532	7.104	1.962	536	**0.050**
Strengthen the use of appropriate teaching aids and information technology to support teaching	7.640	7.216	2.000	536	**0.046**
Use teaching techniques to promote positivity and creativity	7.636	7.191	2.046	536	**0.041**
Focus on subject-specific teaching methods	7.640	7.145	2.329	536	**0.020**
Fostering active learning methods for students	7.704	7.224	2.326	510.964	**0.020**

Similar to classroom management knowledge and skills, Group 1 students were more confident in their competencies to design and use active teaching methods and techniques. It is expected that the training will help student teachers to develop these competencies. However, the result shows the opposite. The differences were significant for all aspects surveyed.

Skills of a teacher in the 21st century

Regarding some skills that are essential for 21st century teachers, students were slightly less confident than other surveyed qualities and competencies, albeit also at a good level. For the self-assessment, the results were from 7.11-7.36 and 7.34-7.47 for the quality of training. The results for the effectiveness of the training were higher (at an average of 0.17).

Table 10. Teacher skills in the 21st century

Skills	Self-assessment		Evaluation of the training		Pearson Correlation *	Difference (B – A)
	M(A)	SD	M (B)	SD		
Self-awareness skills	7.36	2.538	7.37	2.436	.868	0.01
Learning and self-study skills	7.15	2.490	7.34	2.442	.863	0.19
Communication skills	7.14	2.515	7.40	2.424	.860	0.26
Teamwork skills	7.35	2.446	7.40	2.400	.866	0.05
Critical Thinking and Creativity	7.11	2.487	7.40	2.411	.833	0.29
Problem Solving skills	7.17	2.472	7.40	2.428	.851	0.23

Emotion Control skills	7.32	2.477	7.47	2.400	.861	0.15
Average	**7.23**	**2.489**	**7.40**	**2.420**	**0.857**	**0.17**

These skills are crucial for modern teachers (Astuti et al., 2019; Kim et al., 2019b; Frenzel et al., 2021). Kim et al. (2019b) highlighted the notion of "teachers as learners" and other related qualities such as self-awareness, collaboration, and critical thinking, problem-solving as key competencies for sustainable development. These skills also require more attention from the participating institutions in this study.

Table 11 illustrates the differences between the two groups in these skills. Interestingly, there were no significant differences between the two groups of students in the surveyed skills in the 21st century.

Table 11. Differences between the two groups in self-assessment of teacher skills in the 21st century

21st-century skills	Group 1	Group 2	t	df	Sig. (2-tailed)
Self-awareness	7.468	7.228	1.090	536	0.276
Learning and self-study	7.327	6.942	1.786	536	0.075
Communication	7.306	6.929	1.732	536	0.084
Teamwork	7.485	7.178	1.446	536	0.149
Critical thinking and creativity	7.246	6.946	1.391	536	0.165
Problem-solving	7.296	7.004	1.365	536	0.173
Emotion control	7.498	7.104	1.841	536	0.066

3.3. Contributions of seven groups of courses to the teacher education curriculum

In Vietnam, student teachers are trained with seven groups of course in the curriculum: 1) Politics and Philosophy, 2) Pedagogy and Psychology, 3) Education management, 4) Teaching Theory and Subject Teaching Methods, 5) Practicum, 6) Professional Ethics, and 7) Soft skills. This study also asked students to evaluate the contribution of these groups of courses to the development of their qualities and competencies. The results are displayed in Table 12.

Table 12. Contributions of the curriculum to the development of teachers' qualities and competencies

Group of courses	Level of contribution	
	Mean	SD
Politics and Philosophy	2.27	.755
Pedagogy and Psychology	2.54	.737
Education Management	2.31	.808
Teaching Theory and Subject Teaching Methods	2.48	.788
Practicum	2.59	.739
Professional Ethics	2.60	.736
Soft skills	2.62	.706

The results show that Politics and Philosophy courses were rated lowest. Although Politics and Philosophy are compulsory subjects in all of Vietnam's university curricula, students in this study believed that they contributed the least to the student teachers' competencies. The second group of courses with the lowest mean was Education Management (2.31). Since these are general and fundamental courses, it is understandable why students were less aware of the importance of these courses to the curriculum. This could mean that further communication is needed so that students can be more aware of the contribution of these courses to developing their qualities and competencies of teachers.

The groups of courses that were believed to contribute the most were practicum (2.62), professional ethics (2.62), and soft skills (2.65). These courses are "specialised courses" so that students can see the direct connection and contribution of these courses to the development of their professional competencies.

There are many spaces for improvement in all these aspects since a wide range of actions can be taken for student teachers to develop these qualities and competencies at a higher level of confidence. This is also linked to the effectiveness of educational training.

In sum, this study show that for these three main domains that were assessed by the student teachers, none of the competencies and their components had a score of very good level and higher. The same was applied to the training quality of the universities. The results can be seen as positive. The results also show there were significant differences between the two groups of students in their self-assessment on some aspects of competencies. Generally, the 1st- and 2nd-year students tend to be more confident in the surveyed qualities and competencies than the 3rd- and 4th-year students were. For some qualities and competencies, the differences between the two groups of students were not significant. The interesting results can be found with skills of being a teacher in the 21st century, which were similar for the two groups and slightly lower than other qualities and competencies of a teacher.

4. Conclusion

The participating student teachers in the Northwest Region of Vietnam self-reported that they had competencies in many aspects of being a "good teacher" including teacher ideology and qualities, professional skills, and necessary soft skills. Most of them articulated rather clearly their strengths and limitations in teacher qualities. However, there was a small number of student teachers did not answer this question in the survey. Some Vietnamese student teachers chose the career not based on their own will, interests, and characteristics but based on other external reasons including free tuition fees, their parents' choice, or simply because they failed the entrance exam for other majors. Therefore, this should be a remarkable point for stakeholders to plan and develop a better admission procedure to choose suitable candidates for this very important career.

The student's evaluation of the effectiveness of the training was at a good level on average. Yet no particular aspect was evaluated with an excellent level. Noticeably, several compulsory courses in the curriculum received lower appreciation from the student teachers. Further research is needed to search for insight into this issue: whether these are fundamental courses, hence the link to the development of students' competencies is not always explicit or clear, or because of the other issues related to the quality of teaching and learning these courses.

This study provided a general picture of how student teachers in the Northwest Region of Vietnam self-assessed their qualities and competencies related to the teaching profession. However, the data relied much on the student teachers' self-evaluation, without observation of their real behaviours which is the limitation of the current study. Further studies should be conducted to investigate the real-life behaviours and competencies of these participants. A follow-up qualitative study is also needed to explore and provide explanations of the results found in this study.

5. Acknowledgements

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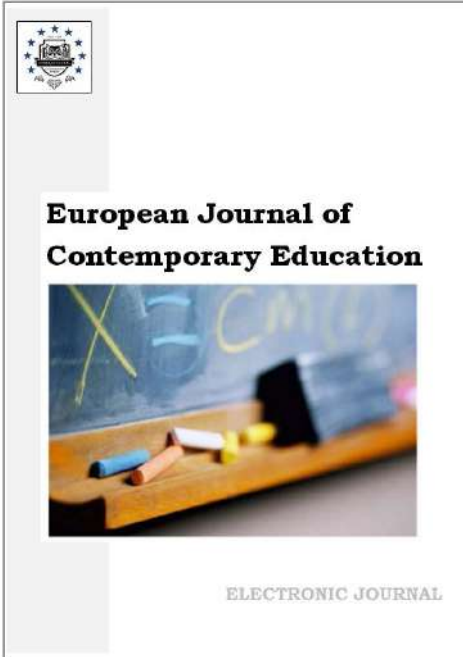
Addressing Specific Vocabulary Challenges through Online Platforms and Internet Channels

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Abstract
Currently, the utilization of information and communications technologies in the educational sphere is experiencing a rapid increase in popularity, in particular, in teaching foreign languages. The use of information and communication technologies (ICT) has become an integral part of the educational process. However, modern technologies should optimize classes, and not be a hindrance in achieving the planned goals. The aim of this paper is to investigate whether the use of educational online platforms can effectively assist in the development of students' lexical skills. Having a number of advantages, web platforms are able to optimize the learning process at the stages of vocabulary semantics, word processing, vocabulary practice and vocabulary output into speech. The article presents a brief description of open online resources and web platforms for the development of lexical tasks and exercises, suggests possible options for working with these resources in the classroom, which can help teachers who want to keep up to date and develop their professional skills. The results of a study on the use of online platforms for enhancing students' vocabulary skills are also reported.
Keywords: communicative competence, computer linguodidactics, development of lexical skills, ICT, information and communication technologies.

1. Introduction
The study program in a technical university is built in such a way that the study of professionally oriented vocabulary at the lessons of foreign languages occurs earlier than the study of core disciplines by students. "There is a demand for specialists capable to integrate successfully the international professional community" (Varlakova et al., 2023), however, future specialists

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often find it difficult to apply the studied foreign language professionally oriented vocabulary in practice during foreign language professional communication because at this stage of their studies, they have not yet developed a clear vision of their future professional activities.

As a result, teaching English for specific purposes, including the use of professionally oriented vocabulary in particular, can largely be limited to the reading and translation of professionally oriented texts. In this respect, the necessity to find new resources and materials for teaching a foreign language that can tackle at least two problems: 1) the utilization of the latest technological resources that keep pace with modern scientific and technological developments, and 2) the enhancement of student motivation to learn a foreign language in order to pursue their future profession.

Nowadays, computer linguodidactics has become widespread, and with the availability of access to the global network at almost every home and practically in each smartphone the process of using network technologies in language learning is greatly simplified. Access to the Internet provides a wide range of opportunities for learning: search for information on the web, access to authentic materials (literature, audio and video files), the ability to communicate directly with native speakers. Having a number of advantages, such as, for example, individual approach, convenience, mobility, network technologies in training are an inexhaustible source of knowledge that is freely available. "Technologies have effected every aspect of our lives and replaced many traditional functions in order to make people lives easier and more comfortable" (Dreimane, Upenieks, 2022: 1938). "Integrating technology into education provides students with an engaging learning experience, allowing them to remain more interested in the subject without being distracted" (Haleem et al., 2022: 276).

There is a huge number of online platforms for effective teaching of general vocabulary, but not every platform is suitable for teaching professional vocabulary. In the selection process, one of the most productive Internet resources, in our opinion, turned out to be such platforms as "VAcademia", YouTube and "Vkontakte".

The virtual reality platform "VAcademia" (https://vacademia.com) is mainly used in Russia to create virtual worlds. This platform has its own in-house developed software, which provides convenience. As a consequence, a wide variety of additional features can be incorporated into the virtual environment. These include a voting system, desktop access, conference calls, and the capability to record events in three-dimensional format. Virtual tools and devices such as virtual classrooms, virtual meeting rooms, and virtual conference rooms are used to provide a fully immersive virtual learning experience. This virtual learning environment can be utilized to host virtual conferences, workshops, and lectures, as well as other educational activities.

One more platform which can be easily used thanks to its simplicity is the third most visited site in the world – YouTube. On this popular video hosting platform, users with varying levels of proficiency may find dedicated online language-learning channels. These channels can be divided into two types: lectures and video lessons.

Lectures are foreign language speeches on a particular topic made by an expert in the specific field. They require more preparation as these speeches should harmoniously unite all aspects of speech.

Video lessons include all stages of the lesson, adopted in pedagogical science and are held by a native speaker. In each lesson lexical and grammatical units on the topic are introduced, afterwards examples of the use of these units in context are given.

The social network "VKontakte" was chosen as the platform for the experiment to integrate social networks into the educational process. The social network "VKontakte" occupies a leading position in Runet. According to official data, the site has more than 200 million registered users, more than 46 million of whom visit the site every day; about 2.5 billion pages are opened daily. Students spend a significant portion of their free time in front of their computers. The popularization of "VKontakte" means that a user's personal page is almost always in a browser tab, and sometimes it is the home page. This allows the users to have constant access to the information provided on the resource, and it gives access to the necessary educational materials, both in distance learning courses and in full-time education. "VKontakte" can be used for not only entertainment purposes, but also for educational and informational purposes, serving as an effective platform for implementing educational activities. It is worth noting that, for users of the VKontakte network, the interface is straightforward and user-friendly, with a simple structure and organized content that is easy to navigate and use.

The Internet platforms contain authentic video materials which not only enhance students' independence, but also significantly support the teaching process for teachers. The researchers in this study have examined the utilization of educational web platforms and assessed their effectiveness in vocabulary instruction. Therefore, the goal of this research is to investigate whether the utilization of online educational platforms can effectively contribute to the enhancement of lexical abilities among students.

Theoretical Background

In the late 20th and early 21st centuries, scientists such as E.S. Polat (2002) and M.A. Bovtenko (2005) began to investigate the potential of information and communications technologies for teaching foreign languages. As a result, computer-based linguodidactic methods began to emerge in the educational process.

It should be noted that the concept of "linguodidactics" was first introduced by N.M. Shansky in 1969. The scientist defined this notion as "the study of general patterns of language learning, the specific content, methods and means of teaching a particular language depending on didactic goals, objectives and the nature of the material being studied, the conditions of monolingualism or bilingualism, the stage of learning and intellectual and speech development of students" (Shansky, 1969).

In its turn, the term "computer linguodidactics" appeared only in 1991 thanks to K.R. Piotrovskaya, who defined the science as "the field of linguodidactics, which studies the theory and practice of using computer and network technologies in language teaching" (1991) (Piotrovskaya, 1991).

In the new reality, distance learning via the internet has become an integral part of the education process. The COVID-19 pandemic has accelerated the transition towards online learning and the utilization of all available educational means (Valieva et al., 2021). "It is prudent to develop electronic learning materials and environments at the institutional level" (Gerasimova et al., 2022: 52). Numerous researchers have conducted studies regarding online learning and digital technologies (Williamson et al., 2020; Shohel et al., 2021; Karimian et al., 2021).

For instance, W. Wargadinata et al. study the use of such applications as "Whatsapp", "Zoom" and "Google Classroom" in the process of education (Wargadinata et al., 2020). J. Keengwe and M. Bhargava examine the application of mobile technologies (Keengwe, Bhargava, 2014).

"It is necessary to have an in-depth knowledge of the search for and implementation of the advanced technologies" (Litvinenko et al., 2020: 435). Due to the fact that "mineral resource complex is one of the factors of sustainable development of the country" (Khrustaleva et al., 2021: 417), teachers at Saint Petersburg Mining University are "closely involved in the study, development, and implementation of online learning technologies and lexical innovations" (Gagarina et al., 2022; Vinogradova et al., 2021).

O.Yu. Kharlamova et al. (2023) study "enhanced terminology acquisition during an ESP course" among the students of the Mining University. S.A. Sveshnikova et al. (2022) analyzes "the development of engineering students' motivation and independent learning skills", Y. Murzo et al. (2019, p. 143) analyze "the experience of text content development for an online course created for oil and gas professionals".

Nevertheless, the issue of using such platforms as "VAcademia", YouTube and "Vkontakte" platforms for the development of lexical skills at the technical university has not yet received serious consideration. Taking into account the extensive list of possibilities offered by the Internet, we would like to analyze and identify the advantages or disadvantages of using these online platforms in teaching foreign language professionally oriented vocabulary.

In addition to the ability "to share information anywhere and at any time, social media platforms are also a great source for networking opportunities" to start social activities and perhaps find new jobs (Zhiltsov, Maev, 2020).

2. Methodology

Research Design

The following methods were used in the research process: 1. Analysis of existing online learning platforms 2. Direct observations 3. Descriptive approach (observations, comparisons, classifications, generalizations, and interpretations) 4. Modeling 5. Statistical analysis and graphical representation. These methods were implemented using computer software, including SPSS 17.0 by IBM and Microsoft Office Excel 2017.

The Student's paired T-test was used to compare related samples, and the equality of variances was assessed using Fischer's F-test.

In our experiment, we conducted a study with second-year students in the architecture program at Saint Petersburg Mining University. We used the opportunities of online platforms mentioned above: videos from the YouTube channel "How to Architect?"; special communities, devoted to English teaching of the social network "Vkontakte" (during the experiment we also created our own community on this social network); and wide range of tools of the online platform "VAcademia".

Improving the professional knowledge, skills and abilities of architecture students can be done only with the help of specially selected audio, video and text materials, including professionally oriented vocabulary. The search, selection and use of these materials at the process of teaching professional vocabulary in English are the most important tasks to be solved during the educational process.

The content of these materials on architecture topics is a necessary condition for the formation of the students' interest in expanding their professional knowledge with the help of professionally-oriented vocabulary.

The videos from the YouTube channel "How to Architect?" were used by teachers of the Department of Foreign Languages of the Mining University to teach professionally oriented vocabulary to architecture students within the framework of the conducted experiment. This channel has been run by a professional architect Doug Patt since 2008. Today you can find hundreds of videos all about architecture there. There is an extensive play-list with a series about why buildings look like they do, videos about making portfolio, videos featuring real architectural projects, a series how to design like an architect. Here there is much video information about laws of architecture and architectural styles.

Our task was to develop tutorials for the 12 lectures on architecture included in the playlist "Understanding Architecture".

Teaching assignments included topical vocabulary, pre-watching assignments, a block of viewing assignments, and after-watching assignments.

The tasks developed were divided into thematic blocks, each devoted to one aspect related to architecture: Understanding Architecture; Architecture: form or function; Function follows form; Symmetry; Asymmetry; Proportion; Scale; Architecture and Skin; Beauty; Modern architects (Moshe Safdie and Zaha Hadid) and Building materials.

Each block of tasks consisted of the following logical parts: 1) pre-viewing, which is aimed at familiarization with the topic of the video material and preliminary elimination of linguistic difficulties before viewing the video; 2) viewing – aimed at understanding the content of the video; 3) post-viewing – involving practice of oral and verbal communication of the students in professional situations.

The pre-view exercises were designed to prepare students for the viewing experience, to establish the main concepts, introduce major lexical and grammatical units, and facilitate the understanding of the video through discussions on various topics, etc. The exercises during watching provided an understanding of the film's content, while post-viewing exercises were aimed at controlling and correcting understanding of the video and also ensuring further use of the video in other forms of work on a given topic.

"Vkontakte" is a social network, which was also used during the experiment. Firstly, the authors analyzed educational communities from "Vkontakte" containing English-language material, such as "Begin English. English for All" (https://vk.com/beginenglish_ru), "English for Teaching & Learning" (https://vk.com/englang4u), "English Every Day | Endaily" (https://vk.com/endaily), "Business English Professional" (https://vk.com/business_english_prof), "IT News in English with ElcomSoft" (https://vk.com/elcomsoftitnews). These educational communities offer educational material, links to English-language textbooks and English-Russian dictionaries, latest foreign news, video clips with interactive exercises, vocabulary and grammar practice cards, and authentic fiction. With the proper integration of social networks into the learning process, both independent and collective work of students can be varied.

For example, the community "Begin English. English for All", which has 4.5 million subscribers, contains 540 discussions about grammar, textbooks, English slang, finding a tutor, books, word memorization methods, etc., 4000 English videos and 800 articles. That is a whole community of likeminded people with similar interests and motivation to learn a foreign language. "The educational

potential of social networks makes it possible to organize an informational and educational environment that stimulates cognitive interest of students in educational activities, provides them with opportunities for further self-education and self-development" (Goltsova et al., 2022).

Then taking into account the advantages and disadvantages of already functioning groups, a new community was created. It was used as an additional educational platform to teach extracurricular reading of authentic texts, watch professional video in English and listen to specific tracks according to the students 'future major.

One more online platform, which we used during our experiment, is Russian resource "VAcademia". It provided us a wide range of tools for teaching and collaborative learning activities: interactive whiteboards, pointers, drawing tools, PowerPoint presentations, remote desktop, 3D objects, voting system, etc.

So, it was decided to use the opportunities of the described online resources both at the English lessons at the University (the YouTube channel "How to Architect?"; the tools of "VAcademia") and in extracurricular activities (the social network "Vkontakte").

The authors have developed an additional distance learning support system for English lessons, which is based on a student-centered learning approach. That is, we attempted to tailor tasks to individual needs and diversify types of independent study. For the second-year students in our experimental group, we created a community that was joined by those in the subgroup and the instructor.

In the created community, the teacher posted methodological material, for instance, examples of the texts for home reading, vocabulary, recommended video and audio files, etc.; the subgroup leader posted homework for the group; and students were able to submit their homework, listen to attached audio recordings, watch video files, ask questions. Particular emphasis was placed on developing the students' skills for independent work with the assigned material, contributing to the individual organization of work time and space.

Participants

The study was conducted at the Saint Petersburg Mining University from September 2022 to December 2022 using convenience sampling. Second-year architecture students were randomly assigned to either an experimental or control group, with each group consisting of 30 individuals.

In the experimental group, regularly used during the teaching of professionally-oriented English vocabulary were YouTube videos and other open online platforms. This included a set of tasks that were developed based on these platforms. Practically at every lesson of English they watched at least one video of the playlist "Understanding Architecture" and did pre-watching exercises, a block of viewing assignments, and after-watching tasks.

As all the classrooms of Saint Petersburg Mining University are equipped with necessary facilities, it was possible to use such instruments of "VAcademia" as pointers, drawing tools, PowerPoint presentations, remote desktop, 3D objects and voting system at the lessons.

Besides, the selected materials of already existing communities and the information from the newly organized community of the social network "Vkontakte" were used as an additional educational platform for specific vocabulary training.

In the control group, vocabulary training was carried out primarily using traditional methods, based on reading specialized texts and completing pre- and post-text tasks.

Here you can see the description of the groups.

Group "A" consisted of 30 students, aged 17 to 22, with A2-B1 language proficiency level. These students studied English as a foreign language using online learning systems.

Group "B" was expressed by 30 people, aged 17 to 22 years with the same language proficiency level. They were studying according to the traditional teaching techniques including reading and translating specific texts and doing vocabulary and grammar exercises.

3. Results and discussion

Ascertaining stage

The ascertaining stage involved a survey to identify patterns in the use of web platforms for the development of students' lexical skills during foreign language classes. The questionnaire included four sets of questions, which allowed us to determine the level of knowledge of professional vocabulary, students' motivation to use web platforms during language lessons, their frequency of using these platforms during language instruction, and their ability to produce professionally relevant oral foreign language texts. A quantitative and qualitative analysis of the

survey data revealed that 66 % of the respondents had a limited vocabulary in relation to their field of specialization, and 52 % have considerable difficulties in composing an oral text on topics related to their future profession, while all of them recognized the necessity of such texts for future professional activity. 94 % noted insufficient use of web platforms in foreign language classes, 92 % of the respondents indicated that the use of online platforms would increase their motivation for learning a foreign language. The results of this survey phase were taken into account when creating the learning materials for the next phase of the project.

Forming stage

During the second phase of the study and the formative experiment, we evaluated the initial level of students' lexical knowledge. To do so, we administered a diagnostic test to the students, which included an interview on one of the topics related to their future profession, such as: "Ten essential skills needed to be an architect", "What does architecture mean in life?", "What does architecture mean to you?", "What are the demands of being an architect?", etc.

When evaluating the oral response, we relied on a qualitative method observational method using Kim's scoring rubric (Kim, 2010): 1) professional vocabulary skills, 2) students' speaking performance, 3) grammatical competence, 4) meaningfulness.

For each criterion, students were awarded a score on a 0-5 scale, with 0 indicating the absence of a developed skill and 5 signifying excellent mastery of that skill.

Students' grades are presented in Figure 1.
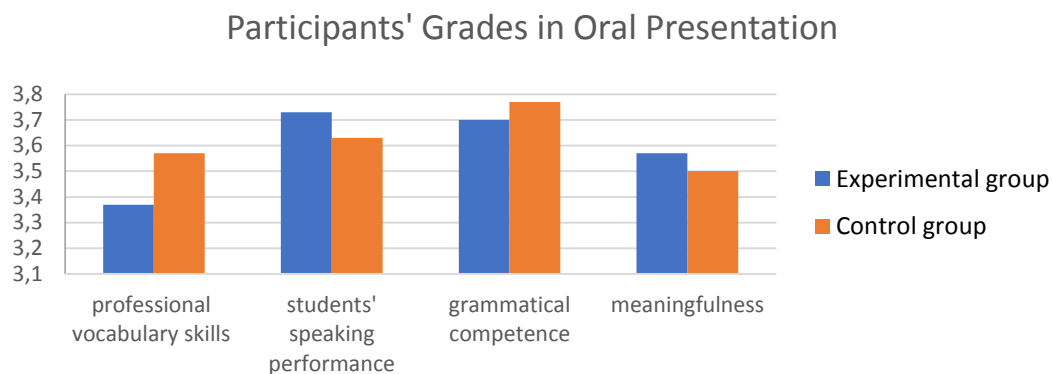
Fig. 1. Results of diagnostic test

Thus, students received lowest marks in two criteria: professional vocabulary skills (control group – $\overline{X}$ = 3,57, experimental group – $\overline{X}$ = 3,37) and meaningfulness (control group – $\overline{X}$ = 3,5, experimental group - $\overline{X}$ = 3,57).

This fact was caused by a number of This fact was caused by a number of errors in the presented monologues, including: a limited or extremely narrow range of syntactic constructions and lexical units on the topic, weak or insufficient disclosure of the topic, lack of clarity of the message, lack of detail in its key points, illogical or fuzzy organization of sentences within the monologue, weak connection between them, disordered and incoherent presentation, limited use, lack or simplicity of means of communication used.

Control stage

During the control stage the effectiveness of web platforms' usage for the development of students' lexical skills was verified. Students passed an oral interview related to professional activities at the end of term. Figure 2 illustrates students' grades.

Participants' Grades in Oral Presentation
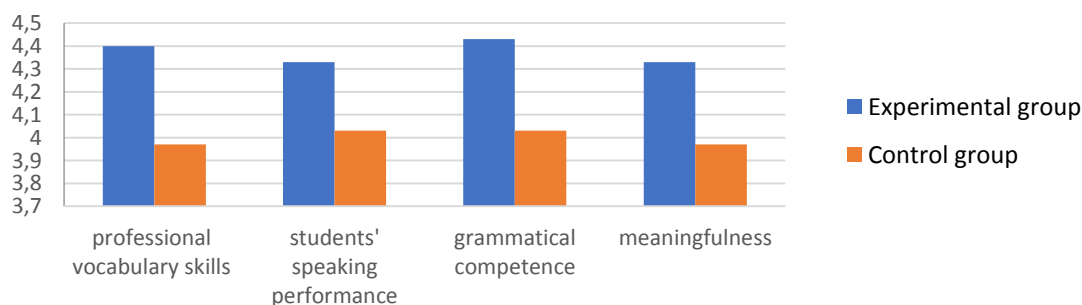
Fig. 2. Results of repeated testing

The findings revealed that students in the experimental group performed significantly better in terms of professional vocabulary skills, speaking performance, and grammatical accuracy, compared to the control group.

Computer programs SPSS 17.0 (IBM) and Microsoft Office Excel 2017 were employed for data processing and graphing.

Indicators of asymmetry and kurtosis, which characterize the shape of a distribution's curve, were utilized to determine the type of feature distribution.

The values are presented as M±SD, where M represents the sample mean, and SD represents the sample standard deviation.

A Student's T-test was conducted to compare the averages, as the distribution of the features conforms to the normal distribution, and the sample variances are equivalent.

The differences between the groups were considered statistically significant with a p-value less than 0.05. In each case, two-sided versions of the statistical tests were used.

Table 1. Statistical data based on the results of diagnostic and repeated testing

Statistical characteristics	Professional vocabulary skills			Student' speaking performance			Grammatical competence			Meaningfulness		
	Diagnostic testing	Repeated testing	Mean difference	Diagnostic testing	Repeated testing	Mean difference	Diagnostic testing	Repeated testing	Mean difference	Diagnostic testing	Repeated testing	Mean difference
Control group (n = 30)												
M	3,57	3,97	11 %	3,63	4,03	11 %	3,77	4,03	7 %	3,50	3,97	13 %
SD	0,63	0,67	7 %	0,61	0,67	9 %	0,63	0,61	-2 %	0,51	0,61	21 %
Tpk	**2,38**			**2,42**			**2,30**			**3,24**		
P1-2	**<0,001**			**0,001**			**0,009**			**<0,001**		
F	**1,13**			**1,21**			**1,07**			**1,43**		
Pf1-2	0,725			0,655			0,924			0,312		
Experimental group (n=30)												
M	3,37	4,40	31 %	3,73	4,33	16 %	3,70	4,43	20 %	3,57	4,33	21 %

SD	0,61	0,62	1 %	0,78	0,71	-9 %	0,60	0,68	14 %	0,57	0,66	16 %
Tpk	6,49			3,12			4,41			4,77		
P1-2	**<0,001**			**<0,001**			**<0,001**			**<0,001**		
F	**1,03**			**1,21**			**1,28**			**1,34**		
Pf1-2	0,955			0,599			0,487			0,421		
Tpk	1,25	2,58	-	0,55	1,68	-	0,44	2,40	-	0,50	2,19	-
Pc-e	0,217	**0,012**	-	0,585	0,098	-	0,674	**0,020**	-	0,634	**0,030**	-

Note: P1-2 – statistical significance of the difference between the averages of the indicators prior to and after training; Pf1-2 – statistical significance of the variance difference i between indicators prior to and after training, as per the Fisher's criterion; Pc-e – statistical significance of the difference in averages between the control and experimental groups.

Statistical analysis of the data indicates that, prior to the training session, the average scores of the control group and the experimental group did not significantly differ in any of the following four aspects: Pc-e > 0.05.

However, after retesting, there was a significant difference (P1-2 < 0.05) in the average values on all four scales, both for the control group and the experimental group.

During the repeated testing phase, the mean score for the "Professional Vocabulary Skills" test in the experimental group increased significantly (Pc-e = 0.012).This increase was approximately 1.11 times higher than in the control group.

The average value for "Student' speaking performance" showed a statistically significant improvement in the experimental group compared to the control group, with an increase of 1.07 (Pc-e = 0.098). Likewise, the average score for "Grammatical competence" in the experimental group showed a significant improvement (Pc-e = 0.020), with an increase of approximately 1.1 times compared to the control group.

Online platforms offer a number of advantages. Firstly, the Internet platform contains authentic video materials, which, not only significantly facilitates teacher's work (Wang, 2009; Jevsikova et al., 2021) but also increases students' independence (Lacka, Wong, 2021). Secondly, teaching foreign language professionally oriented vocabulary with the help of ICT helps searching for fresh and relevant resources (Mkrttchian et al., 2021; Davis, 2020). The findings of the survey align with those of the research conducted by J. Hsu. (2007), L. Lockyer and J. Patterson (2008).

Additionally, a significant role is played by the appropriate selection of internet resources, as the quality of a given resource, in turn, has one of the most significant impacts on the effectiveness of vocabulary instruction. If the resource is outdated or of poor quality, the motivation of the student disappears, and the effectiveness of training will deteriorate.

It should be noted that our research has some limitations. The experiment was conducted at Saint Petersburg Mining University and included 60 second-year architecture students. Convenience sampling was employed; students aged between 17 and 22 years with a level of language proficiency of A2 to B1 were divided into two groups: the experimental group and the control group. We didn't take into account the gender and the age of participants. In future scientific works the authors plan to examine more participants from different majors.

4. Conclusion
The study of using online platforms was performed at the Department of Foreign Languages of Saint Petersburg Mining University from September 2022 to December 2022. The results of the experiment conducted at the Mining University confirm the effectiveness of using web platforms for the development of architecture students' lexical skills, improving their professional knowledge and abilities. Passing an oral interview, the students of experimental group showed better results in such indicators as professional vocabulary skills, students' speaking performance, grammatical competence and meaningfulness. The average value for these indicators in the experimental group was statistically 1.10 times more than in the control group.

The results prove that the use of online platforms when teaching professionally oriented vocabulary has a positive impact on learning in general and helps solve a number of problems that

arise when teaching such vocabulary to students of non-linguistic specialties. Online platforms provide all possible ways of transcoding vocabulary, regular repetition of lexical material, which can favorably affect the effectiveness of vocabulary learning.

Thus, online resources and web platforms are an excellent modern means for the development of communicative competence.

5. Author contributions

Conceptualization, A.Yu.M. and Yu.V.B.; Data curation, O.S.Zh., A.Yu.M. and Yu.V.B; Formal analysis, O.S.Zh.; Funding acquisition, A.Yu.M. and Yu.V.B.; Investigation, O.S.Zh., A.Yu.M. and Yu.V.B.; Methodology, Yu.V.B.; Project administration, A.Yu.M. and Yu.V.B.; Resources, A.Yu.M. and Yu.V.B.; Software, O.S.Zh.; Supervision, Yu.V.B. and A.Yu.M.; Validation, A.Yu.M. and Yu.V.B.; Visualization, O.S.Zh.; Writing—original draft, Yu.V.B. and A.Yu.M.; Writing—review and editing, O.S.Zh.A., A.Yu.M. and Yu.V.B. All authors have read and agreed to the published version of the manuscript.

6. Conflict of interest

We have no conflict of interest to disclose.

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Adaptation of Psychological Performance Inventory for Sport Schools' Students

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Abstract

Recently, there has been an increasing need to develop mental toughness of students who participate in sport, in order to improve their adaptation not only during sporting activities but also in other contexts. Developing mental toughness skills among sport school students is one of the main ways to ensure their psychological well-being, and therefore research in this area is of great importance. However, there is currently a lack of adapted validity measures that consider socio-cultural factors to assess their psychological skills, namely mental toughness. For this purpose, it is necessary to adapt and validate a modern, useful measure of psychological resilience skills. Therefore, the aim of this paper is to conduct an adaptation of the Psychological Performance Inventory-Alternative (PPI-A) for sport school students. The participants of the study were 378 basketball sport school students aged 15-18 years from different Lithuanian basketball sport schools. Confirmatory factor analysis (CFA) was conducted using Jamovi software. Pearson correlation coefficients and average variance extracted were calculated using Jamovi software and Excel program. These indicators were used to check the convergent and discriminant validity of the questionnaire. Reliability of the questionnaire was checked using Cronbach's alpha and McDonald's omega. Structural equation modelling showed an acceptable fit of the four-factor PPI-A model. Validity and reliability analyses revealed a good level of internal consistency between the factors. Given the appropriate psychometric properties, the Lithuanian version of the Psychological Performance Inventory-Alternative (PPI-A) can be used in studies aimed at better understanding of mental toughness among sport school students. Further research on the structure of the instrument is also warranted in order to validate the questionnaire for other samples.

Keywords: mental toughness, psychological performance, validation, adaptation, sport schools, students.

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1. Introduction

Researchers have long discussed the issues of examining the education of sport school students in sport activities (Jankauskas, 2016; Opstoel et al., 2020). A systematic review of the literature (Opstoel et al., 2020) revealed that in the last 10 years, only 26 studies have focused on the personal and social development of students through physical activity and sport. Hardman et al. (2014) encouraged researchers to keep in mind that personal and social development is one of the main and most frequently cited objectives of European education through sport. This undoubtedly demonstrates the relevance of research in this area and that there is scope for further development and expansion of the research related to the personal, social, and psychological education of students in sport schools. According to the results of the systematic review of the literature (Opstoel et al., 2020), personal, social, and psychological education (the development of personal, social, and psychological skills) was the most frequently studied phenomenon. Through sport, pupils learn to behave correctly, to show empathy and respect, to resolve conflicts, and to cooperate with team members (Warburton et al., 2020).

One of the more important psychological skills is mental toughness (the personal ability to consistently achieve high levels of personal goals or top performance despite daily challenges, stressors, and the ability to ignore overwhelming odds) (Gucciardi et al., 2015). In the sports community, there is a widespread belief that an athlete possessing mental toughness is more inclined to attain success in their sporting endeavors (Crust, Clough, 2011). The importance of mental toughness has increased even more in the Covid pandemic and post-pandemic period (Shepherd et al., 2021). In addition, mental toughness has been most often studied in the context of sport, but the importance of mental toughness skills has recently been recognized in other domains (Liew et al., 2019). It has been suggested that mentally tough individuals are likely to be social and to be sociable, as they are able to remain calm and relaxed, and are competitive in many situations, but at the same time, in these situations, they have lower levels of anxiety than others (Guszkowska, Wójcik, 2021). Such individuals have high self-confidence and believe that they are in control of their own destiny as they are not affected by competitive environments (Guszkowska, Wójcik, 2021). Therefore, it is indisputable that mental toughness skills are important not only in the context of sport. Despite its growing popularity, it is important to acknowledge that mental toughness skills are a relatively new area of research for the scientific community (Brace et al., 2020).

There are various research tools, which could be used to measure mental toughness. Typically, these instruments are designed with a specific number of items to assess various aspects of mental toughness. For instance, Psychological Performance Inventory – PPI (Loehr, 1986) contains 42 items constituting seven scales: self-confidence, negative thoughts control, positive thoughts control, attention, control, visualization, performance imagery control, attitude. Psychological Performance Inventory-Alternative – PPI-A (Golby et al., 2007)) is an inventory containing four scales: determination, self-belief, visualization, positive cognition. It contains 14 statements. The MeBTough (Mental, Emotional, and Bodily Toughness Inventory), developed by Mack and Ragan in 2008, is a scale designed to diagnose the psychological, physical, and emotional components of mental toughness. It is composed of 43 statements. Mental Toughness Questionnaire – MTQ48 (Clough et al., 2002) is made up of four main scales and two subscales: commitment, challenge, confidence: belief in one's own skills, self-confidence in interpersonal contacts, emotional control, life control. It contains 48 items. Psychological Performance Inventory-Alternative – PPI-A was chosen for adaptation, as the students who participate in sports do not tend to get used to long questionnaires (with more than forty items) and want to answer the questions as quickly as possible.

For school sports students, mental toughness skills can help them cope with unexpected physical and emotional stresses, such as high levels of fatigue, pain, and intense experiences, during physical activity or sports training (Bird et al., 2021). Performance sport requires exceptional skill and effort, and the high demands placed on young athletes and the challenges of the competitive environment require athletes to have perseverance, self-belief, and positive cognition. Although the actions of sport school students during sporting activities are motivated, they sometimes lack the mental toughness to complete their actions and achieve their goals. Therefore, researchers stress the importance of developing mental toughness and responsibility when facing the challenges of competitive activities (Malinauskas, Juodsnukis, 2017).

The adaptation of the Psychological Performance Inventory-Alternative (PPI-A) for sport school students is essential as it can significantly increase the effectiveness and relevance of psychological assessment in the context of sporting activity. Sport school students have unique psychological needs

and challenges compared to the general student population (Romanová, 2021). A tailored psychological inventory can be adapted to address specific psychological factors that are critical for success in sport, such as the mental toughness, competitive mindset and goal setting of competitive sport students.

To be able to have an instrument to determine how a student would react to different external (e.g. competition) and internal (e.g. fatigue, stress) factors, it is necessary to carry out an adaptation and validation of the inventory. As young athletes are often faced with stressors specific to their sporting environment, including performance pressure, competition anxiety and injury concerns, the statements in the adapted inventory are important in assessing how well the students are coping with these sport-specific stressors, thus providing valuable insights for both the students and their coaches (Wu et al., 2021). The aim of sports schools is to develop not only academic but also sporting excellence (Romanová, 2021). A specialised adapted psychological performance inventory can help to identify athletes' and sport schools' students' psychological skills that need to be improved. The development of an adapted and validated instrument can lead to targeted interventions to improve students' athletic performance and enhance their psychological strength (mental toughness).

Adaptation and validation of this research instrument is needed as the Psychological Performance Inventory-Alternative (PPI-A) for Sport Schools is in line with the principles of evidence-based practice. This ensures that the assessment tools used are valid and reliable in the specific context, which increases the accuracy of the results and the usefulness of the information gathered for decision-making (Behnke et al., 2019).

Study hypothesis – we hypothesize that Lithuanian version of the Psychological Performance Inventory (PPI-A; Golby et al., 2007) has good psychometric properties. Our hypotheses are based on a previous study (Pocius, Malinauskas, 2023), where a mathematical model of instrument's exploratory factor analysis was used to find that the instrument is suitable for factor analysis, furthermore, four factors explaining 67.03 % of the total number of factors in the factor analysis were identified. The extracted factors and their constituent items were in perfect agreement with the items extracted by the authors (Golby et al., 2007), and the internal consistency of all subscales was considered good.

However, there is currently a lack of adapted validity measures that consider socio-cultural factors to assess psychological skills among sport schools' students, namely mental toughness. For this reason, it is necessary to adapt and validate a contemporary useful instrument for mental toughness skills. Therefore, the aim of this paper is to conduct an adaptation of the Psychological Performance Inventory (PPI-A) for sport school students and describe its psychometric properties.

2. Methods

The participants of the study were 378 basketball sport schools' students aged 15-18 years from different Lithuanian basketball sport schools. The selection of basketball sport schools was conducted by randomization software. Then students were randomly selected from roosters of chosen basketball sport schools.

The sport school students completed the Psychological Performance Inventory-Alternative (PPI-A) questionnaire (Golby et al., 2007). Each questionnaire item is scored on a 5-point Likert scale. The questionnaire consists of 4 subscales: determination, visualisation, positive cognition, self-belief. We decided to analyse data with subscales not only by summing the item scores of each subscale but also by averaging the summed scores.

The Psychological Performance Inventory-Alternative (PPI-A, Appendix 1) was forward-translated into the Lithuanian language and back-translated into English following the methodological considerations for double translation and reconciliation. During the translation and adaptation processes linguistic and psychological differences in the Lithuanian population and peculiarities in sport practices were considered through the choice of experts with relevant expertise, e.g., knowledge of sport, knowledge of sport psychology, and proficiency in Lithuanian language. The confidentiality and anonymity of the data was ensured during the study.

A pilot study involving 203 sport schools' students was previous undertaken, during which participants were asked to provide feedback on the clarity of individual items and the rating system (Pocius, Malinauskas, 2023). A mathematical model of exploratory factor analysis of PPI-A was performed to extract the factors and to assess whether they correspond to those extracted by the authors (Golby et al., 2007) of the instruments (Pocius, Malinauskas, 2023). Principal component analysis and orthogonal Varimax rotation were applied in the pilot study, uncovering four factors that accounted for 67.03 % of the total variance. The factors and the items associated with them, as identified in the pilot study, were found to align completely with those identified by the creators of

the instrument (Pocius, Malinauskas, 2023). Therefore, the present study only conducts a confirmatory factor analysis with another sample of participants (378 sport school students), as is required by the methodological standards for instrument validation.

Confirmatory factor analysis (CFA) was conducted using Jamovi software (The jamovi project, 2022). To evaluate model fit, χ^2 statistics, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), standardized root mean square residual (SRMR), Akaike information criterion (AIC), Bayesian information criterion (BIC) were calculated. Pearson correlation coefficients and average variance extracted (AVE) were calculated using Jamovi software and Excel program. These indicators were used to check the convergent and discriminant validity of the instrument.

Discriminant validity was assessed by examining the square root of the AVE. When this value of each measure variable is greater than the correlation coefficient between the variables, it indicates that discriminant validity is established (Hair et al., 2013).

The internal consistency of the questionnaire was assessed by Cronbach's alpha coefficients. Reliability of the instrument was checked using McDonald's omega coefficients. To confirm the normal distribution of the data, the normality of the data was assessed by asymmetry (skewness) coefficient and by measure of the tailedness of a distribution (kurtosis). Skewness and kurtosis coefficients were between +1 and -1, and is possible to conclude that the distribution of all variables does not significantly differ from the normal distribution. Statistical significance was set at $p < .05$ for all tests.

The study was approved by the Committee for Social Sciences Research Ethics of Lithuanian Sport University. The research was conducted in accordance with ethical guidelines and the legal code of the country in which the study was conducted. The researcher obtained approval from the coaches at sports schools to administer a face-to-face questionnaire to the students.

3. Results

Confirmatory Factor Analysis

Using confirmatory factor analysis (CFA), we wanted to see how well a pre-specified model, which was tested in a pilot study, is confirmed by the observed data from this study. The results obtained from the CFA, using the Psychological Performance Inventory (PPI-A) are summarised in Table 1. As illustrated in Table 1, all standardized estimate values are greater than 0.50 and statistically significant, what, according to Chin (1998), proves that all variables with loadings higher than 0.50 are acceptable for the predefined (four-factor PPI-A) model.

Table 1. Indicators of the confirmatory factor analysis (CFA)

Factor	Item	Estimate	SE	Lower	Upper	Z	p	Stand. Estimate
				95 % Confidence Interval				
Factor 1	P1	0.736	0.0394	0.659	0.814	18.69	< .001	0.820
	P2	0.678	0.0435	0.593	0.763	15.60	< .001	0.726
	P3	0.786	0.038	0.711	0.860	20.56	< .001	0.875
Factor 2	P4	0,654	0,064	0,528	0,780	10,15	< .001	0.537
	P5	0.558	0.040	0.480	0.637	13.96	< .001	0.682
	P6	0.772	0.0424	0.689	0.856	18.21	< .001	0.853
	P7	0.583	0,063	0,458	0,709	9,14	< .001	0.501
Factor 3	P8	0.453	0.0401	0.374	0.531	11.30	< .001	0.575
	P9	0.576	0.0396	0.498	0.653	14.56	< .001	0.702
	P10	0.648	0.0425	0.565	0.732	15.26	< .001	0.731
	P11	0.473	0.0379	0.399	0.547	12.50	< .001	0.618
Factor 4	P12	0.713	0.048	0.619	0.807	14.84	< .001	0.720
	P13	0.817	0.046	0.727	0.907	17.74	< .001	0.830

P14   0.762   0.045 0.673   0.851   16.76   < .001   0.792

Notes: Items (P1–P14) of Psychological Performance Inventory-Alternative (PPI-A) are described in Appendix 1. Factor 1 – Determination; Factor 2 – Visualization; Factor 3 – Positive Cognition; Factor 4 – Self-belief.

The results of the CFA showed that all indices (Chi-Square Fit Index [$\chi^2(70)$ = 203.0, p < 0.001]; CFI = 0.95; TLI = 0.93, SRMR = 0.047, RMSEA= 0.070 (RMSEA 90 % CI 0.06–0.08)) were adequate and suggested data fit to the 14-item instrument PPI-A structure (Table 2). There is no need to evaluate AIC and BIC as the pre-specified (four-factor PPI-A) model of instrument created by the authors Golby, Sheard and VanWersch (2007) is model fit and no modified models have been developed and analyzed.

Table 2. Model goodness of fit criteria of the confirmatory factor analysis for the Psychological Performance Inventory (PPI-A)

χ^2	df	p	CFI	TLI	SRMR	RMSEA	RMSEA 90 % CI		AIC	BIC
							Lower	Upper		
203	70	< .001	0.945	0.928	0.047	0.070	0.0598	0.0825	11976	12169

Notes: df – degree of freedom. CFI – Comparative Fit Index; TLI – Tucker Lewis index; SRMR – Standardized Root Mean Square Residual; RMSEA – Root Mean Square Error of Approximation; AIC – Akaike Information Criterion; BIC – Bayesian Information Criterion.

The estimated factorial loadings (standardized estimates) above the arrows are displayed in Figure 1. As already mentioned, all the items with factorial loadings higher than 0.50 are acceptable for the predefined model.
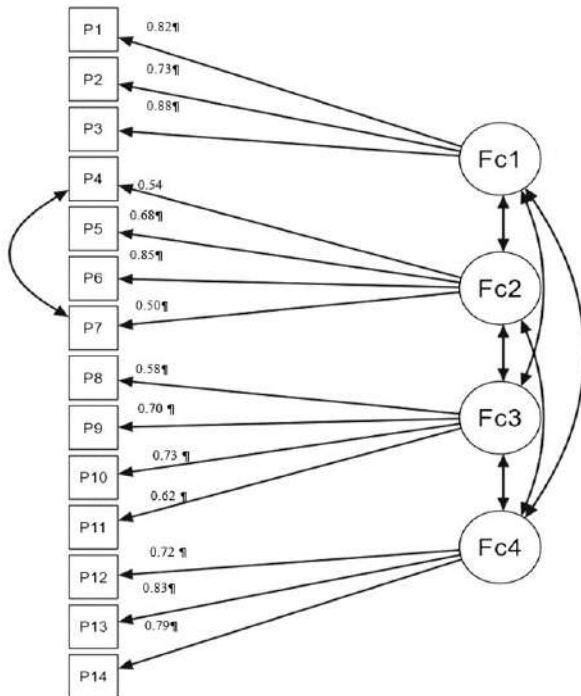

Fig. 1. Path Diagram
Notes: Items (P1–P14) of Psychological Performance Inventory-Alternative (PPI-A) are described in Appendix 1. Factors: Fc1 – Determination; Fc2 – Visualization; Fc3 – Positive Cognition; Fc4 – Self-belief. The factorial loading of P7 is 0.501.

Descriptive, Reliability and Validity Analysis

In order to elaborate on previous results of the present study, the reliability and validity of the model's indicators (factors) were assessed. Table 3 provides the descriptive statistics, the Cronbach's alpha, composite reliability (such as McDonald's ω), and AVE. The internal consistency of all factors was determined to be above 0.70, with values ranging from 0.75 to 0.84, indicating a high level of internal consistency for the measures. The composite reliability values were above 0.70 for all the factors. As the composite reliability of all constructs is well above the recommended level, the internal reliability of the measurement items is considered as good.

AVE was used as a measure to assess convergent validity. According to Psailla and Vagner (2007) AVE values above 0.40 indicate that the convergent validity of the instrument is acceptable. The AVE for all factors ranges from 0.43 to 0.66 (Table 3). This means that the convergent validity criterion is met.

Table 3. Descriptives, reliability and validity analysis indicators

Factors	Mean	SD	Cronbach's α	CR – McDonald's ω	AVE
Factor 1	4.09	0.795	0.844	0.850	0.655
Factor 2	3.68	0.788	0.746	0.745	0.433
Factor 3	3.80	0.618	0.750	0.753	0.435
Factor 4	3.44	0.842	0.822	0.825	0.611

Notes: AVE – Average Variance Extracted. CR – Composite Reliability. Factor 1 – Determination; Factor 2 – Visualization; Factor 3 – Positive Cognition; Factor 4 – Self-belief.

The Fronell-Larcker criterion (Fornell, Larcker, 1981) was used to check the discriminant validity of the model. According to this criterion, the square root of the average variance extracted by a construct must be greater than the correlation between the construct and any other construct. When this assumption is met, discriminant validity is established. The criterion for discriminant validity was satisfied, as the correlations between the PPI-A factors were found to be less than the respective square roots of the AVE values, which were not less than 0.658 (Table 4).

Table 4. Square root of the average variance extracted (AVE) and correlations matrix

Factors		1	2	3	4
1	Factor 1	(0.809)			
2	Factor 2	0.611	(0.658)		
3	Factor 3	0.656	0.552	(0.660)	
4	Factor 4	0.343	0.186	0.432	(0.782)

Notes: Values in parentheses represent the square root of the variance extracted (AVE). Factor 1 – Determination; Factor 2 – Visualization; Factor 3 – Positive Cognition; Factor 4 – Self-belief.

4. Discussion

The cultural context of sports schools in different countries can be unique. Using an instrument adapted and validated in a specific country could ensure that the assessment of psychological well-being is relevant to the experiences of students in sport schools and the learning and sporting environments in that country. That is why this study aimed to conduct an adaptation of the Psychological Performance Inventory-Alternative (PPI-A) for sport school students and describe its psychometric properties.

A review of the national scientific literature on mental toughness suggests that there is still no consensus on a specific single scale that can be used to measure the level of mental toughness of sport school students. Therefore, this study is important to fill this gap in the relevant literature. It can be assumed that this study has established a valid and reliable measure of mental toughness in sport school students. A CFA was carried out to assess whether the data confirmed the theoretically devised model. According to the fit indices obtained, it can be said that the construct validity of the Psychological Performance Inventory-Alternative (PPI-A) has been confirmed (Gucciardi, 2012; Gucciardi et al., 2021) because fit indices were of the four-factor structure were sufficient. The conceptual and psychometric analyses revealed the factors are essential to pre-

specified (four-factor PPI-A) model of instrument created by the authors Golby, Sheard and VanWersch (2007).

The reliability of the measurements obtained from PPI-A instrument was examined by Cronbach's alpha and McDonald's omega reliability methods. We found acceptable Cronbach's alpha coefficients for all four subscales of instrument (ranging from 0.75 to 0.84), which was in line with those seen in a similar study (Gucciardi, 2012). Measurements with a reliability coefficient of 0.70 and above are considered reliable (Sürücü, Maslakci, 2020). The findings suggested that the Lithuanian version exhibited a satisfactory to commendable degree of internal consistency.

The use of tools such as the PPI-A questionnaire, which provide comprehensive information while minimizing the load on students, is essential in the field of sport education science. This ensures that the assessment does not interfere with the training process. Based on our empirical findings, the adapted version of the PPI-A is an ideal choice for researchers and practitioners seeking to obtain concise data covering key aspects of mental toughness among sport school students (Guszkowska, Wójcik, 2021). There are currently no other instruments available in the country that appear to be a better choice for measuring specific aspects of mental toughness (Pocius, Malinauskas, 2023).

The hypothesis, that Lithuanian version of the Psychological Performance Inventory (PPI-A) has good psychometric properties, has been confirmed. As already mentioned, the results of present study confirmed a four-factor structure, which is consistent with the structure of the original inventory in English language. It should be noted that our data are very close to the original version's factorization rates (Golby et al., 2007; Gucciardi, 2012), whereas latent factors were stable and 'all indexes reaching levels of adequate fit: $\chi^2(70) = 160.14$, p < .001, CFI = .907, IFI = .909, SRMR = .060, RMSEA = .060, 90 % CI [.047, .073]' (Gucciardi, 2012: 399).

The significance of research. As the field of sport psychology develops, so the tool for assessing mental toughness among sport school students must also improve. The adaptation of the PPI-A inventory ensures that it is in line with the latest research and best practice, allowing for continuous improvement in the assessment and maintenance of the mental toughness like indicator of psychological well-being of sport school students.

Limitations and future prospects. Our results are limited to 15–18-year-old students from sports schools and the findings are based on cross-sectional and self-report data. This analysis did not cover students of other age, and as a result, the conclusions cover only peculiarities of this age of group students. It would be appropriate to conduct similar study by examining other age groups of students. Future research can also observe gender differences.

5. Conclusion
The Lithuanian version of the Psychological Performance Inventory Alternative (PPI-A) can be used in studies aiming to better understand the mental toughness of sport school students, as this study has shown adequate psychometric properties of this instrument. It must be concluded that it is important to consider research on mental toughness as an essential component of research on the sustainable development of sport school students. Coaches and sports organisations should take a holistic approach to the sustainable development of athletes by integrating the development of mental toughness skills alongside physical education and sport. This may include mental toughness training, such as visualisation exercises, mindfulness practices and techniques to help maintain attention and concentration. The use of a validated instrument (i.e., PPI-A) can help to assess the effectiveness of targeted interventions and the need for support for sport school students.

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Appendix 1

Items of the Psychological Performance Inventory-Alternative (PPI-A) Questionnaire (Golby, Sheard, VanWersch, 2007). (For clarity, items are presented in English)

Item labels	Items	Degree of agreement with the statement				
P1	The goals I've set for myself as a player keep me working hard.	1	2	3	4	5
P2	I don't have to be pushed to play or practise hard. I am my own best igniter.	1	2	3	4	5
P3	I'm willing to give whatever it takes to reach my full potential as a player.	1	2	3	4	5
P4	I lose my confidence very quickly.	1	2	3	4	5
P5	I can keep strong positive emotion flowing during competition.	1	2	3	4	5
P6	I am a positive thinker during competition.	1	2	3	4	5
P7	My self-talk during competition is negative.	1	2	3	4	5
P8	I can clear interfering emotion quickly and regain my focus.	1	2	3	4	5
P9	Playing this sport gives me a genuine sense of joy and fulfilment.	1	2	3	4	5
P10	I can change negative moods into positive ones by controlling my thinking.	1	2	3	4	5
P11	I can turn crisis into opportunity.	1	2	3	4	5
P12	I mentally practice my physical skills.	1	2	3	4	5
P13	Thinking in pictures about my sport comes easy for me.	1	2	3	4	5
P14	I visualize working through tough situations prior to competition.	1	2	3	4	5

Notes: 1 – Almost never ‖ 2 – Rarely ‖ 3 – Sometimes ‖ 4 – Often ‖ 5 – Almost always. Items 1–3 measure Determination; 4–7 measure Self-belief; 8–11 measure Positive Cognition; 12–14 measure Visualization.

Using 3D Modeling to Develop Schoolchildren's Research Skills in the Process of Studying Natural Science Disciplines

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Abstract

3D modeling and prototyping are important areas of digital education and have undoubted didactic potential for the development of engineering thinking, that is highly sought after in today's economy. The authors suggest using 3D modeling technology to develop the research skills of schoolchildren when studying natural sciences and implementing interdisciplinary projects aimed at forming the foundations of a holistic scientific picture of the world through understanding the relationship and interdependence of the natural sciences. The purpose of the study is to theoretically substantiate and develop approaches to the development of schoolchildren's research skills when studying natural science disciplines based on 3D modeling.

The work uses the following classification of research skills: operational, communication, organizational, and information. For them, the authors have identified the corresponding indicators: conducting observations and research during modeling; putting forward a hypothesis; planning research activities; and analysis of information sources. The curriculum and lesson planning for the "Technology" course are presented, which allows students to develop research skills during the implementation of applied educational tasks. A system of tasks and sample models has been developed to support all stages of students' research activities during the implementation of educational interdisciplinary projects following the proposed lesson planning of the module.

In conclusion, the didactic potential of computer 3D modeling and prototyping for the development of research skills of schoolchildren is formulated: putting forward a hypothesis of a

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natural science nature and testing it experimentally; mastering the methodology of independent planning and conducting an experiment in compliance with safety regulations, etc.

Keywords: Industry 4.0, additive technologies, research skills of schoolchildren, interdisciplinary project, didactic potential, prototyping, reference model.

1. Introduction

K. Schwab, founder and president of the World Economic Forum, noted in 2016 that the world is on the verge of the fourth industrial revolution. In his opinion, the new technologies of Industry 4.0 should allow us to combine the physical, information, and biological worlds in the near future (Schwab, 2016).

According to the conclusions of A.A. Krushanov, the main directions of Industry 4.0 are the following advanced technologies: the Internet of Things, Additive Manufacturing, Artificial Intelligence, etc. (Krushanov, 2022). The requirements for engineering professions related to industrial production are gradually changing, and the job functions of specialists who will work in "smart" factories or conduct scientific research are being rethought (Bauer et al., 2022).

E. Bidaibekov, V. Grinshkun note that a comprehensive assessment of the digital maturity of the education system and the search for optimal didactic strategies are necessary (Bidaibekov, Grinshkun, 2021). The formation of new skills is possible by revising the content of education. The authors believe it is possible to develop digital skills through specialized disciplines such as computer science and technology. Or include training in digital competencies in all disciplines of the educational program as an end-to-end content line. Changing principles and approaches to education leads to the inevitable search for new approaches and techniques for organizing the educational process.

An example of such innovations could be the introduction of additive technologies into the general education system. For example, in 2017, the UK announced its plans to become a global leader in the additive manufacturing sector by 2025. The UK National Additive Manufacturing Strategy 2018–2025 has been adopted (Additive Manufacturing..., 2018). The strategy describes the main activities aimed at achieving the goal. The UK is already one of the largest countries in Europe for additive manufacturing (after Germany). In particular, due to the fact that a significant number of 3D printer manufacturers are concentrated in Europe (such as Ultimaker and Admatec) and online services that provide remote 3D printing services are developed (for example, Shapeways).

Education officials in Singapore are so convinced of the potential of new digital technologies that they plan to introduce the use of a 3D printer into the educational process of every primary school in the country within the next 5 years.

In Russia, the "Strategy for the Development of the Information Society in the Russian Federation for 2017–2030" was adopted, aimed at creating an information space taking into account the needs of citizens and society (Ukaz Prezidenta..., 2017). Thus, many developed countries of the world have entered into competition for primacy in the field of dissemination of additive technologies in education. N.L. Karavaev, E.V. Soboleva substantiate that the education system faces a responsible task – to give future specialists of the digital economy (engineers, technologists, designers, planners, etc.) sufficiently deep fundamental knowledge, to form research skills and practical skills in the latest technologies (Soboleva, Karavaev, 2020). The solution to this problem cannot be achieved without the use of digital tools in the educational process as part of the modern information and educational environment.

International pedagogical research PISA for 15 years has shown that the level of science literacy among Russian schoolchildren is not high enough (PISA Model..., 2020). The formation of natural science literacy does not come down to the integration of subject knowledge, skills, and abilities in physics, chemistry, and biology. To solve this educational problem, it is necessary to use special technologies and tools that can develop in students a special attitude towards understanding meta-subject tasks and a fundamentally different approach to their implementation.

It should be noted that at present it is important to acquaint students with such information technology tools that will be in demand in their future life in the digital economy. Among such promising technologies are 3D modeling and prototyping, which are gradually penetrating various spheres of human activity: from engineering and architecture to medicine and design (Gordeev, Ananikov, 2020). To date, several Russian (Mudrakova, Latushkina, 2020) and foreign studies (Huang et al., 2019) have already been carried out aimed at developing methods of teaching 3D modeling.

In particular, methods for developing engineering competencies using 3D technologies are being tested (Isaev, Plotnikov, 2019). Particular studies on the use of 3D tools in biology, chemistry (Petrov, 2023), and the training of future teachers (Masharova et al., 2020) are presented.

However, within the Russian educational system, there is a lack of scientifically based methodological approaches for incorporating 3D modeling technology into the study of natural science disciplines. This hinders the development of research skills among schoolchildren. Mainly single studies are conducted to describe the stages of introducing 3D printing technology into the educational process (Faritov, 2019).

So, despite the obvious developmental potential of 3D modeling technology and the growth of its popularity abroad, it has still not taken its rightful place in domestic methodological systems for teaching school subjects.

The presented study will allow pedagogical science to justify at a theoretical level the need to develop approaches to the development of schoolchildren's research skills when studying natural sciences based on 3D modeling. At the practical level, the authors present an appropriate approach (description of the structure and content of the module, a system of tasks and sample models).

2. Relevance
2.1. Literature review
2.1. Analysis of Russian scientific and pedagogical literature

A. V. Leontovich identifies the following functions of students' research activities at different levels of education (Leontovich, 2018). For example, in a basic school, this is the development in students of the ability to independently set a goal and achieve it in educational activities in the course of applying elements of research activities within the framework of curriculum subjects; in high school – the development of research competence and pre-professional skills as the basis for general and additional education. The author poses the problem of the relationship between the educational and research activities of schoolchildren.

The most logical from the point of view of natural science disciplines is the classification of skills proposed by V.I. Andreev. The scientist identifies four groups of skills: operational, information, communication, and organizational (Andreev, 1983). This classification generally corresponds to the main functions of pedagogical activity and most fully defines the range of research skills.

Additive technologies, as defined by E.A. Mamaeva, and T.N. Suvorova, are of great importance for improving the quality of training, as they allow the interdisciplinary nature of modeling activities to be realized. The student not only receives ready-made theoretical knowledge, but also finds himself in the state of a "researcher." In this state, he comes as close as possible to the real process of cognition. At the same time, preparing a clear conceptual framework and terminology is extremely important in order to remain ourselves and develop (Mamaeva, Suvorova, 2020). There are several factors contributing to this issue, such as the absence of necessary laboratory equipment, potential risks associated with certain scientific experiments, and the high costs of materials required for laboratory research (Petuchova et al., 2021).

As noted by I.D. Stolbova, L.V. Kochurova, and K.G. Nosov, traditional 2D image systems (projection) have become secondary both in information content and in technological terms. The basic concept of graphic education should initially and entirely be based on a digital 3D (volumetric) model that combines information about the product at all stages of its life cycle (Stolbova i dr., 2020). Research conducted by M.D. Dammer et al demonstrated that curricula, programs, and textbooks in education exhibit significant deficiencies. Specifically, they highlighted a tendency to undervalue the critical role of incorporating interdisciplinary connections in the teaching of natural sciences to schoolchildren (Dammer et al., 2018).

Some modern concepts of natural science education propose starting education in primary school with an integrative course. The need for integration in teaching is emphasized by many didactic scientists. For example, M.M. Abdurazakov, O.Yu. Lyaginova, and O.N. Tsvetkova indicate that the existing potential of interscientific relations and interdisciplinary connections will help modern school disciplines overcome emerging difficulties and successfully develop in the new conditions of digitalization (Abdurazakov i dr., 2021). However, it is necessary to have an appropriate methodological justification, pedagogical research reflected in the methodology and content of subject teaching at the level of sample programs

There are numerous challenges present in science education within Russian schools. For instance, a study conducted by N.V. Kochergina and A.A. Mashinyan highlights that, among the subjects in the natural science curriculum, the experimental component of the certification process is currently only included in the State Examinations for Physics and Chemistry. This underscores the importance of incorporating practical, hands-on learning experiences in all areas of science education to ensure a comprehensive understanding and assessment of students' knowledge and skills (Kochergina, Mashinyan, 2019). During the final certification in 11th grade, it has been noted that the experimental component is lacking in all disciplines. However, there is a growing discussion within the pedagogical community regarding the implementation of practical components using real equipment during the Unified State Exam in chemistry, physics, and biology. Research conducted by FIPI is actively exploring this possibility. Overall, the findings from studies on the quality of science education in schools indicate that the current methods employed to enhance students' natural science literacy are not sufficiently effective. It is imperative that we continue to evaluate and improve upon these methods to ensure that students are adequately prepared for future academic and professional endeavors.

The use of digital technologies such as 3D printing to support education is not new. The fields of architecture and engineering were the first to use rapid prototyping technologies for educational purposes (Gordeev, Ananikov, 2020).

A.T. Faritov notes that projects using 3D prototyping should involve students developing their unique models that have certain practical or aesthetic benefits (Faritov, 2019). The article presents a generalization of the author's experience in introducing 3D printing into extracurricular activities in a gymnasium in the city of Ulyanovsk. Based on a generalization of experimental data, A.T. Faritov concludes that only with the right methodological approach can the introduction of 3D modeling into the scientific research activities of schoolchildren be beneficial. Proper planning of such activities according to the age of students can bring creativity to learning and prepare them for the challenges of the future industry. However, the author does not propose such an approach either in this or in subsequent works (Faritov, 2019).

A more meaningful, in terms of scientific validity, option for using 3D modeling tools for teaching schoolchildren is presented in the work of E.A. Mikhlyakova, and T.N. Suvorova (Suvorova, Mikhlyakova, 2020). The authors describe the directions of pedagogical support for the creative creative activity of students within the framework of a personalized learning model based on 3D technologies. However, the potential of advanced technologies for the formation of scientific research skills of schoolchildren is not indicated here.

E.E. Petrov presents the results of studying foreign experience in teaching biology based on 3D models (Petrov, 2023). The author analyzes specialized software products and tools that make it possible to implement the study of individual sections of biology using three-dimensional geometric modeling tools. According to his conclusions, 3D learning technology is one of the new educational technologies implemented using information and telecommunication technologies in the process of virtual information interaction between a student and an educational resource.

O.A. Mudrakova and S.A. Latushkina prove that working with three-dimensional modeling improves students' perception of the material (Mudrakova, Latushkina, 2020). This software is much more fun to work with than regular 2D graphics programs (for example, Paint). Having generalized the experience, the authors construct a methodology, and consequently, lessons that were taught in 9th grade computer science lessons.

O.N. Vasilyeva and N.V. Konovalova describe a more holistic methodological work in engineering classes. This approach is designed to benefit not only gifted students with exceptional academic performance, but also those who may not excel in traditional subjects. By implementing this holistic approach, educators can cater to a wider range of students and provide a more inclusive learning environment in engineering education (Vasilieva, Konovalova, 2018). The authors prove that such classes provide an opportunity to develop the abilities and skills of technical thinking in modern schoolchildren (Engineering classes as a tool for professional navigation). The difference between the projects is the involvement of technical students in the educational process as mentors when schoolchildren perform research and design work. However, neither the curriculum nor lesson planning is presented, allowing other teachers to develop students' research skills during the implementation of applied educational tasks.

T.V. Masharova et al. scientifically substantiate the need to improve the training model, taking into account the capabilities of 3D technologies as a response to the challenges of Industry

4.0, ensuring competitiveness, supporting professional self-realization of the student, and developing in-demand innovative thinking (Masharova et al., 2020). The authors present methodological and organizational support for all stages of innovative activity using 3D technologies: analysis of the target market and target consumer (consumer portrait model); performing an analysis of competitors/analogs on the market; justification of the value of the proposed technical solution for the consumer (clarification of the practical problems that the invention will solve); assessment of novelty and social significance. However, the presented research focuses on training university students. And it does not take into consideration the specifics of schooling.

So, in most modern works, the authors identify various advantages of integrating additive technologies in teaching under the challenges of Industry 4.0:

- how to facilitate learning, increase the involvement and motivation of students (Faritov, 2019);

- how to inspire schoolchildren to be creative and improve their attitude towards STEM subjects (Vasilieva, Konovalova, 2018);

- how to help young people in professional self-determination (Suvorova, Mikhlyakova, 2020);

- how to increase the interest and involvement of the mentors themselves (Petuchova et al., 2021).

Comprehensive research is being carried out to improve the training of engineering and teaching staff at leading Russian universities.

At the same time, the resources of the information and educational environment are not sufficiently covered in the scientific literature, and in practice, the resources of the information and educational environment are not used in the formation of research skills in schoolchildren. However, in our country, unfortunately, there are often cases when a school 3D printer is used as a "display sample", demonstrating the fact of the presence of such a progressive object in an educational organization without any use it.

At the same time, a teacher's design of the educational process in a digital environment requires new approaches not only to planning new educational results but also to the selection of educational content, methods, and forms of organizing the educational process based on advanced (additive) technologies.

This determines the need to develop an approach that provides an opportunity to improve the methodology for organizing the research activities of schoolchildren, thereby promoting the development of their research skills by including in the content components related to 3D computer modeling technology.

2.2. Analysis of foreign studies

J. Savolainen and M. Collan conclude that the development of advanced technologies of Industry 4.0 will largely influence the evolution of the structure of production and educational processes (Savolainen, Collan, 2020). In the course of digital transformation, there is a need for a systematic review of existing business models, changes to business processes, and a transition to a qualitatively new government policy, including educational policy. This will require further improvement of the means and methods of applying digital innovations in the training of highly qualified specialists.

I. Gibson et al. note that additive manufacturing provides digital flexibility and efficiency in production operations (Gibson et al., 2021). 3D printing goes beyond industrial prototyping and the manufacturing process. This technology has become more accessible to small companies and even individuals. J. Marić, M. Opazo-Basáez, B. Vlačić, M. Dabic suggest that 3D modeling technologies and related application tools are the basis for Industry 5.0 (Marić et al., 2023).

E. Bauer, N. Heitzmann, and F. Fischer present a summary of information on promising directions for the development of scientific research in the field of application of modeling for educational purposes, development, and upbringing (Bauer et al., 2022). The authors identify vectors for further development, for example, the use of simulation technologies, which involve the use of virtual simulators. Modeling as a research activity encourages students to be active, which increases the intensity of their thinking processes.

T.-Ch. Huang, M.-Y. Chen, Ch.-Y. Lin's experimental data show that the use of 3D (three-dimensional) models of real objects is an important means of transmitting information, which can significantly increase the effectiveness of learning (Huang et al., 2019). The authors note the universal nature of the modeling method for activating cognition in a three-dimensional graphics

environment. According to the authors' conclusions, manipulation with 3D models works best for the development of thought processes.

3D printing technologies can be used in a huge number of areas, and their potential is being developed by companies, enthusiasts, and educational institutions around the world. 3D printing has many benefits, and the technology allows inventors and developers to easily prototype objects that were previously only represented by 2D images and diagrams.

Ch.-Y. Huang and J. Wang describe an approach in which they propose to develop in children from elementary schools the concepts and skills associated with 3D design (modeling) and 3D printing from a practical point of view (Huang, Wang, 2022). As a result of their work on the concept of teaching 3D modeling, the most significant goals of this course in the training, education and development of schoolchildren were formulated:

1) development of spatial imagination and logical thinking;

2) development of creative activity and independence of schoolchildren when learning 3D modeling;

3) developing ideas about teamwork, methods of planning activities, and communication;

4) formation of ideas about working in the information environment;

5) formation and consolidation of initial knowledge and ideas about objects of the surrounding world, their structure, and purpose.

Cheng et al., conclude that the participation of schoolchildren in 3D modeling contributes to the activation of cognition, increased interest, and increased motivation (Cheng et al., 2020). Based on a review of a significant number of academic papers, the authors conclude that 3D printing technology has revolutionized the way STEM (science, technology, engineering, and mathematics) education and research is conducted. This revolutionary technology, they conclude, is project-based learning and free inventive creativity that promotes:

- development of mathematical thinking for two and three-dimensional dimensions when assembling from a flat form into a volume;

- design of functional objects and simple mechanisms in engineering creativity;

- realization of creative possibilities in color schemes;

- development of critical thinking, including solving real problems, and facilitating scientific learning.

The implementation of such educational practices presented by L. Cheng et al. (Cheng et al., 2020). The research is carried out at the expense of special funding (grant).

B. Anđić et al develop the ideas, noting that 3D modeling contributes to (Anđić et al., 2022):

- formation and development of students' creative and technical abilities;

- organizing the educational process based on sociocultural, spiritual, and moral values;

- creating and providing the necessary conditions for personal development, health promotion, professional self-determination, and creative development;

- formation of a common culture.

The peculiarity of their methodological approach is that B. Anđić et al. make the case for the importance of preparing teachers themselves to incorporate 3D into science teaching (Anđić et al., 2022). According to their conclusions, teachers of physics, biology, and chemistry need additional special technical training to fully realize the didactic potential of 3D. For example, how to connect and use 3D printers.

H. Pearson and A. Dube note that education based on 3D modeling teaches children more than theoretical knowledge in physics, biology, or mathematics (Pearson, Dube, 2022). An emphasis on hands-on learning with real-life applications, devices, and prototypes helps develop research skills (critical thinking, creativity, curiosity, decision making, leadership, entrepreneurship, accepting failure, and the like). Regardless of their future career, these skill sets go a long way in preparing kids to innovate.

And yet, despite the powerful didactic potential of 3D modeling for the development of scientific research skills of schoolchildren, as B. Anđić et al., few teachers are using this new environment and technology directly in the classroom. Hence, only a select few students benefit from modeling and prototyping (Anđić et al., 2022).

Educational 3D modeling is becoming widespread in the practice of thematic summer camps.

One example of such a camp is Try Engineering Summer Camp (USA). This is a two-week summer camp with joint education for children in grades VIII-XI. Camp changes take place at leading colleges and universities in the United States. During this shift, children study engineering

disciplines and learn about advanced technologies. It is at this camp that they learn about the four main fields of engineering: electrical, mechanical, civil, and aeronautical. Sometimes, the first project is a 3D printer, which needs to be designed and printed to be used in the creation of subsequent projects (IEEE TryEngineering..., 2023).

Despite the undoubted developmental potential of 3D technologies, we must note that not all schools in the world have received financial support and the opportunity to purchase new equipment for use in the educational process.

Thus, 3D technology is rapidly changing the field of education. An appropriate information and educational environment is proving to be a promising resource, especially for education in the fields of science, technology, engineering, arts, and mathematics. This is convincingly shown by the analysis of the literature.

So, although some countries around the world have already developed approaches to the implementation of 3D modeling and prototyping into the educational process as part of classroom and extracurricular activities, as well as in the field of additional education. This experience requires more detailed study, comprehension, and systematization in order to further adapt to the conditions of the Russian school and develop, on its basis, original proprietary methods that are most effective for developing students' digital competencies.

2.2. Goals and objectives of the study

The purpose of the study is to theoretically substantiate and develop approaches to the development of schoolchildren's research skills when studying natural science disciplines based on 3D modeling.

To achieve this goal, the following tasks were identified:

1) to specify the concept of research skills, to determine the features of their formation, and to identify the features of the study of natural science disciplines at the level of secondary general education;

2) determine the didactic potential of 3D modeling and prototyping technology for the development of schoolchildren's research skills;

3) develop a system of tasks and sample models to support all stages of students' research activities during the implementation of educational interdisciplinary projects;

4) experimentally test the effectiveness of developing students' research skills through the introduction of 3D modeling technology into the educational process for the study of natural science disciplines.

3. Materials and methods
3.1. Theoretical and empirical methods

To solve the problems, the following research methods were used:

Theoretical analysis and synthesis of the literature to clarify the essence of research activities, define the concept of "research skills" and indicators of their formation. The work uses the following classification of skills: operational, communication, organizational, and information. These skills, corresponding to V.I. Andreev's classification (Andreev, 1983), were selected from several others according to the following criteria: compliance with the direction of research activity; taking into account the age characteristics of schoolchildren. For example, no less worthy classifications proposed by A.V. Leontovich (Leontovich, 2018) and P.Yu. Romanov (Romanov, 2003) are aimed mainly at students.

Indicators of the development of schoolchildren's research skills: conducting observations and research during modeling; putting forward a hypothesis; planning research activities; and analysis of information sources.

Analysis of the didactic possibilities of using 3D modeling and prototyping to develop schoolchildren's research skills.

The experimental base for the study was the Vyatka Technical Lyceum. This is a third-level public educational institution in Kirov. Training is conducted according to programs for grades 10–11 with in-depth study of subjects in individual profiles.

Methods of empirical research: the study of innovative experience, observation, conversation, questioning, and pedagogical experiment with schoolchildren is used at the stage of introducing 3D modeling technology into the educational process in the study of natural science disciplines. To determine the level of development of research skills among schoolchildren, we used:

- pedagogical observations carried out in lessons;
- text questionnaires that allow identifying and assessing the level of development of students' research skills.

An experimental research project was conducted from October 2019 to March 2022 in the 10th grade "A" class at Vyatka Technical Lyceum in the city of Kirov.

A total of 104 students participated in the study: 54 schoolchildren of the 10th grade, and 50 schoolchildren of the specialized network class. Control and experimental groups were formed from them. Each has 52 people.

All 104 schoolchildren were divided into experimental and control groups as follows:

1. Participants were asked to complete a research project. Its principles and assessment criteria (diagnostic tasks for operational, organizational and practical skills) are described in detail in paragraph 4.3.1. 4 hours are allotted to complete the project (including time to explain the task).

2. The maximum a student could score was 34. Level "Beginner" (from 0 to 10 points), "Basic" (from 11 to 28 points), "High" (from 29 to 34 points).

3. The subjects are distributed into groups in such a way as to ensure that each group has the same average values for research skills and the same distribution of each characteristic.

The assessment was carried out 2 times: before the introduction of 3D modeling tools into the educational process in the Technology course module for studying natural science disciplines and after.

To fulfill the requirement of representativeness, the size of the population studied is equal to the number of all students in the 10th grade of the lyceum.

Based on the results of the evaluation of the 3D project, the level of the student's research skills was determined. The levels were determined as follows: initial (reproductive), basic (partially exploratory), high (research). Their interpretation and assessment procedure are presented in paragraph 4.3.1.

When compiling assignments and determining levels by the criteria for the development of schoolchildren's research skills, the principles of constructing assignments for the All-Russian Olympiads for schoolchildren in "Technology", Direction: "Engineering, technology, and technical creativity" were taken into account.

Statistical processing of the obtained experimental data was performed using Pearson's $\chi 2$ (chi-square) criterion.

3.2. The base of research

The main goal of the experiment was to test the effectiveness of developing students' research skills through the introduction of 3D modeling technology into the educational process for the study of natural science disciplines.

There are several external variables that may greatly influence the validity and reliability of the experiment. These include the material and technical resources available, the motivation and mood of the students, parental consent, the experience and qualifications of the teacher, as well as the duration and timing of the classes. It is important to consider these factors when designing and conducting experiments to ensure accurate and meaningful results.

To take into account the external variables of the lyceum during the experiment, the following measures were implemented to counteract their influence on the experiment:

- the consent from all schoolchildren, their parents, and legal representatives prior to participation. Let us note that all lyceum students are highly motivated to achieve success, both in their educational activities and in their future professions. As a result, they actively participated in the development of projects both in class and in preparation for olympiads, competitions, and festivals;
- lesson planning of the "Prototyping" module was completed. The duration of classes and scheduled times did not change;
- strict control of conditions and fixation was carried out for the entire 3D modeling process. For example, special recommendations were drawn up (presented in paragraph 4.3.1).

Modeling and prototyping classes were held according to the schedule – 2 lessons per week (40 minutes each).

- classes were held in the same lyceum classrooms. The modeling tools and evaluation criteria for interdisciplinary projects have not changed.

In modeling courses, students become familiar with the basics of 3D modeling, learn to work in 3D programs, create models, and print them on a 3D printer. These modern skills will be useful to them in the future when studying at technical universities, as well as when participating in various competitions, including professional skills competitions.

All equipped classrooms, a library, and a canteen are available for disabled children and children with disabilities. The lyceum has a medical office, and a relaxation and psychological relief room as part of the "Accessible Environment" project.

The study was conducted in three stages from 2014 to 2022.

The pedagogical experiment involved 54 10th grade lyceum students and 50 students from the network profile class "Vyatka Technical Lyceum" in the city of Kirov. The average age of students was 17 years. In the experimental group of 52 people: 52 % were young people, 48 % were girls. Due to the age of the subjects, special attention was paid to compliance with the ethical standards of the study.

The modeling and prototyping teacher informed both schoolchildren and their parents about the stages of work and possible competitions and festivals for participation. For example, he answered all questions that arose and solved organizational difficulties. All information security rules and sanitary and hygienic requirements were observed. For example, the sketch was made according to the standard of the Unified System of Design Documentation on a paper sheet.

3.3. Stages of research

In the first stage of the study (2014–2017), an analysis of scientific, pedagogical, and educational literature on the research topic was carried out. The methodological and theoretical foundations of the research are determined, and existing approaches to organizing interdisciplinary projects in educational institutions are studied.

The role and prospects for using 3D modeling for the development of research skills are identified, the relevance of the research is substantiated, and the goal and objectives are formulated. Separate components of the developed system of tasks have been introduced into the learning process.

The historical background for the development of the research approach to teaching, approaches to the concept and classification of research skills, and their role in the process of studying natural sciences were considered.

Based on the results of this work, the authors clarify that students' research skills should be understood as their ability to consciously perform mental and practical actions that correspond to the logic of scientific research.

Based on the analysis of approaches to the classification of research skills, an approach was chosen according to which research skills are divided into the following classes: operational, organizational, information, and communication.

The completed theoretical analysis of the literature allows us to objectively conclude that it is through research skills that thinking develops most effectively. These skills contribute to the formation of a student's independent personality, ready to generate new ideas, make unconventional decisions, and capable of not only mastering the experience of older generations but also enriching and developing it with their achievements.

In the second stage (2017–2020), a confirmatory experiment was conducted, which made it possible to identify the relevance of developing a model of approaches to the use of 3D modeling for the development of research skills. Systematization, selection, and configuration of software and hardware were carried out.

A review of options for using 3D modeling and prototyping for educational purposes was carried out.

The authors also developed a system of tasks and sample models for the implementation of interdisciplinary projects, compiled a set of materials, and developed recommendations for teachers of physics, chemistry, and biology on the implementation of joint activities based on additive technologies.

Next, an experimental study was carried out, including:

1) acquaintance of 10th grade students with 3D modeling technology as part of the study of the subject "Technology";

2) implementation of interdisciplinary projects to develop students' research skills.

In the third stage (2020–2022), the results of the experiment were analyzed, systematized, and processed, conclusions were formulated and clarified, and the materials of the presented research were compiled.

4. Results
4.1. Theoretical foundations of using 3D modeling to develop schoolchildren's research skills in the process of studying natural science disciplines

Digital educational technologies have an undoubted didactic potential for the development of research skills because they make it possible to transform traditional learning into research-based learning, which is based on the productive activity of the students themselves.

In addition, the relevance of their use increases in the absence of laboratory instruments, in cases of risks arising as a result of certain scientific experiments, and in conditions of high cost of materials required for laboratory research.

But, despite this, we can note that, unfortunately, the means of informatization of education are not sufficiently used to develop research skills, and the theoretical aspects of this process are also not sufficiently covered in scientific research.

So, the study of natural science disciplines contributes to the development of a fundamentally new worldview of schoolchildren. In the course of manipulating objects (real, informational), students learn to propose original ways to solve problems, direct creative forces to implement innovative proposals, to satisfy cognitive interests and needs.

An analysis of domestic and foreign research also shows that one of the most important educational results obtained by schoolchildren in the process of natural science education is natural science literacy. It is an integrative learning result aimed at restoring the natural integrity of the cognitive process based on the interaction of the academic subjects: chemistry, biology, and physics at the level of general problems and concepts, their systems as the basis of the scientific picture of nature.

The content of natural science disciplines provides a foundation for fostering skills in creative activities such as educational and design research. Through educational research, students can enhance their general knowledge and develop a comprehensive scientific worldview with a humanistic and environmental focus. Understanding the impact of natural sciences on various aspects of society, including the environment, economy, technology, and ethics, is crucial for students to integrate into modern society and contribute to solving scientific challenges. By applying their knowledge in both typical and unconventional situations, students can cultivate a motivation for continuous self-improvement and lifelong learning.

The very content of the subject area "Natural Sciences" provides ample opportunities and prospects for organizing educational and research activities for high school students in the field of natural sciences.

The concept of natural science literacy, as well as the task of developing this type of functional literacy, are consistent with the requirements for educational results defined in the current federal standard for basic general education.

The comparison shows that the competencies that make up science literacy and the requirements of the standard are quite consistent with each other. But the current standard often uses different terms to define the relevant skills. Most importantly, these skills are "scattered" across groups of meta-subject and subject results, without forming a single block in the standard that shows the general goals and planned results of studying all natural science subjects.

One of the significant components of science literacy is research skills. Research skills are formed in the process of studying natural science disciplines.

The main way to develop research skills in class activities is to use a problem-based approach to learning. The systematic creation of problem situations stimulates the cognitive search activity of students.

The result is the independent solution of non-standard problems, comparative analysis, and generalizing conclusions to which the student comes. At the same time, the prospect of solving a problem on their own inspires students, mobilizes their volitional efforts, and makes the cognitive process attractive and personally significant.

Non-standard research situations activate students' activities and form such creative personality qualities as independence, systematic thinking, independence of judgment, flexibility, and criticality. Involving students in research situations has the greatest effect in classes where

students with unstable attention and low interest in the subject predominate. Research activities bring variety to educational work, develop students' attention and thinking, and motivate them to provide mutual assistance; contribute to the development of students' ideological positions.

The formation and development of research skills can also occur in the process of students' project activities, since when carrying out projects it is necessary, one way or another, to use all types of research skills: operational, organizational, practical, and communicative.

One of the means of developing research skills can be the means of informatization of education, namely the use of the potential of 3D modeling and prototyping technology.

3D modeling is the process of creating a three-dimensional model of an object. The task of 3D modeling is to develop a visual three-dimensional image of the desired object. With the help of three-dimensional graphics, you can create an exact copy of a specific object and develop a new, previously non-existent object.

The process of creating a three-dimensional model includes the following stages: modeling, texturing, setting up lighting and observation points, and visualization (rendering).

The utilization of cutting-edge 3D modeling and prototyping technologies, along with the incorporation of modern materials in the production of equipment prototypes, has garnered significant attention in recent times. The interest in exploring these technologies and materials stems from the potential to generate 3D models using various graphic software programs, conduct thorough full-scale tests on them, and integrate them into educational settings.

By employing rapid prototyping technologies, intricate models can be created with ease, ensuring a safe manufacturing process. Parameters such as print quality, material composition, and surface finish are established when configuring tasks on advanced devices like 3D printers. The resulting prototype can then be scrutinized to assess its adherence to specified operational and technical requirements, as well as its structural integrity.

Thus, 3D modeling and prototyping is one of the important areas of digital education and has undoubted didactic potential in the development of engineering thinking, which is in demand in the modern economy.

Several countries around the world have already accumulated experience in introducing 3D modeling and prototyping into the educational process as part of class, extracurricular activities, and in the field of additional education.

The educational subject "Technology" is considered in the standard as motivating for the study of others and necessary for the formation of technological thinking. The content of basic general education in this subject includes previously unstudied areas, such as: agro- and biotechnologies: nanotechnologies; robotics and automatic control systems; technologies of electrical engineering, electronics and power engineering; construction; 3D modeling; and prototyping.

Consequently, the subject "Technology" ensures the use of a wide variety of interdisciplinary connections for their practical implementation into progressive ideas, products, and services that meet the needs of individuals, society and the state.

Analysis and generalization of this experience formed the basis for the development of a system of tasks and sample models for the use of 3D modeling and the development of research skills in the study of natural science disciplines.

4.2. A system of tasks and sample models for studying the "Prototyping" module of the "Technology" subject and implementing educational interdisciplinary projects

The subject "Technology" makes it possible to implement end-to-end lines in economic, environmental, legal, and entrepreneurial education, allows students to master the skills of converting materials, energy, and information, and ensures the success of professional socialization. As part of the Technology subject, students have the opportunity to design their product.

1. Taking into account the current situation with the lack of textbooks and teaching aids that include the study of modeling and prototyping at a level that allows schoolchildren to take part in competitions and olympiads, it seems appropriate to change the approach to introducing 3D modeling into the educational process. Possible thematic planning is presented in Table 1.

One of the means to improve the quality of science education is the use of interdisciplinary projects.

Such integrated learning promotes the development of a scientific style of thinking, makes it possible to widely use the natural science method of cognition, develops in students general

concepts of geography, biology, physics, mathematics, chemistry, natural science, supra-subject knowledge, abilities, and skills (or meta-subject, through the inevitable development in these lessons key educational competencies).

Table 1. Thematic planning of the "Technology" course module

Name of section and topic	Number of hours
1. Introduction to Modeling	
Software interface. Working with objects	2
Boolean operations	2
Arrays: one-dimensional and multidimensional	2
Basics of polygonal modeling	2
Modeling to exact dimensions	2
Splines	2
Extrusion modifier	2
Rotation modifier	2
Simple lofting	2
Composite lofting	2
Modeling a composite object	2
2. 3D printing	
Printing software	1
Post-processing	1
The history of additive technologies	2
FDM printing technology	2
3D printer device	2
Consumables	2
Preparing the model for printing	2

Schoolchildren master educational material by solving one or another problem or problem situation. Of great importance is the use of tasks that involve the study of one issue or knowledge of one object using two and/or more educational disciplines.

Developing a task system involves a series of stages that must be carefully considered in order to create an effective and engaging educational experience.

First and foremost, it is essential to define the goals and objectives of the system, taking into account both formal and substantive aspects. For the proposed system of assignments for grades 10-11, the primary goal is to enhance research skills among students.

Next, the selection of the foundations of integration and the system-forming core is crucial. It is recommended to base the system-forming core on the main structural elements of the scientific knowledge system, including facts, concepts, phenomena, properties, quantities, theories, and laws.

Creating a course structure that aligns with societal requirements, the Basic Plan, and the age and level of students is the next step. The integrative didactic model consists of interconnected blocks that shape the educational process, encompassing principles, methods, forms, means, content, control, types of control, form of control, and means of control.

The integrated educational model incorporates elements from various pedagogical technologies, such as game technology, project technology, and traditional teaching methods. This combination enriches the learning process, making it more comprehensive, engaging, and effective, while ensuring the coherence and continuity of educational content across subjects.

Assessing the degree of integration of the course content, including intra-subject, inter-subject, and extra-subject integration at varying levels, is essential. This assessment is conducted according to the analysis scheme of the integrated program.

Finally, organizing the learning process involves utilizing a range of complex and individualized forms of training. The procedural aspect of the integrated course is supported by a diverse array of integrated lessons, learning tasks, teaching methods, and assessment strategies to evaluate students' educational progress effectively. This technology uses independent, problem-based, practical, research, creative work, as well as lectures that summarize lessons.

Let us give examples of a system of assignments and interdisciplinary projects.

Task No. 1. Selection, assessment of the capabilities of a specific software product and available equipment to create a given object;

Task No. 2. Training a group of students in the basic techniques of 3D modeling in a selected software product in accordance with hygienic, design-ergonomic, technical and technological, didactic requirements, requirements for documentation, requirements of a system-activity approach in teaching the development and operation of the model and a description of the methodology for its application in the educational process;

Task No. 3. Create a sketch, a 3D model of a robot, and prepare the model for printing on a 3D printer or printing. Prepare for the presentation of the project by students.

All finished projects were sent in advance by e-mail for evaluation, and in the absence of equipment, the project was sent separately to the lyceum for printing the created product. For each project, the teacher prepared sample models in advance.

Example of interdisciplinary project 1 (to develop research skills using 3D printing). The task is to make a boat that should float and not sink.

Note that tasks formulated using the capabilities of 3D modeling and prototyping allow the formation of meta-subject skills. For example, in the above example of designing a model of a boat, you can start studying or repeating a topic from physics "Archimedes' Law". To complicate the task, you can add the ability to transport cargo of a certain weight.

This assignment demonstrates a problem-based approach to learning. As a result of the announcement of this assignment, students have several research questions that they will solve during the lesson. In the process of pair work, they will formulate problems and put forward hypotheses about what the boat should be like so that it does not sink. After creating a model of an object in a computer-aided design system and then printing it out, the next step is experimentation.

As a result of experiments on the resulting object, conclusions will be drawn about the correctness of the hypotheses and the possible elimination of the shortcomings of the model. Which will require students to critically think and form new hypotheses. Repeated experiments with an object created independently will lead not only to an understanding of engineering concepts but also to the formation of research skills.

Example of an interdisciplinary project 2: Creating a working whistle.

Skills: determine what simple forms need to be used to create a 3D model in the program; select the necessary shapes and create a 3D model; compare the created model with the sample; eliminate defects and make necessary corrections; add new parts to your 3D model; evaluate the result and your model.

Another example of an interdisciplinary project could be the task of creating a catapult. Unlike the previous exercise, when creating a catapult, the entire object can no longer be printed, and in addition to thinking through the shape of the object, students must also take into account how to attach separately printed parts.

We especially note that the object requires a detailed study of the dependence of the projectile's flight range on the structure of the catapult. Students in this task usually put forward hypotheses related to changes in the length of the lever, the angle of departure, the initial speed, body weight, or the methods of attaching the axle. After printing the catapults, it is advisable to hold competitions for flight range or the ability to remove an obstacle (destroying a wall). In the future, you can invite students to design some other throwing weapon. Examples of catapults created by students during testing of this technique are presented in Figure 1.

Fig. 1. Printed catapults

4.3. Experimental assessment
4.3.1. The ascertaining stage of the experiment

As noted above, the assessment of research skills included an assessment of the results of schoolchildren's research activities. Completed educational simulation projects.

All tasks and assessment criteria were developed by the authors based on examples of tasks from past All-Russian and international Olympiads directly related to technical 3D modeling and printing.

An example of a general task formulation: based on the proposed sample, develop a technical drawing of the product, create a model of the product, prepare a project for printing, and make drawings of the product.

For example, the product "Swing-balancer". Requirements for the overall dimensions of the product were determined. Other sizes and requirements:

- the swing model is functional (movable), and consists of at least 3 types of parts (base, beam, chairs – must be reflected on the sample model), other detailing is at the discretion of the student;

- the model is assembled from parts into a whole product using any connections designed by the student; the fastening of the chairs to the beam is strong (the chairs are separate parts, not a single unit with the beam); the connection between the beam and the base is movable;

- cross-sectional size of the beam;

- chairs must have free-form backs, the size of the back is not smaller than the seat;

- the base should be decorated on the sides with a simple decorative overlay (for example, as on the sample model);

- the design of the chairs and the design of the base should be developed independently, taking into account the requirements described above, not necessarily using tubes;

- when modeling, you should set the gaps between the parts for a free fit, taking into account the given dimensions.

Unspecified dimensions and design elements were performed at the student's discretion.

It was permissible to use structural elements that reduce the weight of the product while maintaining the basic shape and functionality.

Methodological recommendations for schoolchildren:

1. Printed models can be quite fragile, so for the product parts you should consider a shape that ensures sufficient structural strength;

2. When completing an assignment, you should be advised to constantly check the table of assessment criteria.

3. When developing a model, you should consider the printing error (when designing holes, grooves, and protrusions); you should not make the elements too small.

4. Send one part for printing while you work on the next one, save time.

5. Consider how to place the model in the slicer program, taking into account its shape and the loads on the resulting parts, as well as the effectiveness of supports and adhesion layers, so that the print is completed within the allotted time.

6. The optimal time for developing a model is half of the total time allotted for practice, do not forget about the final drawings of the product. Take your time, but remember that good timing is encouraged.

The evaluation criteria using the "Whistle" sample model as an example are presented in Table 2.

Table 2. Criteria, indicators and tasks for assessing the level of development of schoolchildren's research skills

Criterion	Indicator	Diagnostic tasks
Operational skills	Proposing a hypothesis	Read the text and answer the questions. There were 3 questions asked. For example, "What is the necessary component of a whistle?" The maximum possible number of points for completing a task at this stage is 3.
Organizational skills	Research planning	You need to make observations of the change in sound in different whistle designs. Present

Criterion	Indicator	Diagnostic tasks
		the result (in writing) in the form of a research plan. The maximum possible number of points for completing a task at this stage is 3.
Practical skills	Conducting observations and experimental studies	You have been assigned to make a whistle. Suggest a design. Do a sketch, describe the working principle and create the product. The maximum possible number of points for completing the task at this stage is 23. Detailed breakdown by points: Knowledge of the basic interface, work in a graphic editor and/or system (degree of independence in making a model) – 1 point. Accuracy of object modeling (compliance with the developed sketch) – 1 point. Complexity of implementation (configuration, technical solutions, number and complexity of tools used, presence of additional elements) – 15 points. Assessment of the quality of manufacturing of all parts – 6 points.
Information skills	Analysis of literary sources	Read the text and answer the questions. There were 5 questions offered. The maximum possible number of points for completing a task at this stage is 5.

The maximum a student could score was 34 points.

Thus, the level was diagnosed as "Initial" (from 0 to 10 points), "Basic" (from 11 to 28 points), "High" (from 29 to 34 points).

These research skills are universal, enabling schoolchildren to design their research activities in the context of the chosen problem. They are correlated with the stages of project activity. Next, the levels were determined directly. They are presented in Table 3.

Table 3. Levels of development of research skills of high school students

Required skills	Basic (reproductive)	Basic (partial search)	High (research)
Ability to define a goal, objectives, research problem	Able to set a goal, objectives, research problem under the guidance of a teacher	Able to partially independently set a goal, objectives, research problem	Able to independently formulate a goal, objectives, research problem
Ability to determine the structure of one's research (introduction, chapters, conclusion, appendix, list of sources and literature)	Able to determine the structure and draw up a simple plan of his research under the guidance of a teacher	Able to partially independently determine the structure and draw up a complex plan of his research	Able to independently determine the structure and complex plan of his research
Ability to select and present the necessary information following the structure of the study	Able to select and interpret the necessary information under the guidance of a teacher following the structure of the study	Able to partially independently select and present the necessary information following the structure of the study	Able to independently select and present the necessary information following the structure of the study
Ability to formulate research results, justify them and	Able to formulate research results, justify them and	Able to partially independently formulate research	Able to independently formulate research results, justify them

Required skills	Basic (reproductive)	Basic (partial search)	High (research)
present them	present them under the guidance of a teacher	results, justify them and present them	and present them

The results of the ascertaining stage of the study indicate that it is necessary to continue developing research skills in schoolchildren. This problem was solved at the formative stage of the study.

4.3.2. Forming stage of the experiment

In the experimental group, training was carried out using a system of tasks and sample models for the implementation of educational interdisciplinary projects. Students learned 3D modeling and prototyping through exercises with objects used in science disciplines.

The tasks included not only the reproduction of models but also conducting experiments and observations on them.

The training program corresponded to the lesson planning presented above.

When developing research skills, a certain set of conditions was created to help schoolchildren consciously engage in research activities. As part of the experimental search work, the following pedagogical conditions were created:

- conducting research lessons;

- the use of exercises and tasks of a research type (express research, conducting experiments, experiments with independently created models);

- involving schoolchildren in the implementation of research projects.

In the control group, students created 3D models while learning various modeling techniques.

While learning 3D modeling, students could take part in festivals and olympiads in the relevant field.

For example, the regional stages of the All-Russian Olympiad for schoolchildren in 3D technologies and the festival of scientific and technical creativity "3D-Chips" were held at the Children's Technology Park Quantorium in Kirov. The competition participants were 122 students in grades 1-11 from educational institutions in Kirov, Kirovo-Chepetsk, Omutninsk, Sovetsk, Belaya Kholunitsa, Lebyazhye and Murygino.

The Olympiad was held in interdisciplinary areas, using knowledge of 3D technologies: 3D drawing 3D-Art / 3D modeling and prototyping.

When completing the competition task, schoolchildren created and implemented their projects, showing imagination and engineering abilities, and presented their projects to the jury.

For example, schoolchildren from the experimental group created an arrow-shaped aircraft for animal space flights. It contained a building containing instruments, a laboratory, rest cabins, a control cabin, a capsule for spacewalks, and even a training area. On board the spaceship there were inhabitants - a cat and a turtle. To realize everything according to a creative idea, it is necessary to carefully and efficiently carry out all the elements and make connections.

As experts noted: the project is distinguished by a well-structured composition, a high level of sketches and drawings at the stage of developing the idea, and a high-quality connection of parts with each other.

4.3. 3. Control stage of the experiment

At the fixing stage of the experiment, the results of research activities – models for interdisciplinary projects – were also assessed. Let's formulate a hypothesis:

H0: the level of students' research skills through the introduction of 3D modeling technology into the educational process for studying natural science disciplines has remained unchanged.

H1: The level of research skills of schoolchildren has increased.

The assessment data before and after the experiment are presented in Table 4.

Table 4. Results of the development of schoolchildren's research skills

Level of formation	The number of tested (people)			
	Experimental group (52 pupils)		Control group (52 pupils)	
	Before	After	Before	After
Primary (reproductive)	26 (50.00 %)	18 (34.62 %)	26 (50.00 %)	22 (42.31 %)
Basic (partial search)	20 (38.46 %)	21 (40.38 %)	19 (36.54 %)	22 (42.31 %)
High (research)	6 (11.54 %)	13 (25.00 %)	7 (13.46 %)	8 (15.38 %)

We calculate the value of the criterion statistics before ($\chi 2obs.1$) and after ($\chi 2obs.2$) the experiment (significance level $\alpha = 0,05$. Comparing the empirical results and the table value ($\chi 2crit=5.99$), we obtain $\chi 2obs.1 < \chi 2crit$ (0.103 < 5.99), and $\chi 2obs. 2 > \chi 2crit$ (6.184 > 5.99). Therefore, H0 is rejected and hypothesis H1 is accepted. In other words, the effectiveness of developing students' research skills through the introduction of 3D modeling technology into the educational process for the study of natural science disciplines was experimentally tested.

Let us carry out a quantitative analysis of the experimental results. After the introduction of 3D modeling technology into the educational process for studying natural science disciplines, 25 % of students in the experimental group had a level of research skills defined as "High (research)" that turned out to be significant: (13 participants out of 52). While initially, this percentage was 11.54 % (6 students out of 52). The number of schoolchildren with the "Primary (reproductive)" level decreased from 50 % to 34.62 %.

The dynamics at the "Basic (partially search)" level is the least significant – 1.92%. This is due, in our opinion, to the fact that the majority (in percentage terms) of respondents moved to a high level.

In the control group, changes in the "High (research)" level are not so significant (from 13.46 % to 15.38 %).

After the completion of the experiment, 42.31% of schoolchildren in the control group had a "Basic" level of research skills (22 respondents out of 52). Initially, this percentage was 36.54 % (19 out of 52 respondents). The indicator for the level of formation "Primary" changed from 50 % to 42.31 %. So, the dynamics by levels in the control group are also present, but they are less significant.

5. Limitations
Let us now turn our focus to the potential limitations of the study:

The sample of students was not probabilistic, since the experimental and control groups were formed in such a way that the presence of the same research skills in each group was guaranteed. All participants are schoolchildren who have a high level of motivation to achieve success in educational and research activities.

When developing a system of tasks and sample models, many years of experience in 3D modeling and prototyping at the Vyatka Technical Lyceum were taken into account. It should be noted that the Vyatka Technical Lyceum has the material base, which was supplied within the framework of the national project "Education", and qualified teachers.

Work on the "Technology" course was carried out by the same teacher (E.A. Mamaeva) throughout the entire period of the study. Significantly better results in the experimental group are due to the potential of the developed lesson plan (system of tasks and sample models) aimed at developing the research skills of schoolchildren through the introduction of additive technologies into the educational process.

Participants in the experiment noted that the main difficulty when working with a 3D pen is creating a high-quality surface of products. It is especially difficult to obtain models that are hollow inside without the use of auxiliary elements. In addition, the works had to maintain a balance of composition, which also turned out to be a difficult task for the participants; some works were overloaded with elements.

Another point that received particular attention was the creation of moving elements. The students had to think very carefully about how to attach the parts.

While working on the project, schoolchildren not only acquired new skills but also learned to work harmoniously in a team.

Participants in the experiment noted the following possibilities for using 3D modeling in the educational process to prepare for life in the society of Industry 4.0:
– gaining experience in 3D modeling and printing;
– support for learning (interdisciplinary) under the challenges of the digital society and 21st century skills;
– creation of educational models that reflect real practical applied problems of an interdisciplinary nature;
– creation of assistive technologies (for teaching children with disabilities);
– support for information and educational activities in terms of preparation for in-demand professions in society.

6. Discussion

Significant positive changes in the level of development of research skills of students in the experimental group make it possible to recognize the hypothesis as confirmed and the research problems as solved.

This can be interpreted as the pedagogical effect of introducing a model of approaches to using 3D modeling to develop research skills in science learning.

The presented study refines the ideas of E. A. Mikhlyakova, and T. N. Suvorova regarding the implementation of 3D modeling for teaching schoolchildren (Suvorova, Mikhlyakova, 2020). In particular for:
– demonstration of a three-dimensional object;
– modeling an object based on a starting model specially prepared by the teacher,
– constructing a new object from an interactive collection of models;
– solving experimental problems using interacting objects;
– research into patterns during the influence of one object on another or the environment on an object;
– knowledge testing.

The findings are scientifically and methodologically complementary to the work of O.N. Vasilyeva, N.V. Konovalova (Vasilieva, Konovalova, 2018), and T.V. Masharova et al. since they rely on specific lesson planning and corresponding systems of assignments, and principles for constructing interdisciplinary projects (Masharova et al., 2020).

The authors tried to take into account and adapt the results of Ch.-Y. Huang, J. Wang about the experience of developing children's ideas and skills related to 3D design (modeling) and 3D printing (Huang, Wang, 2022).

When scientifically substantiating the didactic potential of 3D modeling to enhance cognition, increase interest and increase motivation, project-based learning, and free inventive creativity, the authors relied on the materials of L. Cheng et al. (Cheng et al., 2020).

Thus, the conclusions obtained during the discussion allow mentors to create additional conditions when preparing school graduates to achieve those global educational and scientific prospects that K. Schwab outlined in his description of the advanced technologies of Industry 4.0 (Schwab, 2016).

7. Conclusion

The presented study concretizes the concept of research skills by identifying its essence and content in the research of domestic scientists. It is noted that the factors for the development of research skills are the requirements of the current federal standard for the educational results of natural science disciplines (possession of the skills of conducting observations of individual objects, processes, and phenomena, their changes as a result of natural and anthropogenic influences, possession of the skills of analysis and interpretation of various information) and meta-subject results of mastering the main educational program (creation, application, and transformation of signs and symbols, models and diagrams for solving problems; definition of concepts, creation of generalizations, establishment of analogies, classification, establishment of cause-and-effect relationships, construction of logical reasoning, inferences and concluding).

The authors identified the didactic potential of computer 3D modeling and prototyping for the development of schoolchildren's research skills:
- putting forward a hypothesis of a natural scientific nature and testing it experimentally;

- mastering the methodology of independent planning and conducting an experiment in compliance with safety regulations;

- generalization of scientific information;

- assessment and analysis of the obtained modeling results during experimental work, checking them for reliability.

Despite the obvious developmental potential of 3D technologies, it should be noted some difficulties that arise when introducing 3D modeling into the educational process:

– not all schools in the world have financial support and the opportunity to purchase new equipment for use in the educational process;

– the problem of training teachers to use additive technology. In particular, to solve this problem, a series of trainings are being conducted on teaching teachers how to set up printers and use specialized software, as well as their methodological preparation for conducting classes using 3D modeling technologies;

– organizing access for participants in the didactic process to equipment for working with it.

The Technology course has been improved to teach schoolchildren how to create 3D models. The curriculum and lesson planning of the "Prototyping" module are presented, which allows students to develop research skills during the implementation of applied educational tasks.

Within the realm of 3D modeling, students will develop fundamental skills in creating 3D models, rapid prototyping of equipment and its components, and hands-on experience with cutting-edge technology. A comprehensive system of tasks and model examples has been established to guide students through all phases of their research endeavors as they engage in educational interdisciplinary projects aligned with the prescribed model. The application of individual tasks is illustrated with examples demonstrating the achievement of the benefits specified by the model. The effectiveness of developing students' research skills through the introduction of 3D modeling technology into the educational process for the study of natural science disciplines was experimentally tested.

Practical provisions can form the basis for the development of didactic teaching aids: collections of assignments, and methodological instructions.

Further research may be aimed at disseminating the proposed approaches to the development of students' research skills at other levels of education (primary school, higher education) and additional education (Quantoriums, Growth Points, technical creativity centers, etc.).

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Impact of Utilizing the Project Method in the School Educational Environment on the Development of Soft Skills in High School Students

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Abstract

The study aims to analyze the efficiency of developing soft skills with the use of project technologies. The relevance of the study owes to the need for developing soft skills in the younger generation. This need relates to the increased demand for communication and teamwork skills in specialists. The emphasis on these skills is especially topical in school education, where their development via project activities facilitates meaningful interpersonal interaction between project participants. The established goal is achieved in the study through a set of theoretical and empirical research methods, including the analysis of literature on soft skills development, including in the context of the school educational environment, and a pedagogical experiment to test the efficiency of project technologies in developing the soft skills of high school students. The obtained findings indicate a positive dynamic in the soft skills of high school students taught using project activities. For this reason, the study stresses the need to substitute the passive traditional pedagogics limited to the transmission of knowledge with active pedagogics.

Keywords: soft skills, high school students, project method, project activities, critical thinking, teamwork, communication skills.

1. Introduction

At the initiative of the World Health Organization (WHO) in the early 1990s, the concept of life/social skills entered into wide circulation (Gabidullina et al., 2020). The concept refers to a set of social skills necessary for interaction with other people, and the ability to cope with both ordinary tasks and complex situations (Dobriakova et al., 2018).

As society continues to evolve, the acquisition of life/social skills is becoming an important part of personal development. The ability to navigate the complexities of interpersonal

relationships, effectively manage emotions, and make informed decisions is evidence of individual adaptability and sustainable personal development (Sarin et al, 2024).

However, the concept of soft skills is different from life/social skills. Specifically, the former is the broader concept, with life/social skills being a part of soft skills (Canney, Byrne, 2006).

The concept of soft skills (Batsunov et al., 2018) is increasingly often covered in normative educational documents and scientific studies (Ybyraimzhanov et al., 2019a). Researchers understand soft skills as a set of non-specialized, supra-professional skills that ensure the person's successful participation in the work process, their high productivity (Golubeva et al. 2023; Ybyraimzhanov et al., 2019b). Unlike specialized skills, soft skills are comprehensive and do not relate to any particular subject area (Bishop, 2017). These skills encompass a combination of interpersonal and social skills, communication skills, and personality traits (honesty, efficient communication, politeness, responsibility, professionalism, flexibility), as well as the ability to teamwork, attitudes, career attributes, and emotional intelligence quotient (Robles, 2022; Ybyraimzhanov et al., 2022). The term "soft skills" is also contrasted with "hard skills", which are seen as more professional, technical, and specialized, in particular, as those related to the specific profession. Furthermore, hard skills are (usually) easier to master than soft skills (Sopa et al., 2020).

Soft skills are characterized by the person's readiness and ability to act in changing conditions relying on their experience and intuition, as well as the ability to change and transcend rigid functionality (Iorio, 2022; Amirbekova et al., 2023).

To the category of soft skills, researchers attribute educational, social, and personal skills, as well as the skills of information, media, and digital literacy (Hernandez Garcia de Velazco, 2022). The latter, according to the UNESCO strategy, cover the totality of knowledge, skills, and relationships necessary for life and work in using, creating, and transmitting information (Śkuśkovnika, 2022).

Speaking of the skills necessary for the future, researchers note that this set of competencies varies from country to country, yet always relates to the skills demanded in the present, namely critical thinking, communication and teamwork skills, a creative approach, and the skills of operating in the digital environment (Evans Allvin, 2016; Sergeeva et al., 2021). These skills are referred to as the 4Cs.

The program of the educational alliance Partnership for 21st Century Learning explores the 4C formula: creativity as a way to reject stereotypical thinking (according to J.P. Guilford); critical thinking as the ability to think clearly and rationally, understanding the logical links between thoughts and ideas; collaboration, or teamwork skills; and communication skills as a group of skills characterizing the personal traits necessary for the organization and execution of communication and interaction (Mukataeva et al., 2022). Researchers argue (Succi, 2015; Zhilin, 2016) that these are the skills that will be essential in the future.

Thus, the development of critical thinking, interaction and communication skills, leadership qualities, and creativity, e.g., soft skills, is an urgent issue of today (Ybyraimzhanov et al., 2022). The level of soft skills development is a telling characteristic of the school student's "Self" that favorably distinguishes them from other subjects in the educational process (Wats, Wats, 2009; Karimova et al., 2022).

One possible means of building the soft skills of students in general education schools is project activities (Yessenova et al., 2023). Projects serve as an activating learning process (Avdeenko et al., 2018; Berkovich et al., 2018; Pakhar et al., 2021) that develops a wide range of skills in the subjects of the educational process. Application of the project method in class and extracurricular activities immerses students into the subject area, expands the scope of their practical skills, and strengthens their ability to conscious logical actions. At present, the potential of project activities is utilized by teachers to shape and develop both the subject-specific and general competencies of students.

2. Literature review

Soft skills are interpreted across different studies as a set of non-specialized supra-professional skills responsible for successful participation in the work process, high productivity, and, as opposed to specialized skills, are not bound to one specific sphere (Rao, 2012). Soft skills are also defined as a complex of non-technical knowledge and skills that make up the foundation of successful participation in work processes (Vasanthakumari, 2019); the skills that are not related to the workplace and are closely tied to personal qualities (confidence, discipline, self-management, etc.), social skills (communication, teamwork, emotional intelligence, etc.), and leadership skills

(rational time management, resolution of complicated modern problems, critical thinking, etc.) (Ivonina et al., 2017).

Scholars believe soft skills to possess systemic characteristics. One of these is emergence, which provides the combined operation of interrelated elements and the appearance of new functional properties instead of a simple sum of functions. Another systemic characteristic is synergy, which increases the efficiency of activity due to the combination of elements (Ngang et al., 2015). Considering social interaction, soft skills are understood as a set of non-specialized supra-professional soft competencies that contribute to the successful performance of the job duties of specialists in any field (Raitskaia, Tikhonova, 2018).

The prominent role of soft skills is stressed in the vast majority of scientific, methodological, and publicistic sources. Research conducted at Harvard and Stanford Universities proves that soft skills account for 85 % of career success (Tsalikova, Pakhotina, 2019). The same is argued by R. Ibrahim et al. (2017) with an emphasis on the acquisition of key competencies and transversal abilities.

Specialists concur that soft skills represent the personality traits, goals, motivations, and preferences valued in the labor and educational markets. These skills serve as predictors of life success. Soft skills are interpreted as immaterial, non-technical, personal skills that define the person as a leader, facilitator, intermediary, and negotiator (Iorio, 2022). Some researchers equate soft skills with emotional intelligence (Evans Allvin, 2016), while others view them as a dynamic combination of cognitive and meta-cognitive, interpersonal, intellectual, and practical skills (Škuśkovnika, 2022).

Different sources offer varying versions of the term "soft skills", such as "flexible skills" and "success skills", and psychology attributes them to the group of social skills. The conducted review of scientific sources (Batsunov et al., 2018; Robles, 2022; Škuśkovnika, 2022; Sopa et al., 2020) and summarization of sociological studies suggest the following classification of soft skills:

- learning skills (critical thinking, ability to learn quickly, adaptability to changing world realities, creativity, lifelong learning skills, commitment to academic/professional achievement and self-development);
- social skills (positive thinking, emotional intelligence, ability to teamwork, leadership, conflict-free communication skills, public speaking skills);
- personal skills (a person's ability to flexibly manage other people's emotional reactions, to activate and realize personal potential, initiative);
- information, media, and digital literacy skills (ability to find information, determine the credibility of sources using various evaluation tools, publicize the selected facts, create technologies necessary for the exercise of an active civil position).

Existing literature substantiates the pivotal role of soft skills in facilitating academic achievement and professional advancement, however there is a gap in empirical research specifically focused on the development of these skills within the high school educational context in Kazakhstan. The literature review underscores the systemic characteristics of soft skills, which facilitate effective performance across various domains, underscoring their value beyond mere technical competencies. Furthermore, despite the consensus on the importance of soft skills, the review also indicates a lack of comprehensive strategies within the educational system to foster these skills systematically. This gap presents an urgent need for innovative pedagogical approaches, such as project-based learning, that can integrate soft skills development into the curriculum effectively. The empirical component of our study aims to address this gap by examining the impact of utilizing project methods in school education on enhancing high school students' soft skills, thereby contributing to the body of knowledge on effective soft skills development strategies in educational settings.

In this light, the purpose of our study is to analyze the efficiency of developing soft skills using project technologies.

The research objectives set to achieve the goal of the study are:
1) to conduct diagnostics of the development of soft skills among high school students;
2) to experimentally test the efficiency of project technologies in soft skills development for high school students.

3. Methods

The study was conducted during the 2022–2023 calendar academic year.

The research employed a set of theoretical and empirical research methods, including:

- analysis of literature on the problem of soft skills development, including in the school educational environment;

- a pedagogical experiment to test the efficiency of project technologies in developing the soft skills of high school students.

Before the pedagogical experiment, we performed an analysis of literary sources, which were selected from Web of Science and Scopus using the keywords "soft/flexible skills", "soft skills", "high school students", and "senior school students" with a restriction on the publication date not older than 10 years.

The primary research method was a pedagogical experiment conducted on 146 11th-grade school students in the city of Pavlodar (Kazakhstan). The choice of 11th-grade students as the object of the experiment is explained by the fact that the final school year is when students choose their future path, be it entering the workforce or pursuing higher education. For this reason, it is at this exact stage that it is important to assess the future specialist's capabilities and readiness in terms of developing basic interpersonal skills, such as teamwork, which are highly valued by both employers and educational institutions.

The experimental group (EG), in which soft skills were developed in the classroom using the project method, included 49 students (from one of the participating schools).

The control group (CG), in which training was carried out following the regular educational program without additional methods for the development of soft skills, was made up of 97 high school students (from two other schools involved in the study).

The first stage of the pedagogical experiment was the pre-experimental assessment of high school students' soft skills based on the 4C model: creativity, critical thinking, collaboration (teamwork), and communication skills.

Each structural element in the 4C model has its indicators, criteria, and development levels. Therefore, the assessment of these skills included several methods to determine the level of soft skills development by various components (Table 1).

Table 1. Diagnostic toolkit of the study

Soft skill	Method
Creativity	The Test of Divergent Thinking by F. Williams, adapted by E.E. Tunik – for testing non-verbal creative thinking; The Remote Associates Test (S. Mednick) – for testing verbal creative thinking
Critical thinking	Test questionnaire of intellectual skills. Version for high school students (9-10 grades) (Iu.F. Gushchin); The Complex Analogies method (E.A. Korobkov); The Exclusion of Concepts method (A.A. Karelin)
Communication skills	Test questionnaire of communicative skills: for adolescents and high school students (L. Mikhelson, ed. Iu.Z. Gilbukh) Method of assessing the communication and organizational skills of high school students (V.V. Siniavskii, V.A. Fedoroshin)
Teamwork	The Ability to Teamwork test

Using the diagnostic results, we identified three levels of development of each soft skill: high, average, and high.

In the second stage of the pedagogical experiment, the project method was integrated into the educational programs of students in the EG. Students in the CG were taught by the traditional educational program, without any additional methods for the development of soft skills.

The third stage involved the post-experimental assessment of the level of soft skills using the same diagnostic methods (Table 1). Statistical processing of empirical data was performed using Statistica 7.0 software.

To detect reliable changes in the level of soft skills after experimental training with the project method, we applied the angular transformation, φ^* criterion, which tests the reliability of differences between the percentage shares of two samples. The null and alternative hypotheses for both groups are formulated as follows.

H0: The share of high school students with a high level of soft skills according to post-experimental testing does not exceed the share of high school students at this level before the experiment.

H1: The share of high school students with a high level of soft skills according to post-experimental testing is higher than the share of high school students at this level before the experiment.

In the fourth stage, students in the EG (49 people) were surveyed to determine the list of soft skills that, as they believed, had enabled them to communicate most efficiently with others in everyday life and educational activities.

4. Results
4.1. Pedagogical experiment
The results of the pre- and post-experimental assessment of soft skills are presented in Table 2.

Table 2. Results on the level of soft skills development

Soft skill	Level	pre-experimental assessment, N/(%)		post-experimental assessment, N/(%)	
		EG	CG	EG	CG
Creativity	low	22 (44.9 %)	43 (44.3 %)	9 (18.4 %)	39 (40.2 %)
	average	17 (34.7 %)	35 (36.1 %)	22 (44.9 %)	38 (39.2 %)
	high	10 (20.4 %)	19 (19.6 %)	18 (36.7 %)	20 (20.6 %)
Critical thinking	low	20 (40.8 %)	39 (40.2 %)	15 (30.6 %)	37 (38.1 %)
	average	18 (36.7 %)	37 (38.1 %)	19 (38.8 %)	38 (39.2 %)
	high	11 (22.4 %)	21 (21.7 %)	14 (28.6 %)	22 (22.7 %)
Communication skills	low	21 (42.9 %)	37 (38.1 %)	11 (22.4 %)	35 (36.1 %)
	average	17 (34.7 %)	38 (39.2 %)	17 (34.7 %)	39 (40.2 %)
	high	11 (22.4 %)	22 (22.7 %)	21 (42.9 %)	25 (25.7 %)
Teamwork	low	24 (49.0 %)	36 (37.1 %)	10 (20.4 %)	35 (36.1 %)
	average	14 (28.6 %)	39 (40.2 %)	16 (32.7 %)	40 (41.2 %)
	high	11 (22.4 %)	22 (22.7 %)	23 (46.9 %)	24 (24.7 %)

Comparative analysis of pre- and post-experimental testing results shows an improvement of all the assessed soft skills in the EG.

Next, we construct empirical frequency tables for two values, "presence of effect" and "absence of effect", and calculate φ^*emp (Tables 3 and 4). In this case, we define the presence of effect as the achievement of a high level of soft skill by high school students.

Table 3. Table for calculating the φ^* criterion to compare the results of pre- and post-experimental testing in the EG

Soft skill	Stage	presence of effect		absence of effect		φ^*emp
		N	%	N	%	
Creativity	pre-exp.	10	20.4 %	39	79.6 %	2.67
	post-exp.	18	36.7 %	31	63.3 %	
Critical thinking	pre-exp.	11	22.4 %	38	77.6 %	1.68
	post-exp.	14	28.6 %	35	71.4 %	
Communication skills	pre-exp.	11	22.4 %	38	77.6 %	4.45
	post-exp.	21	42.9 %	28	57.1 %	
Teamwork	pre-exp.	11	22.4 %	38	77.6 %	4.79
	post-exp.	23	46.9 %	26	53.1 %	

Critical values of φ^*: 1.64 ($p < 0.05$); 2.31 ($p < 0.01$)

The values of φ^* for the EG fall into the zone of significance ($p < 0.01$) for every structural element in the 4C model. This result refutes H0 and confirms H1 for the EG. Thus, the use of the project method as a means of developing soft skills proves effective.

Statistical analysis shows that especially good results from the use of the project method are achieved in the development of teamwork and communication skills. Much weaker is the effect of the project method on the development of critical thinking. This shortcoming needs to be accounted for and compensated at further introduction of the means and methods of developing soft skills.

Table 4. Table for calculating the φ* criterion to compare the results of pre- and post-experimental testing in the CG

Soft skill	Stage	presence of effect		absence of effect		φ*emp
		N	%	N	%	
Creativity	pre-exp.	19	19.6 %	78	80.4 %	0.34
	post-exp.	20	20.6 %	77	79.4 %	
Critical thinking	pre-exp.	21	21.7 %	76	70.3 %	0.36
	post-exp.	22	22.7 %	75	69.3 %	
Communication skills	pre-exp.	22	22.7 %	75	69.3 %	0.68
	post-exp.	25	25.7 %	72	74.3 %	
Teamwork	pre-exp.	22	22.7 %	75	69.3 %	0.56
	post-exp.	24	24.7 %	73	75.3 %	

Critical values of φ*: 1.64 ($p < 0.05$); 2.31 ($p < 0.01$)

In the CG, the empirical value of φ* is not significant ($p > 0.05$) for any of the structural elements of the 4C model. This fact disproves H1 and confirms H0 for the CG. Thus, the traditional educational program without additional methods of soft skills development does not increase the level of these skills.

4.2. Survey
The first question, "Identify the three most prioritized soft skills that you apply in life", gives the following results: 43 respondents (87.8 %) gave priority to communication, 31 students (63.3 %) emphasized critical thinking, 25 students (51 %) pointed to communication/teamwork skills, and 21 people (43 %) highlighted creative thinking. The survey thus shows that most participants see communication and critical thinking as the most important soft skills.

The second question, "Name the three soft skills most demanded in educational activities", delivers the following data: 44 students (89.8 %) emphasized critical thinking, and 40 students (81.6 %) pointed out communication/collaboration skills.

The third questions sheds light on the most valuable soft skills in extracurricular activities. Among these the respondents note the following: 46 people (93.9 %) indicated communication, 41 people (83.4 %) referred to collaboration/teamwork skills, and 30 people (61.2 %) mentioned creative thinking.

The fourth question concerns the use of soft skills in interaction as part of project activities. The results show the following hierarchy: 49 students (100 %) stressed the skills of cooperation/teamwork, 41 people (83.4 %) pointed out communication, 31 people (63.3 %) noted critical thinking, and 29 people (59.2 %) highlighted creative thinking.

5. Discussion
In the present study, we hypothesized that the integration of project-based learning (PBL) within high school curricula in Kazakhstan would significantly enhance the development of students' soft skills, including communication, teamwork, problem-solving, and critical thinking. Our empirical investigation, grounded in a quantitative analysis of pre- and post-intervention assessments, provides substantial evidence supporting this hypothesis. Students exposed to PBL methodologies demonstrated marked improvements in their ability to collaborate effectively, articulate ideas clearly, and approach complex problems with innovative solutions, compared to their counterparts following a traditional educational model.

Given that most of the surveyed students accentuate the importance of communication skills, we can deduce that they all realize the importance of communication in everyday life. Critical thinking, in turn, is distinguished by them as a skill needed both in daily life and in class.

Students' choice of the most valuable soft skills in extracurricular activities can be attributed to their perception of communication and teamwork skills as important for receiving timely help when searching for, processing, analyzing, and synthesizing the necessary information virtually in any sphere of life. The emphasis placed by students on these skills reinforces the hypothesis of our study, suggesting that project-based learning (PBL), with its inherent focus on collaborative problem-solving and communication, is aptly suited to address these educational needs.

In the context of soft skills being utilized in interaction as part of project activities, the high schoolers refer to collaboration and communication as the most important, as teamwork essentially cannot proceed without communication. Of equal importance, in students' view, is creative and critical thinking, given that the development of these skills to some degree influences the process of completing a project.

Agreeing with M.I. Berkovich et al. (2018), we believe that the development of soft skills can be efficient subject to the following requirements: alignment with age and individual characteristics; development of soft skills on the basis of partnership pedagogy; and stage-by-stage work on the formation of soft skills.

However, it is rather challenging to account for each and every soft skill. Furthermore, the use of soft skills assumes the ability to use different models of behavior even in the same situations, to understand one's own interests and those of other stakeholders, to promptly and clearly set priorities, make the optimal choice from alternatives, quickly adapt to new challenges and circumstances, be resistant to strain and stress, and achieve the goals set (Evans Allvin, 2016).

As argued by researchers (Iorio, 2022; Vasanthakumari, 2019), the labor market has the highest demand for the following soft skills: complex multi-level problem solving, critical thinking, creativity in a broad sense, ability to lead and interact with people, emotional intelligence, forming personal opinions and making decisions, logic and negotiation skills, and flexibility of mind. The results of our study on a sample of potential school graduates partially confirm these observations.

Furthermore, researchers and specialists in recruiting and employment highlight the following key skills:

- leadership skills (ability to control and direct other workers, forge relationships between management and subordinates through the organizational chain; evaluate, motivate, reward, and discipline employees; build teams, resolve conflicts, and shape the desired culture of the organization; understand how to influence people and satisfy their needs, etc.) (Sopa et al., 2020);

- teamwork skills (given that most employees are part of a team/department/division, and even those not included in the official team need to cooperate with other people) (Succi, 2015);

- communication skills (success in communication involves five components: verbal communication concerns the ability to speak clearly and concisely; non-verbal communication refers to the ability to project positive body language and facial expressions; written communication implies skill in drafting text messages, reports, and other types of documents; visual communication implies the ability to convey information with images and other visual aids (active listening helps to listen and hear others) (Bishop, 2017);

- problem-solving skills (ability to apply one's knowledge in finding answers to pressing questions and formulating weighted solutions, discussing mistakes, holding responsibility, etc.) (Batsunov et al., 2018);

- work ethic (adherence to work rules, punctuality, time management, goal setting and result-oriented work, etc.) (Sopa et al., 2020);

- flexibility/adaptability (in today's rapidly changing world, these qualities take on new value; it is important to be able to cope with many different tasks and to be willing to take on responsibilities that may lie outside one's own sphere of competence) (Iorio, 2022);

- Interpersonal skills (the ability to build and maintain relationships, develop them, and use diplomacy; the ability to express and receive constructive criticism, to be tolerant and respectful of others' opinions and empathize with them; these skills are among the most important, as they are central to team building and trusting relationships).

Among the limitations of the study, we can note the insufficient number of educational institutions involved in the pedagogical experiment. Prospective further research could focus on the process of soft skills development in other age groups of school students using other tools, such as game methods.

6. Conclusion

Our study aimed to explore the impact of project-based learning on the development of soft skills among high school students in Kazakhstan. The results affirm our initial hypothesis, revealing that PBL significantly contributes to the enhancement of essential soft skills, thereby validating the effectiveness of innovative pedagogical strategies in contemporary educational settings. This evidence substantiates the argument for a paradigm shift in educational practices, advocating for the broader adoption of PBL methodologies to prepare students for the complexities of the modern workforce and societal engagement.

To build soft skills, school graduates need to recognize the importance of personal development, which requires an active pedagogy approach to teaching. That is, the acquisition of these skills requires active teaching methods, one of which is the project method. A useful means of soft/flexible skills development in school education is the introduction of project activities associated with the curriculum, which provide practical implementation of the acquired knowledge, as well as the problem-based approach, which appeals to the reality and daily challenges faced by students. Another clearly powerful method is group activities, as they allow students to develop a strong sense of identity and realize the value of teamwork, which helps them achieve better results in their daily work and personal activities. Thus, the use of project methods in teaching high school students has great potential both in activating cognitive interest and improving the quality of perception of educational material, and in building a wide range of soft skills. Summarizing our findings on the practical aspects of soft skills development, we highlight the need to replace traditional passive pedagogics, which is limited to the transmission of knowledge, with active pedagogics.

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Using a WebQuest Technology in Preparing for an English Language Exam in a Technical University

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Abstract
The purpose of this article is to create a web-quest aimed at preparing for an English exam in a technical university, namely to practice those lexical topics from the exam that are challenging for most students. The issues of creating of a WebQuest aimed at preparing for the English language exam in a technical university, namely, working out those grammar and lexical topics from the exam that cause particular difficulty for most students, are considered. The role of Internet technologies in the educational process was determined, the importance of this technology in preparation for passing the English language exam in a technical university was indicated; the obtained results of the work were analyzed. The following tasks that were approached during the study: to define the concept of "Internet technology"; to define the role of Internet technology in the educational process; to define the term "WebQuest technology"; to identify the role of WebQuest technology in the educational process; to conduct a questionnaire in order to identify the most difficult exam topics for students; to develop and test a WebQuest aimed at working out the most difficult exam topics; to analyze the results of the conducted research. The theoretical basis of the topic was studied, questionnaires in order to identify the most difficult topics were developed and conducted, the possibilities of uploading a WebQuest at various platforms, their advantages and disadvantages, were analyzed. Based on the material studied, a WebQuest was developed and conducted. In order to identify the effectiveness of the WebQuest, a survey of participants was conducted. As a result, the developed WebQuest turned out to be effective.

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1. Introduction

All through the time the world exists there has been a continuous search for and improvement of the methods and techniques for the transfer of the knowledge accumulated in all fields of human activity (Smirnov et al., 1999; Zemenkova et al., 2022; Pashkevich et al., 2023). The rapid development of computer technologies contributes to acceleration of this search (Potekhin, Galkin, 2023; Sholokhovich, 1998; Cherepovitsyn, Tretyakov, 2023) by encouraging the design of novel feasible techniques and methods that keep in line with the realities of today and help to enhance learners motivation, which finally leads to improving the quality of education (Bauer-Ramazani, 1998–2005; Polat et al., 2002).

As of today, pedagogical science has accumulated a substantial number of established educational techniques, with some sources listing over one hundred ones (Boyko et al., 2022; Borisova, 2022; Barinova, 2019, Kharlamova, et al.,2023, Oblova, et al.,2023). The classification of the known educational methods developed by V.G.Selevko (Selevko, 2005) numbers over 50 varieties (Bovtenko, 2008). The list includes:

- educational technologies based on student-centered education;
- educational technologies aimed at improvement and enhancement of learner performance (game-based methods and communicative teaching techniques developed by E.I. Passov);
- alternative techniques (free work method of Célestin Freinet);
- nature-aligned techniques (the Montessori method);
- developmental teaching techniques (self-development learning techniques).

As a result of further development of teaching and learning technical aids, new technologies appear (Yarasheva et al., 2014; Zakharov et al., 2022; Zaitsev, 2012). Of special interest are information and communication technologies (ICT), which can be explained by intense computerization on the social level and by introduction of technical aids in education. Now, Internet-based technologies are also used as a a part of teaching and learning process. In terms of foreign language training, the most relevant are online training programmes or tutorials as well as search, play-based and imitation learning online tools (Vorobyov, 2004; March, 2001; Safonov, 2017).

One of the factors in information technologies is using a variety of schemes aimed at applying a choice of online resources in the teaching and training process (Zemenkova et al., 2022, Zhuk, 2006). Further improvement of computer technologies and implementation of machine learning (Potekhin et al., 2023; Filippov, 2022) in various industries will contribute to introducing more internet-based technologies in the current education and boost their appeal for teaching practice. (Nikonova et al., 2023; Zemenkova et al., 2022)

Taking into account the factors mentioned above, we can identify the purpose of this study as the implementation in the analysis and selection of specialized platforms, as well as the further implementation of the Internet technology "WebQuest" in the process of preparing students of a technical university for the English language exam.

2. Literature review

In the case of foreign language teaching methodology, we can note the tendency towards the emergence and development of such interdisciplinary areas and branches as computer-based and later, electronic linguodidactics, considering theoretical aspects of informatization (Gartsov, 2010) mainly in teaching Russian as a foreign language. Practical experience of integrating information technologies and rethinking the role of information technologies in language education can be traced in the studies of a number of Russian and foreign researchers as M.V. Botvenko (Bovtenko, 2005; Bovtenko et al., 2006; Bovtenko 2008), O.V. Volkova (Volkova, 2010), L.G. Zhuk (Zhuk, 2006), P.V. Sysoev (Sysoev, Evstigneev, 2008; Sysoev, Evstigneev, 2010), etc. WebQuest technology is one of those in question: E.I. Baguzina (Baguzina, 2010), G.A. Vorobiev (Vorobyov, 2003; Vorobyov, 2004), Bauer-Ramazani Chr. (Bauer-Ramazani, 1998–2005), Lamb A. (Lamb, 2004) etc.

At the same time, the vector of research activities of the last decade is related to the introduction of digital technologies into the educational process. The project "Modern Digital Environment in the Russian Federation" launched in 2016 only confirmed the need to create conditions for "systematic improvement of the quality and expansion of opportunities for lifelong

learning through the development of the Russian digital educational space" (Pasport prioritetnogo proekta..., 2016).

In our study one of the Internet technologies, which, in our opinion, can be used today in the process of teaching a foreign language in general, and for effective preparation for the English language exam, in particular, is a web quest – an inquiry-oriented task requiring that most information used by learners comes from online sources.

The term was first introduced in 1995 by B. Dodge, a professor of education technology at San Diego State University (Dodge, 1997). A learning WebQuest is arranged by a teacher with the aim of organizing the students' learning activity. The concept of the technique was built up by B. Dodge and T. March (March, 1995; March, 1998; March, 2001). These days, WebQuests are being developed for practically all subjects and, according to E.I. Baguzina (Baguzina, 2010), can offer a variety of advantages. These include enhanced student's motivation, improving the analytical and creative thinking skills as well as the teamwork abilities, possibility to organize teleworking and create a scenario that keeps students interested.

To the opinion of the authors, the list of educational WebQuests which are considered as the most applicable in foreign language training are narration, compilation, creativity tasks, journalistic research, and persuading the opponent. The quests can cover the widest range of topics; the problem-solving tasks can be planned at different levels of complexity, and the outcomes, depending on the material studied, can be presented in a variety of forms (oral statements, presentations, essays, web pages, etc.).

As a teaching method, educational WebQuest includes and relies on:
- the use of real-life resources (besides basic resources, such as textbooks, learning guides, dictionaries, etc., online resources can be also used in order to complete a task);
- a comprehensive task that reflects real-life issues, which considerably enhances learner motivation;
- the opportunity for the participants to work at individual pace and go back to the material that was not properly learned;
- completing a task through thinking out a puzzle or making an inquiry, similar to doing a quest in a computer gain, which appeals to learners;
- the opportunity to put the outcomes on the web, which allows for feedback from real people. Public support and approval encourages the learners to produce the best possible results.

Like other teaching techniques, WebQuests are never flawless. Their drawbacks include labour-intense and time-consuming preparation, a certain level of computer skills, difficulty in regulating the time of learners' work, and possible Internet disconnection. It is worth to note, however, that the deficiencies noted are not critical and can be mitigated by teacher's active steps.

The topic of quests can be very different, problematic tasks can differ in varying degrees of complexity, and the results of work, depending on the material studied, can be presented in different forms (oral speeches, presentations, essays, web pages, etc.) (Lamb, 2004). As part of our research, we refer to such training topics as "Power Engineering," "Electric fields," "Capitals," "Nuclear Energy," "Cogeneration," "Solar cells," which is due to the data of a survey conducted among students, the results of which are presented in detail in the following paragraphs.

There is a wide choice of internet services that allow to start blogs, develop websites or interactive tasks, and many other resources that can be used in a WebQuest design. The work provides the analysis of up- and downsides of some online platforms with regard to running a WebQuest as part of English exam preparation

The first platform to analyze was ZUNAL (ZUNAL, 2019), the most popular as a tool for developing quests, which is actually an online educational quest design website. With the help of this service a user only needs to sign up, then enter the required information in a sequence of pop-up windows. Thus, the service is actually a ready-made template for a WebQuest for a teacher to fill in. This makes ZUNAL the easiest to use and the best to provide the quickest possible WebQuest preparation. The service is free for users. The disadvantages are, first, the English-only interface and second, the old-fashion appearance of the website and, consequently, of the WebQuests designed. Today, the trendy and attractive external design, unusualness and novelty are the factors that matter a lot to young people. For this reason, a decision was made to avoid using a standard template in favour of attempting to design an original WebQuest. The platform chosen, therefore, is the one that can be used not only for WebQuest developing but for other educational purposes as well.

A wide range of existing internet services now allows for starting an own website, with Wix, Tildapublishing, uKit, uCoz, and GoogleSites being the most commonly used. These website builders are practically similar and instrumental for creating websites with any topical content with a variety of images, fonts, and add-in items.

As a result of preliminary analysis for each of the services mentioned, GoogleSites was chosen as an optimum platform for developing the target WebQuest. GoogleSites is a free means for designing and co-editing simple web pages, compatible with all other Google web applications. Although it does not allow users to design business websites, it is quite suitable for developing uncomplicated information and communication ones. As for other advantageous characteristics, the platform:

- is user friendly;
- is readily understandable for wide audience, without the necessity for specific computer programming skills and knowledge;
- provides Russian interface;
- allows for integration with other Google web services (tables, spreadsheets, forms, presentations, maps, YouTube videos);
- offers ready-made templates.

The disadvantages of the platform (e.g., no possibility to give commentaries and the cloud storage limit of 50Mb) were considered as insignificant. Developing a WebQuest does not involve uploading of materials that require large amounts of memory, since a WebQuest is mostly intended for information search and analysis in order to complete a specific task.

2. Materials and methods

In the process of research, the following scientific methods were used: literature analysis (both academic and methodical/instructional sources), surveying of web-based platforms where the WebQuest can be uploaded, questioning, and modeling representation, methods of statistical data analysis, data processing and graphical presentation were performed using computer programs SPSS 17 (IBM) and Microsoft Office Excel 2017. Various methods of statistical processing were used depending on the type of random variables and the research task. The boundaries of confidence intervals for the mean values were calculated for a confidence probability of 0.95 (CI 95 %). The values of qualitative variables are presented as observed frequencies and fractions (percentages). For fractions, the boundaries of confidence intervals for 95 % confidence probability (95 % CI) using the Wilson method are calculated. For quantitative values, medians, first and third quartiles in the Me (Q1; Q3) format are given. To compare quantitative values of two groups, the nonparametric Mann-Whitney U-test (for independent samples) and Wilcoxon W-test (for related samples) were used. Differences were considered statistically significant at $p < 0.05$, where p is the probability of a first-order error in testing the null hypothesis. Two-sided versions of the criteria were used in all cases.

3. Results

The beginning of our experimental work is associated with the survey among the undergraduate students of the National Research University "Moscow Power Engineering Institute", according to which 65 % of respondents identified the technology of WebQuest as the most useful and convenient in preparing for classes, which is explained by the students themselves extensive functionality of digital platforms for creating WebQuests, the peculiarities of the discipline "Foreign Language" and the requirements for its mastering.

The questionnaire survey conducted among the 1st year students majoring in "Biotechnical systems and technologies" (groups ER-18-23, ER-17-23, ER-16-23) showed:

1. For students, motivation to learn English is related to the specifics of future professional activity (62 %), the possibility of conducting researches (33 %) and self-improvement and development of personal qualities, intellect, imagination, creative thinking (5 %).

2. The majority of students indicated digital gadgets and Internet technologies as an integral part of modern life (86 %) and realize the need to ensure the protection of devices and personal data while working with them (92 %).

3. In the process of preparation for academic classes, the majority of students (88 %) address Internet technologies in 75-60 % of cases. The use of Internet technologies is almost equally related to the fulfillment of everyday tasks (study, work) and leisure time. In addition to the WebQuest,

the technologies used by students to prepare for classes were electronic dictionaries and Microsoft Office tools (25 %), thesauri (20 %), G-Suite cloud services (21 %), video lectures and podcasts on Ted-ED and YouTube (17 %), and open access learning materials (17 %).

5. Besides, one of the important indicators for our study was to identify the students' ability to determine their own professional and learning needs and, to customize the WebQuest toolkit during the course of the learning tasks according to them. The presence of this skill was confirmed by 95% of respondents, while the rest of them (5 %) would prefer to ask for help from the teacher.

The questionnaire survey results are presented in Table 1.

Table 1. Descriptive statistics of questionnaire results of the total sample (n = 40) of control (CG) and experimental groups (EG)

| Questionnaire Aspects	Absolute Frequency	Prevalence, %	Confidence Interval	
			Left bound	Right bound
Motivation to learn English is related to the specifics of future professional activity	25	62 %	47 %	75 %
Motivation to learn English is related to self-improvement	13	33 %	20 %	48 %
Motivation to learn English is related to the opportunity to conduct research and development activities	2	5 %	1 %	17 %
Digital gadgets and related technologies are considered to be an integral part of modern life	34	86 %	72 %	94 %
The need to protect devices and personal data while working with them is met	37	92 %	79 %	97 %
Internet technologies are used in 75-60% of time for class preparation	35	88 %	74 %	95 %
Electronic dictionaries and Microsoft Office tools are used for class preparation	10	25 %	14 %	40 %
Thesauri are used for class preparation	8	20 %	10 %	35 %
Cloud services are used for class preparation	9	21 %	11 %	36 %
Video lectures and podcasts on Ted-ED and YouTube are used for class preparation	7	17 %	8 %	31 %
Publicly available learning materials are used for class preparation	7	17 %	8 %	31 %
Professional-learning needs are distinguished the web-quest toolkit during the course of the learning tasks is customized according to them	38	95 %	83 %	99 %
Teacher's assistance is required within the training process	2	5 %	1 %	17 %
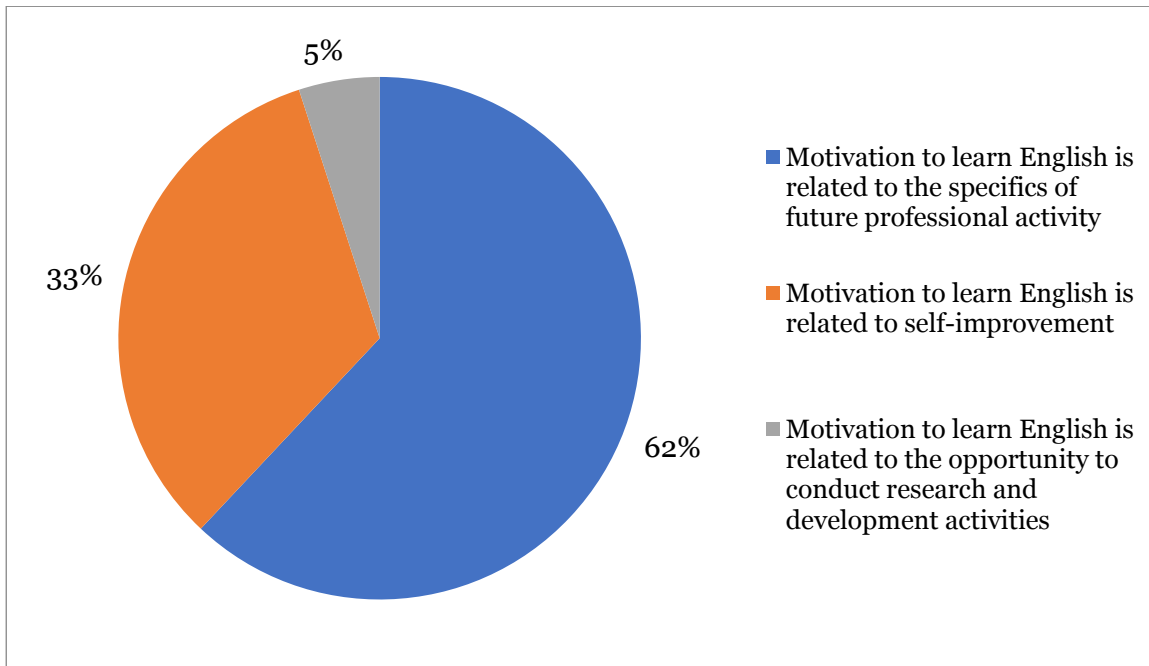
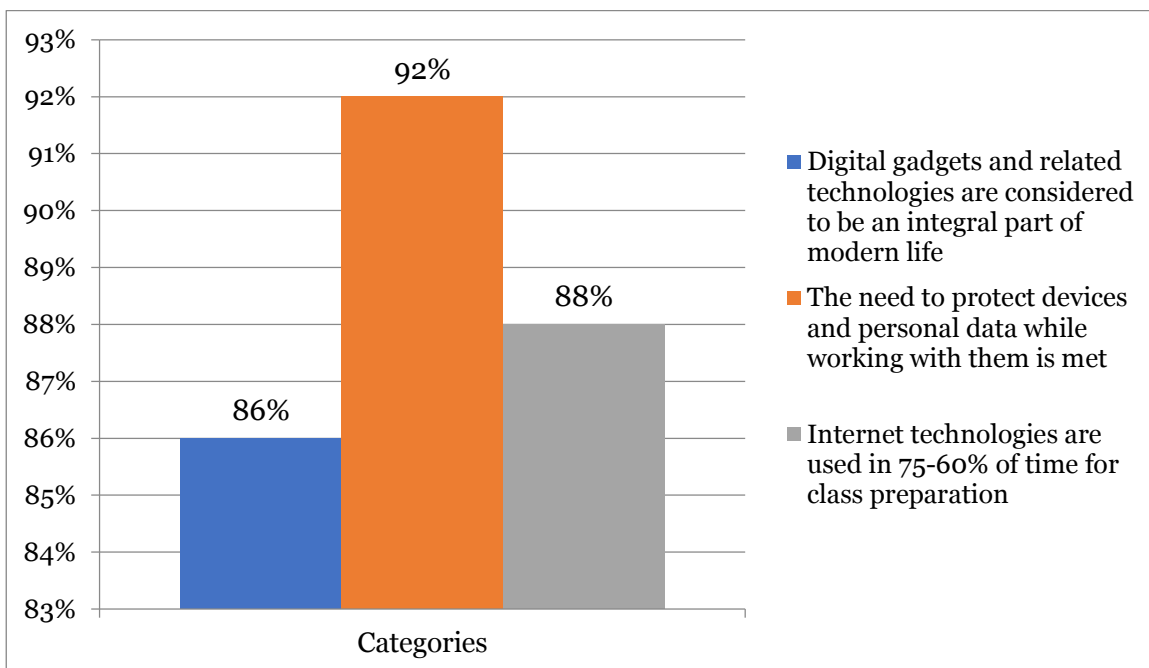**Fig. 1.** The structure of different motivations for learning English

Fig. 2. Structure of different attitudes towards the use of information technology for learning English
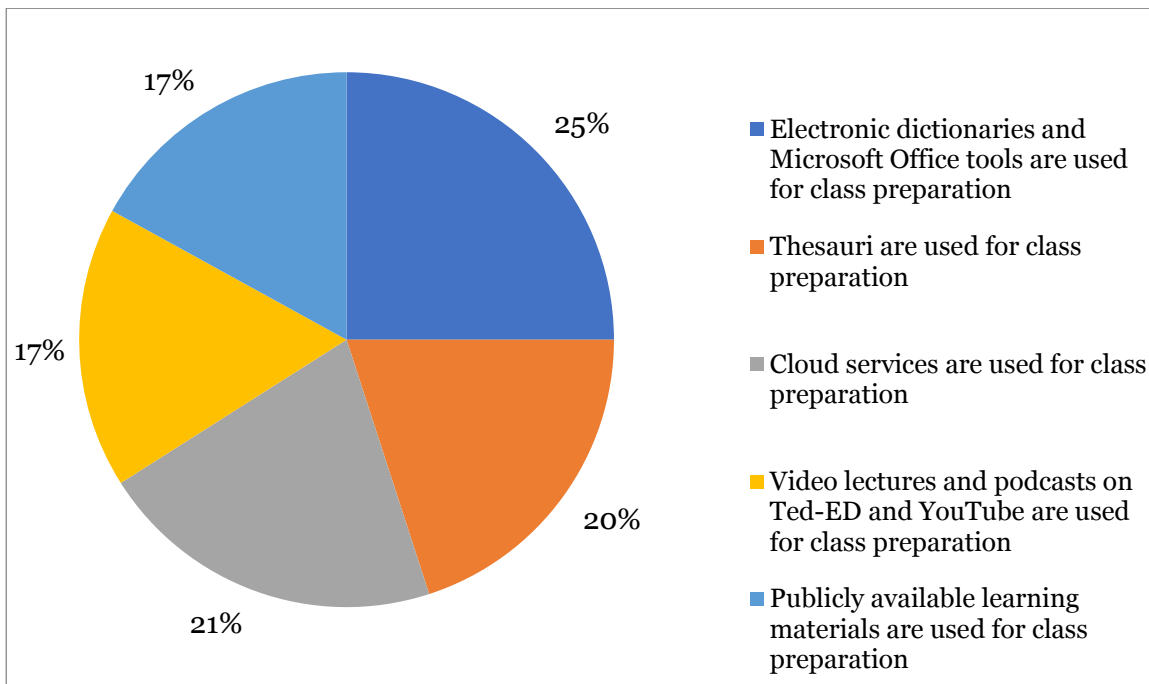
Fig. 3. The structure of the sources of training materials used
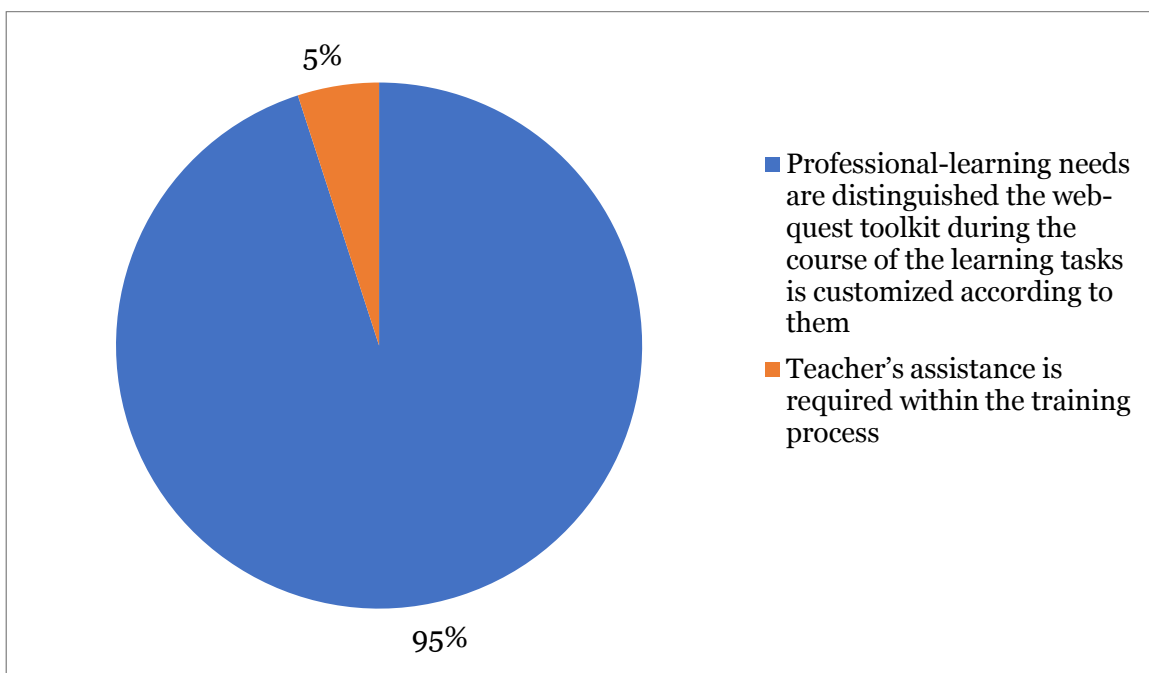
Fig. 4. Structure of ways of evaluating one's own English language learning outcomes

In addition to the questions concerning students' general motivation and personal experience of using Internet technologies, the questionnaire form also included points devoted to the most difficult grammatical and lexical topics, according to the students' opinion. These included the use of passive voice, infinitive and the infinitive constructions, participle and conditional sentences (second and third types) in oral and written speech.

The most difficult lexical topics for learning were "Power Engineering", "Electric fields", "Capasitors", "Nuclear Energy", "Cogeneration", "Solar cells", which proves to us the need for extra materials for revising this topic. Thus, the obtained questionnaire data confirmed the relevance and perspectivity of the problem discussed in this study. The students' answers also allowed us to approach consciously the planning and implementation of experimental training.

As part of the preparatory stage, students got familiar with the goals and objectives of the experiment and the principles of working with the Google Sites platform. The total number of participants involved at this stage is 80.

The first, input diagnostics involves a test consisting of 50 questions for the participants of both groups. The first 40 questions reflect the grammar course of the discipline "English language", the remaining 10 deal with the vocabulary course. Each answer is valued 1 point. This format of entrance control is necessary not only to assess the level of foreign language proficiency necessary for our experimental training (Intermediate or "B1" according to CEFR), but also to identify some of problematic topics that require studying or extra revision during the exam preparation course. As a result, all of the students who proved the intermediate level of foreign language proficiency were divided into two groups: control group (CG) and experimental group (EG). . The total number of remaining participants is 40.

The formative stage of the experimental work involved English language training in the CG and EG according to the planned pedagogical experiment. In the EG training was based on thematic WebQuests created with the help of Google Sites. In the CG training was carried out in the traditional form, using the teaching materials. The timing of the pedagogical experiment was determined in accordance with the thematic distribution of academic hours specified in the "English language" syllabus.

For the WebQuest development, the following structure was chosen:
1. The Welcome Page;
2. The Plan of Activities;
3. List of Resources;
4. Algorithms;
5. The Assessment Criteria;
6. Questionnaire.

Following the scenario, the participants try on the role of authors-developers of the exam variants, who have to make two test variants in order to practice the topics that cause the greatest difficulties.

The *Welcome* page is supposed to introduce the participants to key information about the exam, namely, the assessment criteria, structure, and preparation techniques, so it contains all the necessary details. *The Plan of activities* section sets the tasks to be done in order to complete the quest. At this stage, the teacher also splits the students into two teams. Having known the team they belong to, the participants receive detailed instructions regarding the tasks completion in the WebQuest.

The *List of resources* represents the contents of the WebQuest, namely, the links to the rules for using Quizlet, to the cloud service where the results are to be uploaded, and to the videoconferencing room. This part suggests general introduction to resources for the participants who can do it from home, spending 5 to 7 minutes of their time. Afterwards the participants can see the evaluation principles for the activities they perform in *Assessment criteria* section. It contains a detailed description of how to estimate every piece of their work and a table for the scores gained by each of the two teams. According to the rules, the scores gained by every participant are summed up and added to the scores gained by their team for developing a sample examination task. After that, the overall score of each team is calculated, and the winner is determined.

When the 1st stage is completed, a video conference is scheduled to be held on any online platform suitable for the participants and organizers (e.g. Zoom). The conference is attended by all the participants and the instructor and is dedicated to discussing any possible issues and clarification or updating the details.

Following the discussion, the participants start the task, which means going on to Stage two, the key stage of the WebQuest. This includes a number of tasks for the participants to achieve:
1. To study the detailed instructions explaining how to do each of the tasks placed in the *Strategies.*
2. To develop a version of an English language test. In order to do that, the participants must take up one of the functions listed below and, in accordance with the function chosen, find the applicable tasks using online sources. This way, at the end of the stage each team is supposed to produce a ready-to-use version of the specified test, where all assignments cover one and the same vocabulary topic (one group has "Solar energy," the other has "Nuclear power"). In their teams, each participant performs some personal functions, being one of the following three:

- *Translators* are supposed to choose assignments for the "Translation" section;
- *Grammarians* look for the grammar and vocabulary use assignments;
- *"Orators"* – select tasks from the oral speech section.

The members of each team contribute to achieving the common goal, so in the process they master the skills of working in a team, sharing and delegating tasks, exchanging their experience, learning to present their opinions and considering the opinions of others, and using creative approaches.

3. To develop a series of flashcards containing the new relevant topical vocabulary on Quizlet, which afterwards can be studied by the team two members in preparation to taking the English language test created by one of the teams.

After the instructor checked and approved the test versions prepared by the teams, they started preparing for 3rd stage of the WebQuest. The teams exchange the links to the sets of flashcards they created, and are given two days to study the vocabulary. Then within the period of three days at the specified time the WebQuest participants are given tasks from the test version developed by the other team. On the first day they receive the translation, grammar and vocabulary tasks, all of which must be completed within 30 minutes (the interval includes a specified time frame to complete each of the tasks and 10 minutes to send the completed tasks to the facilitator). On the second day they receive the writing tasks, with 30 minutes given to complete them and send them to the facilitator. On the third day they are given the speaking tasks, this time on an individual basis, and then contact the facilitator by video.

So at this stage we can see the participants acquire the vocabulary and use it in their speech. The participants master the new vocabulary on the most complicated topics and consolidate its knowledge by going through the English language test version designed specifically for the revision of the material. A WebQuest also allows the students to adapt to the time frames and learn the strategies pertaining to the English language test.

To check whether the goals set for the practical part of the work were achieved, a survey was carried out among the students of a number of groups who were to take the English language test at the end of the current term. The results of the survey showed that most students need a considerable amount of time and effort to prepare for the test, with many having difficulty in studying specific areas of grammar and vocabulary, which justifies online search for additional materials.

As a result of the research, an original WebQuest was developed using GoogleSites. The students who developed and solved the tasks gained knowledge about the strategies of dealing with all aspects of an English language test. They also searched for and found specific tasks related to these aspects and based on them developed fully valid versions of the test (complete with vocabulary lists for preparation) aimed at revision of specific topics that appear to be the most difficult. Finally, the WebQuest participants mastered the target vocabulary and solved the tasks they had developed as a part of preparation for the end-of-semester English language test.

Using educational WebQuests in preparation for foreign language tests has proven to be an effective tool, because this technique provides tailoring the preparation to the specific exam requirements and allows for individualized approach. In addition, the gamification of foreign language test preparation makes it more appealing for the learners, this enhancing their motivation.

The results of the surveys and questionnaires confirm the relevance and effectiveness of the developed WebQuest which covered the most challenging aspects and topics included in the English language test.

The practical value of the work is in the practical applicability of the methodological developments. The prospects of their further use may lie in developing similar quest techniques for a wide range of topics and aspects of language learning and foreign language test preparation.

The questionnaire identified two topical vocabulary sets, "Environmental issues" and "Technological development, its prospects and implications" as the ones causing the greatest difficulties for the learners. Writing and speaking were also recognized as the skills most difficult to master. The analysis of the findings allowed for the development of a WebQuest aimed at overcoming the challenges mentioned above.

The final stage of the experiment involved both groups and was in fact a final discussion where every student was given an opportunity to speak on the topic and evaluate the text they had studied, to evaluate the quality of understanding and interpretation of the extract read and the soundness of the arguments put forward by other participants to the experiment, and to review and

finalize the definitions of terms. It is worth to note that the students of the experimental group were more creative in the process of discussion and had a better knowledge of specific terminology. The end stage of the educational experiment was a final test taken by both experimental and control groups. The students were offered an English language test, similar to the initial test, and a set of questions related to the topic covered in the experimental study module. The test results for each of the two groups are given in Tables 1 and 2 below as percentages of the tasks completed correctly to the overall number of tasks (100 %).

Table 2. Results of comparative analysis of input and final diagnostics in control (CG) and experimental groups (EG)

Students Groups	Test results for the course "Foreign language" Me (Q1; Q3)		Statistical significance of the differences between the entry and final test by the Wilcoxon test, P
	Entry	Final	
Control (n = 20)	75 (72; 78)	77 (74; 80)	0,649
Experimental (n = 20)	73 (71; 75)	86 (83; 89)	**0,001**
Statistical significance of differences between groups by Mann-Whitney test, P	0,592	**0,046**	–

Statistical analysis of the data showed that at the entrance testing stage there were no statistically significant differences between the control and experimental groups (P = 0.592).

At the final testing stage, the median value of scores in the experimental group was statistically significantly (P = 0.046) higher by 12 % than in the control group.

After training in the control group, the median value of scores at the final testing stage was not statistically significantly changed (P = 0.649) compared to the entrance testing stage.

After training in the experimental group the median value of scores at the stage of final testing statistically significantly (P = 0.001) increased by 18 % in comparison with the stage of entrance testing.

Consequently, training in the experimental group was more effective than in the control group.

4. Conclusion

A WebQuest was created and tested on the Google Sites platform, during which the students got familiar with the algorithms of each of the exam tasks, found exercises devoted to the most problematic topics. Afterwards these topics ("Power Engineering", "Electric fields", "Capasitors", "Nuclear Energy", "Cogeneration", "Solar cells") were used to create full-fledged test variants, as well as lists of vocabulary. Then the participants memorized the vocabulary selected for them by the rival team and solved the created exam variants.

The use of educational WebQuests in preparation for the English language exam is effective, as this technology allows organizing the preparation taking into account the specifics of the exam and uses an individual approach. Besides, with the help of this technology it is possible to gamify the process itself, which will make it more attractive and interesting for examinees and, therefore, worth of their motivation.

The practical value of this work is manifested in the possibility of using the obtained methodology in the process of language disciplines training. The prospects for further research may be related to the development of similar quest-technologies devoted to a more comprehensive preparation for the English language exam. The results of the conducted surveys and questionnaires confirmed the relevance and effectiveness of the created WebQuest dedicated to practicing the most difficult grammar and oral topics declared for preparation for the English language exam.

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Empty Spaces? The Show Must Go Home! Teacher Crossing "Hybrid Boundaries" of Space and Emotion during COVID-19

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Abstract

This quantitative study delves into the emotional experiences of teachers as they navigated hybrid teaching from home during the peak of the COVID-19 pandemic, with a particular focus on understanding the relationship between physical space and emotions. This was a turning point, for the first time in the teacher's professional life, the space takes on a significant dimension. The research involved 135 teachers hailing from northern Israel, aiming to shed light on the intricate interplay between work environment and emotional well-being amidst unprecedented circumstances.

The findings of the study revealed alarmingly high levels of fatigue among the participating teachers, indicative of the immense challenges they faced while transitioning to remote teaching. Interestingly, teachers who engaged in continuing education programs tailored to remote teaching exhibited higher levels of optimism compared to their counterparts who did not participate in such programs. However, despite their increased optimism, teachers who underwent these programs also reported elevated levels of burnout and fatigue, suggesting a complex relationship between professional development and emotional strain.

One of the key insights gleaned from the study was the significant impact of working from home on teachers' emotional states, with many experiencing burnout and grappling with strong negative emotions. Moreover, the data unveiled a weak yet discernible negative correlation between the level of optimism and the number of hours spent working from home, indicating that increased home working hours were associated with decreased optimism levels among teachers.

Keywords: Covid-19, teacher, distance learning, hybrid teaching, emotions.

1. Introduction

The COVID-19 pandemic disrupted education systems, blurred the boundaries of space, and generated a diversity of emotions (Nissim, Simon, 2020; Nissim, Simon, 2022; Whalen, 2020).

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In Israel, all educational institutions switched to emergency learning from March 2020 to February 2021. Approximately two million students spent 100 days in full lockdown, and for another 98 days learned remotely or in a "hybrid" system which comprised mainly remote learning. Teaching activities were originally called "remote teaching". From June 2020 the Ministry of Education switched the definition to "hybrid learning" (Israel Ministry of Education, 2020). However, in practice, this does match the definition of "hybrid learning" based on synchronous remote learning combined with classroom learning. All age groups in the education system spent most of this time indoors (188 days), and in fact spent only 45 days in classrooms with frontal learning. This is the highest number of days of remote learning worldwide, and the lowest number of days of face-to-face learning on campus (State Comptroller of Israel, 2021). This situation had an emotional impact on all involved.

This study seeks to examine the cognitive-emotional attitudes of teachers towards the hybrid learning that took place largely within the domestic space, taking the approach of the general appraisal theory (Moors et al., 2013).

This study was conducted during December 2021, before and during the third lockdown (see Figure 1).
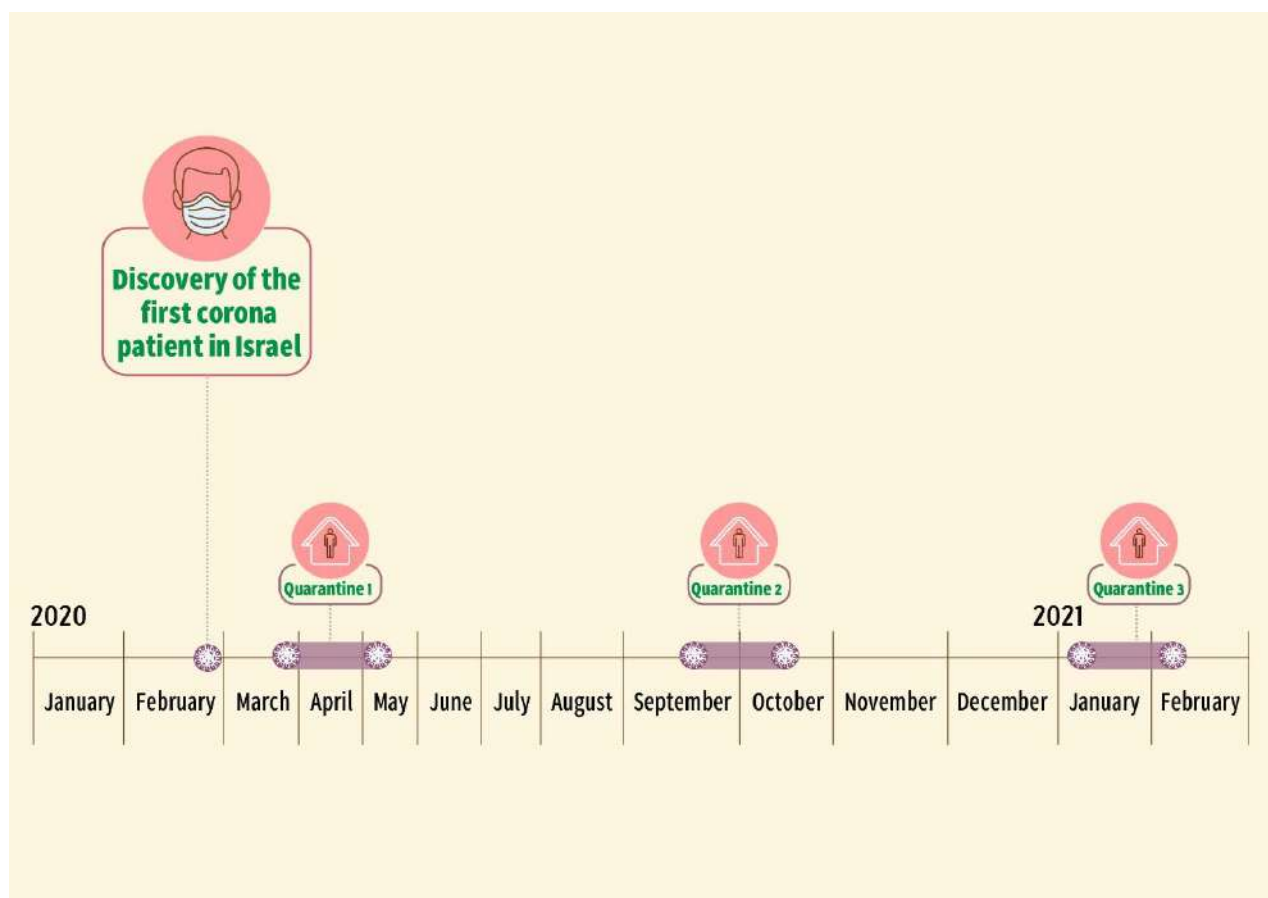
Fig. 1. Timeline of lockdowns in Israel during the COVID-19 pandemic period
(State Comptroller of Israel, 2021)

We can ask: How did the changing space during the COVID-19 lockdowns affect the teachers' cognitive perception of their emotional world?

Many studies have focused on different issues related to remote learning and teaching. Some have tried to elucidate the effect of a pandemic on the emotional crisis experienced by the teachers, which also has consequences for the emotional wellbeing of the students. The present study is based on the appraisal theory of emotion, which claims that human emotion is a reaction that reflects unconscious appraisal of a particular stimulus and its relevance for human needs. This approach examines the response to a particular event or object, rather than the emotion-generating object itself (Le et al., 2020).

2. Literature review

The COVID-19 pandemic temporarily changed schools and transformed them from a physical learning space to a virtual space. This necessary disruptive process caught the entire system off guard and highlighted the range of aspects involved in remote learning and space (Nissim, Simon, 2022; Gilbertson et al., 2023). Teachers and children alike were forced to learn in front of computer screens in their home environment (Dhawan, 2020; Reimers et al., 2020; Donitsa-Schmidt, Ramot, 2022; Roslan et al., 2022).

Teaching and learning during this emergency demanded a space that supports working and learning, computers and devices suited to remote learning, and a good internet connection. Moreover, it required an ability to share space and computers with other family members who found themselves in the same lockdown situation of working at home and learning remotely (Cowden et al., 2020; Lucisano, 2021). These difficulties and complexities were a source of stress and tension for many teachers (Cowden et al., 2020; Nash, 2020).

The forced change generated by the COVID-19 pandemic was dramatic and demanded implementation of knowledge and technical skills, different modes of thinking, and different pedagogies. In addition to the diversity of challenges experienced by the teachers, due to the crisis that was created, cognitive and social skills and professional teaching activities changed (Crawford et al., 2020; Reimers et al., 2020; Scull et al., 2020). These changes affected the teachers' welfare and wellbeing both personally and professionally. Moreover, the interaction between students and teachers changed and new tools for use in teaching and learning were introduced (Darling-Hammond et al., 2020; Di Pietro et al., 2020; Klusmann et al., 2023).

Studies conducted in Israel indicate that the first stage of the full lockdown was characterized by factors related to *a long stay in a narrow, confined space*—the home. During lockdowns, the home became the main space for all family members, as well as the workspace. Everyone was "imprisoned" in the same space during the period of time in which it was forbidden to go outside. And all of this took place during a period of increasing illness and uncertainty (Dabaui, Beles, 2021).In this context, pre- Covid studies considered space and emotion to be interdependent factors (Elden, 2007).

Thus, a *blurring of spaces* and boundaries formed between the home space and the work and learning space, creating a primarily "hybrid space" comprising home–computer–work–family in the same unit of space for both teachers and students. The boundaries of private life and work life were crossed and became intertwined.

The term "boundary" represents a social-cultural demarcation between two or more sites (Akkerman, Bakker, 2011), a space that divides and causes discontinuity of activity or interaction. Prior to the pandemic, the term "cross-border" described professionals who continue their professional work even when the boundaries and spaces become blurred in an unfamiliar situation, without suitable preparation or qualification (Suchman, 2002). In the present study we will use the concept "hybrid space" as one that comprised work-home and family during the COVID-19 period (Figure 2).

Studies on the relationship between space and emotions focus primarily on the mobility and "navigation" taking place within the relationship between emotions and space. A recent study claims that different people develop diverse emotions with respect to the space in which they are present and act (Galvez-Pol et al., 2021).

Neurological studies have demonstrated that people's appraisal of their environment involves activation of an internal model that their body creates in order to conduct itself in the world. This model reflects information about their emotional and physiological state and their future, desirable state (Byrne et al., 2007). However, the environments and spaces that surround us are not only physical places, but also spaces engraved in our memories, places that our imagination visits, pictures, experiences, and more. The representation of space in people's eyes serves as a tangible, emotional experience, which is based on and takes place with or without a relationship to the external environment (Doyle, 2020; Galvez-Pol et al., 2021).

The teachers were given very little preparation time (Daniel, 2020). A "pandemic pedagogy" (Wang et al, 2020; Wright et al., 2023) was created and activated rapidly to generate a parallel change in the roles of teachers, children and parents in online teaching (Williamson et al., 2020). This issue challenged researchers with the question: What happens when "space-time" in the classroom is suddenly integrated into the home environment? The term "polysynchronic world of learning" was introduced into family life; researchers call this the "third space" (Johnston et al., 2021).
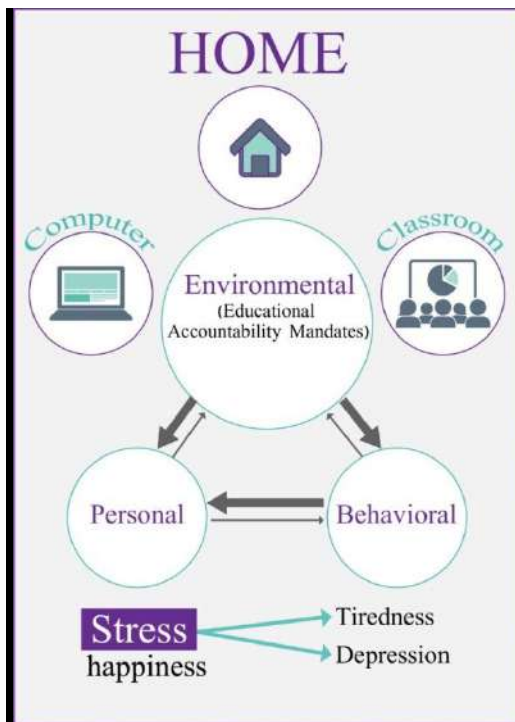
Fig. 2. The hybrid space model

In the profession of teaching and learning, emotions are considered to be very significant and located at the center of all activities (Oplatka, 2018). Teachers experience different emotions while working; these emotions are usually connected to their cognitive world, teaching practices, and burnout. These emotions, particularly the negative ones, also affect teachers' decisions to drop out and leave the profession (Sutton, Wheatley, 2003).

Other studies claim that emotions have intention, involvement, and a perception of the world that "seals its fate" (Ebrahimi, 2022). This is a modern perception that gives emotion a central, meaningful place; it has been integrated into the holistic, integrative bio-cultural model that recognizes emotions and experiences, for good and for bad, as those that are planted in the physical space. This integrative model tries to understand how emotions are built from within this space through architectonic perceptions with a multidisciplinary perspective. Nevertheless, this model demands further investigation with respect to education and teaching (Ebrahimi, 2022). Indeed, few researchers to date have focused on the emotional triggers and their effect on emotion that creates a reaction leading to a certain result (Prayag, 2022).

The appraisal of emotion approach states that emotions are a reaction to a certain situation that led to that reactiveness, in other words, an automatic appraisal of emotions with respect to a certain situation that affects the wellbeing of the individual. One of the many criteria that serve as possible triggers for an emotional reaction is "change of space". I will use this approach to seek answers to the main research question: How did teachers appraise their emotions while they focused on hybrid teaching during the lockdown period? This question will be examined through three main dimensions: the happiness and optimism dimension, the depression and unhappiness dimension, and the fatigue and burnout dimension. To reinforce the theoretical foundations with respect to the examined situation we will use the new model presented by Zeng et al. (2020) – the Model of Triadic Reciprocal Determinism, based on Bandura (1978). The model assumes that people are affected by the combination of their environment, their personal traits, and their behavior. The environment can affect people and their attitudes, as well as changing the direction or intensity of an individual's behavior (Bandura, 1978).

Teaching and Emotion in Teachers' Work

Teaching is an emotional profession. The teachers' emotions have a significant effect on their professional work and the learning outcomes of their students (Yin et al., 2019). Moreover, the teachers' wellbeing is a significant and important issue with many consequences for many aspects of the profession. Teachers usually feel a sense of accomplishment and self-fulfillment in their profession, feelings that contribute to professional satisfaction (Vossen et al., 2023). They are

driven by the feeling that they are agents of change in their students' lives, and through them, a change in society. These feelings contribute to the teachers' wellbeing (Walter, Fox, 2021).

Alongside social support, it is important and possible to manage stress and tension as a central component that affects the teachers' wellbeing. Even during routine times teaching is defined as a profession that creates a high level of stress; indeed, teachers have reported high stress levels at work on a daily basis (Pressley et al., 2021).

Studies conducted during the COVID-19 pandemic emphasized the importance of considering social symptoms such as tension, anxiety, depression, loneliness, panic, and other symptoms arising from the situation and from the forced social distancing and closing of workplaces. The highest levels of stress were reported by women; the reasons for this are embedded in the career–family balance (Quílez-Robres et al., 2021) – a balance that was completely disrupted during the many lockdowns. Other studies have found that the emotional reactions of women and youth to the situation created by the pandemic were expressed through higher levels of stress and depression (Diehl, Carlotto, 2020; Lacomba-Trejo et al., 2022).

The Teaching Profession – Feelings of Stress and Burnout

Teaching poses many emotional challenges in the workplace. Teachers must juggle between their professional qualities, personalities, and emotions (De Stasio et al., 2019). Over the years, studies have indicated that teachers have a high risk of developing anxiety, stress, and burnout due to their work and due to exposure to a wide range of stress factors at work on a daily basis (Othman, Sivasubramaniam, 2019). Stress is defined as a situation in which people must cope with higher demands than what can be performed given the resources at hand, according to their subjective perception (Meurs et al., 2022). The stress response is related to personal factors, personality traits, and personal resources, as well as environmental factors, such as community support and cultural background. This of course, was correct for in the pandemic period (Zadok Boneh et al., 2022).

During the COVID-19 pandemic, many teachers reported strong feelings of loneliness, increased levels of depression, anxiety, and sleeping and eating disorders. A study that examined 634 language teachers in Europe and North America, in April 2020, during the COVID-19 pandemic, revealed a positive relationship between loneliness and anxiety, sadness, and anger (MacIntyre et al., 2020). Other studies have indicated that stress and burnout among teachers depends on their health, approach to the profession, and quality of teaching, and the achievements of their students (Klusman et al., 2022).

Levels of burnout among teachers throughout the world rose significantly with the outbreak of COVID-19 (Pellerone, 2021; Sokal et al., 2020). During the first weeks of the pandemic, teachers in Argentina reported feeling unease and stress following the closure of the schools; this feeling of being overloaded weighed heavily on the teachers who were forced to transition to virtual, remote learning (Vargas Rubilar, Oros, 2021). In the USA, teachers reported difficulties balancing work and family responsibilities during the pandemic (McKim, Sorensen, 2020). This was considered much more significant for women, who experienced difficulties balancing paid work with unpaid household tasks. Another study found that during lockdown, continuous work on digital platforms might lead to cynical behavior (Trittin-Ulbrich et al., 2021).

Stress and Burnout among Teachers in Israel during the Pandemic

A survey conducted in Israel among teachers that left the teaching profession in late 2021 found that young teachers tended to leave because of concerns related to their responsibility for the care of the children. In contrast, older teachers were concerned about their own health risks. Stress rose among all teachers. Teachers from the Jewish community experienced stress related mostly to personal factors, while teachers from the Arab community experienced stress related mainly to their functioning and their working environment (Zadok Boneh et al., 2021).

Stress levels rose because the teachers were required to manage relationships with their students, their families, and their students' families, other teachers, and the school leadership. Simultaneously, their private lives changed. During the pandemic there was an increase in anxiety regarding teaching demands, management of communication with parents, and a lack of administrative support (Pressley, Ha, 2021), in addition to the requirements to teach and to follow the safety protocols of the pandemic period. Recent studies indicate that the emergency in the education system generated negative emotions among the educational staff, including stress, anxiety, sadness, and loneliness (Beaker et al., 2021; Diliberti et al., 2021).

In light of the above, we decided to examine the emotions of teachers in northern Israel with respect to hybrid learning as experienced at the height of the pandemic in Israel (November 2020 – January 2021).

Research Question

How did teachers appraise their emotional wellbeing with respect to hybrid teaching (home–classroom) during lockdown? This question was examined through three main dimensions: the happiness and optimism dimension, the depression and unhappiness dimension, and the fatigue and burnout dimension.

3. Methodology

This is a quantitative study based on a general appraisal of emotion questionnaire. The questionnaire used in the present study required self-reporting by teachers on a Likert scale of 1–7. The first part of the questionnaire collected background information, including gender, age, marital status, teaching experience, socioeconomic status, and participation in continuing education programs for remote teaching. The second part included six statements that examined the feelings and emotions of the respondents with respect to hybrid teaching, for example, "When you think about hybrid teaching, to what extent to you feel tired?"

The questions were general and were based on personal reporting about feelings and emotions. The wording of the questions required thinking about emotion with respect to hybrid teaching. The questionnaire was based on a similar research tool developed by Maslach (2003). For the present study, the statements were tailored to the times and to the aims of the study. They sought to examine how teachers thought, in real time, about their feelings and emotions, during the COVID-19 period, after the second lockdown and at the peak of the third lockdown (Maslach, 2003).

The questionnaire was validated (i.e. examined with respect to its suitability for the research aim) by three content experts with PhDs in education. It was disseminated via the college email network to approximately 800 teachers in northern, Israel, *after the second lockdown*, and the answers were collected *during the third lockdown* (November 2020 – January 2021).

Analysis of the closed questions sought to identify and organize the teachers' general appraisal of their own emotional state in order to elucidate the relationships between the background information and the range of different feelings and emotions the teachers felt about hybrid teaching.

There were 135 respondents, comprising 132 women (97.8 %) and three men (2.2 %), mostly in the age range 31–60 (82.2 %) and married (89.6 %). Nearly half of the respondents had at least 15 years' experience (47.4 %). The respondents taught in different types of schools (public schools, religious public schools or religious private schools). See Table 1.

Table 2 presents the six questions from the questionnaire, with their average scores and standard deviations. In general, negative emotions received higher scores than positive emotions. The respondents reported a high level of fatigue (4.71 ± 1.55) and burnout (4.90 ± 1.71), and intermediate levels of all other emotions.

Table 1. Distribution of demographic variables among the study participants (N = 135)

Variable	Category	N	%	Minimum	Maximum	Average	St. dev.
Gender	Male	3	2.2				
	Female	132	97.8				
Age	18-25	6	4.4				
	26-30	13	9.6				
	31-40	36	26.7				
	41-50	45	33.3				
	51-60	30	22.2				
	+60	5	3.7				
Marital status	Single	6	4.4				
	Married	121	89.6				
	Divorced	8	5.9				
Seniority (years)	0-5	19	14.1				
	5-10	26	19.3				
	10-15	26	19.3				

Variable	Category	N	%	Minimum	Maximum	Average	St. dev.
	15-25	31	23.0				
	+25	33	24.4				
Type of school	Public	66	48.9				
	Religious	67	49.6				
	Democratic	1	0.7				
	Special education	1	0.7				
School level	Elementary	80	59.3				
	Elementary and middle	3	2.2				
	Middle	23	17.0				
	Middle and high	29	21.5				
Experience in remote teaching	Yes	18	13.3				
	No	117	86.7				
Number of work hours at home				1	11	2.67	1.80

Table 2. Average and standard deviation of the scores of the research questions, which were answered on a Likert scale of 1–7 (N = 135)

When you think about hybrid teaching, to what extent do you feel:	Average	St. dev.
1. Tired	4.71	1.55
2. Happy	3.32	1.52
3. Exhausted	4.90	1.71
4. Optimistic	3.56	1.59
5. Depressed	3.70	1.88
6. Unhappy	3.44	1.99

From these statements, we created three dimensions: fatigue and burnout s (statements 1 and 3), happiness and optimism (statements 2 and 4) and depression and unhappiness (statements 5 and 6), which are summarized in Table 3.

Table 3. Descriptive statistics of the three research dimensions (N = 135). The original statements were examined on a Likert scale of 1–7

Dimension	Average	St. dev.	Cronbach's α
Fatigue and burnout	4.80	1.56	0.903
Happiness and optimism	3.44	1.45	0.842
Depression and unhappiness	3.57	1.83	0.882

The reliability of the dimensions, according to Cronbach's α, was high, indicating high stability and consistency in the responses of the participants to the statements comprising each dimension. In the next stage, we sought to determine which of the background factors may affect the range of emotions experienced by the teachers during the COVID-19 period.

Data analysis

Our approach employed a quantitative sequential exploratory model (Setiawan, 2020). This is a comprehensive approach involving one stage of convenience sampling. Triangulation of the

research literature, questionnaire validation, and the statistical analysis of the findings indicated high reliability and validity of the data (Cronbach's α = 0.819).

To test the effect of seniority (years of teaching experience) and school level (categorical variables with more than categories) on the teachers' emotional responses, we conducted separate one-way ANOVAs for each statement, followed by separate tests for each dimension. To test the effect of participation in continuing educational programs on remote teaching (categorical variable with two categories) on the teachers' emotional responses, we conducted separate, independent t-tests for each statement, followed by separate tests for each dimension. To test the effect of hours of work at home (continuous variable) on teachers' emotional responses we performed Pearson correlations per statement, and then per dimension. All data analyses were conducted in SPSS V25 (SPSS Inc., IL).

4. Results
Seniority

The highest level of fatigue (4.94) and burnout (5.32) were among respondents with 15-25 years' experience. To test the relationship between fatigue (statement 1: "To what extent do you feel tired") and burnout (statement 3: "To what extent do you feel burnt out") we conducted a further Pearson test (n = 135). We obtained a strong, significantly positive correlation (R = 0.827, p < 0.01) between fatigue and burnout, in other words, the more tired the subject is, the more burnt out they feel, and vice versa.

The highest levels of depression and unhappiness were among respondents with 5–10 years' experience (3.92 and 3.85, respectively). The highest level of happiness was found among respondents with 0–5 years' experience (3.89), while the highest level of optimism was found among respondents with over 25 years' experience (3.91). However, none of the differences between the groups were significant for any of the statements.

Table 4. Responses to research statements as a function of seniority, ANOVA (N = 135). Values are average ± standard deviation

Emotion	Experience (years)					F
	0-5 (N = 19)	5-10 (N = 26)	10-15 (N = 26)	15-25 (N = 31)	+25 (N = 33)	
Fatigue	4.58±1.46	4.62±1.53	4.54±1.84	4.94±1.36	4.79±1.60	0.32
Happiness	3.89±1.33	2.96±1.64	3.38±1.68	3.00±1.39	3.52±1.48	1.55
Burnout	4.58±1.64	4.81±1.74	4.62±1.79	5.32±1.62	4.97±1.76	0.85
Optimism	3.68±1.34	3.38±1.50	3.62±1.65	3.23±1.71	3.91±1.63	0.86
Depression	3.63±1.80	3.92±1.81	3.62±1.70	3.84±2.19	3.48±1.87	0.26
Unhappiness	3.42±1.89	3.85±1.99	3.15±1.89	3.61±2.19	3.21±1.96	0.57

Table 5. The research dimensions as a function of seniority, ANOVA (N = 135). Values are average ± standard deviation

Dimension	Experience (years)					F
	0-5 (N = 19)	5-10 (N = 26)	10-15 (N = 26)	15-25 (N = 31)	+25 (N = 33)	
Fatigue and burnout	4.58±1.47	4.71±1.57	4.58±1.75	5.13±1.37	4.88±1.64	0.61
Happiness and optimism	3.79±1.22	3.17±1.45	3.50±1.56	3.11±1.46	3.71±1.43	1.21
Depression and unhappiness	3.53±1.83	3.88±1.78	3.38±1.69	3.73±2.07	3.35±1.79	0.43

The highest level of fatigue and burnout was among respondents with 15–25 years' experience (5.13). The highest level of depression and unhappiness was among respondents with 5–10 years' experience (3.88). The highest level of happiness and optimism was among respondents with 0–5 years' experience (3.79). However, as for the individual emotions, none of the differences among groups were significant for any of the dimensions.

Participation in Continuing Education Programs on Remote Learning

Table 6. Teachers' emotions as a function of participation in continuing education programs on remote learning, t-test (N = 135). Values are average ± standard deviation

Emotion	Participated (N = 96)	Did not participate (N = 39)	t
Fatigue	4.82±1.47	4.44±1.73	1.32
Happiness	3.34±1.53	3.26±1.53	0.30
Burnout	4.97±1.65	4.72±1.86	0.77
Optimism	3.77±1.57	3.05±1.52	2.43*
Depression	3.71±1.88	3.67±1.90	0.12
Unhappiness	3.38±1.96	3.62±2.06	0.64

* $p < 0.05$

The level of optimism among respondents who participated in continuing education programs on remote teaching was found to be significantly higher (3.77) than among respondents who did not participate in such programs (3.05) (t_{133} = 2.43, $p < 0.05$). No significant differences were found for any of the other emotions.

Table 7. The research dimensions as a function of participation in continuing education programs on remote teaching, t-tests (N = 135). Values are average ± standard deviation

Dimension	Participated (N = 96)	Did not participate (N = 39)	T
Fatigue and burnout	4.90±1.48	4.58±1.73	1.08
Happiness and optimism	3.56±1.45	3.15±1.41	0.48
Depression and unhappiness	3.54±1.84	3.64±1.83	0.29

The level of fatigue and burnout among respondents who participated in continuing education programs on remote teaching was higher (4.90) than among respondents who did not participate in such programs (4.58). Similarly, their level of happiness and optimism was higher (3.56) than among respondents who did not participate in such programs (3.15). However, the level of depression and unhappiness among respondents who participated in continuing education programs on remote teaching was lower (3.54) than among respondents who did not participate in such programs (3.64). Nevertheless, none of these comparisons were significant.

School Level

Table 8. Teachers' emotions as a function of school level, ANOVA (N = 135). Values are average ± standard deviation

Emotion	Elementary school (N = 80)	Elementary and middle school (N = 3)	Middle school (N = 23)	Middle and high school (N = 29)	F
Fatigue	4.69±1.60	3.67±0.58	5.04±1.36	4.62±1.61	0.84
Happiness	3.36±1.54	4.33±0.58	2.96±1.58	3.38±1.47	0.91
Burnout	4.79±1.79	3.33±1.15	5.57±1.34	4.83±1.67	2.19
Optimism	3.44±1.52	4.67±1.15	3.35±1.58	3.97±1.76	1.43
Depression	3.60±1.88	3.33±1.15	4.52±1.81	3.34±1.88	1.97
Unhappiness	3.39±2.02	3.33±1.15	4.17±2.04	3.03±1.86	1.49

The highest levels of fatigue, burnout, depression, and unhappiness were among respondents teaching in middle school (5.04, 5.57, 4.52, and 4.17, respectively). Furthermore, the highest levels of happiness and optimism were among respondents teaching in elementary and middle schools (4.33 and 4.67, respectively). Nevertheless, none of the differences among school levels were significant for any of the questionnaire statements.

Table 9. Research dimensions as a function of school level, ANOVA (N = 135). Values are average ± standard deviation

Dimension	Elementary school (N = 80)	Elementary and middle school (N = 3)	Middle school (N = 23)	Middle and high school (N = 29)	F
Fatigue and burnout	4.74±1.62	3.50±0.87	5.30±1.31	4.72±1.55	1.58
Happiness and optimism	3.40±1.43	4.50±0.87	3.15±1.44	3.67±1.53	1.12
Depression and unhappiness	3.49±1.86	3.33±1.15	4.35±1.84	3.19±1.67	1.91

The highest levels of both fatigue and burnout, and depression and unhappiness, were among respondents teaching in middle school (5.30 and 4.35, respectively), while the highest level of happiness and optimism was found among respondents teaching in elementary and middle schools (4.50). Nevertheless, none of these differences were significant.

Hours of Work at Home

A weakly positive, significant relationship was found between burnout and hours of work at home ($r = 0.185$, $p < 0.05$), in other words, as the number of hours invested in work at home increased, burnout also increased. Similarly, a weakly positive, significant relationship was found between depression and hours of work at home ($r = 0.199$, $p < 0.05$), in other words, as the number of hours invested in work at home increased, depression also increased. In contrast, a weakly negative, significant relationship was found between optimism and hours of work at home ($r = -0.187$, $p < 0.05$), in other words, as the number of hours invested in work at home increased, optimism decreased. The rest of the relationships were non-significant.

Table 10. Pearson correlations between teachers' emotions and hours of work at home (N = 135)

Emotion	Hours of work at home
Tired	0.136
Happy	-0.165
Exhausted	0.185*
Optimistic	-0.187*
Depressed	0.199*
Miserable	0.167

*$p < 0.05$

Table 11 Pearson correlations between questionnaire dimensions and hours of work at home (N = 135)

Dimension	Hours of work at home
Fatigue and burnout	0.169
Happiness and optimism	-0.189*
Depression and unhappiness	0.193*

*$P < 0.05$

A weakly negative, significant relationship was found between the level of happiness and optimism and hours of work at home (r = -0.189, p < 0.05), in other words, as the number of hours invested in work at home increased, the level of happiness and optimism decreased. In contrast, a weakly positive, significant relationship was found between the level of depression and unhappiness and hours of work at home (r = 0.193, p < 0.05), in other words, as the number of hours invested in work at home increased, the level of depression and unhappiness also increased.

In summary, it appears that one of the main factors affecting feelings and emotions is the number of hours invested in working at home on remote, hybrid teaching. The workload generated in the domestic space has a significant effect on the negative feelings of teachers who were forced, during the pandemic, to replace the school classroom space with the domestic space.

5. Conclusion

The COVID-19 pandemic in Israel required teachers to work most of the time in the domestic space. The transition of the teaching space from the classroom to the home, by means of computer screens, including teaching via different technologies, led to a blurring of boundaries between living spaces and work spaces in all aspects of life. This issue had a significant effect on the teachers' emotions, as demonstrated by the findings of this study.

The emotional responses to the thought of hybrid teaching were expressed by high levels of fatigue and burnout. This study revealed that as the numbers of work hours at home increased, so did the level of burnout and depression. In contrast, the level of optimism decreased. Thus, the workload in the domestic space has a significant effect on the negative feelings of the teachers who were required, during the pandemic, to replace the school classroom space with the domestic space. The findings of the present study are in line with studies conducted in Israel indicating that in the first stage of the full lockdown various difficulties developed as a result of *spending long periods of time in a narrow, limited space* – the home (Taub Center researchers, 2021). Moreover, levels of stress increased due to the great load placed on the teachers' shoulders (RAMA, 2022). Another study that examined stress among teachers during the pandemic found that teachers experienced stress mainly due to personal factors and other reasons related mainly to their role and their work environment (Appel, Robbins, 2022; Zadok Boneh et al., 2021).

We also found that the levels of fatigue and burnout among respondents who participated in continuing education programs on remote teaching were higher than among respondents who did not participate in these programs. We assume that the reason for this lies in the fact that teachers who participated in such programs invested more time and effort in preparing classes, suitable technologies, and teaching tailored to the content being taught. Therefore, their emotional experiences indicated amplified levels of fatigue and burnout. Indeed, findings from surveys performed by the Ministry of Education, the Taub Center, and others indicate that most teachers dedicated "much more time than usual" to preparing online classes (Dabaui, Beles, 2021).

On the other hand, we found that the levels of happiness and optimism among teachers who participated in such programs were higher than among those who did not, but this was not significant. It was clear that these teachers experienced remote teaching as a challenge that expresses the knowledge and practical tools acquired during these programs, and that for them, the pandemic provided an "opportunity" to implement the knowledge they had gained in real time. These findings are in line with other recent studies (Apple, Mills, 2022; Pham, Phan, 2023).

The blurring of the boundaries created a "layered space" that affected the experiences of teachers teaching remotely, in turn affecting their emotions. We believe that a hybrid experience comprising an emotional-teaching and learning space was created. Its results were an emotional overload expressed by burnout. The results of this burnout, as revealed by this study, were a high level of fatigue, the consequences of which have yet to be elucidated. These issues should be expanded and addressed through training and internships in the education system.

The findings of the present study are in line with other studies that have reported an increase in levels of anxiety due to the demands of teaching, managing communication with parents, and a lack of administrative support (Pressley, Ha, 2021). In addition to teaching and following the safety protocols during the pandemic, teachers also managed external sources of stress related to their personal lives, which were perhaps unique to their personal context, in the classroom, and to the leadership circumstances of the school (Beaker et al., 2021; Diliberti et al., 2021). A study by Klusman et al. (2023) reported high levels of emotional burnout resulting from the health effects of

anxiety and high workloads among teachers. It is important to address these factors in order to enhance the desirable variables while decreasing the undesirable ones (Simon, Nissim, 2023).
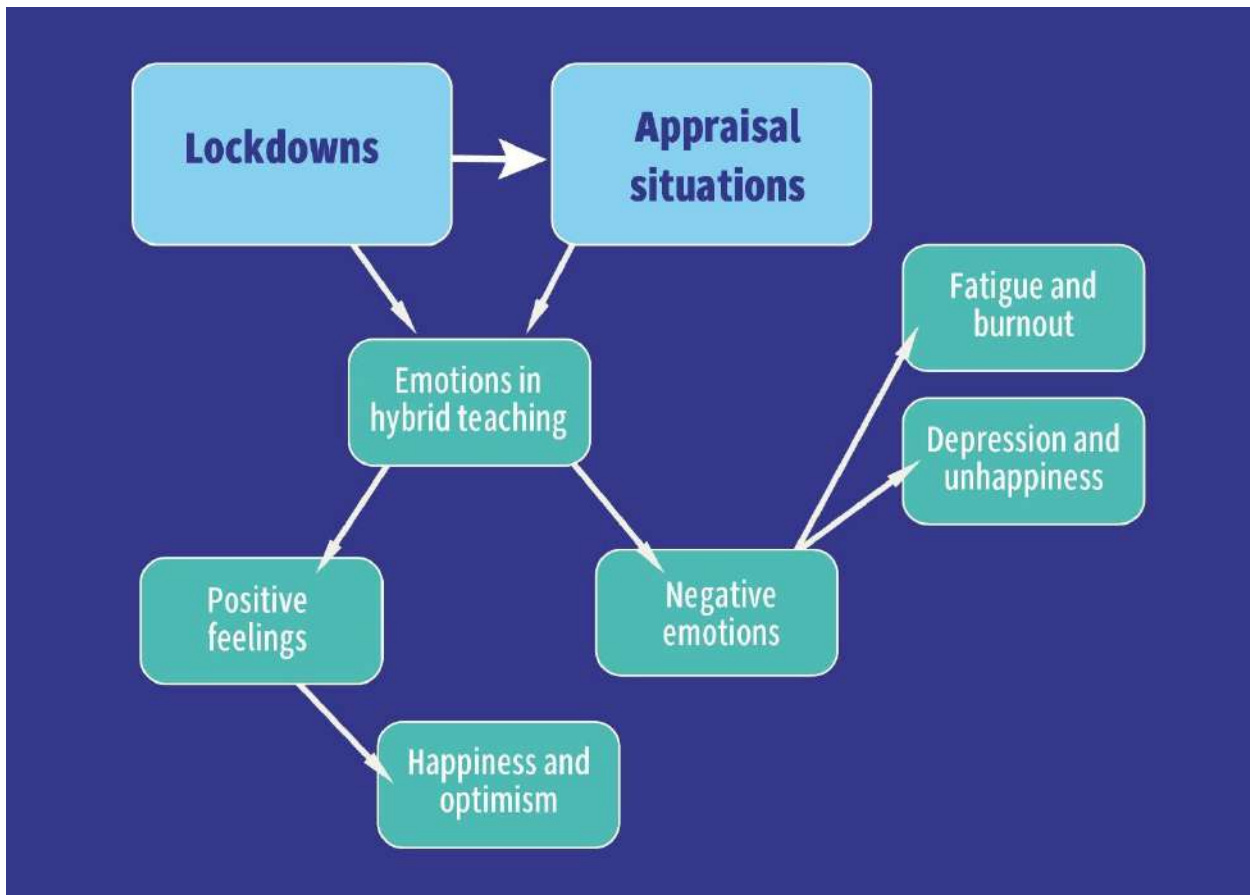

Fig. 3. An appraisal and emotional response model of teachers during the COVID-19 period

In summary, it is clear that the lockdown period and the change in teaching spaces, with respect to the challenges posed by that period, had an effect on the emotional wellbeing of the teachers. This effect was expressed mainly by high levels of fatigue and burnout. In general, this was related to high workloads, numerous teaching hours, and blurring of the boundaries between home and work. This finding is similar to a recent study that found high levels of fatigue and increased emotional exhaustion during the COVID-19 pandemic (Klusmann et al., 2023).

The pandemic brought significant changes to online teaching and learning, and emotional challenges for both teachers and students. Hong et al. (2021), Pham and Phan (2023) and Wang and Jiang (2022) recently demonstrated that during the pandemic teachers and students used different strategies to regulate their emotions, including cognitive reappraisal, social support, attention, positive thinking and positive psychological intervention in order to manage their emotions and promote positive emotions and wellbeing. These findings highlight the importance of understanding and supporting emotional experiences in the context of remote teaching in emergency situations and the need for further research to fully elucidate the consequences of these emotional experiences.

6. Limitations of the Study

This study was conducted on a small sample during a period of lockdowns at the peak of the COVID-19 pandemic; this could account for the lack of significance of many of the statistical tests, for example, the non-significant finding that levels of burnout and negative feelings were higher among teachers in middle schools. This study sought general reporting and appraisal of the teachers' emotional world; further in-depth research is required to expand knowledge on the issues studied.

7. Statements and Declarations

Partial financial support was received from Tel Hai College.

8. Competing Interests
Non-financial interests: none

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Scientific and Linguistic Creative Domains in Secondary Education. A Case Study in Spain

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Abstract

Creativity has been included as one of the four C's of 21st-century skills essential for students to succeed both in school and in the workplace. Thus, many countries are including this topic in their educational policies. This is the case of Spain, where the last educational law (LOMLOE) states that creativity must be worked out in all subjects. In the process of assessing the real situation of the Spanish educational system in terms of creativity development and observing future changes regarding its implementation, this work presents a cross-sectional quantitative study. The performance of 223 students of the four grades of compulsory secondary education in both the scientific and the linguistic domains of creativity was evaluated. Two instruments were used to measure daily and specific microdomains of scientific creativity and verbal-metaphorical microdomain of linguistic creativity. Results show a moderate to low development of creativity in secondary students in all studied domains of creativity. There were statistically significant differences according to gender, with women being the ones with greater creative skills. A progressive increase in creativity was observed up to the third year of compulsory secondary education, with a decrease in the last year. Finally, a positive correlation between scientific and linguistic creativity was established, in addition to an even higher correlation between both microdomains of scientific creativity. This study shows that there is still work to be done to promote creativity in the Spanish educational system, attending to the different subjects and creative domains. Some proposals are discussed, which highlight the importance of teacher training to achieve this goal.

Keywords: creativity assessment, Compulsory Secondary Education, creativity domains, scientific creativity, linguistic creativity.

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1. Introduction

Research on creativity has experienced an exponential development since the mid-20th century (Torrance, 1959; Guilford, 1967). Currently creativity is considered a transversal and essential macro-competence in education (Kaufman, Sternberg, 2019). Despite the difficulty of specifying a satisfactory definition, it has been agreed that creativity is an inherent capacity of the human being, which implies novelty or the production of something new and useful within a given context (Stein, 1953; Guildford, 1967). Research in this field is focused in two different areas: personality characteristics associated with creativity and the different creative domains.

Regarding the personality characteristics of creative people, studies highlight that openness is one of the factors that has a more consistent and contrasted link with creativity. Specifically, this factor is related to the curiosity to experiment, discover, and learn, in such a way that it encourages the ideas or products generated to be varied and unusual (Sánchez-Ruíz et al., 2017; Dollinger et al., 2004). It is worth mentioning that the most recent works suggest that creativity has a componential nature, and it is influenced not only by personality characteristics, but also by affective, motivational and sociocultural aspects (Kaufman, Glăveanu, 2019).

On the other hand, the existence of different creative domains constitutes a hot and controversial research topic. In this context, a domain is understood as a specific area of knowledge, such as scientific, mathematic, linguistic, artistic, etc. that can be divided into different subdomains. Thus, the discussion centers on whether creative people are creative in everything they do, or only in those activities pertaining to a certain domain. Pioneering works in this field defended the existence of general creativity and, therefore, its transferability from one domain to another (Torrance, 1959). However, subsequent studies point to the existence of different creative domains, with a person having different performances in each of them (Runco, Bahleda, 1986).

In this sense, the Amusement Park theoretical model (Baer, Kaufman, 2005), which includes both general and specific elements, is worth mentioning. It is based on a hierarchical structure in four levels: initial requirements, general subject domains, specific domains and microdomains. In the first place, initial requirements such as intelligence, motivation or the appropriate environment make it possible for creativity to appear in any domain. Second, the general thematic areas are associated with different areas of knowledge. The controversy is to establish how many and which domains exist. For example, Kaufman (2012) distinguishes five domains: everyday, scholarly, performance, scientific/mechanical, and artistic. Third, there are specific domains. Thus, within the general artistic domain, music, painting or dance are located. Finally, microdomains are associated with more specific creative tasks. For example, within writing, different microdomains can be distinguished depending on whether the generated product is a poem or a novel. In short, this hierarchical model is a powerful theory, but limitations have also been noted, which stem mainly from the fact that distinction between levels and domains is not very precise.

Regarding the two domains analyzed in this study, more attention has been given to scientific creativity when compared to linguistic creativity. Research on scientific creativity is based on the fact that science and its generation of knowledge is based on creative processes. A recent meta-analysis (Julmi, Scherm, 2016) reinforces the idea of the existence of a specific scientific/mathematical domain, and it is known that mathematical education has an impact on the development of students' creative potential (Kontrová et al., 2021). In any case, there is a strong consensus that scientific creativity is based on domain-specific knowledge (science knowledge) and other skills (Huang et al., 2017), and there are different instruments to measure scientific creativity in secondary education (Hu, Adey, 2002; Sak, Ayas, 2014; Hu et al., 2010). On the other hand, the linguistic domain of creativity is closely related to the ability to generate metaphors and analogies (Veale, 2006). These are used to create new ways of thinking about issues that may be familiar, but which involve exploring the boundaries separating conceptual categories to structure the world and, consequently, the use of words to communicate it (Ortony, 1993). It should be noted that construction grammar, one of the main cognitive linguistic theories, has also recently been added to research on linguistic creativity (Hoffman, 2019).

Thus, it can be concluded that creativity is present in many different areas. It not only allows the production of works of art or musical pieces, but also business actions or cutting-edge scientific-technological advances. Furthermore, all these creative outputs in different domains share three characteristics: novelty, fitness for purpose, and utility. For all these reasons, the development of creativity is a key objective of education, since it has been explained that education directly influences six aspects affecting creativity: cognitive abilities, specific knowledge,

the struggle to excel, openness to new ideas and experiences, collaboration, and motivation. This role of education in creativity might also be extrapolated, since the degree of creativity of the students influences not only their own person, but also the social and economic context (Tang, 2017). From this more global perspective, creativity helps individuals to identify problems and seek new solutions or improvements and, therefore, increases the probability of achieving individual and collective goals. In addition, it helps students to function in a constantly changing society. It seems clear that the future will generate the need for new professional profiles and especially an ability to adapt to a versatile world that depends largely on creativity (Kaplan, 2019).

This key role of creativity in the training of people has clearly been reflected in political-educational institutions. It is worth highlighting the relevance that the OECD has granted to creativity (OECD, 2019). It has configured a competence framework for creativity and has incorporated the measurement of different domains of creativity in the 2022 edition of its PISA Tests. The OECD insists on the need to grant the space that creativity deserves in curricula. And this is what is happening in the case of the Spanish curriculum. The first mention to creativity can be found in the LGE law (BOE, 1970), but only for the Early Childhood Education stage. In the subsequent laws there is no mention to creativity but in the LOCE law (BOE, 2002) creativity is considered as a fundamental value for the development of society. It is established as a quality principle and as an objective to be achieved both in the Primary Education stage and in Baccalaureate. The LOE law (BOE, 2006) established creativity as an objective to be achieved in all educational levels. Finally, the LOMLOE law (BOE, 2020) highlights the transdisciplinary character of creativity, pointing out that "creativity will be worked on in all subjects" (p. 1222874). However, much work remains to be done to achieve this goal, starting with teacher training, the design of didactic materials to foster creativity and, finally, a better conceptualization of creativity and its importance in core aspects such as problem-solving.

With regard to the aforementioned 2022 PISA Tests, these must be interpreted as a turning point. It will allow us to have a global idea of the state of the development of creativity in Spain with respect to other countries (it is expected that the results are released on 2023) and it will also offer very sensitive data when discussing and triangulating complementary measurements. At this point, it should be noted that creativity assessment is still developing, since the construct of creativity, the debate over its distribution in domains, and even the assessment instruments require further development. The case of Spain is not an exception because there are not many studies on student's creativity and rather located in specific populations, such as gifted students (Bermejo et al., 2010).

In this context, the present study aims to evaluate the creativity of 223 students from the four compulsory secondary education levels, taking into account the scientific and linguistic domains. Two specific objectives are proposed: (1) to study the possible differences according to gender or level; and (2) to establish the degree of correlation between scientific and linguistic creativity. The focus of this research makes it possible to determine the current situation of different creativity domains in Spanish classrooms. This is an essential prior step to design an educational plan focused on the development of creativity (Beghetto, 2019), which will be detailed in the conclusions section.

The hypotheses nurturing this work are that creativity performance, at both scientific and linguistic domains, of compulsory secondary education students is low-to-moderate with no differences according to gender, with an increase in creativity as the student progresses in the educational system. A positive correlation between both scientific domains is expected, whereas no correlation is expected between both scientific domains and the linguistic domain.

2. Method

This work presents an exploratory, cross-sectional, quantitative research design. It was developed in an educational center in the province of Valencia (Spain). The educational center is located in a medium size town (around 23.000 inhabitants) at 21 km of the capital of the province, with an average income close to 30.000 euros. Participants were 223 students homogeneously distributed in the four levels of compulsory secondary education. Table 1 shows the demographic characteristics of the sample.

Table 1. Demographic characteristics of the sample studied

Level	Number of students	Age		Men	Women
		Mean	Standard deviation		
1st	57	12.38	0.49	28	29
2nd	55	13.21	0.46	22	33
3rd	57	14.44	0.50	29	28
4th	54	15.48	0.54	36	18

Data was collected in 50-minute sessions during the 2021-2022 academic year, the year before the implementation of the new LOMLOE law (BOE, 2020). Prior to the sessions, school management teams, legal guardians, and participants were informed about the treatment of the data and the scope of the research. Two previously validated instruments were used to assess the creativity of the students. They were presented as paper-based questionnaires, with the visual support of the projection of the corresponding statements on slides.

The first instrument, to assess scientific creativity, was developed by Hu et al. (2010) and is based on the establishment of scientific problems. It is inspired by the Torrance Test of creative thinking (Torrance, 1966), and assesses fluency, flexibility and originality. Fluency refers to the number of generated questions, flexibility to the number of knowledge areas in which these questions are framed, and originality arises from the statistical treatment of the data. This instrument includes two items. In the first one, participants are asked to generate scientific questions based on their life and daily observations (daily scientific creativity, DSC). In the second one, students are asked to formulate scientific questions related to an image of an astronaut on the moon (specific scientific creativity, SSC). Time was limited to 8 minutes per item, as in the original research. Hu et al. (2010) described the instrument as robust and reliable (with interrater reliabilities between .69 and .85).

The second instrument focuses on the linguistic domain of creativity, specifically the verbal-metaphorical microdomain, which is considered a central core of creativity (Kasirer, Mashal, 2018). In summary, the ability to create metaphors is related to the linking of two apparently unrelated concepts, which reflects the ability to break the most conventional or obvious links, to establish new, more creative ones (Dietrich, 2004). An instrument developed by Levorato and Cacciari (2002) and later adapted by Kasirer and Mashal (2018) has been used. It includes ten items, each of which corresponds to a feeling or emotion, such as joy, sadness, euphoria, or frustration. Five of these are presented to the participants with the aim of promoting figurative reformulation, such as "love is...", while the other five are presented as an analogy, such as "feeling frustration is like...". Time was limited to 8 minutes in total. Two judges coded the data independently, with an agreement rate of 89 %. Any case of disagreement was discussed by both coders.

The procedure for data analysis of the answers to the first instrument was similar to that described by Hu et al. (2010). Fluency was scored as the number of (valid) generated questions. To assess flexibility, a prior categorization of the questions was carried out (Pont-Niclòs et al, 2023), which resulted in 12 categories for DSC (the most common were "astronomy" and "functioning of the human body") and 7 categories for SSC (the most common were "characteristics of the moon" and "physical-technical aspects of the trip to the moon"). Flexibility was scored as the number of categories used per participant. For the originality assessment, the frequency of appearance of each question in the total sample was calculated. Those questions with a frequency of less than 5% received a score of 2; those with a frequency between 5 % and 10 % obtained 1 point; while those with a frequency of more than 10 % did not add any points. Finally, the total scientific creativity score was obtained as the sum of the scores obtained for fluency, flexibility and originality. Regarding the second instrument, we proceeded as explained in Kasirer and Mashal (2018). The questionnaires of each participant were evaluated independently, first discarding invalid answers (out of context or empty). Next, the answers were quantified according to three categories: literal answers (1 point), conventional metaphors (2 points) and new metaphors (3 points). The score for verbal-metaphorical creativity was obtained by adding the total scores obtained.

All collected data were treated anonymously and SPSS Statistics v26 program was used to carry out the pertinent statistical calculations. Normality of the distributions was determined using the Kolmogorov-Smirnov test (Table 2). As it can be observed, specific scientific creativity (SSC)

displays a normal distribution (p > .05), whereas daily scientific creativity (DSC) and verbal-metaphorical creativity are non-normally distributed (p < .05). For the non-normally distributed variables (DSC and verbal-metaphorical creativity), values for skewness indicate a slightly positive-skewed distribution (DSC: .19; verbal-metaphorical: .05), while kurtosis correspond to light-tailed distributions with few outsider data points (DSC: .08; verbal-metaphorical: -.4). In the case of the normally distributed variable (SSC), value for skewness indicates a symmetric distribution slightly left-skewed (skewness = -.06) and the kurtosis value corresponds to typically platykurtic distribution (kurtosis = -.08). Those values have been considered acceptable for a normally distributed sample (Burdenski, 2000).

Table 2. Kolmogorov-Smirnov tests results and values for skewness and kurtosis for the studied microdomains

Microdomain	Test statistic	p	Skewness	Kurtosis
DSC$^\phi$	.07	.02	.19	.08
SSC	.05	.2	-.06	-.08
Verbal-metaphorical$^\phi$	.06	.03	.05	-.4

$^\phi$ Non-normally distributed variable

An inferential statistical analysis was carried out to assess the existence of significant differences between the variables. Thus, for the comparison between genders Mann-Whitney U test was used for non-normal distributions, and Student's t-test for independent samples for variables with normal distributions. For the comparison by level, Kruskal-Wallis test was used for non-normal variables and one-way ANOVA test for normal variables. The effect size was calculated using Hedges' g. To study the correlation between the different domains of creativity studied, Spearman's correlation coefficient was calculated. In all cases the level of statistical significance was set at 0.05.

3. Results and discussion
3.1. Scientific domain of creativity
In this study, two components of scientific creativity have been addressed: daily and specific. The first one was evaluated by means of an open question, while for the second one a closed question was used. These two components were analyzed according to the three variables described above (fluency, flexibility and originality); the sum of which gave rise to the total score. For DSC a high number of questions were related to wireless connections and ICT tools. Other recurring questions were related to the Universe, life on Earth or on other planets, or with means of transportation. On the other hand, for SSC the most common questions were linked to gravity, the presence of air on the moon or the possibility of life in the moon.

The total score for the two domains of scientific creativity studied (daily and specific) according to gender are shown in Table 3. Women generally show greater creative ability to formulate problems and scientific issues. This result is in line with other studies, according to which self-concept greatly conditions the creativity of students, who have assumed a certain social role marked by their gender (Nakano et al., 2021).

Table 3. Differences according to gender on the scientific creativity microdomains

Micro-domain	Gender	Mean	SD	Median	IQR	Statistic	p	Hedges's g
DSC$^\phi$	Female	21.79	7.10	22	10	z = 3.39	.001**	.45
	Male	18.41	7.95	17	10			
SSC	Female	20.39	5.37	21	7	t = 3.73	.000***	.50
	Male	17.30	6.83	17	10			

$^\phi$ Non-normally distributed variable
** There are significant differences with a significance level of 0.01
*** There are significant differences with a significance level of 0.001

To check if the observed differences were statistically significant, Mann-Whitney U test was performed for DSC, and t-Student test was performed for SSC (see Table 2). As can be seen, there are statistically significant differences according to gender for both types of scientific creativity (p < 0.05). The effect size was found to be moderate for DSC and strong for SSC, according to the classification provided by Cohen (1988) for behavioral sciences.

The results depending on the level of the students are shown in Table 4. For the non-normally distributed variable DSC, the Kruskal-Wallis test was used, whereas for the normally-distributed variable SSC, ANOVA test was applied. In the latter case, the homogeneity of the variances was corroborated by using the Levene test (F = .3; p = .8). Since p > .05, verifying the ANOVA applicability criterion of homoscedasticity. It can be observed that, in both microdomains, these values are similar for the first two years, with a slight increase in the third year and a slight decrease in the last level of compulsory secondary education. The first increase can be justified by the development of the knowledge and skills in this stage since they have a positive impact on the performance of the creative processes. On the other hand, the decrease in the fourth year may be related to the disagreements typical of the adolescent age and a low motivation (Hu et al., 2010). As can be seen, no statistically significant differences were found between courses for the two microdomains of scientific creativity studied (p > 0.05).

Table 4. Differences according to level on the scientific creativity microdomains

Microdomain	Level	Mean	SD	Median	IQR	Statistic	p
DSC$^\phi$	1st year	19.56	7.47	18.0	9.5	H = 1.75	.63
	2nd year	19.40	8.60	19.0	11.0		
	3rd year	21.00	7.02	20.0	10.5		
	4th year	20.20	7.83	20.5	10.0		
SSC	1st year	18.72	6.30	19.0	7.5	F =1.92	.13
	2nd year	17.62	6.46	18.0	10.0		
	3rd year	20.39	6.40	21.0	9.5		
	4th year	18.41	6.03	17.0	8		

$^\phi$ Non-normally distributed variable

3.2. Linguistic domain of creativity

The total scores for verbal-metaphorical creativity according to gender are shown in Table 5. As happened for scientific creativity, women obtain better scores. Although these results are contrary to those presented by Kasirer and Mashal (2018), it should be considered that their sample was small (54 participants). In addition, there are other studies in the literature supporting the existence of significant differences between genders, derived from self-concept and pre-established social roles (Nakano et al., 2021) and similar results were obtained in a sample of Spanish first-year secondary students (Pont-Niclòs et al., 2023). Results of Mann-Whitney U test show that these differences are statistically significant, with a moderate effect size.

Table 5. Differences according to gender on the verbal-metaphorical microdomain

Micro-domain	Gender	Mean	SD	Median	IQR	z	p	Hedges's g
Verbal-metaphorical $^\phi$	Female	15.65	5.69	16	8	2.95	.003**	.33
	Male	13.65	6.42	12	9			

$^\phi$ Non-normally distributed variable

** There are significant differences with a significance level of .01

Regarding differences between levels, the total scores for verbal-metaphorical creativity are shown in Table 6. The trend is similar to that detected for scientific creativity, with the increase in this case between first and second years, similar values for second third years and a decrease in fourth year. This could be similarly explained by the development of knowledge and skills typical of the stage in the second year of compulsory secondary education and low motivation in fourth-year students. In this case, and unlike what happened for scientific creativity, Kruskal-Wallis test indicates that the observed differences are indeed statistically significant. To determine where the

differences laid between groups Bonferroni test was applied. For α = 0.05, the *post-hoc* analysis indicated statistically significant differences between fourth year and second year (p = 0.033) and fourth year and third year (p = 0.046), but not between the other groups (p ≥ 0.942).

Table 6. Differences according to level on the verbal-metaphorical microdomain

Microdomain	Level	Mean	Standard deviation	Median	IQR	H	p
Verbal-metaphorical ᵠ	1ˢᵗ year	14.07	6.45	14.0	8.5	10.13	.018**
	2ⁿᵈ year	15.47	6.25	17.0	10.0		
	3ʳᵈ year	15.67	6.11	15.0	9.0		
	4ᵗʰ year	12.41	5.44	12.0	8.3		

ᵠ Non-normally distributed variable
** There are significant differences with a significance level of .01

3.3. Correlation between scientific and linguistic creativity

In the context of this research, it is essential to study a possible correlation between scientific and linguistic creativity. This is especially relevant attending to the intense debate on the existence of specific domains of creativity, or the consideration of creativity as a general construct. Huang and Wang (2019), for example, found positive correlations between general creativity and scientific creativity, but Bernal et al. (2017) pointed to domain-dependent creativity, having found no correlation between scientific and figurative creativity. Thus, the Spearman correlation coefficient was calculated for each of the microdomains studied. Table 7 shows the corresponding results.

Table 8. Spearman correlations between the different microdomains of creativity

Micro-domain	DSC		SSC		Verbal-metaphorical	
	r_s	p	r_s	p	r_s	p
DSC	1	-	.71	< .001***	.42	< .001***
SSC	.73	< .001***	1	-	.42	< .001***
Verbal-metaphorical	.42	< .001***	.42	< .001***	1	-

*** Correlation is significant at the .001 level

As can be seen, there is a positive and significant correlation in all cases (p < 0.05), which indicates that students who are creative in one microdomain are also creative in the other two microdomains. Even though this result, a priori, could point out to the non-existence of creativity domains, a deeper analysis is needed. First, a very high correlation is obtained between the two aspects of scientific creativity studied (r_s > 0.7), which indicates a presumable relationship between daily and specific scientific creativity. However, the correlation between the two types of scientific creativity and verbal-metaphorical creativity, although positive, is clearly lower (r_s ≈ 0.4). This means that a particular student can show a good creative capacity that will be greater or lesser depending on the students' skill in that area of knowledge.

4. Conclusion

As explained, there is a certain difficulty in conceptualizing, measuring and, in short, understanding creativity in depth. There is, however, a consensus in the idea that creativity is fundamental for the development of people and their ability to function in different spheres of life. Thus, there is no doubt that creativity must occupy a nuclear space in educational debates and curricula. This will undoubtedly benefit from the impulse of the OECD and its PISA 2022 Tests.

This context legitimizes the interest in evaluating creativity in educational contexts, and, particularly, in Compulsory Secondary Education, which is the educational stage that PISA takes as a reference. Thus, the present investigation allows to measure and interpret very sensitive aspects related to the development of creativity of these students in the scientific and linguistic domains. There are some limitations, however, derived from the sample size and representativeness, as well

as the deficiencies that, although validated and widely used by the scientific community, the assessment instruments used may have.

Firstly, it has been possible to verify that the Spanish students generally present a moderate to low level of creativity. Secondly, statistically significant differences were found according to gender, being female students those showing greater creative skills, which is contrary to the initial hypothesis. Also, statistically significant differences have been detected between levels in daily scientific creativity and verbal-metaphorical creativity, obtaining similar trends for all the studied variables. Finally, positive correlations have been established between all the studied microdomains of creativity, with a greater correlation between both scientific creativity microdomains than between these and the verbal-metaphorical microdomain. These results are partially in line with the proposed hypothesis. Thus, it can be deduced that students have a greater capacity to develop creatively in those domains in which they are more proficient.

It is essential to reflect on how and when to develop creativity in the educational system. Being creativity a very important macrocompetence, it is not correct to address it just in general terms or circumscribe it to specific domains such as art. The teacher training faculties have to intensify a reflection on the development of creativity, which is specified in three proposals. The first one is related to the training of preservice and in-service teachers. They must conceptualize creativity and its metacognitive processes, taking into account aspects such as students' cognitive styles (Prosekov et al., 2022), as well as understand the teaching materials able to foster it. The second proposal involves a need to discriminate which didactic materials are able to develop creativity, using qualitative studies with a categorization taking into account the different creative domains. This is a preliminary step to verify that there are interesting materials that can be used, but also that it is urgent to design new didactic materials to foster a transdisciplinary development of creativity. Transdisciplinary because, as the last Spanish educational law (LOMLOE) specifies, it has to be carried out in all areas or disciplines. This could be done assimilating didactic approaches related to problem-solving or divergent thinking, for example. However, it is also interesting to design specific materials regarding a particular subject, knowledge field, or creative domain (Hu et al., 2013; Soboleva et al., 2022).

Finally, the third proposal implies a true transfer effort, with the most important conclusions of the theoretical and empirical studies on creativity having their projection in instructional and didactic changes. The legislative change of the LOMLOE is a propitious context because it not only highlights the importance of attending to creativity in all subjects, but also the autonomy of centers and teachers to decide how the syllabus should be implemented. The aforementioned transfer can also rely on manuals, courses or even workshops conducted by experts in creativity that can be a point of support for teachers. Then, they will become aware of the current state of creativity in the Spanish educational system, which the present study has contributed to outline.

5. Funding

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Development of a Chat Bot Algorithm to Improve the Efficiency of the Process of Organizing Corporate Training

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Abstract

The development of professional competencies of personnel is an important task for modern organizations. And its effective solution is facilitated by the emerging opportunity to use artificial intelligence, with the help of which the boundaries of access to the latest tools and training technologies are expanding, allowing personnel to adapt to changes and prepare them to solve current problems and achieve strategic goals. Also, the use of digital services and tools opens up broad prospects for ensuring continuous training and development of personnel, which helps to increase the value of human capital in the organization. One of the promising innovations using artificial intelligence is chat bot technology, which provides quick information search, improves adaptation and communication processes, activates human potential, and helps improve learning efficiency through additional interaction with people through text messages. The article presents a summary of the experience of organizations in using chat bot practices in the HRM system. The implementation of the chat bot technology saves labor costs and allows companies' management to personalize training, provide staff with highly intelligent support, free up their time from performing routine tasks, maintain a high level of interactivity in the learning process, while continuously monitoring the acquisition of knowledge by employees with receiving feedback. The following methods were used for the study: analysis, synthesis, comparison, graphic description, structuring, modeling, visualization. The authors have developed algorithms for working with requests for personnel training. It has been shown that the implementation of chat bot technology saves labor costs and increases the efficiency of work with internal clients of the HR department. The authors calculated the effectiveness of the chat bot by reducing the time spent processing applications from internal clients of the HR department. In further research, it is

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advisable to continue the work begun in terms of expanding the functions of the chat bot and supplementing its algorithm with machine learning.

Keywords: algorithm, corporate personnel training, machine learning, chat bot, efficiency.

1. Introduction

The emerging trend of lifelong education in any area of business requires the development and implementation of new technologies and personnel training tools. The range of opportunities for corporate training of personnel has expanded significantly with the introduction of digital technologies, which at the same time complicated the work of specialists in human resources management (Pulyaeva, 2021). The relevance of introducing digital innovations that make eLearning possible and in demand to train employees in the modern world, which is characterized by the rapid pace and speed of introducing changes aimed at improving both technological and management processes (Tome et al., 2021). The new reality is that traditional forms and methods of training do not satisfy modern business (Tome et al., 2022). The emergence of new professions and activities requires the introduction of technologies that allow working with large amounts of information in a rapidly changing environment and an atmosphere of multitasking (Skhvediani et al., 2022). The implementation of new learning strategies involves modern digital methods of transferring knowledge and monitoring their assimilation (Zaborovskaia et al., 2020). E-Learning includes a wide range of applications and processes built on web technologies, involves the use of a personal computer or mobile communication devices, virtual classrooms and other telecommunication technologies (Balashova, Gromova, 2017). The e-learning system is used by almost all of the world's largest companies like Honeywell, Johnson & Johnson, Microsoft, Adidas, Gazprom, Yandex. The entire global online education market is valued at $165 billion, and by the end of 2023, according to Global Market Insights, it will grow to $240 billion, and this is a conservative forecast (The High Impact…, 2023). Many large companies that are pioneers in the technology sector, such as Amazon and Google, have introduced new training methods for their entry-level employees and are using social networking technologies (Barykin et al., 2020). The well-known large company Deloitte has switched to a fully digitized and gamified personnel adaptation process. Technological solutions and advances in virtual and augmented reality provide teachers with new ways to provide information and learning materials to users, ensuring high levels of engagement, stimulating their cognitive activity and inclusion in the process. Digitalization of internal corporate training is an integral part of building the digital ecosystem of a modern enterprise (Babkin et al., 2021).

One of the newest and most effective technologies for organizing an internal corporate educational process is a chat bot. This is a program with a specific algorithm and limited content of operating knowledge. The principle of its operation is that the user specifies certain commands using a word or a number (a sign, a combination of symbols, keys, etc.) and an instant response to the given command from the bot (Balatamoghna, Nagajayanthi, 2022).

The well-known nickel and palladium producer Norilsk Nickel has implemented its HR Chat Bot based on the Telegram messenger. A bot named Nika answers all questions regarding internal communications, vacations, receiving certificates from work, annual vacations, etc. (Global Marketing…, 2023). According to previous studies, chat bots, typically built on machine learning, are mainly used in areas such as customer support (Vu et al., 2021), therapy (Konapur et al., 2021) or personal devices (for example, the Siri bot in Apple products) (Mohamed et al., 2021).

Chat bots are widely used in the human resource management system of modern organizations to adapt new workers, helping them solve many issues without addressing more experienced colleagues. This technology saves the time of mentors and managers to solve typical problems when adapting an employee, and the employee himself may not distract the mentor and not wait for an answer for a long time (Suvalova et al., 2021).

Since the organization is interested in accelerating the adaptation of a new employee, delegating the functions of his support to a chat bot allows him to quickly go through all stages of onboarding, including coordinating his actions during this period, developing an individual learning path, informing about the dates of training events and monitoring the results of their completion . Chat bots can show a map of the office, as well as the location of workstations, which will help navigate the new work environment. In the chat bot newcomers can familiarize themselves with the necessary documents: charter, internal labor regulations, work instructions, code of ethics and others. A virtual assistant can, to some extent, replace a mentor by answering

common questions from newcomers, which will save time for mentors. There is an opportunity to get acquainted with information about the organization: its history, mission and values. In addition, you can show informal rules of behavior in the team and in the office, and make newsletters for employees in an interesting and unusual form.

Scientists from Norway studied the practice of using chat bots in HRM and concluded that the chat bot can increase HRM efficiency by processing repeating requests and adapting HRM support in response to the results of the analysis of the chat bot. At the same time, the chat bot affects the HRM function in terms of new tasks and requirements for the competence of HR specialists (Taule et al., 2022).

As Akshay Khetrapal, a specialist from India, notes, there is already a large range of developed chat bots in the field of HR that companies can use to solve the problem in recruiting, adaptation and motivation of the staff. He called 14 modern chat bots from various developers, which allow reducing the temporary costs of the routine tasks of HR specialists (Khetrapal, 2023).

To justify the rationale for addressing the use of a chat bot as one of the examples of the using of artificial intelligence in corporate training, it is necessary to provide a number of arguments. The effectiveness of the spread of artificial intelligence has been recognized in many activities (Kabudi et al., 2021). The obvious use of artificial intelligence resources is expressed in the method of assisting an employee in performing professional functions, taking into account the challenges of the modern world, these include: accelerating the pace of work due to increasing changes, transitions with the processing of large volumes of data, which, in turn, actualizes the need for liberation it from routine and similar tasks, by automating them and delegating them to machines, which allows reducing the labor intensity of performing functions and increasing productivity efficiency. This becomes possible only if innovation is introduced into the employee training process itself, since its organization must correspond to the pace and rhythm of the environment. Therefore, the use of a chat bot, as one of the options for the emerging educational process, should help in achieving the goal of increasing the efficiency and productivity of a person in the workplace. The potential use of a chat bot is to provide time savings and enhance the skills of the worker according to the required requirements to perform the job. Since some of the resources are delegated to the virtual personal assistant, he, in turn, will be able to solve more creative problems that require intuition and empathy. Chat bots allow you to quickly provide access to data, allow you to better manage time, maintain internal communication, etc. Therefore, saving time and material resources is carried out by efficiency measurement factors. For subsequent interaction with suppliers, the chat bot becomes a virtual mentor, interaction with which allows you to maintain a successful learning trajectory in adaptation and course management. This ensures that a new employee quickly joins the team and begins working independently, which indicates the effectiveness of investments in training.

2. Methods

An important scientific source on which the authors of this study relied is the work of scientists from South Africa (Okonkwo, Ade-Ibijola, 2021), who previously analyzed 53 works on chat bots from recognised digital databases. They found that only 5 % of studies focused on the administration and organizational side of using a chatbot. "This implies that the frameworks for the development and implementation of Chatbots, as well as the design features and contents, must be improved" (Okonkwo, Ade-Ibijola, 2021). It is for this reason that the authors chose the following purpose and object for their study.

The purpose of this study is to explore the possibilities of using chat bot technology to improve the effectiveness of corporate training and meet the organization's need for highly qualified personnel.

Achieving the set goal will be based on testing the null hypothesis, which is that the use of the developed chat bot algorithm will increase the efficiency of organizing internal corporate training.

The main object of the study was the activities of an international IT company specializing in the field of information security, using the example of which the process of developing and implementing a chat bot in the corporate training process was analyzed. The subject of the analysis was the procedure for processing applications for training, its optimization and efficiency, which allows for a reduction in the labor intensity of the business process through the use of chat bot technology.

The researchers used the following methods: data collection, survey, compilation of a graphic image of a working day of a specialist, analytical review, comparison, observation, graphic description,

modeling, visualization. The authors relied on the data obtained as a result of the analysis of sources presented in the open access on official websites of the analyzed companies, as well as the internal corporate data of the company being the object of the research. The main object of the study was an international IT company specializing in the field of information security.

The research methodology included the following stages:

1) studying scientific and practical literature on the problems of using chat bots in the modernization of management business processes of the organization;

2) analyzing the process of intra-corporate training of employees (auxiliary business process) of the organization under study, the identification of its narrow places. At the same time, a graphic image of the working day was used to evaluate the labor cost of HR specialists;

3) developing the chat bot algorithm to reduce the preparatory stage of the process of organization of training in the organization using methods of graphic description, modeling and visualization;

4) evaluating the efficiency of the developed algorithm based on an assessment of static data on the time spent and the speed of processing employees' applications for training.

The main indicator of the evaluation of the efficiency of the process of organizing corporate training in this study is the speed of processing applications received in the training department from employees of the IT company, which is the main indicator of the efficiency of this business process. The calculation and analysis of the complexity of the business process, as well as an analysis of the degree of automation of the process were the methods of the analysis and economic evaluation of the efficiency of the business process modernized using the chat bot.

As the generally recognized theorist and practitioner of management, Henry Gantt (Gantt, 1910), emphasizes, time is the most precious thing that employees have, which is precisely the assessment of labor cost reduction and the focus of the authors of this study.

3. Results and discussion

The internal training system in the organization under study is carried out in the following areas:

1 – Teaching foreign languages (7 languages to choose from);

2 – Training Soft Skills and Hard Skills;

3 – Trainings from the Internal Training Academy;

4 – Providing access to educational platforms (Coursera, Pluralsight, Safari Online books, etc.).

A division called HR-Scholar is responsible for organizing personnel training in the organization under study. Specialists of this division are responsible for receiving, processing and coordinating requests for training from all employees of the organization, concluding and maintaining contracts with external training providers, as well as drawing up reports on the training provided and assessing its efficiency.

Regardless of the chosen direction of training, the employee is to submit an application for training in the prescribed form, which includes such parameters as: the applicant's name and surname, department, direction of training, justification for the feasibility of this training, approximate budget, training period. After the application is received by HR-Scholar, its employees coordinate the application with the applicant's manager and the head of HR-Scholar. The authors compiled a graphic image of the working day of HR-Scholar specialists (4 people) during a week of observations. Summarized results of labor costs for the entire division are presented in Table 1.

Based on the results of evaluating the labor costs of employees of the HR-Scholar division, we can conclude that 70 % of the working time in this division is spent by employees on processing applications that come from internal clients – the personnel of the organization under study. On average, per week, HR-Scholar specialists process 86 applications in all four areas of study: 13 applications for foreign language training, 33 applications for Hard and Soft skills training, 10 applications for training the leading company specialists, and 60 applications for access to learning platforms. As a result, it was determined that processing an application for foreign languages training or Hard and Soft skills training takes about 0.93 hours, processing an application for training at the Internal Training Academy takes 1 hour, and processing an application for connecting to an educational platform takes 0.5 hours.

Table 1. Labor costs of employees of the HR-Scholar division

Type of work	Time, person/hour
Processing applications for foreign language training	12
Processing applications for Hard and Soft skills training	30
Processing applications for Internal training of leading experts	10
Processing applications for Access to learning platforms	60
Support of study groups	30
Writing reports	18
Total	160

Source: compiled by the authors based on a graphic image of the working day of 4 workers during one working week.

In order to reduce labor costs for routine processing of applications and responding to applicants, the authors created a chat bot algorithm that includes a starting greeting and a standard set of questions to determine the possibility of training for a specific employee. According to the organization's regulations, training at the expense of the organization cannot be completed by those who work under a fixed-term contract or have not completed the probationary period. The starting algorithm is presented in Figure 1.
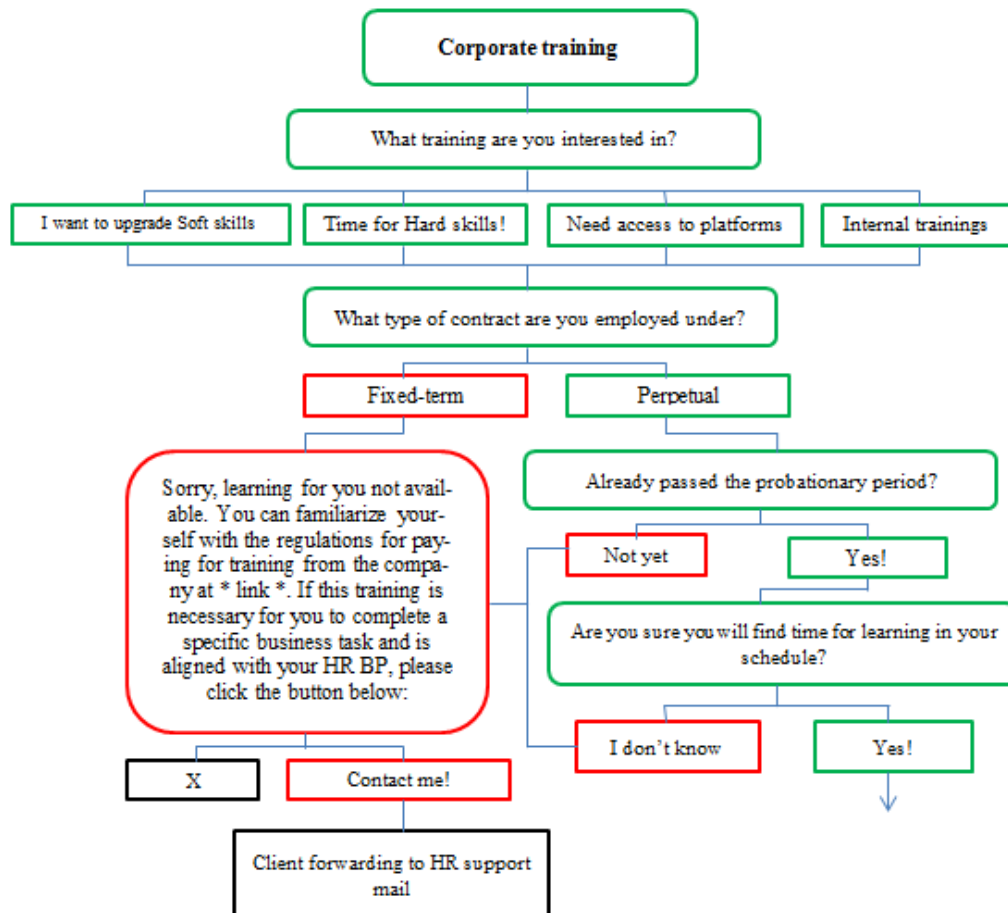

Fig. 1. Beginning of the learning bot algorithm
Source: compiled by the authors.

Response options from the red zone will return the employee to the message that under such conditions the application is impossible, but, if necessary, the applicant will be able to contact the HR department directly for an individual review of the application and assessment of its feasibility. It is important to note that the number of such applications is extremely small and amounts to less than 1 %.

After answering the questions for admission to training, the applicant gets access to one of the options for the bot algorithm, depending on the direction of study he has chosen. For the areas of foreign languages and Hard and Soft skills, the algorithm is presented in Figure 2. These two areas were combined into one algorithm, since when registering for these courses, the questions are identical and ultimately the applicant is redirected to the online application form in the intranet.
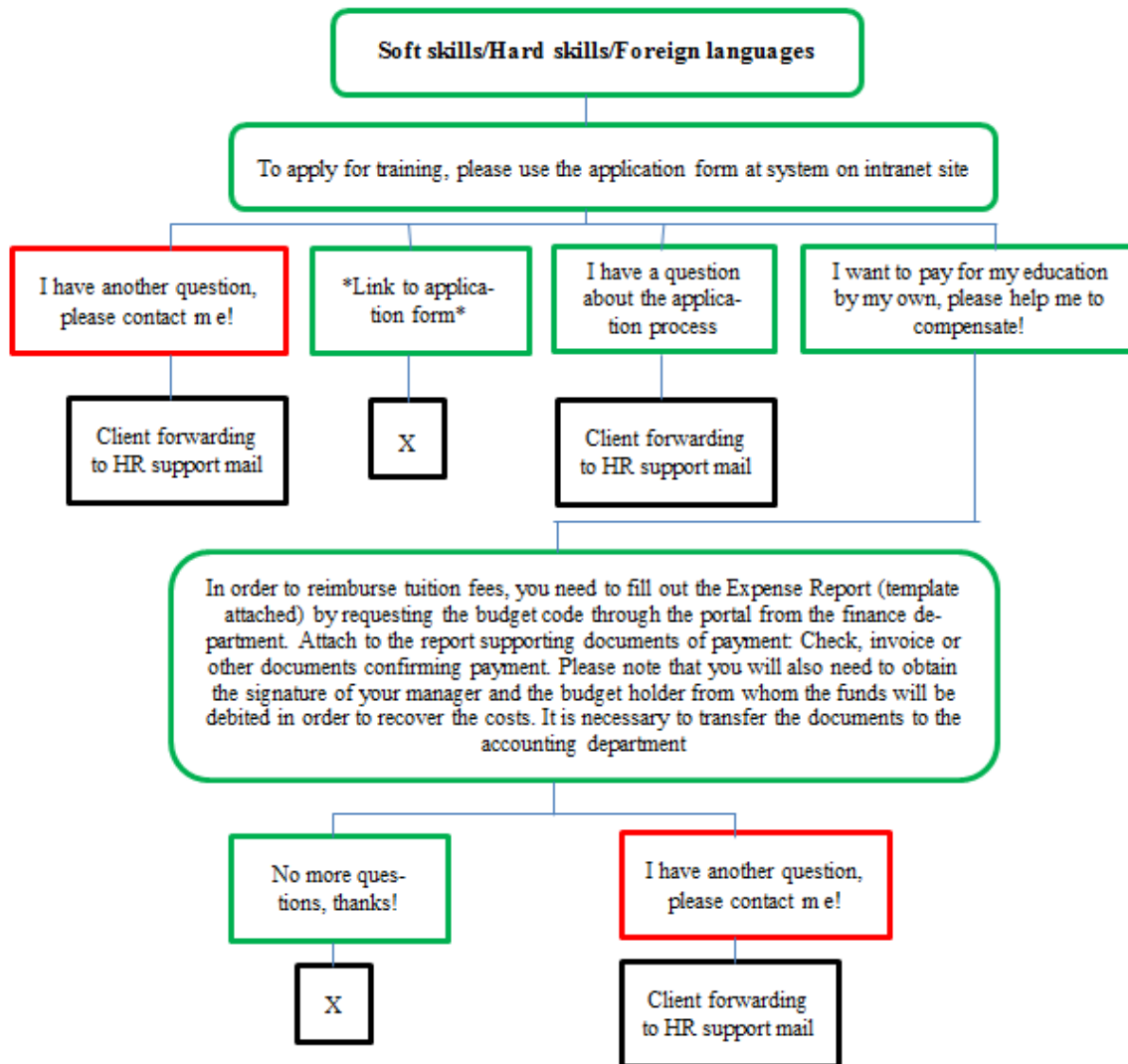
Fig. 2. Bot algorithm for questions on foreign languages, Hard and Soft skills
Source: compiled by the authors.

When submitting an application for training from the Internal Training Academy, the bot will offer the applicant training options and descriptions. Figure 3 shows an example of the bot algorithm when applying for the development of communication skills with the help of leading specialists of the organization itself. Searches for internal trainings are carried out using keywords and based on a database of trainings developed in the company.

To get access to the learning platform, the chat bot will connect the applicant's manager to obtain his approval and, after receiving this approval, will immediately send access keys to the platform (Figure 4).

The developed chat bot algorithm was implemented in the organization under study on the basis of Power Virtual Agents from Microsoft, which is a platform for developing chat bots that integrates with other Microsoft products.

Previously, researchers from Poland demonstrated an increase in the efficiency of contact centers' response to customer requests when introducing various technologies, including chat bots (Plaza, Pawlik, 2021). The results obtained in the study conducted by the authors also indicate a significant increase in the efficiency of the HR department in terms of communications with internal clients by reducing the time spent on processing training applications (Table 2). The first column presents the types of requests, the second and third columns show their processing time in minutes before the implementation of the chat bot (calculated on the basis of Table 1) and after it (determined by the observation method during approbation of the chat bot), respectively. As already mentioned, time expenditure is the main indicator of the efficiency of HR-Scholar specialists when working with internal clients.
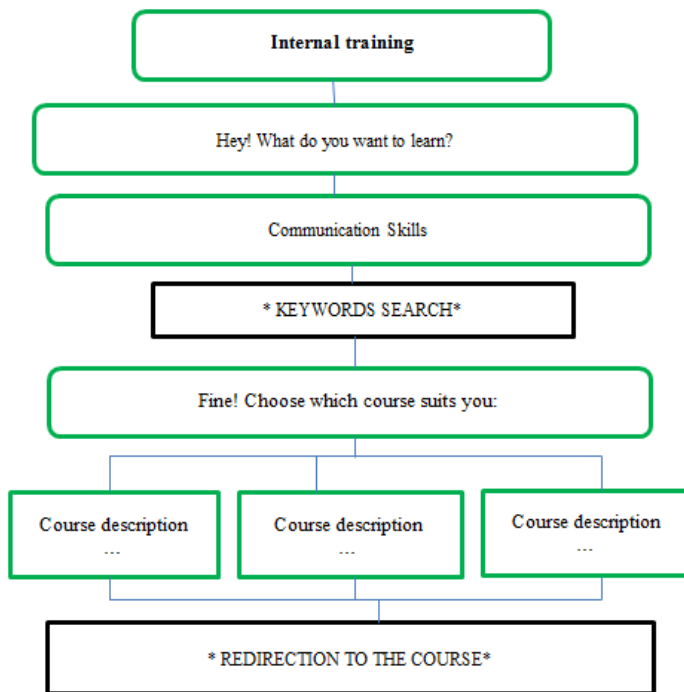
Fig. 3. An example of a situation with a bot algorithm for questions about internal courses
Source: compiled by the authors.

Table 2. Comparison of time spent before and after launching a chat bot

Parameter	Time spent before implementing a chat bot, min.	Time spent after implementing a chat bot, min.	Saving, %
	1	2	3=(1-2)*100/1
Foreign languages or Hard and Soft trainings	56	35	37.50
Internal training from leading experts	60	15	75.00
Access to learning platforms	30	0	100.00
Total minutes:	146	50	65.75
Total in hours:	2.43	0.83	65.75

Source: compiled by the authors based on Table 1 and internal corporate data

Fig. 4. Bot algorithm for gaining access to learning platforms
Source: compiled by the authors.

As it can be seen from Table 2, the processing time for applications using a chat bot will be reduced by 37.5-100 %: the savings will be 37.5 % in Foreign languag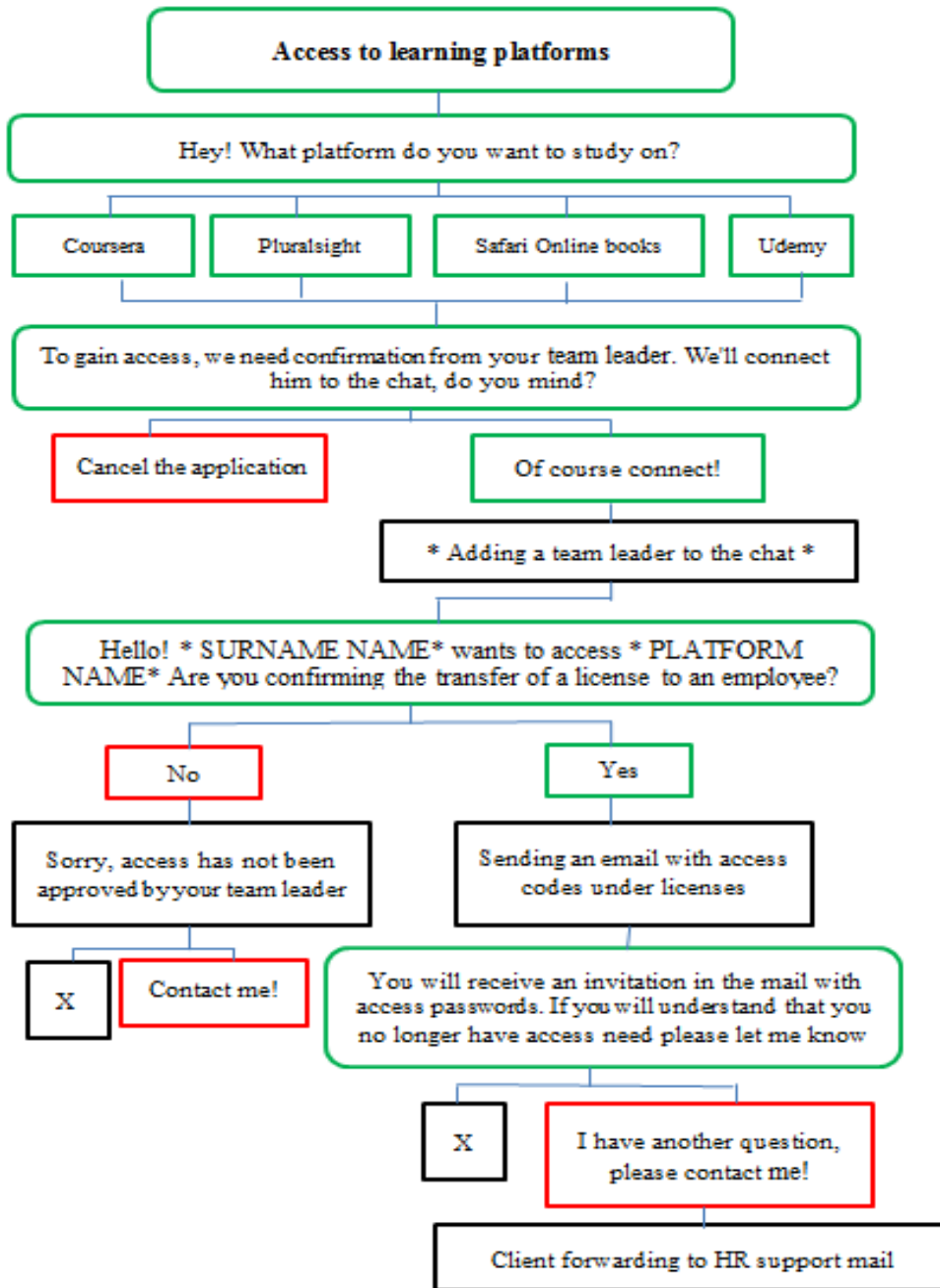es or Hard and Soft trainings, 75 % in Internal training of leading experts and access to learning platforms will not require spending any working hours of an HR specialist at all.

At the same time, the period of launching the bot is associated with an increase in the load on HR service employees, which is due to the time required for them to master this function. At the stage of implementation of this digital technology, it is difficult to avoid information doubling, since requests for training can come from many channels, including the organization's email services. However, the benefits that this innovation brings to the organization of corporate training certainly outweigh the difficulties that may arise when launching a chat bot. In addition, as HR specialists and all employees of the organization work with the chat bot, various errors in algorithms may be identified. In this regard, the algorithms will be adjusted and improved.

4. Discussion

The presented algorithm for interaction between a chat bot and a person has significant prospects, as it allows to expand the audience of participants in joint activities, without reducing the quality of processing applications and servicing internal clients of the HR-Scholar division. The continuous development of digital technologies will allow to continue to introduce new functions and possibilities for using the chat bot. And the diversity of its organization will lead to an expansion of the range of tasks in corporate training that can be solved.

In modern conditions, the advantages of using such a digital tool include: providing support to the HR service in terms of optimizing its work and increasing the efficiency of processing applications for training, which, of course, frees up time that is spent on solving such routine tasks (Ivanova, Sadova, 2020). However, with the expansion of machine learning capabilities, it will be possible to implement systematic monitoring of results and build an individual learning trajectory (Kabudi et al., 2021). The use of artificial intelligence will make it possible to recognize the student's potential, eliminate possible errors and provide him with advice on the way to obtaining the necessary knowledge and competencies (Okagbue et al., 2023).

Ten years ago, researchers from Iran proved that the use of IT tools increases the productivity of human resources above average (Shoushtary, 2013), which is fully consistent with the results obtained by the authors on reducing labor costs for organizing the learning process with the implementation of the developed chat bot. Also, scientists from India substantiated the efficiency of implementing chat bots in HRM by monitoring their functionality in real time (Majumder, Mondal, 2021).

As a result of the study, the opinion was identified and substantiated that the speed and quality of processing an application for training, which are the leading time parameters, are the main indicators that determine the effectiveness of the training process. However, and this is important to emphasize, other equally important indicators that influence this should also be analyzed. These include: the degree of staff involvement, the number of requests to the teacher, the regularity of completing tasks, the number of users, their activity in training, the results of monitoring the success of training, etc. Since the use of artificial intelligence and neural networks increasingly makes it possible to recognize the student's potential and provide him with advice on ways to obtain the necessary knowledge and competencies, then assessing the correlation between the acquired amount of knowledge and its application in work is also a parameter that measures the effectiveness of training (Webb et al., 2021).

The work carried out by the authors continues previous researching of the international scientific community, and the conclusions obtained by the authors do not contradict previous studies.

5. Conclusion

The authors' analysis of earlier studies on chat bots showed that the use of a chat bot resource has a positive effect on increasing the awareness of employees regarding their opportunities to undergo training, and also opens access to training content and accumulated knowledge bases in the organization.

The practical study showed that a large share of an HR training specialist's working time is occupied by routine tasks of processing applications from internal clients. Reducing labor costs for these operations is possible by using a chat bot developed in Power Virtual Agents from Microsoft. The efficiency of this innovation is justified by the reduction in time spent processing training applications from the organization's personnel.

It is important to continue this research in the following directions. Firstly, it is necessary to improve the proposed algorithm, taking into account the introduction of additional options in connection with the use of machine learning. The introduction of a chat bot during the procedure for processing applications for training at the initial stage is considered as an initial innovative impulse, which will make it possible in the future to reconsider all work on organizing corporate training. Secondly, the development of chat bot technology is also seen in the high potential of its use in onboarding and mentoring processes, in providing consulting services when choosing directions and courses of study, conducting evaluation procedures after completing training, making adjustments during training, carrying out control activities, and also as an electronic assistant in the management and distribution of working time.

In addition, in the future, the authors plan to evaluate the effectiveness of the use of chat bots not only by time indicators of labor costs, which can be quantified, but also by qualitative characteristics, such as involvement, satisfaction and quality of training.

Thus, expanding the functions of the chat bot can improve the administration process of the entire organization and ensure increased staff involvement in its affairs. Through the active involvement of personnel in the exchange of knowledge, the organization will acquire the status of a self-learning one, which will ensure an increase in the value of its human capital. All this confirms the relevance of subsequent study of the problem outlined in this article.

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Control Student Knowledge in the Context of Digitalization of Education: New Problems and Risks

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Abstract

In the context of digitalization of higher education, the system of control and assessing students' knowledge requires a revision of existing practices. The use of algorithmic methods for assessing knowledge makes significant changes in the interaction between teacher and student. The purpose of the study was to analyze the impact of digitalization of education on the transformation of the system of control and assessment of student knowledge in Russian universities. The leading method of collecting empirical data was an online survey of students (N = 1107), conducted in 2021. The survey results were supplemented by a focus group study (N = 12, 2023). It is concluded that there are problems in control students' knowledge in the context of using digital technologies. Analysis of empirical studies shows that 31.1 % note the lack of a clear control system, 24.2 % consider the requirements for the work performed to be unclear. Students who would like to study in the traditional way in the classroom (without forms of online learning) most critically evaluate changes in the process of knowledge control in the context of digitalization. It has been established that there is a request from students to increase the intensity of interaction with the teacher when scaling algorithmic knowledge assessment tools. It is concluded that the active position of the teacher reduces the risk of educational exclusion of students. The most significant risk of digitalization of student knowledge control is the spread of dishonest student behavior during the session and violation of ethical principles. However, it has not been established that there is a direct relationship between the clarity of the control system and the practices of dishonest behavior of students online. The results of the study allow us to draw a

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conclusion about the formation of new sources of stress for students when using digital technologies during knowledge control.

Keywords: digitalization, education, knowledge control, session, ethics of behavior, requirements, students.

1. Introduction

Digitalization of all spheres of public life places new demands on the level of training of specialists, which actualizes the need to revise traditional teaching methods and make adjustments to the process of training specialists in higher educational institutions. The pandemic period intensified these trends and set a trend for intensive digitalization of higher education, including the modernization of practices for monitoring and assessing students' knowledge (Eremeev et al., 2022). According to a number of foreign researchers, this process has significant risks for the work of teachers and students (Söderlund et al., 2023). In particular, studies have shown that the direct transfer into the digital environment of technologies that were used in a full-time format does not improve the quality of student learning. Among the key problems, scientists have identified the following: low digital competence of participants in the educational process, integration of various forms of educational work in the digital environment (Turnbull, 2021), problems of synchronization of contact and non-contact forms of control (Frolova et al., 2023), the presence of a gap between students' expectations and everyday practice of online learning and knowledge control (Van Schoors et al., 2023).

The results obtained by foreign experts showed the existence of contradictions between the recognition of the need to introduce digital technologies into the educational process, knowledge control systems and the inertia of the educational environment. The presence of inertia is explained by the differentiation of the level of training and competence in the use of information and communication technologies, and the low motivation of teachers for retraining (Hämäläinen et al., 2021). Similar conclusions were made earlier in the work of M.J. Kenzig, who drew attention to the lack of appropriate knowledge and skills of teachers to adapt traditional pedagogical methods to the digital format (Kenzig, 2015). These circumstances cause concern among the management of educational organizations; this often limits the use of digital tools in universities (Grando, Calonge, 2014).

Particular attention in foreign studies is paid to the advantages of digital technologies for monitoring students' knowledge. In particular, student surveys showed that the use of digital forms of control enabled students to develop skills such as time management, correct task setting, information search, the ability to work in groups, and independently manage their time (Reyna et al., 2021). Similar conclusions were made in Russian studies (Frolova et al., 2023). Also L.G. Volkova says that digitalization of knowledge control makes it possible to develop students' competencies and qualities such as initiative, responsibility, and the ability to analyze the situation and information. The effectiveness of digital methods of assessing knowledge makes the system of control interesting for students and stimulates the development of self-control (Volkova, 2023). The system of control students' knowledge in the context of digitalization is designed to provide quick access to educational content, standardization of assessment methods and reduction of time costs for the teacher (Peters et al., 2023).

An important advantage of the system of control student knowledge in the context of digitalization is the construction of individual assessment routes. M. Bulger concludes that algorithmic assessment systems make it possible to adapt educational material and assignments to the level of students' preparation (Bulger, 2016).

Considering the specifics of monitoring students' knowledge in the context of digitalization, foreign scientists pay attention to the transformation of the practice of interaction between student and teacher. The research concludes that teachers demonstrate a desire to escape "the awkward task of personally assessing students". This request is associated with an increase in cases of challenging grades by students and even lawsuits. In this context, algorithmic assessment systems reduce teacher vulnerability during assessment activities (Selwyn et al., 2023). At the same time, scientists warn against the danger of crowding out personal communication from the educational environment (Pasquale, 2020).

Scientific research questions the limits of using artificial intelligence in the system of control students' knowledge (Shanley et al., 2020). However, relevant studies conducted on Russian material are not presented in the scientific community today. It can be assumed that this direction

of studying trends in the development of the system of control students' knowledge can be considered as promising when intensifying the processes of digitalization of higher education.

The introduction of digital technologies into the system of monitoring students' knowledge has determined a new vector of research - analysis of the inversion of ethical standards of students, violation of the principles of academic education, and the spread of unfair practices in the use of IT-technologies in order to circumvent established rules. (Frolova, Rogach, 2022). This problem is not a dysfunction of the Russian education system only. According to M.N. Singh, the scaling up of practices of violation of ethics in exams, cheating of students is becoming a consequence of the digitalization of the younger generation. Access to smartphones makes it easier for students to pass security checks, which threatens the integrity and validity of academic education (Singh, 2021).

2. Methods

The purpose of the study was to analyze the impact of digitalization of education on the transformation of the system of control and assessment of student knowledge in Russian universities. In particular, the authors set the following research tasks:

1. Study of the characteristics of the knowledge control system in the context of digitalization, assessment of student perception.

2. Analysis of the emergence of new risks when control students' knowledge in the context of digitalization.

3. Analysis of the prevalence of practices of unethical behavior of students during knowledge control in an online format, assessment of the influence of the conditions for organizing control on violations of ethics in the educational process.

During the work, the authors used a complex of analytical research methods. The emphasis in the work is on comparative and correlation analysis. The authors also used the method of generalization, systematization and analysis of scientific sources. The empirical material is presented by data from a survey of Russian university students, which was conducted after the end of the pandemic and students began full-time education. The questionnaire was posted on an online service (Google Forms). The choice in favor of online questioning was made in view of the possibility of more complete coverage of respondents and a reduction in the frequency of refusal to participate in the survey. Limitations of the study are related to sampling bias due to the use of the snowball method during the recruitment of respondents. The number of respondents surveyed was 1107 people.

In order to clarify the data obtained, a focus group was held in September 2023 with students of 1-4 years of undergraduate study. The total composition of participants is represented by 7 girls and 5 boys.

Research hypotheses:

1. Students who prefer face-to-face classes in the classroom are more critical of assessing the clarity of the knowledge control system in the context of digitalization.

2. The teacher is a compensator for the risks of using «unmanned technologies» for knowledge control, algorithmized knowledge assessment systems.

3. With the spread of online learning format, students are more likely to exhibit dishonest behavior during the session.

4. Organizing a clear control system at the university reduces the prevalence of dishonest student behavior during online sessions.

3. Results

According to the data obtained, in the conditions of digitalization, the majority of students consider the requirements that the teacher makes for the quantity and quality of work understandable (75.8 %). At the same time, a quarter of respondents do not understand the requirements of the teacher, which can be considered a barrier to including student data in the educational process. At the same time, only 68.9 % of students agree that in the conditions of digitalization a clear the system of control students' knowledge is being formed.

In this context, it is of interest that there is a relationship between the preferred form of learning and the perception of students' knowledge control system (Table 1).

Table 1. The relationship between the choice of form of education and improving the characteristics of the educational process, pers.

What form of training do you prefer: traditional (in the classroom) or remote (online)	Use your personal example to evaluate the characteristics of the educational process in the context of digitalization		Total
	Clear requirements for quantity and quality of work		
Possible answer	**Yes**	**No**	
online	435	97	532
traditional	241	125	366
difficult to answer	163	46	209
Total	839	268	1107
	Clear the system of control students' knowledge		
online	414	118	532
traditional	212	154	366
difficult to answer	137	72	209
Total	763	344	1107

Among students who prefer online learning, the proportion who positively assessed the clarity of the requirements for the quantity and quality of work is significantly higher. The choice of the "yes" answer is higher than the average for the sample by 6 percentage points. Among students who would like to study "traditionally" in an auditorium, there is a higher proportion of those who rated this criterion negatively (34.2 %, which is 10 percentage points higher than the average values). An analysis of arbitrary contingency tables using the χ^2 criterion showed that when the number of degrees of freedom is 2, the value of the χ^2 criterion is 30.630. The critical value of χ^2 at the significance level $p = 0.01$ is 9.21. The relationship between factor and resultant signs is statistically significant at a significance level of $p < 0.01$.

A similar correlation was established during the analysis of the relationship between the perception of the system of control students' knowledge in the context of digitalization and the choice of the preferred form of training. When the number of degrees of freedom is 2, the value of the χ^2 criterion is 41.444.

The results of the focus group led to the conclusion that even in online learning conditions, students are guided by the teacher and count on his help in overcoming difficulties in interacting with impersonal algorithms. During the focus group, the following student opinions were expressed: *"it's good that the teacher can explain the task; the system itself is difficult to understand,"* *"the system is not perfect, but the teacher can enter into your situation, add points, go to a meeting and allow you to pass the test"*.

Subjective assessments of digitalization and perceptions of the system of control students' knowledge are interdependent variables. In particular, communicating clear requirements for knowledge control to students creates a positive perception of digitalization in general. Thus, among respondents who noted the lack of clear requirements for the quantity and quality of work, the proportion of those who positively assess digitalization in general is significantly lower (72.4 %, which is 11.5 percentage points below the average). A similar situation arises with respect to the "clear the system of control students' knowledge" parameter. Among students who noted the lack of a clear control system in the context of digitalization, the proportion of those who "positively" and "rather positively" assess digitalization in general is significantly lower (73.5 %, which is 10.4 percentage points below the average).

It can be assumed that the organization of a clear control system at a university allows students to feel psychological comfort in the process of using electronic educational resources (Figure 1). During the focus group, the following answers were recorded: *"I want everything to be explained clearly and clearly - this reduces stress", "sometimes the teacher himself changes the rules for receiving points, after which it is very difficult to understand", "I feel discomfort when completing assignments in electronic environment, if everything is not clearly explained to me before completing the tasks."*
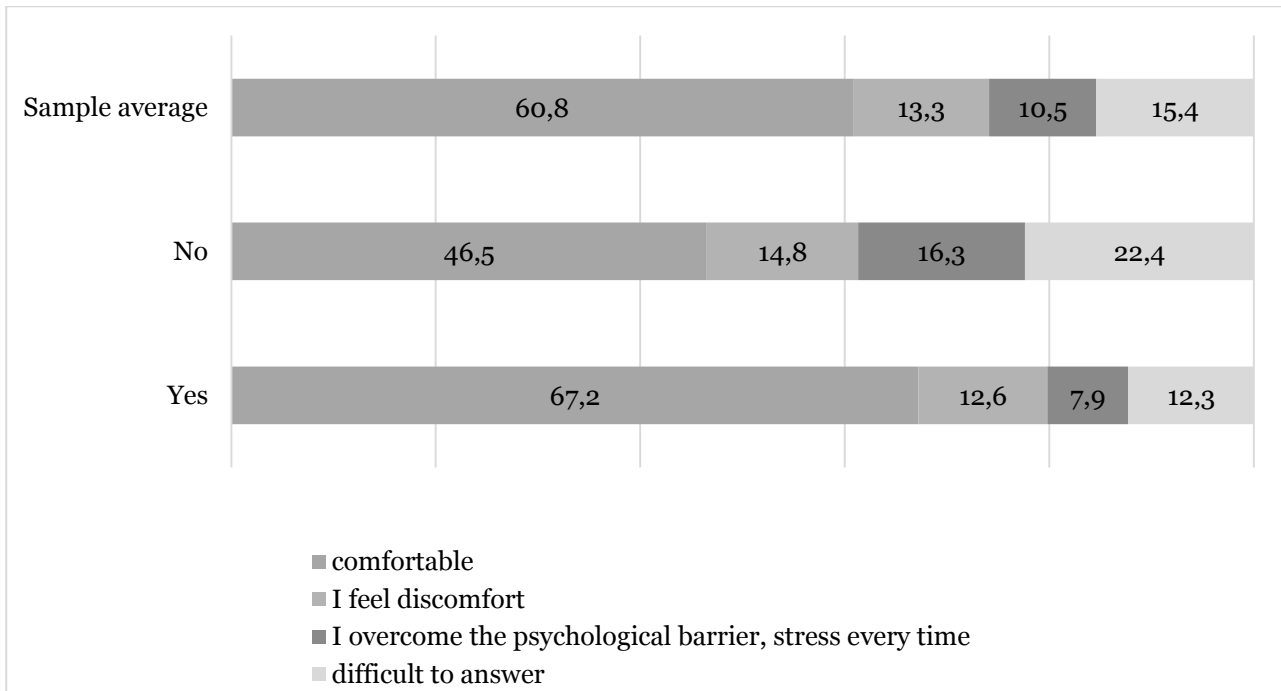
Fig. 1. Distribution of answers to the question: "How psychologically comfortable is it for you to use electronic educational resources at a university?" depending on assessments of the system of control students' knowledge (answer options "yes"/"no"), %

A similar trend is observed in the analysis of assessments for the indicator "clear requirements for quantity and quality of work". The results of the correlation analysis demonstrate the relationship between the organization of the system of control students' knowledge at the university and the student's comfort level when working with electronic resources (Table 2).

Table 2. The results of the correlation analysis between the indicator "psychological comfort" of using electronic educational resources and the parameters of the student knowledge control system

Possible answer	χ^2 criterion	number of degrees of freedom	the significance level p = 0.01
clear the system of control students' knowledge	49.217	3	11.345
clear requirements for quantity and quality of work	17.532		

The relationship between factor and resultant signs is statistically significant at a significance level of $p < 0.01$. At the same time, a comparative analysis of the obtained correlations illustrates a higher relationship between the student's psychological comfort when using electronic educational resources and the creation of a clear the system of control students' knowledge.

It has been established that poor material and technical equipment of the university does not affect the clear the system of control students' knowledge (Table 3). The results of the study did not show the presence of statistically significant differences in the perception of the clarity of the control system in groups of students with diametric assessments of personal experience (answer options "yes"/"no") according to the parameter "poor material and technical equipment of the university reduces the benefits of using digital technologies in the educational process".

Table 3. The relationship between the level of material and technical support of the university and students' assessments of the clarity the system of control students' knowledge, pers.

Use your personal example to evaluate the characteristics of the educational process in the context of digitalization:			
poor material and technical equipment of the university reduces the benefits of using digital technologies in the educational process	**clear the system of control students' knowledge**		
Possible answer	Yes	No	Total
Yes	484	203	687
No	279	141	420
Total	763	344	1107

An analysis of arbitrary contingency tables using the χ^2 criterion showed that when the number of degrees of freedom is 1, the value of the χ^2 criterion is 1.969. The critical value of χ^2 at the significance level $p<0.05$ is 3.841. The relationship between factor and resultant signs is not statistically significant at a significance level of $p>0.05$. Significance level $p = 0.161$.

Although the results of the study showed that there was no significant relationship between these indicators, during the focus groups we identified inflated expectations of students, their high demands on the material and technical infrastructure of the university and on the IT competencies of teachers. The following opinions were expressed: *"how strange it is that some teachers have not mastered even basic IT functionality", "in some classrooms there is only chalk and a blackboard - that's all the infrastructure", "we only hear about interactive technologies, but in reality this is not the case or almost not".*

The focus group materials also made it possible to establish a chain of student expectations: the material and technical support of the educational process and good digital skills of the teacher provide interesting learning and a high quality control system in the electronic environment. However, among 62.1 % of respondents, a negative attitude towards the material and technical infrastructure of the university prevails, which, in their opinion, limits the success of digitalization of education. Also, 41.5 % of students believe that teachers do not have a high level of digital competence and are not ready to work remotely. In this context, the contradiction between students' hopes for the transformation of digital forms of control and its actual practice in modern conditions seems quite obvious. During the focus group, the following expectations of students regarding the construction of digital knowledge control in the future were expressed: *"it seemed to me that the standard exam is outdated, we need something in a game format, we cannot evaluate everyone the same way, we need a different approach", "if this is a number, then there has to be something interactive and interesting, even if it's the system of control students' knowledge".*

Determining the risks of reducing control over students' knowledge deserves special attention. The authors test the hypothesis that one of the key risks is the spread of practices of dishonest behavior among students in the context of large-scale digitalization and unproven control methods. This hypothesis was confirmed by empirical data illustrating the frequency of dishonest behavior among students when conducting an online session. Thus, a quarter of respondents (27.5 %) confirmed that such cases occurred frequently in their practice (Figure 2).

Given the sensitivity of this topic and the subjective barriers that prevent respondents from answering the question about dishonest behavior sincerely, it can be assumed that the scale of ethical violations when taking a test/exam online is much greater. During the focus group, students commented more openly on their position: *"if classmates cheat, then honesty will look strange against their background," "the online format encourages the use of additional materials... it's difficult to cheat in the classroom, but online it's much easier".*
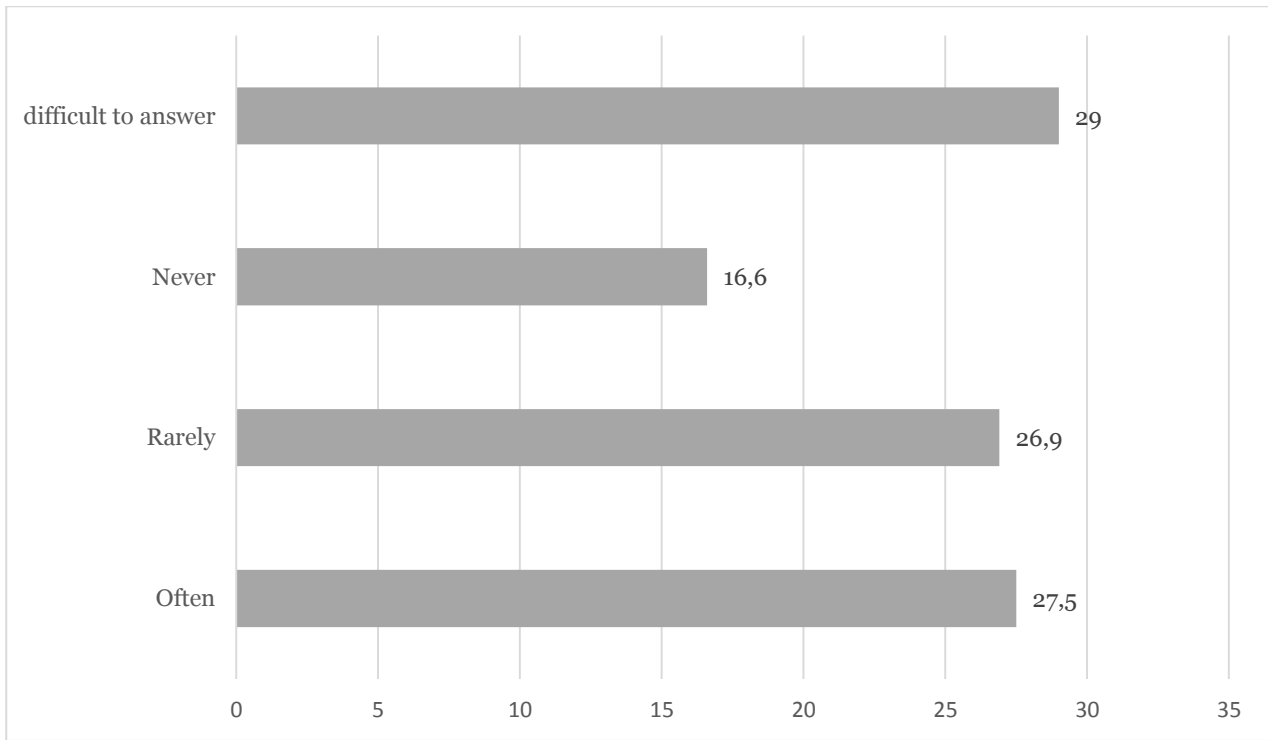
Fig. 2. Distribution of answers to the question: "What do you think was the behavior of students during the online session? Have there been any cases of dishonest behavior by students (using additional materials when taking a test/exam)?", %

The study tested the hypothesis that a clear control system can block students' dishonest behavior during an online session. However, the results of the correlation analysis did not confirm this assumption (Table 4). The ambiguity of the digitalization process and limited experience in conducting online sessions did not allow Russian universities to create effective tools to combat student dishonesty.

Table 4. The relationship between the frequency of cases of dishonest behavior of students during online sessions and the clarity the system of control students' knowledge, pers.

Use your personal example to evaluate the characteristics of the educational process in the context of digitalization:	What do you think was the behavior of students during the online session? Have there been any cases of dishonest behavior by students (using additional materials when taking a test/exam)?				**Total**
Clear the system of control students' knowledge	**often**	**rarely**	**never**	**difficult to answer**	
Yes	201	217	129	216	763
No	102	80	55	107	344
Total	303	297	184	323	1107

An analysis of arbitrary contingency tables using the χ^2 criterion showed that when the number of degrees of freedom is 3, the value of the χ^2 criterion is 4.079. The critical value of χ^2 at the significance level $p < 0.05$ is 7.815. The relationship between factor and resultant signs is statistically significant at a significance level of $p > 0.05$. Significance level $p = 0.254$.

The study attempted to analyze the relationship between practices of unethical behavior during a session and the level of psychological comfort of a student when using electronic educational resources (Table 5). An analysis of arbitrary contingency tables using the χ^2 criterion showed that when the number of degrees of freedom is 9, the value of the χ^2 criterion is 77.834. The critical value of χ^2 at the significance level $p = 0.01$ is 21.666. The relationship between factor and resultant signs is statistically significant at a significance level of $p < 0.01$.

Table 5. The relationship between the psychological comfort of using electronic educational resources at the University and the presence of cases of dishonest behavior when conducting a session online, pers.

How psychologically comfortable is it for you to use electronic educational resources at a university?	What do you think was the behavior of students during the online session? Have there been any cases of dishonest behavior by students (using additional materials when taking a test/exam)?				Total
Possible answer	often	rarely	never	difficult to answer	
comfortable	177	200	105	191	673
I feel discomfort	56	39	19	33	147
I overcome the psychological barrier, stress every time	31	27	41	17	116
difficult to answer	39	30	19	83	171

Despite the presence of a stable relationship between these variables, this issue remains controversial. Indeed, the results of the study suggest that the discomfort of using electronic educational resources becomes a source of stress that pushes students to violate academic ethics. However, it must be taken into account that a student's unethical behavior during an exam can be caused by various factors, primarily his individual psychological characteristics, such as honesty, morality, decency, responsibility, etc.. Analysis of these features requires a deeper psychological understanding of student behavior, which is beyond the scope of this study.

Students were asked what is a source of stress for them when conducting an online session. With multiple choice available, the following results were obtained (Figure 3). The greatest source of stress is problems with technical support for online knowledge control (34.4 %). The second line of the conditional rating is occupied by students' traditional fears during the exam – not answering the teacher's questions without preparation (22.9 %). At the same time, almost every tenth respondent (8.2 %) does not experience stress when conducting a session online.
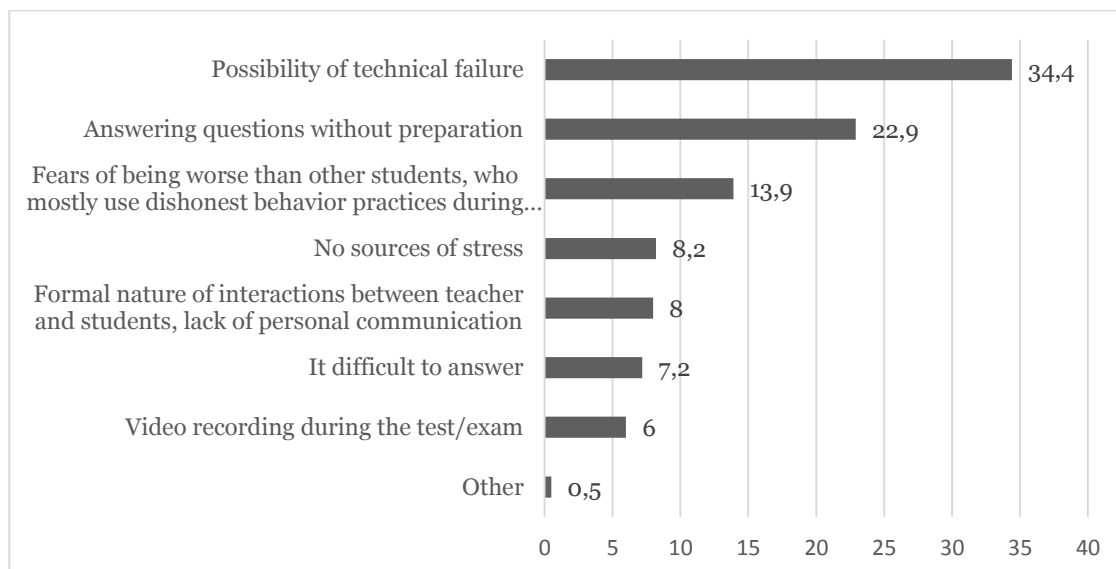

Fig. 3. Distribution of answers to the question: "What is the source of stress when conducting an online session?", multiple choice, %

The results of the focus group showed the presence of anxiety among students when conducting the session online. "*Of course, it is psychologically more comfortable when you*

communicate directly with the teacher. I'm always worried that the Internet will fail, or the microphone won't turn on, or something else will fail at the most crucial moment."*

4. Discussion

The results of the study made it possible to draw attention to the presence of destructive practices in the systems of monitoring students' knowledge. In particular, a quarter of students do not understand the teacher's requirements for the quantity and quality of work; another third of respondents note the lack of a clear the system of control students' knowledge. Solving these dysfunctions seems very relevant in view of the threat to their scalability. The use of algorithmic methods of knowledge control is becoming ubiquitous in the context of digitalization and can become a source of dysfunction in assessing student academic achievements. It is concluded that students' knowledge control system assessments are determined by their subjective perception of digitalization processes. Complementing this idea, we can cite the results of a study conducted by S. Willermark and M. Gellerstedt. Scientists conclude that it is necessary to place different requirements on technologies and tools for assessing students' knowledge depending on the profile of the disciplines taught (Willermark, Gellerstedt, 2022).

Students who adhere to the traditional form of education demonstrate a more negative perception of the elements of knowledge control in the context of digitalization. The most negative assessments are typical for such a parameter as: "clear the system of control students' knowledge." At the same time, students showed a more loyal attitude in the parameter "clear requirements for the quantity and quality of work." It can be assumed that the teacher, in the context of digitalization, acts as a "buffer" between the algorithmic knowledge assessment system and the student. The widespread use of computer testing, as well as strict assessment algorithms, creates a space of discomfort in the interactions between the student and the electronic environment. For some students, the stress of interacting with "unmanned technologies" creates risks of educational exclusion. Similar risks are noted in the work of foreign scientists. F.M. Aldhafeer and A.A. Alotaibi, assessing the risks of digitalization, argues that the unified approach to the system of control students' knowledge is unconstructive (Aldhafeer, Alotaibi, 2023). Scientists conclude that the digital shift requires a more careful approach to the formation of integrated social and pedagogical practices, and ensuring the flexibility of the system of control students' knowledge.

It is noteworthy that the clarity of the system for monitoring students' knowledge is not determined by the level of material and technical equipment of the university. The results of the focus groups showed that students have high expectations for the digital skills of teachers (with a low assessment of their actual level) and digital forms of control. Epithets are often used: *interactive, interesting, playful, etc*. However, such an approach is not an element of the system for assessing student knowledge control. It is fair to note that foreign scientists in a number of cases share the point of view that was expressed by students during the focus group. Researchers have concluded that game-based testing has benefits in improving students' academic performance, especially in low-proficiency groups (Wang et al., 2023). The works of S. Bayne and M. Gallagher conclude that it is necessary to increase the attractiveness of knowledge control systems for teachers and students, and to diversify assessment methods (Bayne, Gallagher, 2021). The role of digital literacy of teachers is also noted, which consists of relevant knowledge and skills in using information and communication technologies in the educational process (Seiler et al., 2021).

In general, it can be assumed that the leading role in the process of organizing a clear control system belongs to the University Administration and teachers. Foreign scientists, assessing the effectiveness of digital transformations, come to similar conclusions. The works of A. Jakoet-Salie and K. Ramalobe postulate the idea that in addition to technical support, careful methodological support for online classes is necessary to take into account the needs of students (Jakoet-Salie, Ramalobe, 2023). This approach, in their opinion, allows students to be included in the educational process and prevent them from falling behind in their academic work.

The study confirmed the hypothesis about the prevalence of dishonest behavior among students when conducting online sessions. These risks, which are inherent in digitalization, are also noted in foreign studies. In particular, A. Balderas and J.A. Caballero-Hernández theorize that educators are generally unable to assess students due to the possibility of fraudulent behavior, which is nearly undetectable in an online learning environment (Balderas, Caballero-Hernández, 2020). Developing this idea, T Lancaster and C. Cotarlan conclude that the increase in unethical

behavior in online exams is forcing teachers to strengthen control measures. This fact raises concerns among students (Lancaster, Cotarlan, 2021).

The conclusions drawn on the basis of empirical material from foreign scientists were not confirmed in our study. In particular, the hypothesis that a clear control system can have an impact on reducing cheating in online exams was not confirmed. The influence of this factor turned out to be statistically insignificant. It can be assumed that the tightening of control measures provokes students to search for destructive practices to overcome them. The identified trends indicate the need for further research into factors that counteract unethical behavior in the online environment.

Sources of stress when conducting an online session can be divided into two groups: traditional (fear of answering worse than others, fear of answering the teacher's questions, etc.) and sources that are related to the specifics of digitalization of education (the possibility of a technical failure, lack of personal communication with the teacher, video recording the exam, etc.). The results obtained during the study indicate the formation of new risks when monitoring students' knowledge in the context of digitalization of education. Partially, this conclusion is reflected in the analysis of the reaction of students in the Netherlands and Australia to video recording of exams (Doffman, 2020). There is a negative perception among students of the use of artificial intelligence and information technology to control student behavior during the exam.

The risks of control students' knowledge in the context of digitalization identified in the author's study are associated with imperfect technological support. According to the authors, the digitalization of education should largely transform the educational process, adding new technologies and tools to improve the quality of knowledge transfer. At the same time, it is more promising to leave knowledge control in the traditional form, thereby reducing the level of stress experienced by the student and preventing technical errors from interfering with the control activities.

5. Conclusion

The study concluded that there is destruction in the organization of the system of control students' knowledge in the context of digitalization. It has been established that every fourth student negatively evaluates such a parameter as clear requirements for the quantity/quality of work. Almost every third respondent notes the lack of a clear system for monitoring students' knowledge in the context of digitalization. The dysfunctions of digitalization of knowledge control are perceived most painfully by students who prefer traditional teaching practices (face-to-face in the classroom). Thus, the first hypothesis was confirmed.

The results of the focus group showed the actualization of the request to increase the intensity of interaction between student and teacher in the context of scaling algorithmic knowledge assessment tools. The research materials allowed us to confirm the second hypothesis. In particular, if the teacher acts as a "buffer" between the student and the "unmanned technologies" of knowledge control, then the risk of educational exclusion of students is reduced.

It has been established that the key risk of digitalization of student knowledge control is the growth of unethical student behavior practices, which confirms the third hypothesis. It is concluded that with the spread of the online learning format, students are more likely to exhibit dishonest behavior during the session. At the same time, the hypothesis about the relationship between the clarity of the control system and the practices of dishonest behavior of students online was not confirmed.

It is concluded that in the conditions of digitalization, in addition to the traditional sources of stress when testing students' knowledge, specific ones are added, which are characteristic of the digital format of organizing knowledge control. According to the results of the study, these include: the possibility of technical failures, video recording of the exam, and the formal nature of the interaction between the teacher and students.

Thus, the problems of digitalization of student knowledge control lie in the formation of new sources of stress, insufficient level of ensuring the clarity of the control system and clear requirements for the quantity/quality of work.

Further areas of research may be the following: identifying factors that reduce the risks of unethical behavior of students in the context of digitalization of knowledge control, detailing the expectations of students to ensure the clarity of the control system, assessing the transformation of the role of the teacher acting as a "buffer" between the student and algorithmic methods of assessing knowledge.

6. Limitations

The limitations of the study conducted by the authors include the principle of student selection (random sampling). This approach did not allow for a representative representation of the opinions of all categories of students. Therefore, the authors used an additional method (focus group) to reduce the risk of excluding students' specific assessments of the problem under consideration. However, in the future, it is undoubtedly necessary to use a differentiated methodology for selecting respondents to conduct a mass questionnaire survey.

7. Declaration of Competing Interest

The manuscript's authors declare that there is no interest in conflict, and all reference materials were dully acknowledged.

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Serious Unintentional Injuries Among In-School Adolescents in Saint Lucia: A Further Analysis of Prevalence and Correlates

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Abstract

Serious injuries among adolescents are a leading cause of death and a global public health concern. This study examined the prevalence and correlates of serious injuries among in-school adolescents in Saint Lucia. Using a two-stage cluster sampling design to attain a fair population representation, we analysed data from the World Health Organization's 2018 Global School-based Health Survey among adolescents in the Eastern Caribbean Island of Saint Lucia. We used the Chi-square test and binomial logistic regression analysis with an adjusted odds ratio (AOR) at a 95 % confidence interval (CI). We observed that the prevalence rate of serious injuries among adolescents in Saint Lucia was 44.5 % (24.5 % male versus 20.0 % female). After controlling for other factors, serious injuries among in-school adolescents in Saint Lucia were predicted by sex (male) (AOR=1.110, 95 % CI=0.792-1.556), missing class without permission (AOR=1.308, 95 % CI=1.009-1.696), abusing alcohol (AOR=1.370, 95 % CI=1.114-1.684), experiencing physical attacks (AOR=1.669, 95 % CI=1.327-2.099), physical fight (AOR=1.527, 95 % CI=1.529-1.225) and being bullied (AOR=2.171, 95 % CI=1.712-2.753). Adolescent health promotion and injury prevention programmes should adopt multidisciplinary approaches to address these personal and psychosocial risk factors in Saint Lucia.

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1. Introduction

Injuries and violence account for a substantial proportion of the global disease burden in adolescents, especially in low-income and middle-income countries (Han et al., 2019). Findings from a Global School-based Student Health Survey (GSHS) for adolescents aged 12-15 years from Low-and Middle-Income Countries showed that the overall prevalence of physical attack, physical fighting, and serious injuries for the past 12 months were 35.6 %, 36.4 % and 42.9 %, respectively (Han et al., 2019). Prevalence of serious injuries among adolescents of school-going age in Liberia [71.0%] (Pengpid et al., 2021), Ghana [66.0 %] (Ackah et al., 2021), Panama [45.0 %] (Sarfo et al., 2023), Mauritius [39.0 %] (Mireku et al., 2021), Canada [24.0 %] (Gilbride et al., 2006), China [38.0 %] (Gao et al., 2019), and Europe [13.1 %-30.4 %] (Keyes et al., 2014) is alarming.

Generally, being a victim of childhood injuries has severe consequences on education, health and well-being (Han et al., 2019; Omaki et al., 2017; Priesman et al., 2018; Street, Jacobsen, 2017; Vos et al., 2019). Unintentional injuries such as fractures, concussions, open wounds, and burns are a common cause of morbidity and disability among adolescents in the global community (Gore et al., 2011; Branche et al., 2008) and may have social, behavioural, and economic consequences for the injured children as well as their families (Morrow et al., 2014). According to Peyton et al. (2017), 34.0 % of students who reported having at least one injury in the past year missed school contact hours and were admitted for medical treatment. Thus, the main factors associated with serious injuries per geographical location and population must be given serious attention to providing effective interventions to prevent adolescent injury occurrences. Consistently, serious injuries among adolescents have been associated with multiple risk factors (Ackah et al., 2021; Han et al., 2019; Mireku et al., 2021).

These factors include sex, age, grade, hunger, truancy, drugs and substance use, close friends, physical attacks, physical fights, bullying and suicidal behaviours (Ackah et al., 2021; Mireku et al., 2021). In a study by Han et al. (2019), serious injuries in 68 low-income and middle-income countries were collectively higher among boys than girls (47.8 % vs 37.5 %). This high prevalence might be because boys had higher prevalence rates for both physical attacks (41.0 vs 29.4 %) and physical fighting (45.5 % vs 26.9 %). A similar trend was observed among male school-going adolescents in Mauritius (Mireku et al., 2021). Although the magnitude of the sex difference varies greatly between countries and is based on societal gender role disparities, de Looze et al. (2019) explained that boys experienced more physical fighting, physical activity, and injuries than girls. Additionally, Mireku et al. (2021) noted that lower grades were associated with serious injuries among school-going adolescents in Mauritius.

Furthermore, Han et al. (2019) outlined that injury can be caused by a physical attack where one or more persons hit or strike someone or hurt someone with a weapon such as a stick, knife or gun or a physical fight where two students of similar strength or power choose to fight each other. Han et al. (2019) further clarified that injuries could occur in the form of fractures or dislocated joints, cuts, concussions, knocked out or inability to breathe, wound injuries, burns, or poison injuries. Studies have indicated that children exposed to violence and the resulting injuries are more likely to smoke, misuse alcohol and other drugs, engage in other risky behaviours, and are likely to endure a range of physical and mental illnesses later in life (Han et al., 2019; Priesman et al., 2018; Vos et al., 2019).

Moreover, studies have associated risk factors with bullying, hunger, truancy, marijuana smoking, alcohol use, parental neglect, and suicidal ideation (Ackah et al., 2021; Mireku et al., 2021; Pengpid et al., 2021). For example, an extensive literature review regarding serious injury risks shows that these factors are interrelated and vary across cultures among school-going adolescents (Baiden et al., 2017a; Baiden et al., 2017b; Brown, Plener, 2017; Costa et al., 2020; Fu et al., 2020; Liu et al., 2017; Monto et al., 2018; You et al., 2017; Xavier et al., 2018). Additionally, interpersonal stressors, neurobiological background, emotional dysregulation and adverse childhood experiences such as bullying (Brown, Plener, 2017), poor sleep quality and frequent nightmares (Lio et al., 2016), impulsive behaviours and feelings of loneliness (Costa et al., 2020) and bullying victimisation and depression (Sarfo et al., 2023) are significantly associated serious injuries.

Considering the paucity of evidence and interventions targeting serious injuries in the Caribbean Islands, Saint Lucia will fall short of meeting the United Nations' (UN, 2016) Sustainable Development Goals (SDGs) by the end of 2030. Specifically, to "ensure healthy lives and promote well-being for all at all ages" (Goal 3), and ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" (Goal 4). Furthermore, understanding serious injuries and providing evidence-based measures using a national representative survey like the GSHS would provide generalisable findings that would form the baseline for adolescent injury prevention programmes and support. Thus, we analysed the GSHS data to examine the prevalence and associated factors of serious injuries among adolescents in Saint Lucia.

2. Methods
Research Design
We gathered and used data from the 2018 Global School-based Student Health Survey (GSHS) from the Saint Lucia context (WHO, 2021). The GSHS uses a self-administered questionnaire to collect data from students in a school-based survey. This cross-sectional study was conducted by the WHO, the United States Centres for Disease Control and Prevention (CDC) and Saint Lucia's Ministry of Health and Wellness (MoHW). The survey collected data on the behaviour, health status, and risk factors related to the principal cause of serious injuries and death among adolescents or young adults of school-going age. Using a cross-sectional survey design, data were gathered from WHO member countries interested in dealing with adolescents' health-related issues.

Ethical Consideration Followed in the Study
Ethical approval was obtained for this survey with the following Survey ID Number: LCA_2018_GSHS_v01. An initial pilot test was conducted before data collection to guarantee the reliability and validity of the survey questionnaire. The researchers strictly followed all ethical considerations and policies from the WHO, CDC, Saint Lucia's MoHW and the Ministry of Education (MoE) during the study period. Additionally, specific informed consent was separately obtained from the ministries, school administrators, instructors, parents of minors and students before data collection. The WHO Non-Communicable Disease Microdata Repository provides access to the dataset and information regarding the survey (WHO, 2021).

Sampling
The study participants were adolescents in grades 1-6 of the Saint Lucia educational system. The study used a two-stage cluster sampling design to attain representative information of all the selected schools across the country. In the first stage, the researchers selected schools using probability proportional to enrolment sizes. The researchers randomly selected classes in the second stage. All students found in the selected classes qualified to partake in the study. The response rates for the schools, students, and overall data were 100.0 %, 84.0 %, and 84.0 %, respectively. A total of 1,864 students participated in the survey (WHO, 2020).

Variables
We used two main categories of variables in the study: the outcome/dependent variable and the explanatory variables. The dependent variable was serious injuries identified or reported among the students. The dependent variable was a defined construct: "whether or not the student was seriously injured one or more times over twelve months before the survey." The options ranged from zero (0) times to twelve (12) or more times. This study further dichotomised the responses. Those without injuries, i.e., zero injuries, were grouped as "no injury" and given 0 as a code, whereas those with at least one or more injuries were coded 1, as "serious injuries." The explanatory variables were categorised as sociodemographic factors (sex, age, and grade), personal attributes (hunger, missed school without permission), drugs and substance use (amphetamine use, current marijuana smoking, and current alcohol use), and psychosocial (number of close friends, physical attacks, suicide (ideation, planning, and attempt), and bullying). Table 1 displays the explanatory variables used in the study.

Table 1. Definition of explanatory and measurement coding of variables

Age	How old are you?	0 = 12-14
		1 = 15-17
Sex	What is your sex?	0 = Male
		1 = Female
Grade	In what grade are you?	0 = Forms 1-3
		1 = Forms 4-6
Hunger	Have you gone hungry most of the time or always because there was not enough food at home for the past 30 days?	0 = yes
		1 = no
Close friends	Do you have close friends?	0 = yes
		1 = no
Physical attack	Have you been attacked physically before?	0 = yes
		1 = no
Suicidal ideation	During the past 12 months, did you ever seriously consider attempting suicide?	0 = yes
		1 = no
Suicidal attempt	During the past 12 months, did you attempt suicide?	0 = yes
		1 = no
Suicidal plan	During the past 12 months, did you make a plan about how you would attempt suicide?	0 = yes
		1 = no
School truancy	During the past 30 days, did you miss classes or school without permission?	0 = yes
		1 = no
Amphetamine use	During your life, did you use amphetamine or methamphetamine (also called ice or yellow)?	0 = yes
		1 = no
Current use of alcohol	During the past 30 days, did you have at least one drink containing alcohol?	0 = yes
		1 = no
Current marijuana smoking	During the past 30 days, did you use marijuana?	0 = yes
		1 = no
Physically bullied	Have you been physically abused before?	0 = yes
		1 = no

Data Analysis

In all the analyses, the sample weighting method was applied at the school, student, and sex within grade levels to make it representative of the adolescents of the school-going population in Saint Lucia and minimise bias on various trends and nonresponses. Some variables were recorded on a binary scale in this study, as in other GSHS studies (Aboagye et al., 2022; Ackah et al., 2021; Alikhani, 2014; Mireku et al., 2021; Sarfo et al., 2023). The current analysis did not include students aged 11 and below, and those above 18 years since their frequency was below 100 cases. We also used the multiple imputations (MI) technique to address the issue of missing data. The MI technique was used where the missing values exceeded 1.0 %. The missing data was 1.0 % to 14.0 % and were missing at random. Like a similar GSHS injury study (Mireku et al., 2021; Sarfo et al., 2023), we conducted five MI with the automatic imputation method to maintain data quality concerning missing values. Imputed values were compared reasonably to observed values and results using the complete case analysis. The final model goodness of fit was checked, and the results revealed no evidence of a lack of fit with our model's attempt to predict serious injuries significantly. We conducted two stages of primary analysis to measure variables strongly associated with serious injuries among the students in the adolescent group in Saint Lucia. First, we performed a bivariate analysis using Pearson Chi-square to estimate the relationship between serious injuries and the explanatory variables. Subsequently, we entered the variables that showed significant association ($p < 0.05$) into a binomial logistic regression model. The results obtained from the analysis were presented with a corresponding adjusted odds ratio (AOR) at a 95 % confidence interval (CI) [$p < 0.05$].

3. Results
Background Characteristics of the Adolescents in Saint Lucia
The prevalence of serious injuries among adolescents in Saint Lucia was 44.5 % (see Figure 1). The prevalence of serious injury was significantly high among male adolescents (24.9 %). Moreover, serious injuries were significantly higher (24.5 %) among male adolescents than female adolescents in St. Lucia. Also, serious injuries occurred more (24.8 %) among adolescents in Forms 1-4 than those in Forms 4-6 (19.7 %). Besides, adolescents who drink alcohol significantly experienced more serious injuries (24.1 %) than those who do not drink alcohol (20.4 %).
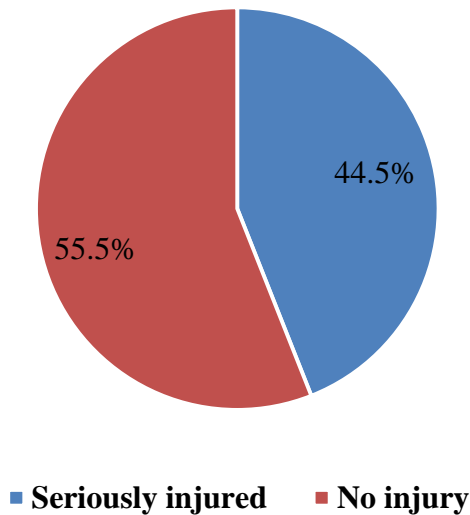

■ **Seriously injured**   ■ **No injury**

Fig. 1. Serious injuries among adolescents attending pre-tertiary schools in Saint Lucia

Chi-Square Analysis of Serious Injuries and Associated Factors
The Chi-square analysis we carried out revealed a significant association between serious injuries among adolescents in Saint Lucia and the following correlates: the age of adolescents (χ^2= 5.67, p < 0. 05), sex (χ^2= 45, p < 0. 001), grade (χ^2= 10.37, p < 0.001), hunger (χ^2= 9.29, p < 0.01), school truancy (χ^2= 32.40, p < 0.001), amphetamine use (χ^2=39.35, p < 0.001), marijuana smoking (χ^2= 33.91, p < 0.001), alcohol use (χ^2= 29.80, p < 0.001), having been physically attacked (χ^2= 96.48, p < 0.001), engaging in physical fight (χ^2= 85.69, p < 0.001), being bullied (χ^2=83, p < 0.001), having suicide ideation (χ^2= 8.34.60, p < 0.01), having suicide plan (χ^2=6.07., p < 0.05), and attempted suicide (χ^2= 17.71, p < 0.001). See Table 2 for details.

Table 2. Bivariate analysis of injuries among adolescents of school-going age in Saint Lucia (n = 1,869)

Variables		Serious injury		Chi-Square (χ^2)	φc
		Injury (%)	No injury (%)		
Demographic					
Age (years)	12−14	465 (24.9 %)	522 (28.0 %)	5.67*	.055
	15−17	365 (19.6 %)	512 (27.5 %)		
Sex	Male	457 (24.5 %)	408 (21.9 %)	45.06***	.155
	Female	373 (20.0 %)	626 (33.6 %)		
Grade	Forms 1 − 3	462 (24.8 %)	498 (26.7 %)	10.37***	.075
	Forms 4 − 6	368 (19.7 %)	536 (28.8 %)		
Personal					
Hunger	Yes	97 (5.2 %)	78 (4.2 %)	9.29**	.071
	No	733 (39.3 %)	956 (51.3 %)		
Truancy	Yes	210 (11.3 %)	153 (8.2 %)	32.40***	.132
	No	620 (33.3 %)	881 (47.3 %)		

Drugs and substance use					
Amphetamine use	Yes	95 (5.1 %)	40 (2.1 %)	39.35***	.145
	No	735 (39.4 %)	994 (53.3 %)		
Marijuana use	Yes	157 (8.4 %)	99 (5.3 %)	33.91***	.135
	No	673 (36.1 %)	935 (50.2 %)		
Alcohol	Yes	449 (24.1 %)	428 (23.0 %)	29.83***	.126
	No	381 (20.4 %)	606 (32.5 %)		
Psychosocial					
Did not have Close friends	Yes	104 (5.6 %)	108 (5.8 %)	1.99	.033
	No	726 (38.9 %)	926 (49.7 %)		
Physically attacked	Yes	344 (18.5 %)	212 (11.4 %)	96.48***	.228
	No	486 (26.1 %)	822 (44.1 %)		
Physical fight	Yes	374 (20.1 %)	255 (13.7 %)	85.69***	.214
	No	456 (24.5 %)	779 (41.8 %)		
Bullied	Yes	294 (15.8 %)	175 (9.4 %)	83.66***	.212
	No	536 (28.8 %)	536 (46.1 %)		
Suicide ideation	Yes	245 (13.1 %)	244 (13.1 %)	8.31**	.067
	No	585 (31.4 %)	790 (42.4 %)		
Suicide plan	Yes	204 (10.9 %)	205 (11.0 %)	6.07*	.057
	No	626 (33.6 %)	829 (44.5 %)		
Suicide attempt	Yes	178 (9.5 %)	145 (7.8 %)	17.71***	.097
	No	652 (35.0 %)	889 (47.7 %)		

Logistic Regression Analysis of Significant Factors Associated with Serious Injuries

Table 3 presents the binomial logistic regression results on the factors associated with serious injuries among adolescents in Saint Lucia. The results show that being a male (AOR = 1.11, 95 % CI = 0.792-1.556), missing class without permission (AOR = 1.308, 95 % CI = 1.009-1.696) abusing alcohol (AOR = 1.370, 95 % CI = 1.114-1.684), experiencing physical attacks (AOR = 1.669, 95 % CI = 1.327-2.099), physical fight (AOR = 1.527, 95 % CI = 1.529-1.225) and being bullied (AOR = 2.171, 95 % CI = 1.712-2.753), added significance to the model of serious injury occurrence among adolescents in Saint Lucia.

Table 3. Correlates of serious injuries among adolescents in Saint Lucia (n = 1,869)

				95 % confidence interval for odds ratio	
	B	**Wald test (z-ratio)**	**AOR**	**Lower**	**Upper**
Demographic					
Age	0.105	0.369	1.110	0.792	1.556
Sex (Male)	0.504***	21.768	1.656	1.340	2.047
Grade	0.186	1.179	1.205	0.861	1.686
Personal					
Hunger	0.133	0.579	1.142	0.811	1.609
Truancy	0.269*	4.113	1.308	1.009	1.696
Substance use and abuse					
Amphetamine Use	0.380	2.960	1.463	0.948	2.256
Marijuana Use	0.212	1.705	1.236	0.899	1.699
Alcohol Consumption	0.315**	8.923	1.370	1.114	1.684
Psychosocial					
Physical attack	0.512***	19.193	1.669	1.327	2.099
Physical fight	0.423***	13.684	1.527	1.220	1.911
Bullied	0.775***	40.933	2.171	1.712	2.753
Suicide ideation	0.083	0.300	1.086	0.808	1.459
Suicide Plan	-0.033	0.040	.968	0.704	1.330

| Suicide Attempt | 0.094 | 0.319 | 1.098 | 0.793 | 1.521 |
| Constant | -6.511*** | 102.725 | 0.001 | | |

Notes: *p < 0.05, **p < 0.01, ***p < 0.001; Hosmer and Lemeshow test (goodness of fit), χ2 (8) = 11.890, p = 0.156.

The study examined the prevalence and correlates of serious injuries among adolescent students in Saint Lucia. We found 44.5 % of serious injuries among these school-going adolescents. Using a nationwide representative sample of adolescents between the ages of 12 and 17, the overall prevalence of serious injuries found among the adolescents of school-going age in Saint Lucia was relatively low [44.5 %] as compared with the rates in Ghana [66.0 %] (Ackah et al., 2021) and Liberia [71.0 %] (Pengpid et al., 2021). However, the prevalence of serious injuries in Saint Lucia was higher than the prevalence of injury values recorded in Europe [13.1 %-30.4 %] (Keyes et al., 2014), Canada (24.0 %) (Gilbride et al., 2006), China (38.0 %) (Gao et al., 2019) and Mauritius (39.0 %) (Mireku et al., 2021). Comparatively, the prevalence of serious injuries among adolescents in Saint Lucia gives the impression that adolescent risky behaviours and factors contributing to injuries exist and need attention.

Our study also showed that sex (male) significantly predicts serious injuries among adolescents in Saint Lucia. Males were 1.6 times more likely to be injured than females. Several studies have reported varied results concerning sex differences' role in sustaining adolescent injuries. Our study was supported by de Looze et al.'s (2019) gender inequality and sex differences in physical fighting, physical activity, and injury among adolescents across 36 countries. Accordingly, the study suggested that since culturally based gender inequality relates to sex differences in some adolescent health behaviours, it is essential to reduce inequalities in the health of future generations by encouraging public health policy to target social and cultural factors that shape perceived gender norms in young people. Recent studies like Han et al. (2019) and Mireku et al. (2021) also observed serious injuries higher among males than females.

Besides the sex differences, the current study also reported a significant association between personal factors such as hunger and truancy and psychosocial factors such as substance use, physical attacks, physical fights, bullying, and suicidal behaviours. For instance, more participants who complained of hunger were involved in injurious behaviours or injured than their counterparts who were not. A similar trend was seen with truancy, amphetamine use, marijuana use, alcohol, physical attacks, physical fights, being bullied, and suicide attempts. Like existing evidence on adolescent injury behaviours, the correlates or risk factors are often multifactorial with complex associations (Alikhani, 2014; Branche et al., 2008; Costa et al., 2021; Denny et al., 2016; Han et al., 2019; Mireku et al., 2021; Morrow et al., 2014; Peyton et al., 2016; Priesman et al., 2016; You et al., 2019). In a multi-item measure of self-injury study, a higher prevalence of physical fights, alcohol, marijuana, suicidal ideation, plan and hard drug use existed among participants with serious injuries in the United States (Monto et al., 2015).

Thus, injury behaviours share similar correlates among adolescents in developed and developing countries (Han et al., 2019; Mireku et al., 2021; Monto et al., 2015). Available evidence further suggests that significant correlations among the explanatory variables are related and demand multidisciplinary approaches to address them (Alikhani, 2014; Branche et al., 2008; Costa et al., 2021; Denny et al., 2016; Han et al., 2019; Mireku et al., 2021; Morrow et al., 2014; Peyton et al., 2016; Priesman et al., 2016; You et al., 2019). For instance, the adolescents who reported using hard drugs, getting hungry and being truant exhibited more injury behaviours than their counterparts who did not (Mireku et al., 2021). Consequently, the government of Saint Lucia should develop parent-school management partnerships with stakeholders to address these risk factors. Adolescents in Saint Lucia may benefit from these evidence-based initiatives and the adoption of policies that will support their physical and psychological well-being.

5. Conclusion

Our study indicated a moderate prevalence of serious injury among teenagers in Saint Lucia using data from the 2018 GSHS that are nationally representative. As a result of this discovery, serious injury is now a mildly concerning public health issue in Saint Lucia. In addition to the moderate rates of serious injury prevalence, other explanatory factors are associated with serious injury among teenagers in Saint Lucia. Regarding the bivariate analysis, we discovered that adolescents with the following characteristics were at a high risk of suffering serious injuries: age

(between 12 and 14 years), sex (being male), lower grade (1-3), truancy, hunger, substance use (using amphetamine, marijuana, and alcohol), physical behaviour (physical attack and physical fight), the experience of bullying, and suicidal behaviour (suicidal ideation, suicide plan, and suicide attempt). Additionally, being a male, being truant, drinking alcohol, engaging in aggressive behaviour (physical attacks and physical fights), and experiencing bullying were all strongly related to serious injury among teenagers in Saint Lucia. If this rate of serious injuries persists, Saint Lucia will not be able to offer inclusive and equitable quality education by 2030, stimulate possibilities for lifelong learning, or ensure that these school-age adolescents live healthy lives. Thus, the government, school administration, parents, and other stakeholders must develop policies and programs to help shape adolescents' school conduct. Additionally, Saint Lucia will be able to meet several of the SDG targets (UN, 2016), especially SDGs 3.5 and 4.1 (strengthen the prevention and treatment of substance abuse, including narcotic drug abuse and harmful alcohol use; ensure inclusive and equitable quality education; and promote opportunities for lifelong learning for all), by devising proactive measures to reduce the occurrence of serious injuries. Moreover, in order to support their psychological and mental health needs, students must have access to mental health resources on campus.

6. Strengths and limitations

Using a national dataset, our study is one of the first to examine serious injury among adolescents in Saint Lucia. Due to the representativeness of our sample, the research contributes to our understanding of the risk factors for serious injury among these adolescents in Saint Lucia. On the other hand, because of the GSHS database's cross-sectional nature, we could not establish a causal relationship between the several risk factors and serious injury. Additionally, a single item was used to measure several mental health dimensions, such as bullying and suicide behaviours (suicidal thoughts, plans, and attempts). A question structure like this may not completely capture all clinical disorders or symptoms for diagnostic purposes. Despite these drawbacks, it is significant that the findings of our study will serve as the starting point for additional analysis and youth intervention programs in Saint Lucia.

7. Implications for Research and Intervention

In this study, we have endeavoured to respond to essential research questions about the prevalence and correlates of serious injury among adolescents in Saint Lucia. Explicitly stating, we sought to determine the predisposing/risk factors of serious injury among adolescents. We conclude by briefly underscoring some possible research and serious injury prevention interventions.

Our findings acknowledge that serious student injury is related to demographic, individual, drug and substance use, and psychosocial factors. The educational system has developed to provide additional opportunities for student-teacher interaction. Due to this circumstance, pupils now consider their school a second home. As a result, school employees now serve as pupils' second parents. Consequently, schools in Saint Lucia had to offer mental health services and support networks for adolescents through behaviour monitoring, direction, and counselling on stress management and how to handle physical assault and bullying (Chaniang et al., 2022). To do this, it would be crucial to designate a few school staff members as mental health focus points or call points and teach them the fundamental skills for spotting pupils who are most at risk of serious injury (Mireku et al., 2021).

Additionally, Saint Lucia's school system needs to move away from a one-dimensional approach to addressing issues with adolescent mental health and instead consider a much broader and nuanced perspective. We hope the schools investigate a serious injury risk assessment tool available online where students can answer standardised questions about a serious injury at predetermined times. The objective is to identify each student's risk factors for serious injury and provide appropriate therapy and referrals considering those risks (Haas et al., 2003; Mireku et al., 2021).

Adolescent substance use behaviours are a further promising topic for serious injury prevention interventions. Mainly, amphetamine, marijuana, and alcohol usage were related to several types of serious injury. Additionally, researchers have found that student drug and substance usage has a detrimental impact on poor academic performance (Botvin, Griffin, 2003). Preventing student substance use would have a positive ripple effect by reducing hostility and

enhancing academic performance. Botvin and Griffin (2013) emphasised that to stop students from using alcohol and other drugs, the educational structure or environment must not be disregarded.

In general, we advise schools to offer opportunities for skill development through athletics, music, and other pursuits that pique adolescents' interests and serve as a substitute for drug usage. We hope that establishing cooperative efforts between policymakers, the school, and other pertinent stakeholders to address social and behavioural issues, particularly substance use among students, will significantly reduce serious injury, improve mental health, and improve academic outcomes.

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9. Author contributions
JOS conceived the idea of the study. JOS and PO downloaded and analysed data and prepared tables. JOS, PO, TPD, NIG, COBO, RSS and KO wrote the manuscript. All authors read and approved the final version of the manuscript.

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11. Competing interests
The authors declare no competing interests.

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Contemporary State of the Phenomenon "Digital Intercultural Competence" in Pedagogical Science

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Abstract

Digitalization of modern society has caused extreme reforms in the information sphere. The education system has not been spared. The problem of lifelong learning and constant moral development of the specialists, ready to critical and creative solving of professional tasks, is getting more topical. For contemporary specialists the presence of digital intercultural competencies is an essential part of their professiograms. Due to requirements for the pedagogical concept and the principles of solving scientific problems it's necessary to analyze historical and pedagogical background in the field of digital intercultural competence. Historical and pedagogical analysis is determined by etymological complexity and multidimensional nature of the research problem, the absence of clear historical boundaries of the phenomenon, digitalization of social and business processes, expansion of intercultural contacts between different nations. Every period of historical development was analyzed from the political and socio-economical viewpoints. The whole investigation was carried out since the advent of information theory till the emergence of theory of intercultural communication. Historical and pedagogical analysis of the researched problem was carried out from beginning of XX century to the present day, because this period is associated with a significant change in social and scientific spheres, that demonstrate the dynamics of the phenomenon of digital intercultural competence objectively. Crucial impact on the rash development of the pedagogical phenomenon of the digital intercultural competence has played socio-economical digitalization of the contemporary world, which determined the increased interest of the government and employers in the necessity of developing digital competencies and increasing of the Russian science' competitiveness in the world. The investigation was carried out between first-year students of the training direction 45.03.02 Linguistics (bachelor's degree). The linguistic direction of training was chosen consciously because of the direct connection of intercultural interaction with a foreign language and linguistic training.

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Keywords: genesis, digitalization, digital economy, education, key competence, digital intercultural competence.

1. Introduction

Developing of the digital competencies of modern specialists is considered as one of the key aspects of innovative and effective functioning and progress of Russian Federation. Contemporary requirements from the government and employers towards the university graduates and their intercultural competencies is determined by the active and strong integration of innovative technologies in all spheres of economics. All above mentioned has caused the increased interest of the representatives of pedagogy, sociology, philosophy, psychology, informatics to the phenomenon of intercultural competence of the future specialists in connection with the wide-spread digitalization.

The digital transformation of the Russian education system is associated with a complex of material and technical problems, as well as the readiness of the lecturers and students. The digitalization of the Russian economy required the formation of various kinds of digital competencies and the widespread integration of computer technologies in the educational process and in pedagogical science as o whole.

So, the purpose of this study is to conduct a historical and pedagogical analysis, substantiate the specificity and component composition, as well as the current state of the phenomenon of "digital intercultural competence".

Traditionally pedagogical researches require implementation of the detailed analysis of historical development of the researched problem (Zagvyazinskiy, 1982; Yakovlev, 2010). The logical approach allows to consider the phenomenon in its current stage of development while historical approach opens specific features of its historical evolution (Novikov, 2007). We believe that integrated utilization of these approaches gives the researchers the excellent opportunity to obtain objective information about the current state of the phenomenon under study, providing initial scientific knowledge about the problem, highlighting aspects that need special attention of the scientific community. The periodization of social phenomena is traditionally studied in Russia by historiography (Yakovleva, 2013), that requires to identify the starting point and the historical evolution of the investigated phenomenon.

2. Literature review

From the beginning of the 2000s the world sociocultural experience led to significant changes in the development of the problem of digital intercultural competence. In this period the problem of our research turned to stage of methodological conceptualization which is determined by the active integration of computer technologies in the economical, educational, cultural, political spheres of Russian state. The global information society is becoming sharply commercialized, information is moving into the status of a commodity unit (Booch, 2006; Varakin, 2001; Sergeeva, 2001).

In philosophy, the concept of "information" has been used since ancient times. In contemporary science this concept is popular due to the development of cybernetics, which central categories are information, communication, and control. Until the middle of the 20th century information was considered in the form of data or knowledge. Information is data that objectively reflects various aspects and elements of the surrounding world and human activity, accumulated socio-cultural experience. There is no doubt that any information should be of some interest and novelty, have a materialized form for use, transfer, storage and/or processing. Important features of information are timeliness and ability to enlarge knowledge. G.M. Romantsev (Romantsev i dr., 2005) considers information primarily as data transmitted by people during communication, as well as the process of transmitting or receiving this information.

In the globalized society information is used to increase efficiency, stimulate innovation, ensure global competitiveness, and enhance prestige. Information is becoming a subject of mass consumption among the population, provides for the development of human potential. We propose that the emergence of the term "information culture" is a consequence of the listed manifestations of the information society.

M.S. Kagan (Kagan, 1996) noticed that the main components of culture are: 1) a person as a product and creator of culture; 2) the innate qualities of a person as a subject of activity; 3) ways of human activity that are invented, improved and passed on from generation to generation in the process of training, education, upbringing; 5) various objects of material, spiritual, artistic culture,

which are translators of human creations to other people; 6) communication as an active way of realizing the needs of people in each other.

K.K. Kolin (Kolin, 2011) proposes to consider the following as the main components of information culture:

1. Information and computer competence and literacy of a person;
2. Electronic books, electronic libraries, museums, and art galleries, etc.;
3. Information retrieval technologies, multimedia, virtual reality, etc.;
4. New types and forms of information communications in society.

It is obvious that since 2010 the key competencies have acquired in the Russian Federation the status of a necessary feature of a contemporary specialist. In this regard the process of development of appropriate professiograms is underway, the Russian educational paradigm is actively updating, causing the separating of cultural and academic competencies into different groups.

In the UNESCO materials there is a list of key competencies as an integral final component of the educational process, which is the main condition for successful professional activity and education throughout life. Russian scientist I.A. Zimnyaya (Zimnyaya, 2009), speaking about the concept of "competence", differentiates the cognitive, motivational, relational and regulatory components in its structure. According to this differentiation academic competence ensures the ability to solve various kinds of tasks in the professional field on the basis of the formed skills.

Etymologically the term "competence" (from the Latin "competens") literally means "appropriate, capable." Currently, the concept of "competent" is most often used in the sense of "experienced in a particular field of activity." In the Latin language there is also a related concept of "competence" (competentia), which is defined as the range of issues in which this person has knowledge and experience.

A.M. Kondakov (Kondakov, 2024) understands competence as "a systemic set of competencies that make it possible to solve problems in the everyday or professional life effectively". In addition, the scientist considers such a phenomenon as basic competencies "that are necessary throughout the whole life in all types of human activity, and form the basis for professional competencies, concerned with critical and creative thinking, continuous self-development and responsibility".

The Council of Europe, considering in 1990 levels in a foreign language proficiency as a component of linguistic competence, identifies General language competences (ability to learn, existential competence, declarative knowledge, skills, and know-how) and Communicative language competences (Common European..., 1990). Communicative language competence includes a linguistic component, a sociolinguistic component, a pragmatic component. So, the concept developed and proposed by the Council of Europe, became a leader in the field of teaching foreign languages. Today it is as a platform for the creation of curricula, teaching aids and teaching methods, shifting the perspective from grammar and vocabulary as the main goal of language education to the formation of communication skills.

Russian scientists, analyzing competence-oriented education, understand competence as "knowledge-based, intellectually and personally determined social and professional human activity", identifying 37 types of competencies as a result of educational process (Zimnyaya, 2009).

Summarizing all the above interpretations of the concept "competence", we understand "digital competence" as a set of competencies of independent search, selection, analysis, transformation, preservation, and transmission of the necessary digital information that are acquired by a person in the process of cognition and subsequently appear in his professional activity in the context of global digitalization of social and economic processes, becoming his personal characteristics that determine the ability to communicate and cooperate, creative and critical thinking, continuous self-development.

In modern society, active interest of scientists and politicians is caused by the issues of highlighting key competencies that are mandatory for people in the digital society.

European scientists single out five variants of competencies that have 21 more part-competencies in their structure (Carretero et al., 2017). The key competence, which is of great importance for our study, is "netiquette" (network + etiquette) that is based on certain behavioral norms and digital communication methods. Netiquette determines the presence of knowledge and tolerant acceptance of cultural differences that has special importance in the digitalized world (Baimuratova i dr., 2018).

Discussions about the moral development of modern people as the important part of social cohesion and security we find in the investigation of Tatiana Ershova, who believes that key-competencies, based on a value component, provide personnel productivity and competitiveness in the innovative reality (Ershova, 2018). She considers that key-competencies in the digital professional world consist of thinking style, ways of professional activity and professional skills. Professional skills provide for the presence of business, communication, information, digital or technical characteristics. At the same time, family, educational institution, work, media, state, educational and cognitive activities can enhance the formation of certain competencies.

3. Materials and methods

With the purpose to single out the periods in the development of the problem of the formation of digital intercultural competence we consider the following provisions:

1. The priorities of university education in the field of digitalization and competence development, that can be described by the method of historical and pedagogical analysis;

2. Unclear boundaries in the development of the digital intercultural competence, that allow us to start the investigation of the genesis from the first half of the 20th century, associated with the initial attempts to comprehend the researched problem. In this period appears the information theory.

3. The main prerequisites that determined the formation and subsequent development of the problem of the formation of digital intercultural competence were: digitalization of social and business processes; globalization of economic processes; expansion of intercultural contacts which determined emerging of the necessity of the formation of digital intercultural competence.

The investigation was carried out in Ural Federal University (Ekaterinburg, Russia); Tyumen State University (Tyumen, Russia); Chelyabinsk State Pedagogical University (Chelyabinsk, Russia). In total in the study took part 332 students of the training direction 45.03.02 Linguistics (bachelor's degree). The linguistic direction of training was chosen consciously because of the direct connection of intercultural interaction with a foreign language and linguistic training. Experimental groups were formed from first-year students with the same academic performance and English language proficiency level according to the Common European Framework of Reference for Languages (B1).

The study used diagnostic tools based on the theoretical developments of M. Rokich (direct ranking of the list of values: terminal (beliefs that the ultimate goal of individual existence is worth striving for) and instrumental (beliefs that some way of acting or property of a person is preferable in any situation).), M.I. Lukyanova, N.I. Kalinina (identification of one or more motives in a student: external, game, evaluative, positional, social, educational), L. Michelson (determination of the level and the quality of communicative competence and basic communicative skills) and K. Thomas (investigation of the personal predisposition to conflict behavior and to identify certain styles of conflict resolution).

4. Discussion and results

Thus, the importance of the formation and development of digital intercultural communication skills and related competence is obvious today.

In linguistics, the concept of intercultural competence is considered from the standpoint of the presence of foreign language communicative knowledge and skills in a person, as well as the formation of a linguistic personality. Considering the phenomenon of intercultural competence, some scientists emphasize in its structure the importance of such a quality as a mediator of cultures with the obligatory consideration of cultural identity. In addition, the researcher considers concepts of intercultural and foreign language communicative competence as similar phenomena, highlighting linguistic, behavioral, and psychological aspects, which ensure the formation of a fundamentally new quality of personality (Narolina, 2010).

In psychology, intercultural competence is associated with certain personal parameters, providing intercultural interaction of a professional, sociocultural, and personal nature. Psychologists single out intercultural communicative competence as the ability to communicate with representatives of other cultures and nationalities using elementary knowledge of international etiquette, recognition of cultural values and a tolerance towards different cultures, even if the knowledge of foreign language is not good enough.

Considering intercultural competence as a structural component of intercultural communication, sociologists interpret intercultural competence as various forms of human

interaction with consideration to the importance of cultural differences. Very important ability in this context is the ability to recognize, understand and adequately take cultural diversity into account. The effectiveness of communication process is directly dependent on the level of mutual understanding between communicants and is provided by a certain set of intercultural knowledge, skills, and abilities, which are common to all participants of intercultural dialogue.

The theory of communicative competence was developed also by the Dutch scientist Van Ek (Van, 1986), who highlights, that it is one of the main components in the personal and social development of the individual in the process of learning a foreign language and it is not limited only to the development of communicative skills and abilities. In the structure of foreign language communicative competence, Van Ek considers:

- linguistic competence, which means knowledge of the norms and rules of the foreign language;

- sociolinguistic competence, connected with the knowledge of language forms and ways of expressing them;

- strategic competence, which presumes the ability to use verbal and non-verbal communication strategies;

- sociocultural competence, describing the consciousness of sociocultural contexts;

- social competence, characterizing the readiness and ability to interact;

- discourse competence, which is understanding as the ability to construct and interpret texts.

Summarizing the above interpretations of the concept of "intercultural competence", in our study, by "intercultural competence" we will understand a complex personal characteristic, a set of intercultural competencies, providing for the readiness and ability of an individual for intercultural interaction on the basis of the knowledge about the characteristics of native and foreign cultures. Then we will understand "digital intercultural competence" as a complex personal characteristic, a set of intercultural competencies of independent search, selection and analysis of the necessary information using digital tools of communication, manifested in the readiness and ability of an individual for intercultural interaction based on the knowledge about the characteristics of their own culture and the culture of partners.

As a next step of our research, we will determine the level of development of digital intercultural competence of the would-be lecturers on a set of criteria based on the interpretation of the concept of "digital intercultural competence":

1) The axiological criterion presupposes the acceptance of human values and readiness for online communication in accordance with axiological rules;

2) The linguistic criterion determines the readiness to non-verbal digital communication as well as the skills of responsible handling of digital media;

3) The digital criterion provides information and media literacy;

4) The technological criterion presupposes the ability to create digital learning tools and resolve difficulties in a digital intercultural context.

The results of the study of the level of digital intercultural competence in accordance with the identified criteria are presented below.

The manifestation of the axiological criterion was observed in the learning process (problem situations and projects), with the analysis of the progress and quality of students' achievements (Table 1). By the M. Rokeach's test methodology we were able to reveal the key features of a person's orientation and his relationship to the world (Greben', 2007). M. Rokich's method of studying value orientations based on direct ranking of the list of values is by far the most widespread and valid in pedagogical and psychological science. It should be noted that M. Rokich distinguishes two classes of values: terminal (beliefs that the ultimate goal of individual existence is worth striving for) and instrumental (beliefs that some way of acting or property of a person is preferable in any situation). In the course of the experiment, respondents are offered two lists of values (18 in each). In the lists, the subject assigns a rank number to each value, and the cards are arranged in order of importance.

The diagnostic showed that the most respondents have a minimum level of digital intercultural competence according to the axiological criterion. Contemporary students have an insufficient level of awareness of human values. Educational decisions are not thought-out enough, without considering the axiological component. Orientations towards humane axiological rules of behavior are weakly formed. Digital communication and teaching media are considered as inappropriate and uncomfortable.

Table 1. Manifestation of the axiological criterion

Group	Number of people in group	Levels of development of digital intercultural competence of the would-be linguists		
		Minimal	Optimal	Leading
Group-1	56	26 (46,4 %)	20 (35,7 %)	10 (17,9 %)
Group-2	52	23 (44,2 %)	20 (38,5 %)	9 (17,3 %)
Group-3	48	16 (33,3 %)	26 (54,2 %)	6 (12,5 %)
Group-4	60	31 (51,7 %)	21 (35 %)	8 (13,3 %)
Group-5	63	31 (49,2 %)	25 (39,7 %)	7 (11,1 %)
Group-6	53	26 (49,1 %)	15 (28,3 %)	12 (22,6 %)
Total	332	153 (46,1 %)	127 (38,3 %)	52 (15,6 %)

The investigation of the level of digital intercultural competence according to the linguistic criterion (Table 2) was carried by means of technique for measuring the learning motivation (M.I. Lukyanova and N.I. Kalinina), as well as using the test of communicative competence and communication skills (L. Mikhelson) (Greben', 2007). The methodology of M.I. Lukyanova, N.V. Kalinina involves the identification of one or more motives in a student, namely: external, game, evaluative, positional, social, educational. The method represents 18 unfinished sentences with variants of continuation to them and includes six blocks that reflect the indicators of motivation. Each block is represented by three sentences:

1-3 sentences → personal meaning of learning (I block);
4-6 sentences → degree of development of goal-setting (II block);
7-9 sentences → other motives (III block);
10-12 sentences → external or internal motives (IV block);
13-15 sentences → desire to achieve success in learning or to avoid failure (V block);
16-18 sentences → realization of learning motives in behavior (VI block).

L. Michelson's test is designed to determine the level and the quality of communicative competence and basic communicative skills. The questionnaire contains a description of 27 communicative situations with 5 possible variants of behavior. It is necessary to choose one inherent way of behavior in this situation. As a result, it is proposed to count the number of correct and incorrect answers as a percentage of the total number of selected answers.

Table 2. Manifestation of the linguistic criterion

Group	Number of people in group	Levels of development of digital intercultural competence of the would-be linguists		
		Minimal	Minimal	Minimal
Group-1	56	20 (35,7 %)	28 (50 %)	8 (14,3 %)
Group-2	52	27 (52 %)	15 (28,8 %)	10 (19,2 %)
Group-3	48	30 (62,5 %)	10 (20,8 %)	8 (16,7 %)
Group-4	60	31 (51,7 %)	18 (30 %)	11 (18,3 %)
Group-5	63	38 (60,3 %)	15 (23,8 %)	10 (15,9 %)
Group-6	53	29 (54,7 %)	18 (34 %)	6 (11,3 %)
Total	332	175 (52,7 %)	104 (31,3 %)	53 (16 %)

The results of diagnostic measures demonstrate the presence of a rather low level in all test groups, a total of 175 people (52.7 %).

The digital criterion that determines an effective digital intercultural interaction is realizing in use of linguistic units in speech and compliance with digital security rules (Table 3). Information and media literacy is also an integral indicator of this criterion that was diagnosed through questionnaires, projects, lexical and grammatical tests.

Table 3. Manifestation of the digital criterion

Group	Number of people in group	Levels of development of digital intercultural competence of the would-be linguists		
		Minimal	Minimal	Minimal
Group-1	56	27 (48,2 %)	21 (37,5 %)	8 (14,3 %)
Group-2	52	32 (61,5 %)	12 (23,1 %)	8 (15,4 %)
Group-3	48	34 (70,8 %)	9 (18,8 %)	5 (10,4 %)
Group-4	60	34 (56,7 %)	17 (28,3 %)	9 (15 %)
Group-5	63	40 (63,5 %)	13 (20,6 %)	10 (15,9 %)
Group-6	53	31 (58,5 %)	12 (22,6 %)	10 (18,9 %)
Total	332	198 (59,6 %)	84 (25,3 %)	50 (15,1 %)

So, the statistical data in the Table 3 demonstrate the predominance in all experimental groups of the minimal level of formed digital intercultural competence according to the digital criterion (59.6 %). The diagnostic showed that in students' speech there are lots of stylistic and lexical mistakes. They use extremely rare professional terminology. The ability for critical assessment of information is not formed.

The investigation according to the technological criterion was carried out in the situations of creation of digital content and resolving problematic situations in a digital intercultural context (using the questionnaire by K. Thomas "Behavior Style in Conflict" (Greben', 2007), lexical and grammatical tests, projects) (Table 4). It should be noted that the questionnaire "Conflict Behavior Style" by K. Thomas is designed to study personal predisposition to conflict behavior and to identify certain styles of conflict resolution. The author proposes a two-dimensional model of conflict resolution based on cooperation, taking into account the interests of all participants in the interaction, and assertiveness, defending only one's own interests. According to these two main dimensions, K. Thomas identifies the following ways of conflict regulation: competition, accommodation, compromise, avoidance, and cooperation.

Table 4. Manifestation of the technological criterion

Group	Number of people in group	Levels of development of digital intercultural competence of the would-be linguists		
		Minimal	Minimal	Minimal
Group-1	56	33 (59 %)	18 (32,1 %)	5 (8,9 %)
Group-2	52	32 (61,5 %)	16 (30,8 %)	4 (7,7 %)
Group-3	48	33 (68,7 %)	12 (25 %)	3 (6,3 %)
Group-4	60	36 (60 %)	19 (31,7 %)	5 (8,3 %)
Group-5	63	41 (65,1 %)	14 (22,2 %)	8 (12,7 %)
Group-6	53	33 (62,3 %)	14 (26,4 %)	6 (11,3 %)
Total	332	208 (62,7 %)	93 (28 %)	31 (9,3 %)

All experimental groups showed approximately the same results with the domination of the minimal and optimal level of development of digital intercultural competence due to the technological criterion. Consequently, we can summarize, that it is necessary to strengthen the methodological basis of the process of formation of digital intercultural competence with innovative forms and methods.

5. Conclusion
Summing up, we note that the current stage of development of the problem of the formation of digital intercultural competence is associated with:

1) widespread digitalization of all economic spheres as the main sociocultural factor and the insufficient level of digital intercultural competence by the would-be specialists;

2) significant changes in the connotation of intercultural competence, determined by the increased intercultural contacts in the digital environment;

3) the priority of the governmental policy in the digital development and improving the country's competitiveness in the global market.

The present study is theoretically and practically completed and opens prospects for further research in the field of formation of digital intercultural competence: substantiation of innovative theoretical and methodological foundations; allocation of new characteristics and structural filling of the researched phenomenon taking into account the changing geopolitical situation in the world, preservation and strengthening of national identity in the process of intercultural interaction in the digital environment and much more.

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Vocabulary Acquisition through Thesaurus Modelling within ESP Course for Engineering Students

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Abstract

The paper is intended to reveal positive experience of applying a newly-elaborated thesaurus modelling technology which represents an effective tool of engineering pedagogy process involving comprehensive learning of the professional vocabulary. The participants of the research were second-year engineering students of the mineral resources specializations in St. Petersburg Mining University. Conventional-based way of learning English professional terminology and vocabulary acquisition through thesaurus modelling within ESP course were used in control and experimental groups accordingly during the academic year of 2022–2023 which entails writing assignments accomplishment and final essay assessment. The gathered data were manually put into the SPSS software and analyzed statistically with the chi-square test output with identification of p-value.

The purpose of the study was to determine what impact thesaurus modelling technology has on the mastering of such general competences as communication, project development and implementation, teamwork and leadership, critical thinking, self-regulation while teaching professional vocabulary to engineering students within ESP course. The results of the final essay assessment as well as the results of the general competences questionnaire proved to be statistically effective and revealed uneven distribution. The interpretation of the results showed that although communication skills and self-regulation capacity have been mastered almost equally by students of both groups, other general competences as project development and implementation, teamwork and leadership have been developed by the experimental group much more profoundly than the control group.

Keywords: engineering education, professional vocabulary acquisition, thesaurus modelling, ESP, general competences, communication skills, critical thinking, team-work, terminology mastery.

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1. Introduction

Due to the obvious fact pointed by numerous researchers that "mineral resource complex" (Khrustaleva et al., 2021: 417) along with "mineral resources as natural capital" (Litvinenko et al., 2023: 95) and "a pronounced resource specialization" (Bykova et al., 2023) representing a clear-cut factor of a country's sustainable development, the segment of the mining engineering education should be given particular emphasis as a key factor of technological and scientific progress (Bergamo et al., 2022; Gutierrez-Bucheli et al., 2022; Sigahi, Sznelwar, 2023). Technical education "needs modern and sophisticated methods" (Skornyakova, Vinogradova, 2022: 100) to keep in line with the demands of the global labour market demand. Gerasimova et al. assert that highly-qualified specialists "being essential for the sustainable economic development" are in great demand nowadays (Gerasimova et al., 2021).

Among substantial purposes of engineering specialties educational process is the integration of interdisciplinary bonds since integrative educational courses improve students' ability "to think systematically and independently, to use a set of knowledge and skills that allow effectively solving professional problems" (Goldobina et al., 2020: 803). Future engineering specialists undergo a holistic competence-based education approach to be entirely prepared for their upcoming career path (Chan, Luk, 2022; Franco et al., 2023; de Oliveira et al., 2023). Key engineering competences are highlighted and scrutinized through the lens of professional engineering ethics (Ovchinnikova, Krotova, 2022).

Mining specialists training needs implementing modern educational technologies and methods, among which there is also an important concept of "global focus of training, i.e. graduates are prepared to work worldwide" (Kretschmann et al., 2020: 248), which emphasizes foreign language communication ability. Both researchers and professional communities agree that "high-skilled engineering workforce with proficient knowledge of foreign languages is in demand in a globalised world with knowledge-based economies" (Pushmina, Karter, 2021: 150).

Following the labour market need for comprehensively-skilled and all-round specialists, Saint Petersburg Mining University teachers apply novel educational methods, for example, blended learning model of traditional and digital components of ESP course (Gerasimova et al., 2022), the corpus approach in ESP teaching (Boyko, Koltsova, 2023), integrative Business English course for master's students (Varlakova et al., 2022).

In its educational programmes, Mining University first and foremost is guided by the Federal State Education Standard of the Russian Federation which stipulates acquisition of a number of competences. Within this work, some general and professional competences are considered that can be obtained during the course of foreign language. Among these competences are: communication, critical thinking, leadership/teamwork, project development and implementation, self-regulation.

Mastering a foreign language for future professional communication as well as development of further general competences are in the limelight of the educational institutions all over the world (Awang, Daud, 2015; Burkholder, 2021; Castelló, 2023), and Saint-Petersburg Mining University is of no exception. This is why future engineers studying in this university are taught various aspects of professional communication in the foreign language, including different types of professional vocabulary acquisition. This research focuses attention on the thesaurus modelling method.

In the recent decade there has been widespread attention paid by multiple researchers on various thesauruses modelling in different domains and for different purposes. V. Radygin et al. have created a thesaurus for thematic search for violations of the public procurement Federal Law of the Russian Federation (Radygin et al., 2021). L. Scutelnicu demonstrates CoRoLa Corpus for contemporary Romanian language summing up almost 1 billion Romanian words from a wide range of domains, covering all literary genres. The CoRoLa corpus has been developed for four years, since 2017 it is visible for research (Scutelnicu, 2021). F. Meng et al. propose a method of domain keyword extraction and construct a thesaurus for domain news (Meng et al., 2022). I. Subirats-Coll et al. give a comprehensive description of AGROVOC, a multilingual and controlled vocabulary designed to cover concepts and terminology under Food and Agriculture Organization of the United Nations' areas of interest. This thesaurus uses both hierarchical and non-hierarchical relations among concepts. It has been Linked Open Data since 2018 (Subirats-Coll et al, 2022). The principles of compiling a bilingual dictionary of investment terms have been scrutinized in the paper by (Shageeva et al., 2022). Important aspects and practical values of Modern Chinese thesaurus for Mandarin native speakers in terms of nursing field are thoroughly described in the

study of Indonesian scientists (Wiratikusuma, Wiratikusuma, 2022). All these researches emphasize the fact that domain thesauruses facilitate the search of the requested relevant information.

Summarizing the points of view illustrated above, we hold the view that thesaurus is a set (arrangement) of words (or terms) organized in a hierarchical system according to their interrelations. There are different types of thesaurus, while one of the most popular and widely-used types of thesaurus is a set of synonyms (Roget's Thesaurus – https://icourse.club/uploads/files/ba02bc65d60c1fef8e082fc48b344d75fbf81b40.pdf).

There are much more comprehensive thesauruses which include a lot of linguistic information and give relations and ties between the words in the form of a graph: https://www.freethesaurus.com/.

The authors of the present paper are in full agreement with a number of researchers who consider thesaurus modelling as an effective tool in teaching terminology in a technical university. According to R. Deniko et al., terminological training has a significant effect on communicative and cognitive competences development. Having a good command of terminology empowers students with abilities to better carry out information analysis, notion conceptualization, to solve engineering tasks much more profoundly. Thus, the exact terminology equivalents knowledge helps future engineering specialists make professional communication more effective. Because of the growing polysemy and synonymy, there is "a need for standardization work that can be done in the form of information thesaurus" (Deniko et al., 2015). M. Martin and co-authors have created and implemented the thesaurus of manufacturing engineering terms through the Virtual Campus where students were supposed to design their own thesauruses according to the given pattern: term, its etymology, English translation, definition sources, reference in a real text, critical review, traceability, related terms, illustrative image (Martin et al., 2015: 216-216). As M. Martin and his colleague assert, thesaurus modelling has become an effective teaching tool being in a continual state of growth and improvement. We definitely support this point of view. G. Chainikova et al. describe a pedagogical method of "lexical competence development on the basis of a Learner's terminological thesaurus and dictionary of software term" (Chainikova et al., 2018: 51). The thesaurus and dictionary in this technology are represented through four parts – classification, ideographic part, glossary, bilingual dictionary – and proves to be effective. The postulate of thesaurus being an influential didactic tool is shared by the researchers M. Bazhutina and O. Brega, who declare thesaurus modelling principles beneficial in teaching scholarly abstract writing to graduate students (Bazhutina, Brega, 2019). A. Bagiyan et al. propose pragmatic and axiological linguistic modelling as an indispensable tool in shaping a professional identity of a student. They meticulously describe methods used and highlight positive results of the suggested modelling (Bagiyan et al., 2021).

From the above mentioned studies, we can definitely conclude that thesaurus modelling technology implementation is growing rapidly. All these findings are in line with the present research focused on interrelation between general competences development and thesaurus modelling. The distinctive feature of the current paper is that it deals with the interrelation between not only the communicative competence and professional vocabulary acquisition through non-conventional education process as stated in the above mentioned researches, but also such competences as project development and implementation, teamwork and leadership, critical thinking, self-regulation. The authors have scrutinized the indicators of the given competences achievement marked by the students themselves while giving responses in the questionnaire.

There is no denying the fact that vocabulary acquisition is one of the biggest issues for engineering students who are studying foreign language (Otto, 2021; Rus, 2020; Kamrotov et al., 2022). There are various teaching methods suggested by researchers, such as implementation of a mobile learning application (Poláková, 2022) or the influence of the spacing effect on targeted vocabulary learning (Yan, Zhou, 2023). In Saint Petersburg Mining University, engineering students have to learn a list of basic vocabulary of their specialization. We suggest using thesaurus as a tool for vocabulary acquisition.

Having scrutinized all the possible types of thesaurus, we elaborated a thesaurus modelling scheme for the purposes of our ESP course (see Figure 1).
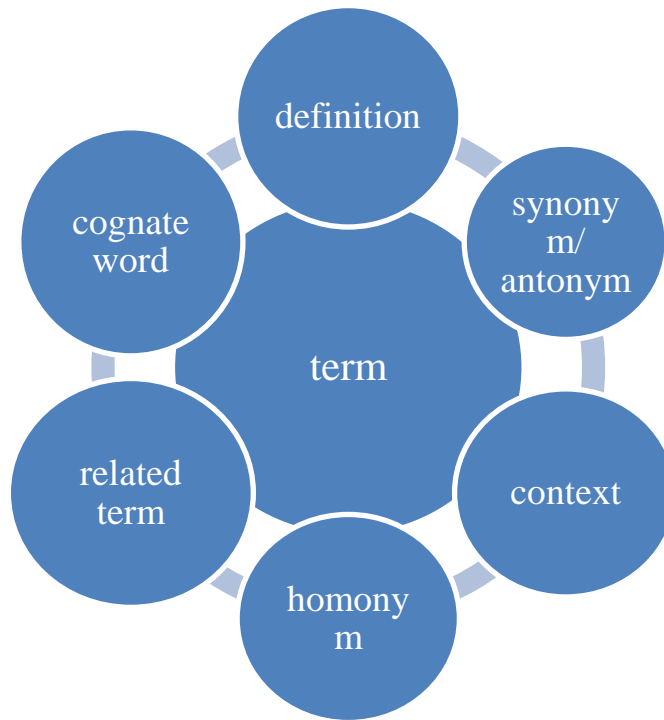
Fig. 1. Thesaurus modelling scheme
Compiled by E. Vinogradova

Having processed various types of thesauruses, the authors of this research have elaborated those aspects of thesaurus modeling technology that are particularly important for the engineering students. These aspects are: filling in the table of the thesaurus modelling assignment; discussion and guessing of the given terms in pairs, in threes, in groups; final essay writing and its assessment.

The focus of the present study is to prove that there is positive correlation between the thesaurus modelling in the ESP course and effective development of general competences. Hence, a novel approach has been elaborated where the use of thesaurus modelling is introduced and implemented. Among the aims of the research is to track the ESP students' general competences acquisition in terms of professional vocabulary acquisition in two different formats – conventional-based education process vs. thesaurus modelling technology application. In the view of this, the research questions put forward by the authors are the following:

- Does the general competences mastering through thesaurus modelling technology while learning professional vocabulary within ESP course prove to be effective?

- Does the thesaurus modelling technology while learning professional vocabulary within ESP course prove to be effective in terms of academic performance in final essay assignment?

In order to answer the research questions, the null and alternative hypotheses were formulated and then verified through the research.

(1) Null hypothesis – There is no significant difference between vocabulary acquisition through the thesaurus modelling technology and vocabulary acquisition through conventional method in terms of engineering students' general competences development.

Alternative hypothesis – There is a significant difference between vocabulary acquisition through the thesaurus modelling technology and vocabulary acquisition through conventional method in terms of engineering students' general competences development.

(2) Null hypothesis – There is no significant difference between students' academic performance when implementing the thesaurus modelling task and students' academic performance when implementing conventional assignments.

Alternative hypothesis – There is a significant difference between students' academic performance when implementing the thesaurus modelling task and students' academic performance when implementing conventional assignments.

2. Materials and methods

During the 2022/2023 academic year the authors of this research introduced with their students at Saint Petersburg Mining University an experimental system of using thesaurus

modelling technology during the course of foreign language. In this paper, it is considered that apart from the communicative competence, the students are supposed to gain further skills: critical thinking, teamwork, project implementation, self-regulation capacity.

The participants are full-time 2-nd year students (irrespectively of gender) from seven faculties of various engineering specializations connected with the mineral sector: faculty of oil and gas engineering, faculty of geological exploration, mining faculty, civil engineering faculty, faculty of mineral processing, energy faculty, faculty of economics Total number of the participants is 188 students (see Table 1). 89 of them were in the experimental group who were offered to learn professional vocabulary through thesaurus modelling technology. The control group included 99 people who had conventional tasks of learning terminology by heart, writing dictations, oral answering of memorized terms. It should be noted here both experimental and control groups included approximately the same number of students. The main requirement for the groups distribution was the equal proportion of the students with the same English proficiency level.

Table 1. Participants distribution

	N	Percentage
Experimental group	89	47,3
Control group	99	52,7
Total		

Since the aim of the experiment was the format of the professional vocabulary acquisition (traditional learning by heart vs. thesaurus modelling technology) in general, there was made no distinction between various faculties. The only difference was in terms of vocabulary lists taught to students of corresponding specialties.

On the basis of the thesaurus scheme we developed an assignment aimed at thorough work with terminology list. It helps students not only study new words, but also build up a cognitive map of their professional field through understanding important notions (terms) and relation to other terms.

Table 2. Thesaurus modelling assignment

definition	cognate word	context
	term	
synonym/antonym		homonym
	related term	

Upon completion of the experiment, the participants filled in a questionnaire revealing the results of competences acquisition in both groups. Also, the experimental group was offered to express their attitude towards the novel approach to studying the professional vocabulary as well as to define how hard it was for them to fill in each box. The questionnaire included the following aspects: task analyzing skill, critical thinking skill; the ability to determine the scope of tasks within the set goal and the choice of optimal ways to solve them (project development and implementation), the ability to define one's role in social interaction and teamwork, based on a cooperative strategy to achieve a given goal (teamwork), the ability to use tools and methods of time management when performing specific tasks (self-regulation capacity). Tables 3-7 represent the corresponding questions and the answers of both groups. A 5-point Likert-scale ('1' for 'definitely disagree', '2' for 'rather disagree', '3' for 'undecided', '4' for 'rather agree', '5' for 'definitely agree') was used to measure the responds.

After having implemented the thesaurus modelling assignment students from both groups were supposed to write the final essay focused on their future speciality and sphere of the studies. The topics suggested for the students were as follows: What is your planned speciality? What are advantages and disadvantages of your future profession?; What are prospective technologies of the education field that you study? Are there any threats or possible dangers of the scientific breakthroughs?; What impact does your education field have on the environment? What are possible ways to mitigate this impact?

Each student was given an answer sheet A4 format. An essay topic and assessment criteria were pointed in the upper part of an answer sheet. The same writing final essay conditions were

provided for students of both groups. A time-limit of 40 minutes was set for writing the final essay. What is more, it should be noticed that the students were not allowed to use any additional materials while accomplishing the given assignments. The assessment scale was developed by the authors in accordance with educational programmes of Saint-Petersburg Mining University in the course of "Foreign language". Since the focus of the experiment is on the professional vocabulary acquisition through thesaurus modelling technology, the researchers scrutinized lexical aspect of the writing assignment and elaborated an extended scale of five lexical aspects: 1) Proper usage of professional vocabulary (adequate choice of the terms with proper meaning, problem of polysemy/multiple meanings); 2) terminology spelling; 3) sophisticated language (vocabulary level complies with their CEFR level – B1, B2, C1); 4) synonyms (diversity, no tautology); 5) word formation (usage of suffixes, usage of prefixes, word building). For each aspect, a student could get 2 points if the student's lexical aspect is presented in a perfect manner. 1 point is given in case the student has minor mistakes in the aspect. A student gets 0 points if he or she made more than three mistakes in the lexical aspect. With a total of 10 points, a student gets a "5" mark for the lexical aspect, 6-8 points are granted with a "4" mark, 3-5 points mean a "3" mark, 0-2 points means that the student failed and gets a "2" mark. The results of the lexical aspect of the essay show the effectiveness of the described methodology and are given further in Paragraph 3, Table 8.

3. Results
3.1. Statistical analysis

The gathered data regarding the students' performance in the final assignment as well as their responses to the questionnaire were manually organized into Excel file and further processed through the Statistical Package for the Social Sciences (SPSS) 17 software (IBM) for Windows (64-bit version) in order to answer the research questions, check the hypothesis and verify statistical significance of the research. Statistical analysis included the chi-square criterion calculation for contingency tables and hypothesis significance testing through p-value. The observed frequencies of the variable Critical thinking statistically significantly differ in the experimental and control groups with the p-value being $P<0.001$. At the same time, the frequency of respondents' positive answers prevails in the experimental group. For example, the proportion of respondents from the experimental group who agree with the statement is 63.1 % higher than of those from the control group (see Table 3).

Table 3. "Critical thinking" competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Critical thinking	Definitely disagree	Frequency	0	16	-	79,5	<0,001
		%	0,0 %	16,2 %	-100,0 %		
	Rather disagree	Frequency	3	25	-		
		%	3,4 %	25,3 %	-86,7 %		
	Undecided	Frequency	7	27	-		
		%	7,9 %	27,3 %	-71,2 %		
	Rather agree	Frequency	44	30	-		
		%	49,4 %	30,3 %	63,1 %		
	Definitely agree	Frequency	35	1	-		
		%	39,3 %	1,0 %	3793,3 %		

The observed frequencies of the variable Project development and implementation statistically significantly differ in the experimental and control groups with the p-value being $P < 0.001$. The frequency of respondents' positive answers prevails in the experimental group. For example, the proportion of respondents from the experimental group who agree with the statement is 207.5 % higher than in the control group (see Table 4).

Table 4. "Project development and implementation" competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Project development and implementation	Definitely disagree	Frequency	1	25	-	101,2	<0,001
		%	1,1 %	25,3 %	-95,6 %		
	Rather disagree	Frequency	2	40	-		
		%	2,2 %	40,3 %	-94,4 %		
	Undecided	Frequency	10	17	-		
		%	11,2 %	17,2 %	-34,6 %		
	Rather agree	Frequency	47	17	-		
		%	52,8 %	17,2 %	207,5 %		
	Definitely agree	Frequency	29	0	-		
		%	32,7 %	,0 %	-		

The observed frequencies of the variable Teamwork and Leadership are statistically significantly different in the experimental and control groups with the p-value being P < 0.001. The frequency of respondents' positive answers prevails in the experimental group. For example, the proportion of respondents from the experimental group who agree with the statement is 122.5 % higher than in the control group (see Table 5).

Table 5. "Teamwork and Leadership" competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Teamwork and Leadership	Definitely disagree	Frequency	0	25	-	79,6	<0,001
		%	,0 %	25,3 %	-100,0 %		
	Rather disagree	Frequency	4	36	-		
		%	4,5 %	36,4 %	-87,6 %		
	Undecided	Frequency	23	18	-		
		%	25,8 %	18,2 %	42,1 %		
	Rather agree	Frequency	40	20	-		
		%	44,9 %	20,1 %	122,5 %		
	Definitely agree	Frequency	22	0	-		
		%	24,8 %	,0 %	-		

The observed frequencies of the variable Communication are statistically significantly different in the experimental and control groups with the p-value being P < 0.001. At the same time, the frequency of full agreement of respondents prevails in the experimental group. For example, the share of respondents from the experimental group who totally agree with the statement is 219.8 % higher than in the control group (see Table 6).

Table 6. "Communication" competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Communication	Definitely disagree	Frequency	0	1	-	54,4	<0,001
		%	,0 %	1,0 %	-100,0 %		
	Rather disagree	Frequency	3	5	-		
		%	3,4 %	5,1 %	-33,3 %		
	Undecided	Frequency	2	9	-		
		%	2,2 %	9,1 %	-75,3 %		
	Rather agree	Frequency	15	60	-		
		%	16,9 %	60,6 %	-72,2 %		
	Definitely agree	Frequency	69	24	-		
		%	77,5 %	24,2 %	219,8 %		

The observed frequencies of the variable Self-regulation statistically significantly differ in the experimental and control groups with the p-value being P = 0.020. At that, the frequency of full agreement of respondents prevails in the experimental group. For example, the share of respondents from the experimental group who fully agree with the statement is 70.1 % higher than in the control group (see Table 7).

Table 7. "Self-regulation" competence achievement

Variables	Responses	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Self-regulation	Definitely disagree	Frequency	0	1	-	11,6	0,020
		%	,0 %	1,0 %	-100,0 %		
	Rather disagree	Frequency	4	7	-		
		%	4,5 %	7,1 %	-36,4 %		
	Undecided	Frequency	5	7	-		
		%	5,6 %	7,1 %	-20,5 %		
	Rather agree	Frequency	28	50	-		
		%	31,5 %	50,5 %	-37,7 %		
	Definitely agree	Frequency	52	34	-		
		%	58,4 %	34,3 %	70,1 %		

Summarizing the statistical analysis data represented in Tables 3-7, we are sure to reject the first null hypothesis which states that there is no significant difference between vocabulary acquisition through the thesaurus modelling technology and vocabulary acquisition through conventional method in terms of engineering students' general competences development. The statistical results showed that the general competences of communication, teamwork, project development and implementation were developed much more profoundly by the experimental group.

The observed frequencies of the variable Mark are statistically significantly different in the experimental and control groups with the p-value being P < 0.001. At that, the frequency of excellent grades (mark "5") in the experimental group is 252.2 % higher than in the control group.

Table 8. Students' academic performance in terms of lexical aspect

Variables	Mark	Parameters	Group		Variation, %	Chi-square criterion	P-value
			Experimental	Control			
Mark	2	Frequency	0	1	-	43,2	<0,001
		%	,0 %	1,0 %	-100,0 %		
	3	Frequency	10	37	-		
		%	11,2 %	37,4 %	-69,9 %		
	4	Frequency	22	43	-		
		%	24,8 %	43,4 %	-43,1 %		
	5	Frequency	57	18	-		
		%	64,0 %	18,2 %	252,2 %		

The second null hypothesis can also be rejected as there is a significant difference between the marks of the final essay lexical aspect in the groups examined during the pedagogical experiment.

3.2. Experimental group attitude

In order to back up the gained results, the attitude of the experimental group should also be given. The students expressed their attitude through a separate questionnaire upon the completion of the ESP course using the thesaurus modelling method. Students were asked to give responses on a 5-point Likert scale to the statement "I consider that the process of professional vocabulary acquisition within the method of thesaurus modelling is effective and advantageous" (See Figure 2).
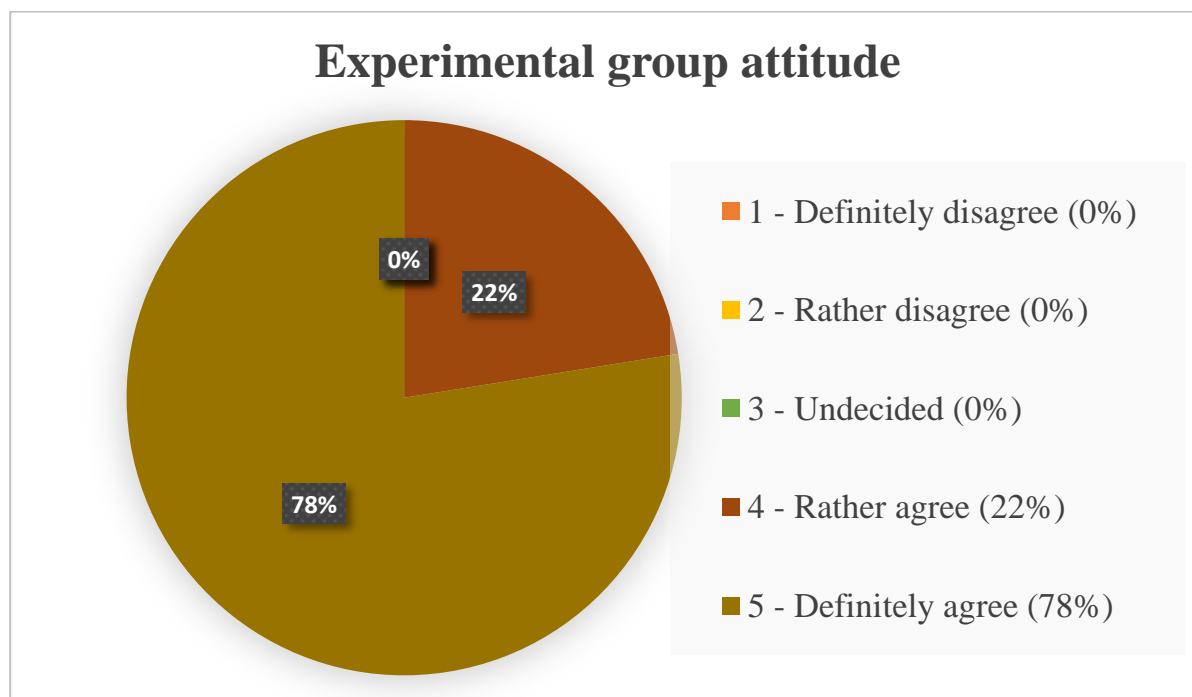

Fig. 2. Experimental group attitude
Compiled by E. Vinogradova

As it can be seen in Figure 2 above, the overall majority of the participants consider the thesaurus method an effective and advantageous one, since there have been no negative or indecisive responses to the posed statement and 22 % rather agree and 78 % definitely agree with the statement.

Furthermore, it is essential to reflect the participants' point of view on the assignment difficulty. The students were asked to rate the parts of the assignment (outlined in Paragraph 2 and

Table 2) from the point of view of their difficulty and challenge on a scale of 1 to 5 where 1 is the easiest and 5 is the most difficult (See Figure 3)
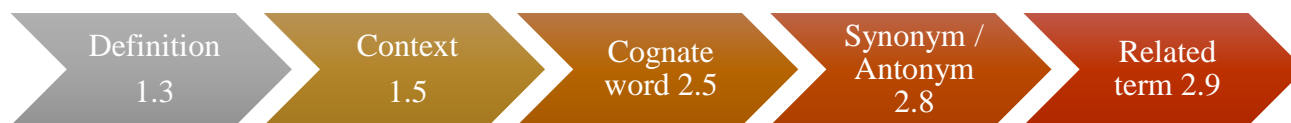

| Definition 1.3 | Context 1.5 | Cognate word 2.5 | Synonym / Antonym 2.8 | Related term 2.9 |

Fig. 3. Assignment parts difficulty level
Compiled by E. Vinogradova

Figure 3 illustrates the assignment difficulty level distribution according to the experimental group opinion poll. The respondents rated the task of giving definition while compiling the thesaurus as the easiest one – mean level is 1.3 points (out of 5); while the most challenging part of the assignment was to figure out the related terms – mean level is 2.9 (out of 5).

4. Discussion
The results described above have various grounds and may be considered in different ways in order continue the experiment in the right direction. So let us consider the students' achievement level of every general competence under study separately.

Regarding critical thinking skill the following fact should be mentioned. Among the academic community there has aroused an "awareness about the symbiotic relationship between language teaching and critical thinking development" (Yuan et al., 2022). Numerous researchers highlighted the utmost importance of students' critical thinking skills development (Fan, See, 2016; Moeiniasl et al., 2022; Pisani, Haw, 2023). The present survey displays that most students who underwent the thesaurus modelling technology within ESP course much better managed to quicker analyze the given task and find out the requested relevant information from reliable sources in a short period of time.

Concerning the question about the project development and implementation during the education process it has to be said that, since it's widely acknowledged that "foreign-language project-based method as means of forming professional competence has a great educational potential" (Beltykova et al., 2015). It should be noticed that project-based learning is widely used in engineering education (Ruslan et al., 2021; Rio, Rodriguez, 2022). The students who were taught with a novel approach to professional vocabulary acquisition through thesaurus modelling could much more easily understand and detect the scope of work within the set goal and choose optimal ways to implement it.

The third question of the students' questionnaire revealed the attitude to Teamwork and Leadership competence achievement. The experiment participation demonstrated the high-potential ability of experimental group to define their role in social interaction and teamwork while discussing the engineering terms thesauruses, based on a cooperative strategy to achieve a given goal. "Developing teamwork skills is particularly important" as it broadens the diversity of competence gained through education (Wilson, Rowan, 2017). Teamwork competence survey has been delved into in multiple researches (Awuor et al., 2022; Baviera et al., 2022; Gerbeth et al., 2022).

The fourth – communicative skill toward which "the emphasis of language teaching is now directed" to the greatest extent (Huang, 2021) – proved to be almost equally developed either during the experiment or within the conventional education process. This fact demonstrates that communication is the inseparable part of any foreign language lesson no matter what novel technologies are being implemented. Thus, each engineering student is to acquire a good command of communicative skills.

The fifth question revealed the self-regulation capacity achievement. Self-regulation entails "cognitive, metacognitive, motivational, behavioral, and environmental processes that learners can apply to enhance academic achievement" (Rose et al., 2018). The results showed practically the same level of this general competence mastery. Time-management skills when performing specific tasks are almost equally developed by 2-nd year engineering students as such skills are formed during the whole education process in a technical university not depending on the discipline.

Students' attitude to the thesaurus modelling assignment is absolutely approving, while their perception of the assignment difficulty varies, which is important since there is interrelation between "students' interest, self-efficacy, and perceived difficulty" as they play "a distinctive role in

the dynamics of task-specific motivation" and competence (Nuutila et al., 2021). These issues determine direction for the further research.

Taking into account the abovementioned, thesaurus modelling technology implementation while learning professional vocabulary proved to be effective and beneficial in terms of holistic competence-based education process improvement.

5. Conclusion

1. The results of the final assignment verifying the results of the experiment turned out to be different in control group with the conventional education format and in the experimental group with the thesaurus modelling technology. Academic performance of the students who underwent terminology memorizing in thesaurus modelling technology format proved to be higher.

2. It was established that the competences of critical thinking, teamwork, project development had developed unevenly in cases of the traditional way of acquiring terminology and thesaurus modelling. The control group of students who underwent conventional education process did not obtain sustainable skills of the aforesaid competences, however, communicative skills and self-regulation capacity in terms of time-management were developed almost equally since they are supposed to be formed within the whole education process in a technical university.

Summing up, it should be pointed out that vocabulary studying in the conventional educational format proved to be equally effective in terms of obtaining communication competence and self-regulation competence of future engineers, which cannot be stated about the development of other general competences as critical thinking, teamwork, project development and implementation. Thesaurus modelling technology declared to be a beneficial didactic tool in shaping professional language personality encompassing the ability of becoming a highly-qualified specialist essential for a country's sustainable development.

6. Limitations

The research is limited to the engineering specialization of mineral sector. It was conducted in an engineering university of mineral sector and is restricted to the students of a number of specializations. Some allowance might be entailed due to the research method of opinion poll since it might be partly subjective. It should also be mentioned that mastering of general competences such as communication, critical thinking, teamwork, project development and implementation and self-regulation has been considered precisely within the framework of professional vocabulary learning tasks.

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Studying the Influence of Gamification Tools on the Development of Emotional Intelligence as a Professionally Significant Property of the Teacher's Personality

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Abstract

The development of emotional intelligence of a teacher is both a direction to improve the teacher training system, and a condition for the social adaptation of young professionals, and the prevention of emotional burnout syndrome, and a factor to raise the quality of education in general. Gamification tools allow creating additional conditions for the formation of both personal characteristics and professional competencies of digital school mentors. The purpose of the work is to study the possibilities of using gamification services for developing emotional intelligence as a professionally significant trait of a teacher's personality.

The methodology is based on the analysis of the potential of digital technologies with the possibilities of gamification of learning both for the development of emotional intelligence and professional qualities of a teacher. The software implementation of game mechanics is performed by the tools of the AhaSlides gaming platform. D.V. Lyusin's questionnaire is used to determine the level of emotional intelligence.

The results of the study. The possibilities of AhaSlides for the development of emotional intelligence are determined by the example of working with a QR code; with a time limit; when processing hidden results; when creating interactive presentations with surveys, a cloud of words, open questions.

The conclusion describes factors influencing the effectiveness of using gamification tools for the development of emotional intelligence of a teacher: temperament properties, features of

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information processing, range of interests, information and digital literacy, experience of participation in gaming events.

Keywords: digital technology, personality property, game mechanics, information interaction, emotionally comfortable environment, AhaSlides.

1. Introduction

Self-knowledge, self-regulation, motivation, empathy, social skills are, according to D. Goleman's theory, the key components of emotional intelligence (Goleman, 1995). It is emotional intelligence, according to the conclusions of UNESCO experts, that is necessary for a personal competence, which is to be developed in order to achieve success and self-accomplishment (UNESCO's action in education–2030, 2023).

At the World Economic Forum 2020, analysts named emotional intelligence in the list of the 20 most in–demand skills of the digital society, helping people to interact effectively both in business structures and in cultural and educational institutions (World-Economic-Forum-Annual-Meeting-2020, 2023).

Emotional intelligence, that is, the ability to manage one's feelings and recognize others' ones, to understand people's motivation and intentions, is important to develop when training teachers of the digital school of the future.

The National Union of Teachers of Russia is actively working to coordinate efforts and improve the quality of collaboration of school managers, teachers, university tutors and students of pedagogical specialties in the following areas: support for individualization and socialization; formation of digital competencies; involvement in the life of society with the help of media technologies, assistance in interpersonal communication, network interaction (National Union of Educators, 2023).

The road map to introduce the national system of teacher development implies that the state will create conditions for the continuous professional development of teaching staff. The latter, according to M.V. Pogodaev, Yu.V. Chepurko, is impossible without the mentors' manifestation of the qualities that form the basis of their emotional intelligence (empathy, tolerance, sociability, openness) (Pogodaeva, Chepurko, 2022).

In addition, according to the requirements of the professional standard specialists in the field of education are to be able to motivate schoolchildren, organize various forms of social partnership in their activities, apply innovative (including gaming) technologies, analyze information resources and develop their own information and methodological projects.

The business game, according to S. V. Savkina, is a form of modeling those systems of relations that exist and can be effectively used in the didactic process (Savkina, 2018). R. Pishghadam and S. Sahebjam justify that in any labour collective it is necessary to build emotional and intellectual culture in a special way, to apply appropriate techniques for the formation of emotional intelligence (Pishghadam, Sahebjam, 2012).

Gamification, according to the conclusions of K. Verbakh is the universal tool that can be and should be used in solving commercial, pedagogical (including educational) tasks (Werbach, Hunter, 2015). As D.B. Pierce convincingly proves, gamified activity in the information and communication environment can have a certain potential for (Pierce, 2016):

- forming skills for the cognition of the surrounding world and oneself;
- controlling the behavior of virtual characters, collaborators, and oneself;
- managing interactions both in a computer game and in the real world.

In other words, there are additional opportunities for the formation of emotional intelligence of both the teacher and students. Implementing these opportunities in practice is complicated by the fact that many gaming services and platforms stopped operating in the country in 2022, e.g.: Microsoft games can no longer be purchased in Russian "digital" stores; Minecraft has been removed from the App Store and Google Play; the familiar and convenient Canva and Kahoot! have become unavailable for teachers.

The hypothesis of the study is that including gaming applications in the training of students of pedagogical specialties will provide additional resources for the formation of skills and abilities that form the basis of individual emotional intelligence.

2. Relevance
2.1. Literature review
2.1.1. Analysis of Russian scientific and pedagogical literature
A.V. Aleshina, S.T. Shabanov indicate that «… in order to adapt to the demands of society, a person must be able to recognize his/pher own and others' emotions, manage them» (Aleshina, Shabanov, 2012). E.P. Ilyin concludes that «… emotions play a special role in the motivational structure of a child. Emerging emotions determine the direction of activity and the ways a person performs certain actions. Based on the understanding of our emotions and the emotions of other people, each of us receives information about the events happening around» (Ilyin, 2009).

A distinctive feature of D.V. Lyusin's psychological and pedagogical model is the division of emotional intelligence into two types: intrapersonal and interpersonal intelligence (Lyusin, 2006).

E.N. Volkova believes that studies of intelligence, personality traits and pedagogical abilities, communicative skills, problems of developing professional self-awareness and self-concept of the teacher have determined both the basis for the standards of higher pedagogical education, professional activity of a teacher, and procedures for certification and evaluation of teachers' activities (Volkova, 2022). According to the conclusions of E. N. Volkova, it is important for a mentor of a modern school to be able not only to listen to the opinions of the students, but also to be able to empathize, understand and accept them. Emotional intelligence not only can, but also should be considered as a predictor of the professionalism of a modern teacher, for whom developing schoolchildren's personality is the main goal and the main result of education.

O.V. Temnyatkina, D.V. Tokmeninova note the importance of forming school teachers' communication skills, cooperation, teamwork, openness towards others (Temnyatkina, Tokmeninova, 2018). According to scientists, teachers cooperate with people, emotional intelligence becomes a professionally significant quality of the personality for them. In the developmental evaluation system the effectiveness of teachers is judged not by how well they meet one or more general standards, but, first of all, by how emotionally stable they can be in a situation of emotional instability and situational denial. It concerns the ability of a mentor to be in contact with a child who is in intensely charged emotional states (fear, anger, resentment, shame, guilt). Here, the importance of the teacher's ability to self-expression is demonstrated.

As noted by E.V. Soboleva, M.S. Perevozchikova, the use of game elements and mechanics in information interaction contributes to (Perevozchikova et al., 2023):
- involving, motivating participants in the didactic process;
- improving the quality of information transmission;
- team building and building effective communications;
- adapting specialists who are just starting their way in the profession and are not well enough in control of their own emotions (confidence, reactions to unforeseen situations).

N.I. Isupova, D.S. Nesterova, T.N. Suvorova also come to the conclusion that with the help of gamification tools, it is possible to improve a person's cognitive abilities (the speed and accuracy of processing information obtained during communication; using it as a basis for thinking and decision-making) (Isupova i dr., 2019). Conducting lessons using game mechanics based on computer technology can change the attitude of schoolchildren to the subject, interest them and even captivate them, thereby increasing their level of activity, contributing to the growth of cognitive interest, the development of critical thinking and skills for solving complex problems.

In addition, gamification of labor activity contributes to (Skurikhina, Pivovarov, 2023):
- employee adaptations;
- coordination of personal goals and goals of the organization;
- prompt information about changes in labor standards, tasks and responsibilities;
- acquiring skills for a new job (e.g.: in the form of a game simulator);
- intensification of feedback.

The implementation of game mechanics in a computer format, according to the conclusions of N.I. Isupova et al., enhances the didactic potential of gamification to improve the quality of training of future teachers (Isupova i dr., 2022).

However, the use of training programs on gaming platforms in training highly qualified specialists, as shown by M.S. Perevozchikova et al., is accompanied by a number of difficulties, e.g.: skepticism about the didactic possibilities of computer games, limited time to study/apply new technologies, the termination of some cloud services (Perevozchikova et al., 2023).

Thus, the following facts were revealed during the analysis:

- the emotional intelligence of a teacher is an important universal personality skill (for example, Volkova, 2022);

- with the help of gamification tools, it is possible to improve a person's cognitive abilities (Isupova i dr., 2019);

- game mechanics based on computer technology have the potential for the development of emotional intelligence of a teacher (Perevozchikova et al., 2023).

However, Russian scientific and pedagogical works devoted to identifying the possibilities of gamification tools on the development of emotional intelligence as a professionally significant property of the teacher's personality are clearly not enough.

2.1.2. Analysis of foreign studies

P. Salovey, D. Mayer define «emotional intelligence» as «a person's ability to track one's own and others' feelings and emotions, distinguish them and use this information in thinking and actions" (Salovey, Mayer, 1990).

J. Pierce emphasizes that emotional self–regulation, the ability to adjust to new formats, ideas, information are factors that determine the professionalism of an employee (Pierce, 2016).

K. Nwosu et al. note that reading other people's emotions, forming the mood of the collaborating participants is carried out as well in the information and communication environment (Nwosu et al., 2022).

R. Pishghadam and S. Sahebjam substantiate that it is the personal traits of a teacher that are the predictors of emotional burnout and personal achievements, e.g.: neuroticism and extraversion predict emotional exhaustion of a teacher, friendliness predicts depersonalization, and responsibility predicts personal achievements (Pishghadam, Sahebjam, 2012).

A. Ruiz-Ariza et al. analyze the influence of the work of Spanish teenagers with Pokémon GO tools on the development of their cognitive abilities (memory, attention, concentration, mathematical and linguistic thinking) and emotional intelligence (well-being, self-control, emotionality and sociability) (Ruiz-Ariza et al., 2017). Scientists note that the Pokémon GO game resources allowed to activate the learners' cognition, increase motivation, and introduce a competitive factor into "routine" computational calculations. In augmented reality, players interacted with each other, built relationships and joined a network collaboration. The authors conclude that it was the gamified augmented environment that contributed to the increased number and quality of completed tasks, the effectiveness of intellectual activity, and network communication in the context of the game. However, according to the conclusions of scientists, further research is needed to compare singleplayer and multiplayer (multi-user) applications in terms of forming previously mentioned abilities and personality qualities.

W. Toh, D. Kirschner investigate the role of video games in the social and emotional development of personality (Toh, Kirschner, 2022). The authors note that interaction in the virtual space of a video game contributes to the development of self-control and self-management skills, formation of socially significant personal qualities (insistence, responsibility, cognitive interest and activity, sociability). Summarizing the data obtained in the experimental work, the scientists conclude that users who have played video games demonstrate «faster and more accurate distribution of attention, better orientation in visual space and intellectual flexibility».

A.P. Bautista et al. conducted the study which describes the possibilities of computer-based educational gaming platforms for the moral education of young people, in particular, to resolve ethical and moral dilemmas faced by users in modern society (Bautista et al., 2022).

N.J. Thomas, R. Baral note that the competent inclusion of computer game elements in didactic interaction can prepare a person not only to solve ethical problems, but also to teach how to cope with stress and maintain mental balance (Thomas, Baral, 2023).

L. Kim, V. Jörg, R. Klasse substantiate that emotional intelligence should be considered a professionally significant property of a modern teacher (Kim et al., 2019). The development of emotional intelligence of a teacher is a condition for the social adaptation of young professionals, and the prevention of emotional burnout syndrome.

A. Cebollero-Salinas, J. Cano-Escoriaza, S. Hernández explore the possibilities of cloud services to form socio-emotional competencies (communication styles, ways to overcome stress and difficulties, emotional intelligence, etc.) (Cebollero-Salinas et al., 2022). The authors conclude that the active use of the Internet significantly affects the formation of interpersonal

communication skills, relationship management, self-control and self-knowledge. Including controlled network gaming interaction in the educational process, in their opinion, will provide additional conditions for the formation and improvement of cybersecurity culture among representatives of the digital generation.

T. Modi, Dr. S. Gochhait study the patterns of game development in work activities (Modi, Gochhait, 2023). The authors note that game mechanics are increasingly used by both employers and employees in the organization to increase motivation, get additional positive emotions, and effective business communication.

However, the presented scientific works, for all their significance, do not take into account the specifics of the Russian Education.

Thus, the analysis of the scientific works listed above makes it possible to identify the problem associated with the need for additional research on the use of gamification services for the development of emotional intelligence as a professionally significant quality of a teacher's personality.

2.2. Purpose and objectives of the study

The purpose of the work is determined by the need to study possibilities of using gamification services to identify their impact on the development of emotional intelligence as a professionally significant property of the teacher's personality.

Objectives of the study:

- to clarify the structure and features of formation of a person's emotional intelligence in the digital school;

- to describe the options for using gamification services that support implementation of the teacher's work functions and contribute to the development of emotional intelligence;

- to identify the factors affecting the quality of using gamification tools for the formation of abilities that build the basis of the individual emotional intelligence;

- to test experimentally the effectiveness of including digital gamification services in the professional training of teachers for the development of their emotional intelligence.

3. Materials and methods
3.1. Theoretical and empirical methods

When clarifying the structure and features of forming personal emotional intelligence in a digital educational environment, a theoretical analysis and generalization of scientific and methodological literature of Russian and foreign researchers on the problem was carried out.

Emotional intelligence in the presented study is considered by the authors as a set of abilities to understand one's own and others' emotions and manage them in order to solve pedagogical problems.

The analytical method is also used when choosing a gamification tool. Digital services, their functionality and didactic potential were considered in terms of emotional intelligence development (AhaSlides, Kahoot!, Employee Test, Google Classroom and others). AhaSlides is a means of gamification of the didactic approach. Its advantages: distribution conditions; availability of a Russian-language interface and developer support; a wide range of supported game elements; technical, methodological requirements for equipment and user level.

50 students of the Vyatka State University (Institute of Mathematics and Information Systems) were involved in the development of materials by means of gamification. The practical implementation and use of the application was carried out in the classrooms in the schools of the city of Kirov (Lyceum No. 21, secondary schools No. 11 and No. 26).

When choosing a methodology for assessing the abilities that form the basis of the emotional intelligence of the teacher, the following tools were analyzed: the WLEIS test for the emotional intelligence model of J. Mayer, P. Saloway and D. Caruso, N. Hall's test, D. V. Lyusin's «EmIn» questionnaire. It is the latter that was used to process the results of the experiment. «EmIn» is a questionnaire containing 46 statements. The EmIn questionnaire gives scores on subscales measuring various aspects of interpersonal and intrapersonal emotional intelligence.

The choice is justified by the fact that this technique is valid and opens the way to a reliable determination of the general integral indicator, interpersonal and intrapersonal emotional intelligence of the teacher.

Statistical data processing was performed using Pearson's $\chi 2$ (chi-square) test.

3.2. The base of research

The main purpose of the experiment was to test the potential of gamification services for the development of abilities that form the basis of the emotional intelligence of the teacher.

The experimental search work was carried out on the basis of the Vyatka State University (Institute of Mathematics and Information Systems). There were involved 50 bachelors in the field of training 44.03.05 Pedagogical education with two profiles (Physics and computer science).

All respondents are fourth– and fifth-year students. The average age of students is 21 years (54 % are female, 46 % are male). The study of digital services with opportunities for gamification and the features of their use for developing emotional intelligence took place within the disciplines "Theory and methodology of teaching computer science", "Methods of extracurricular activities in computer science". Game applications are used by students during the period of pedagogical practice in schools in Kirov: Lyceum No. 21, secondary schools No. 11 and No. 26.

Possible external variables for the experiment: material and technical base, motivation and mood of the pupils, parental consent, experience and qualification of the teacher, 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 tools AhaSlides;
-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 mentors participated in the experiment;
- studies were held in the same classrooms. The tool of gamification has not changed.

3.3. Stages of research

The first stage analyzed literature and best practices in the use of digital technologies with the possibilities for gamification of learning. Various approaches to determining the components of emotional intelligence, methods of its formation have been studied.

Digital services, including gaming applications that are used or have the appropriate potential to activate information interaction were analyzed and compared: GimKit Live, Quizizz, ClassMarker, AhaSlides, Kahoot!, Poll Everywhere, Swing, BookWidgets, Aurasm, Quizlet, Photomath, Google Classroom.

Comparison criteria: distribution conditions, availability of a Russian-language interface and methodological recommendations, the range of implemented game mechanics, requirements for the level of technical level of the user and the level of equipment in the organization, support for cloud technologies, data security and proper level of security, compliance with the activities and labor functions of the teacher, tools for the development of emotional intelligence.

In 2020, the authors chose the Kahoot service! Its options maximally corresponded requirements of easy use, configuration, administration, efficiency of interaction and gamification of learning. However, since March 18, 2022 Kahoot! suspended its work in Russia. From 2022 to the present day, the AhaSlides service is used in training teachers.

Further, 50 students of the Vyatka State University (Institute of Mathematics and Information Systems) in the field of training 44.03.05 Pedagogical education with two profiles (Physics and Computer Science) were tested according to the questionnaire "EmIn".

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.

To assess the reliability of EmIn, its developers calculated indicators of internal consistency across all scales and subscales. And the scientific community recognized these indicators as satisfactory for the use of the questionnaire in practice.

Based on the data obtained, according to the methodology of D.V. Lyusin, conclusions were drawn about the levels of the general integral indicator of emotional intelligence and its components – interpersonal and intrapersonal emotional intelligence of the teacher. Based on the materials of the questionnaire, control (25 students) and experimental (25 students) groups were formed.

The second stage of the study included systematization of theoretical material and accumulation of empirical experience in the aspect of the problem. The content of the disciplines "Theory and methodology of teaching computer science", "Methods of extracurricular activities in computer science" was enriched with blocks/modules that involve the study of digital services with opportunities for gamification and the development of emotional intelligence. Practical implementation of services and applications for gamification of information interaction was completed by students during their pedagogical practice.

The third stage of the study formulated conclusions about the potential of using gaming applications to form the abilities building the basis of emotional intelligence. The factors that provide in maximum emotionally comfortable gamified environment were identified.

4. Results
4.1. Key concepts for the formation of an emotionally comfortable gamified environment

When analyzing the literature, it was determined that structural components of the emotional intelligence of the teacher include: emotional awareness, managing one's emotions, self-motivation, empathy. The discovery of the phenomenon «emotional intelligence» is the result of the development of ideas about the nature of cognitive and affective processes, their interrelation.

Emotional intelligence is the ability of a person to comprehend the surrounding reality and the inner world through emotional components. Another conclusion, objectively follows from the analysis of the literature: emotional intelligence is an integral part of professionally important qualities of a teacher. Its development can help the teacher to become more effective and successful in work.

The use of game elements in the collaboration of participants in the didactic process supports the development of their own system of rules and etiquette. It is also revealed that it is necessary to include in training students of pedagogical specialties activities with new software tools, specifically game applications that support teacher's work functions and contribute to the development of the emotional intelligence

Emotionally comfortable gamified environment is the direct environment of participants in information interaction with a specific aura, establishment of interpersonal relationships and contacts with interlocutors (partners), free access to electronic educational resources, the voluntary nature of gaming activities.

Creating an emotionally comfortable environment is possible through changing the algorithms of traditional didactic games and introducing digital technologies, new game mechanics.

Digital gamification services are software tools that allow to implement game mechanics. Game mechanics is a game concept that includes description of the system of rules, principles of the relationship of characters between themselves and the surrounding game world.

The mechanics determines the state of the game. The game does not just complement the interaction of participants in the didactic process, it becomes an integral part of it.

It should be noted that for a teacher, gamification of information interaction is relevant due to the fact that it allows satisfying cognitive needs, promotes social adaptation, directs creative activity, professional development and self-accomplishment.

Next, we will present a methodological approach that includes describing the stages of training future teachers, ideas and principles of using gamification services in the design of an emotionally comfortable gamified environment and the development of emotional intelligence.

4.2. Practical work on the use of gamification services for the development of emotional intelligence of the teacher

Stage I. Let's clarify that as part of studying basics of general psychology, students get an idea of what emotional intelligence is (the concept, structure, role in the lifelong learning of the teacher). As mentioned earlier, there were 25 bachelors in the experimental group, 54 % female, 46 % male.

In accordance with the methodology of D. V. Lyusin, values were calculated on the scales of interpersonal and intrapersonal emotional intelligence of the teacher. Clause 4.3.1 gives the author's version of their interpretation.

Control and experimental groups, each of 25 respondents, were formed based on the results of processing the materials of the questionnaire "EmIn".

Stage II. During the classes in the discipline "Theory and methodology of teaching Computer science", future teachers in the experimental group studied gaming platforms, digital services with gamification capabilities, and specifics of their application for designing an emotionally comfortable environment.

The logic of distributing hours according to the work program: 1 hour of lecture and 4 hours of laboratory work. 8 hours were given to independent extracurricular work. Topics in computer science, which included elements of gamification were: "General-purpose information technologies", "Stages of solving problems on a computer", "Measurement of information", etc.

As noted earlier, AhaSlides was chosen as a gamification service for the development of emotional intelligence of interaction participants. It is a gaming platform that provides tools for creating interactive presentations with surveys, word cloud, open-ended questions and other types of tasks. It is possible to demonstrate slides both on the projector screen and on a smartphone (tablet).

The logic of studying the gamification tool: the basic principles of AhaSlides functioning; methods and features of registration; AhaSlides template library; creating a new presentation; slide modes and types; creating standard slides; asynchronous mode and options for connecting participants; using Google Slides presentations in AhaSlides; sorting presentations by folders; exporting answers to Excel; additional quiz settings; advantages and disadvantages of AhaSlides.

Stage III. Mastering ideas and principles of gaming technologies, mechanisms of gaming activity took place at school in classes in the discipline "Methods of extracurricular activities in computer science".

The classes were organized as follows: 1 lecture hour and 4 hours of laboratory work. 6 hours were given to independent extracurricular work.

In the classroom, students of the experimental group analyzed the experience of schools on the use of game mechanics, digital technologies to activate cognitive interest and information interaction, e.g.: forms of extracurricular activities in the general intellectual direction with AhaSlides use include: subject weeks, library lessons, competitions, excursions, olympiads, conferences, project activities, development of projects for lessons.

Example 1. Photo quest "Book commotion". In the quest space, schoolchildren got acquainted with the characters of fantasy worlds, tried to help them, get the necessary attributes for them (an apple, a key, a map). To cope with the tasks, the participants studied theoretical facts, solved puzzles and took tests.

The conclusion made by future teachers is that participants of such a game event through the gameplay and informal communication with the heroes of books have an opportunity to get interesting and useful information about the history of books, genres and types of computer graphics.

The students also highlighted the features, rules and principles of information collaboration in implementing game mechanics of the quest: the presence of the plot, contact and contactless characters, triggers for launching game events, award options.

The teachers of the experimental group analyzed trainings, business and board games.

Example 2. The Bridge game. The participants of the two teams are to build one strong bridge using the proposed materials, but the teams work in isolation from each other. The only way to communicate is to negotiate for one minute, which can be held three times. Teachers noted: this game is about team actions, communication, technical thinking, the ability to think together with your team and to assume possible solutions (conclusions) of members of the other team. And even if the game ended with the fall of the bridge, the pedagogical effect will be positive, since the participants of the game will gain experience from a detailed final analysis.

Stage IV. Digital services for gamification of information interaction was usedt by students during their pedagogical practice in schools in Kirov: Lyceum No. 21, secondary schools No. 11 and No. 26.

The AhaSlides platform was used for:
- collecting opinions, ideas, responses from the audience in real time;
- increasing the activity of participants in information interaction;
- conducting quizzes with identifying the winner;
- brainstorming;
- increase the interactivity and engagement level of an already created presentation by importing from Google Slides.

For example, AhaSlides was used for conducting a quiz («Reward» mechanics). Students, acting as a game teacher, using different types of slides on the AhaSlides platform and other interactive tools (QR code; Time limit; Hide results; Allow audience to submit more than once, etc.), were able to create quizzes with assessment. Next, the players competed with each other to get the highest number of points for correct answers to questions. The basic rule is at the end of the quiz, the winner's name is placed in the leaderboard.

Example 3. Game mechanics «Gradual transfer of information». In a dialog box with an image (a scientist in the field of computer science and programming, a discovery, an object or a phenomenon), using AhaSlides, the mentors of the digital school created graphic objects where the necessary descriptive part was placed. In detail, as if in a book, teachers could describe the appearance, behavior and emotions of the participants of the events/discoveries. With the help of such graphical windows, schoolchildren further formulated conclusions, predicted possible reactions in different spheres of society. The main rule is minimalism in the design of text, drawings, tables, and colors.

Example 4. The mechanics of the «Endless Game». Students of the experimental group developed slides containing images of great computer scientists, programmers, and IT developers.

Next to the image is a phrase, a description of a feeling or emotion, e.g.: Alan Turing (honesty), Steve Jobs (extreme egocentrism) and others. As many images as there are phrases. Each player addressed a slide under the N-number to another participant indicating the image. The participant could read the emotion and continue the game – address a new card to the next player, etc. The basic rule of this mechanics consists in strict observance of the order of actions of the participants.

Stage V. Discussion of factors affecting the quality of using gamification tools to form skills basic for an individual's emotional intelligence (e.g.: at the closing conference on the results of the practice).

4.3. Experimental assessment
4.3.1. The ascertaining stage of the experiment
In accordance with D. V. Lyusin's methodology, values were calculated on the scales of interpersonal and intrapersonal emotional intelligence of the teacher ("Very high", "High", "Medium", "Low", "Very low") to determine the overall integral indicator of emotional intelligence. The principle of their construction: very low values correspond to 10 % of the lowest scores, low values fall in the range from 11 % to 30 %, medium values – from 31 to 70 %, high values – from 71 to 90 %, very high values – from 91 to 100 %.

The author's version of their interpretation is presented below.

Level «Very high»:

Intrapersonal emotional intelligence of the teacher. The students' internal vocabulary contains many different types and forms of emotions. The future teachers improve strengths and fights with the weaknesses, not allowing the latter to direct actions and prevent from developing as a professional in their field. They skillfully apply various means to correct their behavior, making right decisions.

Interpersonal emotional intelligence of a teacher. The future teachers perceive feelings and emotions of others through themself. They like to observe the behavior of other people. They try to understand the characters and actions of their students. They masterfully use various means to correct the behavior of others.

Level «High»:

Intrapersonal emotional intelligence of the teacher. The students are aware of and understand their emotions. They constantly replenish their own vocabulary of emotions. They arbitrarily manage their emotions, using various means.

Interpersonal emotional intelligence of a teacher. The students are aware of and understand other people's emotions, manage them without mistakes. They know how to empathize with the current emotional state of the partner (interlocutor), they are ready to provide all possible support including through the impact on the emotional state with the help of various means.

Level «Medium»:

Intrapersonal emotional intelligence of a teacher. The students are almost always aware of and understand their emotions, in most cases successfully manage them. If necessary, they

replenish their own vocabulary of emotions. Practically without mistakes, they use means to correct their behavior.

Interpersonal emotional intelligence of a teacher. The students are almost always aware of and understand other people's emotions, and in most situations successfully manage them. They are able to empathize with the current emotional state of the partner (interlocutor), but not always ready to provide support. They know and with little difficulty use the means to influence the emotional state of the participants of the collaboration.

Level «Low»:

Intrapersonal emotional intelligence of the teacher. The students in most cases are not aware of and do not understand their emotions. They don't know how to control them, replenish the vocabulary of emotions very rarely. They often make mistakes when using tools to correct their behavior.

Interpersonal emotional intelligence of the teacher. In most cases, the students are not aware of and do not understand other people's emotions, and do not know how to manage them. They do not always «read» the state of a person by facial expressions, words, gestures. They often make mistakes when choosing and using means to influence the emotional state of the interlocutor.

Level «Very low»:

Intrapersonal emotional intelligence of the teacher. The students very rarely admit that they are wrong. They take a defensive position at the slightest criticism in their address. They do not seek to replenish the vocabulary of emotions. They see no point in using any means to correct their behavior.

Interpersonal emotional intelligence of the teacher. The students turn to other people to solve their problems. They are completely unable to support others and talk about their feelings. They do not think about the possibility of using any means to influence the emotional state of their interlocutors.

Thus, based on the values obtained during the interpretation of the materials, it was possible to collect data on 50 students of the pedagogical specialty. They formed experimental and control groups.

4.3.2. Forming stage of the experiment

Thus, the content of the educational program in the direction of training 44.03.05 Pedagogical education with two profiles (Physics and Computer Science) for the disciplines «Theory and methodology of teaching computer science», «Methods of extracurricular activities in computer science» included practical activities of future teachers in studying and applying gaming platforms, digital services with gamification options.

The participants of the experiment identified the specifics of their application for the design of an emotionally comfortable environment in the information educational space of the school.

According to the results of the experiment, in the course of reflexive activity, students expressed their wishes for the future study:

- features of the Alpha generation, e.g.: strengths of these teenagers include an active interest to new technologies, the ability to form their own idea of time, being in real and game space at the same time. Their weaknesses are clip perception of information; insufficient development of critical thinking; difficulties in data analysis, action planning and decision-making.

- options for the development of the practices studied, e.g.: a serial and series of the game. The advantage is that after a certain time, schoolchildren again and again get a game with characters and mechanics that bring them positive emotions.

Students of the control group were not involved in the study of digital tools with gamification capabilities and their subsequent use for designing an emotionally comfortable environment of information interaction, e.g.: they developed and conducted the journey «I want to become a programmer». The event was organized in the form of a game by stations. The schoolchildren remembered great programmers and their discoveries, got acquainted with the demonstration of the training program, solved crosswords and riddles with program codes, participated in algorithm tracing, were engaged in mutual verification of program codes, made assignments for the following players (for fellow students).

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). Mentors 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.

4.3.3. Control stage of the experiment

On the control stage of the experiment, repeated testing was carried out according to the questionnaire «EmIn».

Information about the level of formed interpersonal and intrapersonal emotional intelligence of teachers before and after the experiment is presented, respectively, in Table 1 and Table 2.

Table 1. Results of using gamification services for the development of interpersonal emotional intelligence of teachers

Level on the scale	Groups			
	Control group (25 students)		Experimental group (25 students)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Very high	1 (4 %)	2 (8 %)	1 (4 %)	4 (16 %)
High	4 (16 %)	4 (16 %)	3 (12 %)	13 (52 %)
Middle	15 (60 %)	15 (60 %)	16 (64 %)	6 (24 %)
Low	4 (16 %)	3 (12 %)	4 (16 %)	2 (8 %)
Very low	1 (4 %)	1 (4 %)	1 (4 %)	0 (0 %)

The following hypotheses were accepted:

H0: the level of formed interpersonal emotional intelligence in the experimental group is statistically equal to the level in the control group;

H1: the level in the experimental group is higher than the level in the control group. For $\alpha = 0.05$, χ^2_{crit} is equal to 9.488. $\chi^2_{obs.1}$ (before) и $\chi^2_{obs.2.}$ (after) the experiment were calculated for each scale.

We get that $\chi2_{obs.1} < \chi2_{crit}$ (0.175 < 9.488), and $\chi2_{obs.2} > \chi2_{crit}$ (10.489 > 9.488). Consequently, the shift in the level of interpersonal emotional intelligence of teachers is not accidental.

The next hypotheses:

H0: the level of formed intrapersonal emotional intelligence in the experimental group is statistically equal to the level in the control group;

H1: the level in the experimental group is higher than the level of the control group.

We calculate that $\chi^2_{obs.1} < \chi^2_{crit}$ (0.001 < 9.488), and $\chi^2_{obs.2} > \chi^2_{crit}$ (9.931 > 9.488). The conclusion is that changes in the level of intrapersonal emotional intelligence of teachers are not accidental.

Table 2. The results using gamification services for the development of intrapersonal emotional intelligence of teachers

Level on the scale	Groups			
	Control group (25 students)		Experimental group (25 students)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Very high	0 (0 %)	0 (0 %)	0 (0 %)	1 (4 %)
High	3 (12 %)	4 (16 %)	2 (8 %)	12 (48 %)
Middle	14 (56 %)	14 (56 %)	14 (56 %)	11 (44 %)
Low	6 (24 %)	6 (24 %)	7 (28 %)	1 (4 %)
Very low	2 (8 %)	1 (4 %)	2 (8 %)	0 (0 %)

Table 3 presents the results of calculating the overall integral indicator of emotional intelligence.

Table 3. Influence of gamification tools on the integral indicator

Levels of overall integral indicator of emotional intelligence	Groups			
	Control group (25 students)		Control group (25 students)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
Very high	0 (0 %)	1 (4 %)	0 (0 %)	0 (0 %)
High	3 (12 %)	10 (40 %)	3 (12 %)	4 (16 %)
Middle	8 (32 %)	11 (44 %)	9 (36 %)	8 (32 %)
Low	13 (52 %)	3 (12 %)	12 (48 %)	12 (48 %)
Very low	1 (4 %)	0 (0 %)	1 (4 %)	1 (4 %)

After calculations: $\chi^2_{obs.1} < \chi^2_{crit}$ (0.001 < 9.488), and $\chi^2_{obs.2} > \chi^2_{crit}$ x2$_{crit}$ (10.445 >9.488). And here, the changes for the integral indicator are not accidental.

So, interaction in a digital educational environment with using game techniques provides additional opportunities to develop a set of abilities that form the basis of the emotional intelligence of the teacher's personality.

«Playing» in the information space becomes important both for modern schoolchildren-gamers who grew up on video and computer games, and for their future mentors.

5. Limitations
As possible limitations for the study we highlight:

1. In the used version, according to D.V. Lyusin, the EmIn questionnaire has a fairly high reliability (Lyusin, 2006). However, for further psychometric substantiation, its validity requires further studies.

2. The sample of subjects was not random, but was formed in accordance with the results of testing according to the psychodiagnostic methodology of D.V. Lyusin. The content of game applications was determined by the provisions of the professional standard of the teacher, the work program of the discipline and the specifics of the school's activities. Work with gifted children (implementation of the complex-target program «Gifted children»), research and project activities.

3. In addition, one of the authors of the presented study (E.V. Soboleva) has been a teacher of disciplines the content which included the study of gamification services for the development of emotional intelligence for the past 5 years.

6. Discussion
Performing a qualitative assessment of the test results, we will analyze separately the dynamics of interpersonal and intrapersonal emotional intelligence of teachers, their ratio and changes in groups for the level of the overall integral indicator.

1. The greatest dynamics for the scale of interpersonal emotional intelligence was recorded in the respondents of the experimental group at levels «Medium», «High» (40 %), for the intrapersonal emotional intelligence scale this is level «Low» (24 %). For the respondents of the control group, qualitative changes are also present, but not as significant.

For the scale of interpersonal emotional intelligence this is level «Very high» (4 %), for the scale of intrapersonal emotional intelligence – level «High» (4 %);

2. The highest dynamics in terms of the overall integral indicator was also determined for the respondents of the experimental group at level «Low» (40 %);

3. Interpersonal emotional intelligence in respondents of each group is developed more compared to intrapersonal. Perhaps this is due to the fact that students of pedagogical specialties are actively involved in team work, in trainings for the development of interpersonal relationships.

At the closing conference, all respondents noted that the interpersonal aspect of emotional intelligence is most effectively formed in professional activity and communication.

The interpretation of the level of intelligence formation on each scale is more informative than on the integral indicator. Therefore, the authors in the results of the study distinguish these two aspects on the levels – intrapersonal and interpersonal.

Future teachers proposed three criteria to assess the relevance of the content of the service with gamification tools:

1) presentation through stories (biographies, facts from the life of scientists, IT specialists and chronology of discoveries);

2) audience involvement in the process (game participants should be motivated to move in real space, answer questions and enter answers in the appropriate information field on the slide, win artifacts in the quest and use the tools of the game service when searching);

3) involvement. Users should understand that the proposed virtual gaming problem is quite real. Assisstance in resolving it for the characters can suggest them a way out in future life difficulties.

The presented methodological approach meets the principles of continuing education. Gaming cloud technologies support educational process even in zones of disasters and military conflicts. UNESCO studies show that this contributes to a faster recovery of society after crisis situations (UNESCO's action in education–2030, 2023).

The authors' conclusions about the potential of using gamification services in a digital school develop the ideas of W. Toh, D. Kirschner about the impact of games on the social and emotional development of the personality (Toh, Kirschner, 2022):

- formation of self-esteem, development of motivation to achieve,

- the ability to perform several work functions simultaneously, as well as the skills of cooperation and effective group work, leadership and taking responsibility.

The research materials complement the directions formulated earlier in the work of E.V. Soboleva, M.S. Perevozchikova to improve training of future teachers for the development and implementation of gaming applications (Soboleva, Perevozchikova, 2019): transferring some topics in the content of the discipline «Methods of extracurricular activities in computer science», in particular, «Methodology of project activities in computer science» (2 hours of practical work), «Gamification of extracurricular activities in computer science» (4 hours of practical work).

7. Conclusion

The presented study proves that training of teachers should include work with new digital tools, including gaming applications that support implementation of labor functions and contribute to the development of emotional intelligence.

Moreover, gamification of learning contributes to the formation of a special emotionally comfortable environment of interaction. However, the participants of the experiment also highlighted the problems of using gamification tools:

- termination of technical support for many high-quality gaming services in Russia;

- resistance to innovations on the part of the administration of educational institutions (for reasons of low levels of funding and material and technical equipment);

- time spent on adapting the content of educational and thematic events to the possibilities of the game service and age, psychological characteristics of schoolchildren.

The factors influencing the effectiveness of using gamification tools for the development of emotional intelligence are also identified: the «clipness» of thinking, properties of the temperament, the peculiarities of information processing, the range of cognitive and professional interests, information literacy, formed digital skills, upbringing and communication styles in the family, experience of participating in other gaming events.

As prospects for gamification of learning, we highlight the following:

- involvement of new users, e.g.: schoolchildren's parents at the stage of developing the plot of a game event;

- using neural networks, e.g.: adding illustrations created by modern technologies to the slides based on the content of the textbook;

- support for career guidance, e.g.: to consider the choice of a profession of the future in the space of the quest (a designer of «smart homes», an engineer of robotic systems, a techno-stylist, a mentor of startups, etc.).

The results of the study can be used:

- to improve educational programs for training students of pedagogical specialties;

- to apply gamification of the information and educational process in digital schools of the future;

- to conduct gaming events in the digital format in cultural and educational centers.

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The Associations between Language-Specific Social and Cultural Capital and Language Exam Acquisition

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Abstract

In Hungary, between 1996 and 2022, a law was in force that ordered to have an at least B2 level foreign language exam to be able to get the degree. The legislation was suspended during the COVID period and abolished in 2022. It is agreed that learning achievement is strongly determined by socio-economic status, but no multidimensional study has yet been carried out on the impact of language-specific social and cultural capital. In the present study, we aim to investigate these close relationship structures among students without a language exam at the end of university years. We hypothesised that language-specific social capital influences attitudes towards language learning and thus the chances of passing the language exam. We conducted a survey among students who graduated from two higher education institutions in the most populous but economically least developed regions of Hungary, but did not obtain a degree due to lack of language proficiency. As a control group, we also interviewed successful language learners who as university students, already had a language examination that met the exit requirements. The full survey was carried out through our online questionnaire sent out on Neptun (Neptun is a unified study system software, which performs the academic and financial administration and educational organisation tasks of Hungarian higher education institutions). Our results show that linguistic social capital in the network of contacts has a significant impact on language proficiency. Informal relationships also have an impact on the effectiveness of foreign language learning, as friends belong to a similar social group to the language learner. The significance of the study of the Hungarian context lies in the unique language examination requirement for higher education, but there are also international lessons to be learned. The cultural and social diversity of learners and students means that language learning cannot be left to families to motivate, create a foreign

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language environment and provide other factors that support language learning, so research on language learning should no longer focus solely on middle-class language learners.

Keywords: lack of language exam, language learning failure, language-specific social and cultural capital.

1. Introduction

In the former Soviet countries of interest the Russian language was compulsory, but as it was forced, it was not a language that the society was keen to learn. The teaching of western languages in schools started later, after the political regime change. Language teachers also had to be replaced. German and English languages were equally attractive for a long time, now English dominates, but there are social and regional differences in the success of language learning.

In the international literature, the lack of language proficiency is explained mainly by psychological factors, a view that is strongly supported by Gardner, MacIntyre and Ling. The dominance of the psychological explanatory model is due to the fact that language learning research focuses on average, middle-class learners. In the international literature, the latter aspect is less frequently examined in recent works (Kahn-Horwitz, Goldenberg and Hackman). The effects of the learner's position in the social structure and his or her cultural and social capital resources have not been taken into account in the study of the career break caused by the lack of language proficiency. The main aim of our research is to investigate the impact of students' socio-economic status and relational resources on language learning careers and language proficiency. We have built the interpretative framework of our study on the main claims of the academic discourse on different aspects of language learning and teaching and on the results of previous research.

Many researchers have already investigated the cognitive characteristics of language learners and their results are almost identical: they have found a strong correlation between language learning success and language abilities, intelligence and language learning strategies (Dörnyei, 2010; Dörnyei et al., 2006; Polonyi, Mérő, 2007; Oxford, 1990). Regarding affective characteristics, research has found that lack of motivation hinders language learning, but also that self-confidence and language anxiety affect language learning outcomes (Dörnyei, 2010; Dörnyei et al., 2006; Kálmán, 2016; Albert, 2004; Piniel, Albert, 2020). However, recent international research has shown that socioeconomic background also influences language learning outcomes through affective and cognitive factors. As parents are the primary stakeholders in their child's academic achievement, they play a huge role in it (Dawadi, 2020). International research has shown the importance of the role of parents in preparing for language examinations, and a clear difference has emerged between children of graduates and children of low-educated parents. The influence of parents on language learning has also been detected in sociolinguistic research (Aslı, Dollar, 2017). In addition to theories and research experiences that analyse the language learning process, the influence of sociocultural background is an important factor in our research. Several studies have looked for the relationship between social background variables, academic achievement and language proficiency. These emphasise the importance of parental schooling (Smith et al., 1997; Iwaniec, 2020; Sanjurjo et al., 2017; Rintaningrum et al., 2017). They also point to the potential for reducing dropout rates among disadvantaged students through a positive classroom environment, regular parent-teacher contact and skills-oriented curriculum modification (Shields, 1991; Allington, 1991). Furthermore, several researches also suggests that disadvantage is associated with poorer stimulation, as the level of cultural experience is very low, and thus lower cognitive stimulation results in lower learning competence development (Neville et al., 2013; Farah, Hackman, 2012; Hackman et al., 2010). Research should identify the socio-cultural causes of language learning failure, as well as the factors and pedagogical practices that can override the influence of social background.

2. Research questions, hypotheses

The main questions of our research are: how demographic and socio-economic variables (parental education, economic and residential status) affect the chances of language proficiency, how language-specific social and cultural capital affects language proficiency, and how the type of secondary school and academic achievement affect language learning success.

Hypothesis 1: Social status and cultural capital would predict language acquisition. It is hypothesised that those in less advantaged social situations and with lower cultural capital will

have lower rates of language proficiency (Bartha, 2002; Réthyné, Vámos, 2006; Németh, 1997; Dweck, 2006; Hunter, 2017).

Hypothesis 2: We hypothesise that language-specific cultural and social capital, i.e. parents' language literacy, language education, working abroad, and language skills of friends and best friends, as well as non-English speaking friends/acquaintances, would predict attitudes towards language learning and thus language proficiency.

Hypothesis 3: It is hypothesised that the place of residence and the location of the primary school during childhood influences the probability of having a language exam: the smaller the municipality where a person lived or attended primary school during childhood, the less likely he or she is to have a language exam (Foreign Language Measurement, 2017; Andor, 2000; Terestyéni, 1996).

Hypothesis 4: We hypothesize that childhood residence influences the school career, which affects whether someone has a language exam. We also hypothesise fewer successful language examiners among students who study part-time in higher education and among those who attend fee-paying courses (Fehérvári, 2008; Imre, 2007).

3. Research methods

In our research, we conducted a quantitative survey of students who did not graduate from two universities in Hungary's most populous but economically less developed region, due to lack of language exams. The database, with 560 participants, was named "Non-degree holders without language examination 2019–2021". The population was defined on the basis of the approximately 14,000 diplomas awarded in 2020 without a language exam due to the legislation suspended in the wake of the COVID situation. As a control group, we also interviewed language graduates who, as university students, already had a language exam that met the exit requirements. They were also students from the two universities studied. This control group of 820 participants was named "Successful Language Learners 2021". This group was also reached by a sampling procedure using a questionnaire sent out via the Neptun system. When interpreting the results, we must take into account the limited generalisability due to the non-representative sample. The students without language exam were fully contacted with our online questionnaire. The questionnaire on which our study of successful language examiners is based was completed in 2021 by sending it out via the Neptun system of the two universities. Language major students were not included in the sample for either database query. The basic distributions of the study sample are shown in Table 1 (Appendix). Stepwise binary logistic regression was used as a method of statistical analysis (Table 2, Appendix).

4. Results

According to the analysis gender, age, parental education, type of secondary school, learning outcomes of secondary school, language specialisation, extra lessons in secondary school, restart of language learning, learning more than one language, leisure activities that support language learning, language learning strategies, going abroad, field of higher education, funding of higher education, language skills of best friend of friends, and having a non-Hungarian-speaking foreign friend were significantly ($P < 0.001$) associated with language proficiency. Finally, a multivariate analysis was conducted to see which effects proved to be really strong when controlling for each other. In the logistic regression analysis (Nagelkerke R-Square= 0.589), the following factors significantly ($P < 0.001$) supported obtaining language exam: gender, financial situation, type of settlement, father's language proficiency, type of secondary school, language specialisation, extracurricular language lessons in secondary school, restarting language learning, and leisure activities that supported language learning (Table 2). The observed effects given by Nagelkerke R-Square are strong.

From the logistic regression analysis of the gender variable, it can be seen that men are the most likely to be unsuccessful in language learning. Among those with a language proficiency test, having children is not common (12.6 %), but those without a language proficiency test are over-represented among those with one child (9.9 %). There were also significant results for employment: those without a language exam were over-represented among those who worked full-time during their studies (32.6 %). Our logistic regression analysis showed that those with a language exam had significantly more, while those without a language exam had more modest financial assets. Both parents of students with language exams have significantly higher educational attainment than those without ($P < 0.001$). The logistic regression analysis also

revealed that high parental status and the parent's (especially the father's) knowledge of a foreign language have an effect on language knowledge. The father's language proficiency has an effect on the chance of acquiring a language exam according to the logistic regression analysis, and language-specific social capital also has a positive effect on the probability of passing a language exam. Respondents with higher language-specific social capital are the children of fathers with higher education and higher cultural capital. The effect of language-specific social capital is clearly positive on language proficiency. Regarding the language skills of friends, it was found that both best friends and friends are over-represented among friends of language proficiency test takers with intermediate or advanced language skills (intermediate: 50.9 %, advanced: 27.5 %), while those without language exams are more likely to have no (23 %) or basic (35.1 %) language skills. Foreign friends and acquaintances are also over-represented among those who have taken the language exam (37.8 %). Not surprisingly, friends who have good academic performance and are successful language examiners are also associated with the socio-economic background of the individual. Furthermore, we also pointed out that small towns are more likely to have successful language learners, with an over-representation of small town residents among language exam takers (37.4 %).

Language proficiency is also influenced by the type of secondary school and the academic performance according to our regression analysis. Students attending secondary grammar school and those with an academic performance of 4.00-5.00 in secondary school are more likely to have passed the language exam. 72.1 % of those with a language exam attended secondary grammar school and 72.1 % had an academic performance of 4.00-5.00. Those who did not have a language exam were over-represented among those who attended secondary technical school (46 %) and those with a lower academic performance (3.00-4.00) (48 %), as well as those who had deferred a year of higher education for reasons of course failure or other reasons. Furthermore, we pointed out that the proportion of language learners who had 6-8 language classes per week is very high those who have a language exam, almost 40 %. As regards the financing of higher education, those who had passed the language exam tended to attend a course financed by the state (73.3 %), while those without a language exam tended to attend a self-cost course. Finally, an analysis of the relationship between the type of funding and the field of study reveals that law (19.3 %), engineering (17.2 %) and humanities (20.2 %) are over-represented in the publicly funded fields of study among language graduates, while the same fields are over-represented among self-cost students with no language examination (law: 21.4 %, engineering: 17.4 %, humanities: 17.4 %).

In general, both those with and without a language exam consider language learning to be important, but there is a significant difference between the two groups. On a scale of 1 to 4, those without a language exam rated the importance of language learning as 3.33, while those with a language exam rated it significantly higher, at 3.74. Since successful language exam takers are mainly the children of more highly educated and language-speaking parents, the importance of language skills is higher among them. Thus, the effect of parental education is reflected in this case, too.

So, in the region studied, a student is more likely no to pass the language exam until the end of university years if he/she is male, if he/she comes from a disadvantaged family, if his/her childhood residence is a big town/city, if his/her father does not have foreign language skills. Furthermore, students are more likely to be unable to pass a language test if they attended a vocational secondary school, if they did not attend a language specialisation class, if they attended fewer extra lessons during their secondary school years, if they repeatedly restarted language learning, if they did not participate in any leisure activities that supported language learning and if they did not have any language-speaking friends.

5. Discussion

In our study we examined the issue of language exam shortages, focusing on a group of students who did not obtain a degree because of the lack of a foreign language exam. Our analysis revealed that high parental status and the parent's (especially the father's) foreign language proficiency have an impact on language exam success. An important new finding is that successful language exam takers are, on average, of higher status and more affluent, so the socio-cultural background may have a significant influence on the chance of passing the language exam. Regarding the social determination of language use, Bernstein (1975) believes that the structure of families within certain social classes is similar, the role relationships are specific, and the relationships within the family together with cultural characteristics form a specific language use.

He calls this language disadvantage a cumulative deficit, which is a disadvantage that causes them to face increasing difficulties during their school career (Bernstein, 1975). The influence of language codes learned in the mother tongue can also be demonstrated in the process of learning foreign languages. Combining these results, we can see that socio-cultural background can have a significant influence on the chances of obtaining a language exam.

Other research has already proven (Bernstein, 1975; Dörnyei, 2001) that positive attitudes toward the culture, community, or foreign friend of the language being studied significantly increase the degree of language development, and thus also the chance of passing the language exam. Our results also show that friends who has good academic achievement and are successful language exam takers are also related to the socio-economic background of the individual, so informal relationships have an impact on achievement.

Our further results show that smaller cities are more likely to have more successful language exam takers. A town and a city is generally an advantage in language exam performance, but those with the best language proficiency in the towns of the studied region goes to the capital or abroad to university, so the children of the towns who stay may be among the weaker ones. Another explanation could be that from towns and cities more people enter higher education, and the weaker students from the weaker secondary schools also get into some higher education nearby, and this does not require as much planning and sacrifice from the family as it would if someone were from the countryside. However, for rural pupils, getting into a higher education institution involves more struggle, more sacrifice on the part of the family and the pupil, and the aspiration to achieve a language examination makes the pupils more motivated. This is why more small towns can have more successful language exam takers.

Few people have pointed out before that people coming from secondary technical schools are less likely to pass the language exams required for a university degree. They are the children of parents with lower status and lower cultural capital - who also have lower language proficiency rates - and are more likely to have attended secondary vocational or technical schools. Also a new finding is that secondary technical school leavers are less likely to have a language exam before the school-leaving examinations. Other research has also shown that students attending secondary technical schools have a lower cultural capital and a higher proportion of low-status parents (Szemerszki, 2015; Csapó, 2002; Varga, 2008; Somfalvi, 2017), and the effect of these factors on academic performance can be demonstrated, thus presumably it also affects the success of language learning. In addition, it can be stated as a fact that the number of language lessons is far below the language lessons of students in high school classes (Imre, 2009). Our analysis also showed that the proportion of language learners who regularly attended 6-8 language classes per week was very high among those who had a language exam. Multilingualism, language specialisation classes and language preparation classes are also typical of schools where children of more highly educated parents attend. It is therefore not possible to say unequivocally that language exams are the success of solely these classes, since if children of highly educated parents are over-represented, this is also an effect of socio-economic status.

An analysis of the relationship between the form of funding of higher education studies and the field of study shows that the fields of study of law, engineering and humanities are over-represented in both the publicly funded courses among those who have passed the language exam and the self-cost students without a language exam. The above-mentioned courses are marketable courses with high entry thresholds, which are the main reason for their popularity and the over-subscription. As a result, full-time entry to these courses is only possible with higher academic results, so they tend to be taken up by students from secondary grammar schools whose parents tend to have higher educational qualifications. The results show that the educational pathway therefore has an impact on language proficiency.

Looking at the overall language learning methods it can be concluded that language exam takers are likely to have been influenced by digitalisation, as it is essential for their typical foreign language film and video watching, music listening and communication situations. This is of course also due to the fact that successful language exam takers tend to be younger. Those who do not have a language exam are more likely to memorise and take notes, which makes language learning a slower process, less motivating and not conducive to the development of all competences. The average age of this group is higher than that of the group who have passed the language exam. Furthermore, the indirect effect of higher educated parents is also evident here, as they have higher cultural capital and a higher proportion of them speak a foreign language than lower educated

parents, and their children are therefore more likely to be interested in foreign language books and films. By combining learning and entertainment, the student acquires the foreign language much more effectively (Palomo-Duarte et al., 2016), and nowadays there are many opportunities to improve language skills through leisure activities, especially with the use of ICT tools, which many studies have shown has already been proven (Esch et al., 2000; Palomo-Duarte et al., 2016).

Overall, since successful language exam takers are mainly the children of more highly educated, language-speaking parents with a higher social status, the importance of language proficiency is higher among them.

6. Conclusion

Our results have brought us closer to understand the factors that contribute to language learning failure: the failure of students who do not obtain a degree due to lack of language exam is mainly due to their socio-economic background, their low language-specific social and cultural capital and their school career. Language learning mistakes and one-sided strategies during their public education also contributed to their failure. Historical trends in language teaching methodology have shown that little account has been taken of social and cultural factors. The results of our research point to the inevitability of taking into account the socio-cultural situation of learners when designing organisational and methodological structures for foreign language teaching. Given the cultural and social diversity of learners and students, eliminating inequalities in language learning outcomes is an educational challenge, and leaving it to families to provide motivation, a foreign language environment and other factors that support foreign language learning is not a satisfactory solution. In the light of our research findings, it is no longer sufficient for language education research and development to focus on middle-class learners. It seems appropriate to consider multifaceted support for foreign language learning for learners from low socio-economic backgrounds.

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Appendix

Table 1. Basic distributions of the questionnaire survey sample

		Did not have language exam at the end of university years (%)	Had language exam (%)
Age	20-30	30	83
	31-40	42	9
	41-50	24	7
	51-	4	1
Gender	male	35	50
	female	65	50
Qualification of mother	maximum primary school	13	4
	vocational qualification without baccalaureate	21	13
	baccalaureate or baccalaureate with vocational qualification	40	52
	degree	26	31
Qualification of father	maximum primary school	8	6
	vocational qualification without baccalaureate	41	31
	baccalaureate or baccalaureate with vocational qualification	40	41
	degree	11	22
Type of settlement	village	39	24
	small town	33	43
	town/city	28	33
Type of secondary school	secondary vocational school	9	1

	secondary technical school	49		26
	secondary grammar school	42		73
Foreign language knowledge of parents	no	72		48
	beginner level	22		32
	intermediate level	4		13
	advanced level	2		7
Foreign language knowledge of friends	no	22		5
	beginner level	41		16
	intermediate level	28		57
	advanced level	9		22

Table 2. Associations between background variables and language exam acquisition (N = 1357) (Stepwise logistic regression analysis)

	1.	2.	3.	4.	5.
Gender	1,911***	1,748***	2,278***	1,766***	1,663***
Qualification of mother		NS	NS	NS	NS
Qualification of father		NS	0,686*	NS	NS
Financial status		1,520***	1,441***	1,334***	1,299***
Type of settlement		0,598***	0,584***	0,596***	0,556***
Language knowledge of mother		NS	NS	NS	NS
Language knowledge of father		1,761***	1,650***	1,551*	NS
Cultural capital		1,203***	1,117***	1,190***	NS
Type of secondary school			1,841***	1,683***	1,654***
Language specification			5,570***	3,636***	3,015***
Extracurricular language lessons in secondary education			NS	1,721***	1,700***
Restarting language learning				0,093***	0,101***
Staying abroad				NS	NS
Language learning in higher education				NS	NS
Leisure activities to support language learning				2,030***	1,630*
Importance of language knowledge				2,354***	1,948***
Language-specific social capital					1,976***
Nagelkerke R-Square	,032	,270	,385	,554	,589

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Model for Assessing Strategic Development Alternatives for the Workforce Advanced Training System in a Single-Industry Town, Taking Into Account Neurodidactic Principles

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Abstract

Today, one of the priority directions of modern education is the use of various methods to improve the quality of educational events. Authors argue that education based on neurodidactic principles helps prepare highly qualified workers for specific tasks in a short period and maintains learners' interest in continuing their education.

The goal of this study is to develop a decision-making model for choosing a strategy for the development of the workforce advanced training system in the conditions of labour market imbalances in a single-industry town and high uncertainty of the labour market's future needs.

In the theoretical aspect, a model for assessing strategic development alternatives for the workforce advanced training system of a single-industry town has been developed, providing information for decision-making.

In the practical aspect, the generation and evaluation of development alternatives for the specific WATS of a single-industry town have been carried out, taking into account the features of its strategy and development.

For preliminary processing of expert assessments and calculations using the AHP method, the LibreOffice Calc spreadsheet editor was used.

As a result of the research, a new approach to assessing and selecting strategic alternatives for the development of the workforce advanced training system of a single-industry town has been proposed, considering the role of the workforce development system as a crucial element of the municipality's The proposed model takes into account the features of the networking of WATS and high uncertainty in decision-making.

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1. Introduction

In the last decade, there has been a reevaluation of the role, goals, and tasks of education on the international level as one of the factors for sustainable global development. In 2015, the United Nations General Assembly adopted the resolution "Transforming Our World: The 2030 Agenda for Sustainable Development" (United Nations General Assembly, 2015). One of the 17 global sustainable development goals in this resolution is "Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." Concerning vocational education, this goal implies providing access to quality vocational and higher education for the population, significantly increasing the number of individuals with skills in demand for employment, decent work, and entrepreneurship.

The development and specification of pathways to achieve this goal were carried out in 2022 during the UNESCO World Conference on Higher Education (May 18-20, Barcelona), where a roadmap for rethinking and developing higher education worldwide was adopted (UNESCO, 2022). Additionally, UNESCO developed a strategy for transforming secondary education and vocational training in 2022. The education system of the future is expected to be flexible, quickly adaptable to the needs of individuals, the economy, and society as a whole, introducing new formats for implementing educational programs and ensuring access to education throughout life. Furthermore, institutions of vocational education are expected to bear social responsibility, produce well-rounded professionals capable of solving complex problems, and contribute to the sustainable development of municipalities, regions, and countries.

Document (UNESCO, 2022) emphasizes the importance of developing strategies for skills enhancement and retraining of the workforce, as well as fostering collaboration between educational institutions, the government, and businesses. The need for developing such strategies is also highlighted in another goal of Resolution (United Nations General Assembly, 2015), which focuses on ensuring the openness, security, resilience, and ecological sustainability of cities and settlements. Addressing the issue of aligning the professional potential of the population with the demands of the labour market requires comprehensive situational analysis, planning, and decision-making.

The problems of social and economic development of single-industry towns in the Russian Federation require active state intervention and the formation of additional measures of state support and tools to develop and implement a strategy (Crowley, 2016). The magnitude of the task stems from a large number of single-industry towns and the diversity of their conditions – in the Russian Federation there are currently 321 settlements with the status of a single-industry town (single-industry municipal formation) (Order of the Government..., 2020). Assessment of single-industry towns by two factors – directions of migration flows and levels of production location – is proposed to form alternatives for a single-industry town development (Shastitko, Fatikhova, 2019). As a result, four alternatives were identified: diversification of industries, independent innovative and technological development of a town which economy is dominated by a single industry or company, liquidation and artificial maintenance of the single-industry town.

Each option suggests different approaches to the formation of a single-industry town strategy: creation of special economic zones - priority development areas (Ulitskaya et al., 2017), ensuring population mobility (Anikieva, 2020), creating conditions for attracting qualified specialists to township-forming enterprises (Nekrasova, 2012), etc. We should note that irrespective of the single-industry town strategy, the most important resource for a single-industry town is the population, and, accordingly, the main task is to provide employment for the able-bodied population. In this regard, an effective advanced training system plays a major role in the successful implementation of a single-industry town development strategy, which should provide the current and expected needs of the single-industry town labour market, as well as the implementation of the educational path and professional careers of individual members of the population (Shirshov, 2017). This makes the issue of a strategy for the development of a single-industry town workforce advanced training system (WATS) a topical one.

One of the key tools of WATS is the application of neurodidactic principles. Neuro didactics is an applied neuroscience which focuses on the use of cognitive neurology, psychology, differential psychophysiology, and neuropsychology, and uses data on the ways brain manages processes of mastering different types of learning material. It also studies issues of students and teachers' IPL

(Individual Profile of Lateration) compatibility. Neurodidactics is based on the fundamentals of pedagogy, psychology, neuroscience, cybernetics, and reflects a person-centered approach in education.

Neurodidactics aims at solving pedagogical problems efficiently and with a good amount of creativity. Here, it is necessary to know how the brain of each individual percepts and processes information; thus, what the peculiarities of their higher cognitive functions are. (Westerhoff, 2008) It focuses on the results that research works in brain and neurobiology bring to the issues of learning and memory; thus, make them useful for pedagogy and didactics. Didactic principles and recommendations for learning and teaching that are not harmful to the brain are based on the knowledge about structure, development, and functioning of the brain (Politsinskaya et al., 2023).

Based on the studies of scientists who have made a significant contribution to the development of neurodidactics, with M. Arnold, W. Hartmann, U. Kraft among them (Lizunkov et al., 2023), we formulated ten principles of neurodidactics that we applied in WATS. In our opinion, these principles become basic for an effective training when we need to train people to perform specific operations or tasks in a short time period of time. The principals are the following:

- students should have an opportunity to obtain specific experience while training (for this purpose we should provide cooperation between educational institutions and employers to identify and implement the most important practical tasks into the education institution curriculum as soon as they help obtain and develop practical competencies);

- training becomes efficient when it includes real social situations (in this context, the development of extra professional as well as cultural competences, which are necessary for further socialization of people at work, will occur during the advanced training);

- training becomes more efficient when educators take into account individual interests and ideas of students. Here, learning motivation and further professional guidance play a key role in making students efficient at work;

- training becomes more efficient when theoretical knowledge and practical experiences that students have already obtained are mobilized (it is necessary to assess students' competences before they start training and offer a program that will help them develop their competencies up to the new professional level, and get new ones in a short period of time);

- when positive emotions are engaged, training also becomes more efficient (emotional well-being of students and methods that help educators create positive and healthy learning environment are important factors that support effective and fast acquisition of new information and skills);

- acquisition of new information and skills becomes more intense when learning environment is appropriate for students and teachers (i.e. the kind of an environment that contributes to a faster perception of new information and its assimilation);

- training also gets efficient when there is time for reflection (students need time to process the information they receive; they need to understand what they are doing, how they are going to use it, and what else they can do acquire the full information or to learn how to perform better);

- training goes on better when students can link learning materials to practical experience (theory and practice combination is an important matter that helps develop practical skills with students);

- training is more efficient when students' personalities and individual abilities and talents are taken into account by educators (methods which help determine lateralization, enhance learning and increase assimilation of learning and training content) (Arnold, 2009).

In our opinion, it is necessary to add neurodidactic principles to WATS alternatives development. Neurodidactic instruments will help optimize advanced training and will accelerate it.

Subject of research

Single-industry town WATS needs to be formed considering the interests of the main actors of labour and education markets in a single-industry town: administration of a single-industry town, employers, educational institutions, population of the town (Zakharova et al., 2020). The objectives of these actors may be different (Lizunkov et al., 2021). The literature review (Zakharova et al., 2020) revealed the importance of organizing networking between the main actors of training as an essential condition for the effectiveness of the training system. This process is particularly important for single-industry towns, as they are the most acutely linked to the results of WATS and the opportunities to diversify the single-industry town economy, move away from single-industry, reduce the brain drain from the city, and therefore retain the population. We should also note that the Covid-19 pandemic has had a huge impact on increasing the number

of remote jobs, which also enhances the importance of networking by providing both training and employment processes for the single-industry town population with new opportunities.

The main task in forming a workforce training system at any level is to forecast the needs of national and regional economies for personnel (Shrestha, 2024). Existing forecasting models are often based on balancing expected labour market needs and workforce supply (Vankevich, Castel-Branko, 2017). This involves collecting information from employers and educational institutions (Sparreboom, Powell, 2009); information on possible scenarios of technological and socio-economic development of the whole country and its regions (Gurtov et al., 2016); analyzing demographic situations in territories (Vasilyeva, 2017), population migration trends and rates (Ostapchuk et al., 2021), and other indicators. Mathematic methods and software that are currently used to forecast labour market needs aim at the meso- and macro-levels; and they do not take into account social and economic specificity of single-industry towns.

Besides forecasting a level of workforce rate, an equally important task for a single-industry town is to develop ways of overcoming staff imbalance in the labour market. The causes of staffing imbalances can include:

- mismatch between the quantitative and vocational qualification structure of labour market supply and demand;

- liquidation of enterprises that have a significant impact on the labour market of a single-industry town;

- migration of the population, usually highly qualified and competitive in the labour markets of other cities and regions, and other reasons.

The high uncertainty of these and other developments in a single-industry town impedes the construction of reliable models of labour market needs in the medium and long term (Zakharova et al., 2020). However, this is the horizon that matters for the training system, so the problem of selecting strategic directions for developing the ATS of single-industry towns does not have adequate tools to solve it.

The subject of our study is the development of a decision-making model that provides the processes of strategizing the development of the advanced training system of a single-industry town in the conditions of network cooperation of actors to eliminate the imbalance in the labour market of a single-industry town. In the article, the term 'strategy' refers to the long-term qualitatively defined direction for the development of a single-industry town's ATS.

2. Methodology

The proposed model for assessing strategic alternatives for WATS development in a single-industry town covers two stages:

1. Generating strategic development alternatives;

2. Evaluating alternatives in view of the importance of network cooperation between the main actors: single-industry town authorities, employers, educational institutions and local residents.

To generate strategic development alternatives we suggest using an "educational institution-labour market" (EI-LM) matrix, which studies two major features of WATS:

- where to train personnel (educational institutions (EI) of a single-industry town; external educational institutions located outside the territory of the single-industry town) – these alternatives can be seen in matrix's lines;

- who will consume training (train personnel for prospective labour market needs of a single-industry town itself or train them for the needs of employers outside the single-industry town providing vacancies for remote and shift work) - these alternatives can be seen in matrix's columns.

At the intersection of lines and columns of the matrix, possible alternatives for the development of a single-industry town with one of the four combinations of characteristics are presented:

Quadrant I. Alternatives aimed at developing the capacity of educational institutions of a single-industry town to develop and implement relevant educational programs and modern pedagogical methods, with the main objective to meet current and future possible needs of a single-industry town labour market.

Quadrant II. Alternatives that also develop capabilities of educational institutions of a single-industry town, but the main task of implemented programs and methods is to satisfy professional

and career interests of single-industry town residents by focusing on current and future possible needs of a single-industry town labour market.

Quadrant III. Alternatives that aim to expand educational opportunities for local residents at external educational institutions, i.e. those that are located in other regions, but have relevant education programs and use modern education techniques. At the same time, programs and methods outcomes of these institutions should meet current and future possible needs of a single-industry town labour market.

Quadrant IV. Alternatives aim to use resources and educational potential of external educational institutions and satisfy employment demands of single-industry town residents in the context of the external labour market.

Alternatives can be formulated at the junction of quadrants, respectively; can prioritize either residents, or authorities, or educational institutions, or employers.

Next step is to assess generated strategic alternatives in terms of the impact they produce on the objectives of networking actors and the WATS target state achievement. This decision-making task has a hierarchical structure: it allows us to identify the relationships between the individual elements, but lacks information about the type of relations between them. For example, in WATS it is possible to identify actors interested in it (residents, educational institutions, etc.) and arrange cooperation between them; determine each actor's goals and find consistency or inconsistency in their goals; generate possible WATS development alternatives and determine ways they might correlate with the actors' goals. However, it is difficult to find clear unambiguous (mathematical) relations between all the factors due to the incompleteness and inaccuracy of available information as well as high uncertainty of the decision-making environment. In addition, a type of dependence will differ for various combinations of factors. All this requires the use of expert knowledge and judgment to assess and select the best alternatives (Rogachev, 2017).

In this regard, we chose the analytic hierarchy process (AHP) (Saaty, Vargas, 2022) as a method for assessing alternative development strategies for WATS. This method allows us to carry out a consistent decomposition of the problem to be solved on several grounds and obtain assessment of alternatives priorities, considering assessment of task elements at different levels of decomposition.

Standard levels of decomposition are usually distinguished as follows (from top to bottom):
- hierarchy focus - the main goal to be achieved;
- actors – those who influence the goal and/or are interested in it;
- actors' goals – goals that the actors want to achieve with respect to the hierarchy focus;
- scenarios (projects, alternatives) – ways, methods and actions used to achieve the main goal.

Decomposition results in hierarchy that appears on these levels. The hierarchy consists of a set of parent and child elements. For example, actors are parent elements for the goals on the one hand, and children elements for the hierarchy focus on the other hand.

Next, a method of hierarchy analysis involves performing sequential procedures of expert assessment of the importance of child elements in relation to the parent ones. After that, calculations of priorities are carried out. Values of these calculations allow identifying the most important alternatives in terms of achieving the main goal (focus), the interests of actors and their private goals.

The following provides a brief description of applying the AHP in the model of assessing strategic alternatives for the development of the advanced training system of a single-industry town in the conditions of network cooperation between the actors. Detailed descriptions of the AHP are given, for example, in (Saaty, Vargas, 2022) and examples of use for education in (Wang et al., 2021).

Stage 1. Presenting the problem as a hierarchy. This is a hierarchical model for assessing strategic alternatives for the development of the ATS:

Level 1 Hierarchy focus (S_o). The main goal is to eliminate the imbalance in the labour market of a single-industry town.

Level 2 Actors of ATS (S). The main stakeholders with objectives that are determinant for the ATS are the following: the town administration, the population, employers, and educational institutions (Zakharova et al., 2020).

Level 3 Actors' objectives (A). There are 2-5 objectives related to the development of the ATS for each actor. We propose to use the criteria of network effectiveness proposed in (Lizunkov et al., 2021) as a basis for identifying the objectives of actors

Level 4 Alternative strategies for the development of a single-industry town WATS (P). They are formulated according to the current situation in the labour market and education and the development strategy of a single-industry town (Li, 2021).

Stage 2. Constructing matrices of pairwise comparisons. An expert compares the elements of each level (excepting the focus) with respect to the parent element of the higher level (elements S are compared with respect to S_o, A – with respect to S, P – with respect to A). The comparison is made in pairs on the basis of the Saaty importance scale (Saaty, Vargas, 2022), which determines the dominance ratio of one item over another (scale values from 1 – equal importance, to 9 – very strong dominance, and inverse values from 1/9 to 1). The result is a set with expert ratings of the importance of the elements in the hierarchy (when they are compared in pairs).

Number of required matrices of pair wise comparison is determined by the number of parent elements on all levels of hierarchy.

Stage 3. Calculating local priorities. Expert assessment is used to calculate local priority vectors in the pair wise comparison matrices. For this purpose the values of elements of an eigenvector V are calculated first. For an i-th element V_i is calculated by formula (1):

$$V_i = \sqrt[n]{\prod_{j=1}^{n} a_{ij}} \qquad (1)$$

where a_{ij} is the value of a matrix element;
$i = \overline{1,n},\ j = \overline{1,n}$ – numbers of matrix lines and columns, respectively;
n – number of elements.

Vector of local priorities is calculated by normalizing values of elements of the eigenvector by formula (2).

$$LP_i = \frac{V_i}{\sum_{i=1}^{n} V_i}, \qquad (2)$$

where LP_i is the i-th element of a local priority vector.

This results in local calculated values for the importance of actors (V_s), actors' objectives (V_A), and WATS strategies (V_P).

Stage 4. Checking the consistency of the results obtained. It serves to check if the matrix is completed correctly by the expert. There are a homogeneity index (HI) and a homogeneity ratio (HR). If the HR<0.1, then the expert's judgements are ordered and the results of the assessment can be used to make decisions.

Homogeneity index is determined by formula (3):

$$HI = (\lambda_{max} - n) / (n - 1) \qquad (3)$$

where λ_max is the largest eigenvalue of the matrix, calculated by formulas (4), (5):

$$\lambda_{max} = \sum_{i=1}^{n} \lambda_i , \qquad (4)$$
$$\lambda_i = \sum_{i=1}^{n} a_{ij} LP_i \qquad (5)$$

The homogeneity ratio by formula (6):

$$HR = \frac{HI}{RR} \qquad (5)$$

where RR is the random homogeneity of the matrix (determined from the table for a given value of n) (Saaty, Vargas, 2022).

Stage 5. Calculating global priorities. To calculate global priority of a hierarchy element, we multiply local priorities of the lower-level elements by a global priority of the parent element of the higher-level element. If there are several parent elements, we find the sum of the weighted priorities for all parent elements. The result represents calculated values of V_s, V_A, V_P relative to the focus of the hierarchy as a whole. The best alternative will be the one with the highest global priority value. The decision-maker (the DM) can set a threshold for global priority, which allows selecting a set of recommended strategic directions.

Stage 6. The best alternative will be the one with the highest global priority value. The decision maker (DM) can set a threshold value of global priority, according to which the set of recommended strategic directions is selected.

For preliminary processing of expert assessments and calculations using the AHP method, the LibreOffice Calc spreadsheet editor was used, which is part of the LibreOffice office suite with a sufficient number of built-in functions to work with matrices and other mathematical operations.

3. Results and discussion
Model Application and Result Analysis

Based on the proposed hierarchical model, we have assessed and selected strategic alternatives for WATS development on the example of a single-industry town in the Russian Federation. Analysis of the development strategy of this single-industry town until 2035 (Strategiya sotsial'no-ekonomicheskogo…, 2021), as well as data from its social and economic development report for 2022 (Socialno-ekonomicheskoye…, 2021) allowed us to formulate the following limitations when choosing a development strategy for WATS:

- imbalance in the labour market caused by the closure of the town-forming enterprise, whereby it is not possible to rapidly create new jobs in the town and, accordingly, there is no possibility to clearly define necessary structure of professional training;

- education institutions are mainly oriented towards the industry of a town-forming enterprise, i.e. there are few employment opportunities among graduates. As a consequence, college and university graduates move to other cities. School leavers also tend to move to other cities to continue their education;

- a single-industry town has Priority Social and Economic Development Area (PSEDA) status, but to attract new employers and create new job opportunities is a distant prospect.

As a result of the system analysis of the situation, a hierarchy of strategy selection was developed. The names of the elements of the hierarchy are presented in column 2 of Table 1, and their symbols are presented in column 1 of the same Table. The graphical representation of the hierarchy, using the notations introduced in Table 1, is shown in Figure 1.

The hierarchical model has four levels:

Level 1. Hierarchy focus – Elimination of imbalance in the labour market (represented by a single element a0).

Level 2. Actors of cooperation in a single-industry town WATS (represented by elements a1-a4).

Level 3. The goals of subjects of network cooperation in a single-industry town WATS (represented by elements a5-a16).

Level 4. Alternative development strategies of a single-industry town WATS (represented by elements a17-a20).

Alternative strategic directions for the development of the WATS (a17-a20) have been formulated as follows:

a-17 – to organize targeted training that is focused at neurodidactic principles at external (territorial) higher education institutions and colleges, with training areas corresponding to the current and prospective needs of the town' employers (positioned in quadrant III in EI-LM matrix);

a-18 – to organize professional training at internal educational institutions after the pool of educational programs, which include neurodidactic principles, will have been reformed to meet the prospective needs of enterprises (including potential investors) (positioned in quadrant I in EI-LM matrix);

a-19 – to organize professional training at internal educational institutions, reformatting the pool of educational programs, which include neurodidactic principles, to accommodate out-of-town employment opportunities with residence in the town (remote or itinerant work) (positioned in quadrant II in EI-LM matrix);

a-20 – to provide training in business skills at internal/external training institutions, followed by business start-ups both within and outside the town (positioned at the intersection of quadrants I-IV in EI-LM matrix).

The expertise was conducted by professionals in the field of advanced training of personnel for businesses and industries that are located in the territories of advanced social and economic development and by the participants of the working group which aim is to develop a WATS strategy for single-industry towns.

As a result, 17 matrices of pair wise comparison were obtained:

- one matrix that includes expert assessment of actor dominance relative to the focus;
- four matrices include expert assessment of goal dominance relative to their actor;
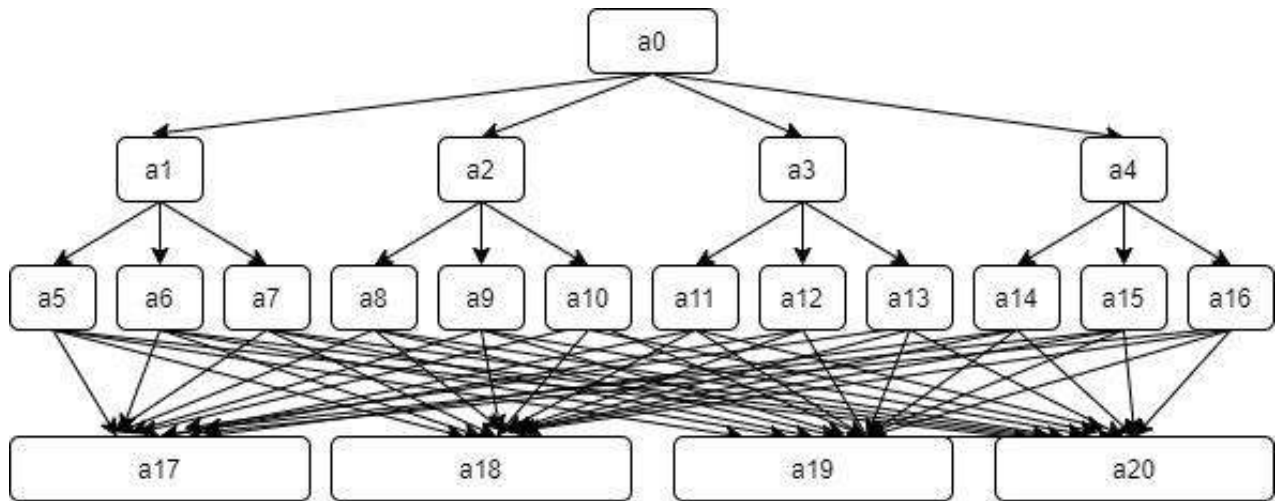- twelve matrices include expert assessment of the dominance of alternatives relative to each goal.

Fig. 1. Structure of development strategy selection hierarchy

Table 1. Results of calculations by a method of hierarchy analysis

Designation	Name of a hierarchy element	Priority	
		Local (LP)	**Global (GP)**
Hierarchy focus (primary objective)			
a0	Eliminating imbalances in the labour market	1	1
Networking actors in a single-industry town WATS			
a1	Authorities	0.600	0.600
a2	Employers	0.045	0.045
a3	Residents	0.228	0.228
a4	Educational institutions	0.127	0.127
Objectives of the networking actors in a single-industry town WATS			
a5	Reduction of unemployment	0.691	0.415
a6	Reduction of population outflow	0.133	0.080
a7	Raising of living standard of residents	0.176	0.106
a8	Attracting highly qualified professionals	0.076	0.003
a9	Filling vacant jobs	0.566	0.025
a10	Enterprise development	0.358	0.015
a11	Improving quality of life	0.196	0.045
a12	Expanding employment opportunities	0.740	0.169
a13	Comfort of the urban environment	0.064	0.015
a14	Demand for educational programs	0.079	0.010
a15	Strengthening relations with employers	0.435	0.055
a16	Increasing rates of graduates employment	0.486	0.062
Alternative strategies for a single-industry town WATS development			
a17	Targeted training at external educational institutions to fill vacancies in the single-industry town labour market	there are no (48 local priority values - 12 for each element)	0.488
a18	Training in a single-industry town for the domestic labour market		0.107
a19	Training in a single-industry town territory for remote or itinerant work		0.220
a20	Training focused on learning to build business skills		0.185

An example of the matrices of pairwise comparisons for a second-level hierarchy with expert additions and calculated local priorities is shown in Table 2.

Table 2. Matrices of pairwise comparisons of actors with respect to the hierarchy focus «Eliminating imbalances in the labour market»

Actors	Authorities	Employers	Residents	Education institutions	Eigenvector, V_i	Local Priority, LP_i
Authorities	1	7	4	6	3,6	0,600
Employers	0,143	1	0,143	0,25	0,267	0,045
Residents	0,25	7	1	2	1,368	0,228
Education institutions	0,167	4	0,5	1	0,76	0,127

Eigenvector elements were calculated by formula (1). For example:

$$V_1 = \sqrt[4]{\prod_{j=1}^{4} a_{1j}} = \sqrt[4]{1 \cdot 7 \cdot 4 \cdot 6} \approx 3,6$$

Local priorities were calculated by formula (2), for example:

$$LP_1 = \frac{V_1}{\sum_{i=1}^{4} V_i} = \frac{3,6}{3,6+0.267+1,368+0.76} \approx 0.600$$

Homogeneity index was determined by formula (3):

$$HI = (\lambda_{max} - 4) / (4 - 1) = (4,243 - 4) / (4 - 1) = 0,081$$

where λ_max was calculated by formula (4):

$$\lambda_{max} = \sum_{i=1}^{4} \lambda_i = 0,937 + 0,847 + 1,287 + 1,172 = 4,243 ,$$

where λ_i was calculated by formula (5), for example λ_1:

$$\lambda_1 = \sum_{i=1}^{4} a_{i1} * V_1^{norm} = (1 + 0,143 + 0,25 + ,167) \cdot 0,6 \approx 0,937$$

The homogeneity ratio is determined by formula (6):

$$HR = \frac{HI}{RR} = \frac{0,081}{0,9} \approx 0,09$$

where RR=0.9 for a given value of n=4 according to source (Saaty, Vargas, 2022).

As the HR < 0,1, the expert's judgements are ordered and the results of the assessment can be used to make decisions.

The obtained values of local priorities shown in Table 1 prove the significance of the Authorities in eliminating imbalances in the labour market at the time of assessment (priority value is 0.600).

Calculated values of all local and global priorities were obtained, and in the paper they are presented in Table 1 (columns 3 and 4 respectively).

To calculate global priority of a hierarchy element, local priorities of the lower-level elements are multiplied by a global priority of the parent element of the higher-level element. When several parent elements occur, it is necessary to find the sum of the weighted priorities for all parent elements.

For example, global priority for element a5 «Reduction of unemployment» is calculated be formula:

$$GP_{a5} = LP_{a5}GP_{a1} = 0.691 \cdot 0.6 \approx 0.415$$

It is worth mentioning that the sum of global priorities equals one for all level elements, and the sum of local priorities equals one for all child elements for one of the parent elements. For example, the sum of local priorities for targets a5, a6, and a7 equals 1, since these three elements are the children of actor a1. This should be taken into account when interpreting the results.

The results allow us to draw the following conclusions. The highest priority in the current situation is strategy a17 "Organize targeted training that is focused at neurodidactic principles at external (territorial) higher education institutions and colleges, with training areas corresponding to the current and prospective needs of employers" (global priority 0.488). However, this considers the objectives of the Authority actor (a1) and the objective of reducing unemployment (a5) to the greatest extent. Targeted training will allow young people of the town to leave for training in other towns and get demanded professions in the labour market of the monotown, and at the same time, targeted training will bring young professionals back to the town. Next in priority are alternative strategies for training for remote work (a19) and entrepreneurial skills (a20), which also contributes to population retention and reduction of unemployment in the city. The alternative to organize vocational training at internal educational institutions to meet the prospective needs of

the labour market and new potential employers-residents of the Priority Social and Economic Development Area (PSEDA) received the lowest priority. This is due to the inertia of the vocational education system and the considerable time required changing the structure of training areas in local professional education and training institutions.

The proposed model is a flexible decision-making tool that allows us to take into account changing decision-making conditions. At the same time, adaptation can be carried out in different ways and to different depths. Here are examples of conditions and corresponding changes in the model.

Only the main goal of a single-industry WATS strategy changes due to the transformation of basic direction of its development (for example, when the economic situation changes or when the importance of the main enterprise located in a town increases). In this case, a hierarchy structure may remain the same, but the change of focus will require new examination. This will result in the revision of priorities at each level of the hierarchy.

Actors might also change (new actors appear or number of actors reduces). In this case, it is necessary to revise links between the elements of the level being changed as well as its child and parent elements. For example, when a new actor (investor) is introduced, its goals should be identified, and the goals should be linked to the strategic development alternatives of WATS. New examination is required.

Goals of actors can be changed (be supplemented, reduced, or new ones might be introduced). In this case, it is necessary to revise connections between objectives and actors as well as between objectives and projects, and conduct a new expert assessment.

Strategic development alternatives may change (be supplemented, reduced, or new ones can be introduced). In this case, it is necessary to revise relations between goals and projects, and to conduct a new expert assessment.

Combination of the above mentioned conditions to adapting the model is possible.

When describing the importance of planning the development of the professional education sector, most researchers emphasize the significance of aligning with current and future labour market needs (Sparreboom, Powell, 2009). It is undisputed that the development of an individual's professional skills throughout their life should provide opportunities for decent employment and an improvement in the standard of living (Vankevich, Castel-Branko, 2017). Furthermore, there is a significant role attributed to the interaction between educational institutions and employers (Mahesh, Naitik, 2014). Some studies delve into additional labour market factors, such as the social and economic development of regions (Gurtov et al., 2016), regional demographics, and population migration (Vasilyeva, 2017). Issues related to labour market modeling for the purpose of developing development strategies and decision-making under uncertainty are also considered (Ostapchuk et al., 2021). Increasingly, it is recognized that the application of neurodidactic principles in workforce training is one of the key tools for their high-quality training in a short period of time.

In agreement with the findings of these studies, this research focuses on a combination of the aspects mentioned in them and new aspects, namely:

Formulating a development strategy for the workforce advanced training system as a crucial element of the municipality's strategy, aiming to enhance the quality of life and urban development sustainability.

Developing a decision-making model that facilitates the process of strategizing the development of the workforce advanced training system for a single-industry town within the context of network cooperation among WATS actors to address the labour market imbalance in the single-industry town.

Accounting for a high level of uncertainty in strategic decision-making.

As a result, new findings have been obtained, supporting the process of making strategic decisions in the development of workforce training system strategies. These findings can be applied not only to single-industry towns but also to other territorial units at the meso and micro levels of governance. The proposed model for evaluating strategic development alternatives for the advanced training system of workforce in a single-industry town offers tools for generating and assessing alternatives. The alternative generation phase is typically loosely formulated, and the matrix method proposed in the study allows to structure alternatives based on the key components of professional education: "educational institutions – labour market." Additionally, unlike existing approaches to WATS planning, the use of the Analytic Hierarchy Process (AHP) method enables the consideration of the interests of key stakeholders (town residents, town authorities, educational

institutions, and employers) in the evaluation of WATS development alternatives, as well as the incorporation of any factors identified by other researchers and the utilization of expert knowledge to support decision-making.

From a mathematical perspective, the model has limitations on the number of level elements subordinate to a single parent element.

According to Saaty (Saaty, Vargas, 2022) it is only possible to evaluate alternatives efficiently when their number is n ≤ 9 (which is related to human capabilities). If experts compare more than 9 alternatives simultaneously, their assessments will be incorrect.

For the hierarchy structure proposed in the paper, restrictions will be as follows: no more than 9 actors, no more than 9 goals for each of the actors, no more than 9 alternatives of strategic development. However, in the issues of strategic management, a larger number of actors, goals and development directions is usually not considered.

In terms of flexibility and the possibility of adapting the model to the problems of strategic development of the system of advanced training of a single-industry town, the model has no significant limitations because it allows changing the composition of actors, their goals and directions of development, as well as the structure of their interrelationships.

4. Conclusion

Thus, the model of assessing strategic alternatives for the development of the advanced training system in a single-industry town under the conditions of network cooperation between the actors provides DM with information about the priority of possible options of the WATS development strategy to eliminate the personnel imbalance in the labour market and to select the best strategy. The model makes it possible:

- to make a decision in uncertainty based on expert judgment;
- to consider the specificities of a single-industry town and its socio-economic development strategy when making decisions;
- to obtain information on the impact of the actors involved in the WATS on overcoming personnel imbalances;
- to apply neurodidactic principles to train highly qualified workers, that are able to perform employers' tasks, in a short period of time;
- to receive information on the prioritization of the objectives of the WATS actors;
- to receive information on the prioritization of options for the development strategy of the WATS in a single-industry town in relation to the objectives of the actors in the network.

The article presents an example of using the model to choose a development strategy for an advanced training system in a particular single-industry town under the conditions of imbalance in the labour market and high uncertainty of prospective labour market needs. The model can be adapted to other contexts by changing the elements of the hierarchy and the relationships between them.

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Empowerment and Power of a Teacher through Contributing to Positive Relationships and Using Positive Discipline in the School Environment: Teachers' Experiences in Two Baltic Countries

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Abstract

There is growing evidence of the role of relationships in teaching, learning and disciplining. This research aimed to compare Latvian and Lithuanian teachers' experiences regarding their empowerment through contributing to positive relationships and power through using positive discipline in school environment. The research questions were two: What does empowerment mean to teachers through their contribution to positive relationships in the school environment? What does the use of positive discipline in the classroom mean for teachers in regard to their power? The total sample consisted of 152 teachers from LV and LT. The research was implemented by applying semi-structured interviews with focus groups and using latent qualitative content analysis for data analysis. Findings showed that LT teachers express their expectations for relationship improvement, while Latvian teachers speak about actions for implementing empowering relationships in the school environment; LT teachers emphasize their power through creating the dyadic trustful, group-related relationships with students as a basic for teaching/learning, while LV teachers use the potential of the school community. Conclusions highlight that LT teachers relate positive discipline to learning from experience which means learning knowledge and skills through direct practice. This entails teachers and students reflecting on the experience they have had to identify new skills and knowledge that they can use within the specific context, case or situation. Regarding their power to apply positive discipline, LV teachers highlight their individual responsibility for structuring the learning environment and managing the classroom, which is related to the teacher's professional expertise/teaching methodology.

Keywords: focus group, positive discipline, positive relationships, qualitative research, school, semi-structured interview, student, teacher empowerment, teacher power.

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1. Introduction

Teacher empowerment attracts the increasing attention of researchers many areas, due to its correlations with teaching/learning quality and outcomes, teachers' input into job satisfaction, organizational commitment and professional identity (Lee, Jie 2014). Empowerment means that the school affords teachers the motivation towards professional growth and development, and continuous learning (Sharp, 2009; Warrah et al., 2019; Gülşen, Çelik, 2021). Empowered teachers make greater contributions into the school environment, and add to creating positive relationships between teachers, students, parents, and school administration (Amoli, Youran, 2014). Empowerment of the teacher through creating positive relationships is an important tool to help students to be successful in any context at school and in society (Mlalazi et al., 2016). Teacher-student relationships have long-lasting implications for students' learning achievements and social development. Positive teacher-student relationships strengthen students' desire to learn (Rimm-Kaufman, Sandilos, 2023). Positive working relationships between teachers empower them to assist their colleagues. They feel safe to be a part of the community of practice at schools (Folasade Akinyemi et al., 2020). A trusting relationship between teacher and school administration is a crucial component of the educational process. A school climate with trust empowers teachers for professional growth and self-confidence (Parker, 2019).

The term 'power' is commonly employed in a wide variety of academic disciplines. The definitions of the term are dissimilar from one discipline to another (Reddy et al., 2021). Power refers to a teacher's ability to affect in some way the student's well-being beyond the student's own control. This narrow view means the absence of intellectual influence on the student (Hurt et al., 1978). Broader views of power are expressed by McClelland (1975), Zaleznik and Kets de Vries (1975). Power is an individual's potential to have an effect on another person's or group of persons' behaviors. This means that the person changes her/his behavior, attitudes or beliefs as an outcome of influence from someone else (McCroskey, Richmond, 1983).

Power and positive discipline within the teacher's work are interrelated. Positive discipline, as a component of teacher power is a crucial in the students' learning. Its aim is to create an educational environment for meaningful learning (Tartari, 2018). Positive discipline means the teacher's role in forming and supporting students' self-esteem, nurturing their autonomy, and fostering their sense of self-confidence (Bej, 2016). Positive discipline ensures educational tools that focus on students' growth through instruction, allowing them to develop their potential (Mlalazi et al., 2016). Positive discipline emphasizes such supportive behaviors as mutual respect, effective communication, collegial planning, setting standards, addressing the causes of misbehavior, and constantly assessing the implementation of discipline (Tartari, 2018). Generally, discipline is student-teacher collaboration based on their positive relationships characterized by warmth and closeness, responsiveness, and high level of positive affect (O'Connor et al., 2011; Hughes, Cao, 2018).

Literature review on an international scale showed that the majority of research is focused on specific aspects – positive relationships at school or positive discipline in the classroom. The fundamental focus in research studies on positive relationships is exclusively related to the teacher-student dyad. When it comes to the use of positive discipline in the classroom, research mostly focuses exclusively on the psychological attitude by emphasizing specific strategies. Consequently, the research findings represent a fragmented perspective on the phenomenon. So here it is necessity to build an integrated research approach with the focus on teacher empowerment seen through teacher-created multidirectional positive relationships in the school environment and positive discipline used as a component of teacher's power in the classroom. Neither in Lithuania, nor in Latvia, nor on an international scale, was it possible to find such kind of studies, even more so, comparative ones based on the qualitative research paradigm. Thus, the research questions were the following: What does empowerment mean to teachers through their contribution to positive relationships in the school environment? What does the use of positive discipline in the classroom mean for teachers in regard to their power?

The research aimed to compare Latvian and Lithuanian teachers' experiences regarding their empowerment through contributing to positive relationships and power through using positive discipline in school environment.

2. Literature review

Teacher empowerment

Empowerment is a process of bringing into a state of ability or capacity to act. In this process teachers develop the competence to take responsibility of their professional development and solving problems, and adapting to situation in order to improve it (Chamberlin, 2008). Teacher empowerment involves critical thinking in problem solving and being a part of decision-making process, sense of self-efficacy and impact (Eaker, 2008). In decision-making within the school environment teachers feel that they control their professional lives, teaching and learning in a classroom, and that they are appreciated and are capable of making input into positive relationships at school (Schwarzer, Hallum, 2008). Empowered teachers use their professional autonomy and professional expertise to improve teaching and learning processes (Shaver, 2004). Empowerment and self-effectivenness correlate with increased teacher professional and self-confidence, improved fellow teacher cooperation and collaboration, higher professional motivation and learning achievements of students (Fleck, 2005).

In terms of using positive discipline in relationship with students, teacher empowerment is related to their interaction with students, student behavior and achievements (Squire-Kelly, 2012). Empowered teachers create rules, implement mutual reinforcement through mutual discussions and managing the classroom by engaging students into sustaining discipline within it (Buksnyte-Marmiene et al., 2022).

The school environment as a set of relationships between the members of a school community is important in supporting teachers' empowerment through professional autonomy and teacher involvement in problem solving, respectful mutual communication and supportive cooperation (Blasé, Blasé, 2001; Tapia-Fonllem et al., 2020).

Communication is an aspect of teachers' input into positive relationships in the school environment. Open communication between teachers and administrators means their ability to share information, opinions, attitudes, resources and news (Kiral, 2020; Calisici Celik, Kiral 2022).

Positive relationships in school provide opportunities for teachers, students, parents and school administration to learn from each other (Bogler, Somech, 2004). Teachers perceiving a stronger sense of empowerment believe that they can impact the work of school and positive relationships within it, facilitate the control of students in a classroom through positive discipline, and that they have the power to set the issues, initiate teaching and learning innovations and institutional change (Ubben et al., 2001).

Positive relationships of a teacher

Positive teacher-student relationships promote students' development (Pianta, Hamre, Stuhlman, 2003; Williford, Wolcott, 2015). Students' self-efficacy beliefs and self-confidence to succeed within different domains at school, has an impact on their learning achievements. Within the teacher-student relationship, teachers contribute to individual students' positive identity as learners (Jederlund, von Rosen, 2022). Teachers who maintain positive relationships with students have had an impact on their adjustment (Wentzel, 2012), including improvement in students' behavior in non-classroom settings (Cash et al., 2019).

For students, a positive teacher relationship is about being listened to and having their teacher take an interest in their lives. Students want to be respected and understood as individuals by a teacher who communicates with them and provides caring and positive feedback at a time (Telli, den Brok, 2012). For teachers, a positive relationship with students is about being supportive, and being aware of the teacher's position of power. It requests teacher self-reflection as an important aspect of effective teaching (Mena Marcos et al., 2008; Martinsone, Damberga, 2016; Pihlaja, Holst, 2013). By setting high expectations for learning and attempts to keep the classroom conflict-free the teacher needs to evoke trust with students, to set clear boundaries and to promote motivation for learning (Martin et al., 2015).

Teachers' relationships at school are multidirectional. They spend a lot of energy and time building relationships with their students and the parents of students. Building relationships with one's colleagues can provide advice and guidance (Folasade Akinyemi et al., 2020).

Positive relationships between the teacher and school administration maintain the teacher's empowerment at school (Reddy et al., 2021). One of tasks of the school's administration is to support and empower teachers. This builds the trust and confidence of teachers (Parker, 2019).

Power of the teacher

A teacher's power through teaching and student learning influences teacher-student relationships, learning outcomes and motivation of students, teaching experiences and achievement of teaching/learning goals (Finn, 2012).

Gordon (1989) highlights four types of power in terms of knowledge, expertise, acquisition of skills, and job-related power. It provides authority for teachers to influence others. Teachers use their expertise-based and job-related power, focusing on commitment and contractual arrangements, to influence students positively and achieve their cooperation (Hawamdeh, 2013).

Larrivee (2004) claims that expertise-based power relates to a teacher's subject knowledge and competence. The referent power pertains to the communication-based teacher-student relationship and involves students' respect for teachers (McClelland, 1975).

Thompson (2019) emphasizes that influence is the capacity to persuade others to believe certain things and behave in particular ways or to cause processes to move in a particular direction. These results reflect the vision, values and expectations of the person exercising the power of influence. If a person in a position of authority has more power, her/his concerns about trust are less in dealing with others who have less relative power, because s/he can sanction a person who violates the authority's trust. If the person in a position of authority has limited power, s/he is more vulnerable in relationships in which s/he has limited trust in others (Turner, 2005; Hurley, 2006; Overbeck, 2010).

Four traits are crucial in recognition of teacher authority and power: interaction between teacher and students, learning activities based upon predetermined educational objectives, organized teaching/learning design with the focus on context and facilities, developing student learning opportunities and facilitating students' learning (Esmaeili et al., 2015). So, the styles of conversations teachers have with students represent the message how they use power to develop relationships with students, influence their learning behavior and motivation (Reid, Kawash, 2017).

Positive discipline used by a teacher

In a classroom the teacher implements teaching for student learning so that they develop individually and socially (Khalkhali, 2010). Positive discipline in education is associated with classroom management, which is directed at creating a calm atmosphere for supporting the learning and holistic development of students (Stronge et al., 2011; Stevens, 2018). Teachers understand that conflicts with students lead to a negative classroom climate. Teachers are aware that good relationships with students help to keep them attentive and engaged in learning (van Tartwijk et al., 2009).

Building positive classroom discipline is considered to be of significant concern for teachers, school administration, students and parents. Teachers and school administration strive to achieve educational outcomes and implement effective teaching/learning, students expect to receive a good quality of education, and parents would like to have more positive discipline in the classroom by influencing their children's learning process and achievements, and positive changes in students' behavior (Hawamdeh, 2013). Positive discipline in a classroom is related to the students' acceptance and recognition of teacher power through the authority of teachers. This relates to the teacher's use of positive discipline while they manage students' individual and group learning and everyday education situations (Larrivee, 2008; Kyriacou, 2018). Using positive discipline in a classroom includes the teacher's ability to engage students in a dialogue, guiding and managing learning activities and situations. When it comes to using positive discipline, teachers need to develop clear patterns with students and have to ensure that the agreed rules are effective as they correlate with teachers' and students' learning expectations in a classroom (Hawamdeh, 2013; Kyriacou, 2018). Positive discipline is effective when students and teachers develop learning environments that encourage students to think critically but favorably of themselves. Also, it promotes students' and teachers' reflection on their thinking, behaviors, attitudes and actions as related to improvements of learning and teaching (Tartari, 2018).

3. Research methodology

Sample

The total research sample consisted of 152 teachers from two Baltic countries – Latvia and Lithuania. Purposeful sampling strategy was applied in both countries.

Samples of Lithuania and Latvia in this study support the depth of case-oriented analysis that is fundamental to the qualitative mode of research. These samples were purposive, that is, selected by virtue of their capacity to provide rich-text-based narratives, relevant to the phenomenon under the study. Thus the purposive sampling selects 'information-rich' cases (Malterud et al., 2015). Sample size determination was guided by the criterion of informational redundancy: sampling was terminated when no new information was elicited (Denzin, Licoln, 2017). Such approach is related to the concept of 'information power', which leads the sample size formation in qualitative research and claims that the more information power the sample provides, the smaller the sample size needs to be, and vice versa (Malterud et al., 2015). The concept of 'data saturation' was also applied in this study when forming the research sample. It means an iterative process of data collection and data analysis when data collection is governed by emerging new information rather than predefined characteristics of the population (Vasileiou et al., 2018).

In the qualitative study, the principle of homogeneity of the sample was ensured in both countries based on the following principles: i) professional principle – the selected focus groups represented the teaching profession, i.e. persons with the professional qualification of a teacher who share the same characteristics in terms of occupation participated in the study; ii) methodological principle – five groups of research participants were formed in each country and the study participants were asked the same interview questions (Nyumba et al., 2018).

Being professionally homogeneous focus groups (teachers) allowed participants felt more comfortable discussing their experiences because their fellow group shared nearly similar experiences (Roller, Lavrakas, 2015). Providing the same interview questions ensured the possibility to analyze the obtained qualitative data based on the same research methodology, and to compare the obtained results (Poliandri et al., 2023) between countries.

Latvia: Focus group participants-teachers were from five schools involved in the 'Teach to Be' project's participatory action research. Two schools were in the capital city, and three were in various regions of Latvia. All schools were municipality-founded general education secondary schools (grades 1–12). The sample consisted of 83 teachers divided into five focus groups. Three focus group semi-structured interviews were implemented in every school: Group A – 15 participants from a town near the capital city Riga; Group B – 15 participants from Riga; Group C – 18 participants from a regional city; Group D – 19 participants from Riga; and Group E – 16 participants from a regional city. According to gender, 78 participants were women and five were men.

Lithuania: Five schools – participants of the Project 'Teaching to Be' – were invited to form focus groups of teachers. The schools represented both big and small cities, and rural areas – in striving to highlight the variety of issues. Five focus groups of teachers participated in the research: Group A (15 teachers); Group B (10 teachers); Group C (15 teachers); Group D (14 teachers); and Group E (15 teachers). In total, 69 teachers-research participants. Demographic characteristics of a sample: groups A and B with 25 teachers in total represented major cities, Group C with 15 teachers was from a small city, Group D, with14 teachers represented a small town, and Group E, with 15 teachers was from a rural area. According to gender, 53 participants were women and 16 were men.

Data collection
The data was collected from September 2021–February 2022 in Latvia and Lithuania by implementing semi-structured interview-based focus groups.

The semi-structured interview was a powerful type of interview in this qualitative research because it allowed researchers to acquire in-depth information and evidence from interviewees while considering the focus of the study (DeJonckheere, Vaughn, 2019). Focus groups helped to discover new aspects and information, as the participants owned and contributed together and provided diverse perspectives on the selected topic than it would be by implementing the individual interviews (Gundumogula, 2020).

Interview questions focus on event, experience, how it unfolded and what it was like in order to elicit the response relevant to research questions (Roberts, 2020). The two research questions for the current research were posed:

Q1. How do teachers experience their empowerment through contributing to relationships with colleagues and students?

Q2. How do teachers perceive their power through using positive discipline for students?

"An interview question can be evaluated with respect to both a thematic and a dynamic dimension: thematically with regard to producing knowledge and dynamically with regard to the

interpersonal relationship in the interview" (Brinkmann, Kvale, 2015: 157). Developing an initial set of interview questions is part of the research process (Rubin, Rubin, 2012).

While considering what kind of interview questions should be, researchers might review the literature to assist in the clarification of possible key concepts to explore in the beginning stages of the qualitative study (Roberts, 2020). The interview questions should be broad that they do not limit the research participants 'responses for exploring what is unknown, rather than leading the course of the interview through the structure of the particular theory or concept. Interview questions should be free of assumptions and convey that the researcher is open to complex aspects of participants 'experience" (Brinkman, Kvale, 2015; Rubin, Rubin, 2012).

The specific interview questions asked in both countries were as follows:
- How do you contribute to positive relationships at school with students, parents, school administration?
- What are some visible, recognizable characteristics of your contribution to positive relationships at school?
- What kind of discipline you use in a classroom? For what reasons?
- How do you use the positive discipline in a classroom?

In this study, the literature review made it possible to explore concepts of 'teacher empowerment' (e.g., Chamberlin, 2008; Eaker, 2008; Fleck 2005; Shaver, 2004; Schwarzer, Hallum, 2008; Squire-Kelly, 2012 and etc.), 'positive relationships of a teacher' (e. g., Pianta et al., 2003; Williford, Wolcott, 2015; Jederlund, von Rosen, 2022; Pihlaja, Holst, 2013; Wentzel, 2012 and etc.), 'power of the teacher' (Finn, 2012; Hawamdeh, 2013; Reid and Kawash, 2017; Thompson, 2019 and etc.) and 'positive discipline used by teacher' (Hawamdeh, 2013; Kyriacou, 2018; Tartari, 2018 and etc.). The literature review revealed that teacher empowerment and positive relationships (Reddy et al. 2021; Schwarzer, Hallum, 2008; Blasé, Blasé, 2001; Tapia-Fonllem et al., 2020) and teacher power, and positive discipline (Esmaeili et al., 2015; Hawamdeh, 2013; Larrivee, 2008) are interrelated. Thus the interview questions were formulated taking into account the two research questions, which reflect the mentioned four concepts and the relationships between them, in order to obtain detailed narratives based on the teachers' experiences at school.

The conceptual information in this qualitative research was used retrospectively, what means that at the end of the study, when the data was analyzed and it was necessary to give meaning to the findings. Hence, the conceptual literature was used purposefully as a post-hoc activity to strengthen the theoretical thrust of a piece of qualitative work. Thus the theory has not driven the research from its outset. This is a typical decision in the qualitative research space, which means that choosing not to apply theory to the qualitative study is not the single or exceptional case (Bradbury-Jones et al., 2014). Because in qualitative research, it is not the conceptual literature that determines the direction of the empirical research, but the findings of the conducted empirical qualitative research guide the researchers to select the literature purposefully in order to support the empirical findings (Giles, Harrison, 2023).

Semi-structured interviews with focus groups of teachers were conducted in Lithuania and Latvia using the state languages: in Lithuania, communication with research participants was conducted in Lithuanian language, and in Latvia – in Latvian language. The collected information was transcribed and analyzed. The product of the final stage of the research was translated into English - formed categories with subcategories and accompanying interview excerpts. This ensured linguistic sensitivity (Karhunen et al., 2018) and content validity as the categories generated use the language of interviewees and reflect the content of qualitative statements made by the interviewees (Brod et al., 2014). The minimum duration of one focus group interview was two hours. The longest duration was three hours and twenty minutes.

Data analysis

Latent qualitative content analysis (LQCA) is used in cases where there are no previous studies dealing with the phenomenon or when it is fragmented. LQCA looks at the meaning of information (content) in textual data by isolating small pieces of the data that represent salient concepts by examining the data (Kleinheksel et al., 2020). This method was used in this study to explore complex phenomena, such as teachers' experiences regarding their empowerment through contributing to positive relationships and power through using positive discipline in school environment. It allowed researchers to gain insights into the subjective experiences of teachers,

and to develop a deep understanding of the contexts that shape those experiences (Hsieh, Shannon, 2005).

LQCA with four stages was implemented in this research (Erlingsson, Brysiewicz 2017; Kleinheksel et al., 2020; Lindgren et al., 2020):

1. Decontextualizing with open coding: familiarizing with qualitative data, reading transcriptions, obtaining thee holistic sense, breaking the text into meaning units, labeling each unit with inductive code.

2. Recontextualizing: checking whether all aspects of the content were covered by meaning units in relation to the research questions, re-reading the original text and finalizing the list of meaning units, excluding meaning units that were not related to research questions.

3. Categorizing with condensation: condensing extended meaning units before creating subcategories and grouping them into categories rooted in the empirical data from which they emerged.

4. Compilating: analyzing once the categories were created, immersing researchers themselves into the data for identifying implied meanings in the interview texts, choosing specific meaning units (quotations) for each category to be presented.

lQCA involved analyzing data without preconceived categories or theories. This flexibility allowed the data to guide the researchers' analysis in order to identify emerging patterns and concepts (Kleinheksel et al., 2020). Both authors discussed their autonomously identified categories and reached a consensus. Similarities and differences of categories were identified and discussed.

In this study, the researchers took into account the concerns regarding using software for qualitative data analysis such as deterministic and rigid processes, privileging of coding, and retrieval methods; reification of data, increased pressure on researchers to focus on volume and breadth rather than on depth and meaning and distraction from the real work of analysis (st. John, Johnson, 2000). Therefore, the researchers made the decision to perform data analysis combining the manual method with the use of NVivo 12 software for Qualitative Research.

Coding or categorising the data involved subdividing the huge amount of raw data was performed by NVivo 12 software. Creating subcategories and assigning them into categories were performed manually by both researchers. The software removed the tremendous amount of manual tasks and allowed more time for the researchers to explore trends, identify subcategories and reflect on categories and its relationships with subcategories in relation to units of meaning from semi-structured interviews (Wong, 2008; Lester et al., 2020).

Research ethics

Ethical permission to implement the study in both countries was received from the Educational Research Ethics Committee at Educational Research Institute, Vytautas Magnus University (February 17, 2022, Protocol No. 5) and from the Research Board at Vytautas Magnus University (March 1, 2022, Protocol No. 17).

4. Results

To answer the question about teacher empowerment with the focus on teachers' contribution to relationships with colleagues and students, three similar categories from Latvian and Lithuanian teachers' responses were developed, namely, 'practicing positivity', 'strengthening mutuality' and 'improving communication':

- 'Practicing positivity' for teachers means motivating feedback. For LT teachers, it is related to dyads of teacher-student/student-teacher, teacher-teacher, teacher-parents/parents-teacher. For LV teachers, it is focused on managing conflicts in a classroom by teacher's modeling of expected strategy, and noticing, when students independently use the strategy.

- 'Strengthening mutuality' involves collaboration/cooperation (for LT and LV teachers it means strengthening professional mutuality with colleague teachers and students while performing a variety of activities through creating, forming and/or sharing professional tools, materials and projects); support (LV and LT teachers value the support of the professional teachers' community at school and school administration when facing issues, solving problems and striving for achievement), friendliness (for teachers from both countries it is related to professional caring, being heard while communicating about (non)professional problems), openness (for LT and LV teachers it is based on mutual trust between teachers and working in the school community where is possible to share different opinions and attitudes while knowing that it will not be

punished) and learning from each other (for LV and LT teachers it means a teacher's learning from colleague teachers, students and their parents when sharing different attitudes).

- 'Improving communication' consists of sharing experiences through conversations (LT and LV teachers treat it as a possibility to have non-formal talk, to tell a joke or to narrate a story), listening and hearing various opinions and attitudes (LT teachers see communication as a tool of personal learning and development, while LV teachers treat communication as a channel to share professional opinions), and listening to advice (LT and LV teachers value each other's advice on professional matters).

In the Table 1, each subcategory is illustrated by excerpts from focus group interviews with teachers from both schools – LT and LV – as empirical evidence of similarities between teachers' experiences from two countries.

Table 1. Teachers' empowerment through contribution to relationships with colleagues and students: similarities between Latvian and Lithuanian teachers' experience-based perceptions, opinions and attitudes

Category	Subcategory	Quotes from interviews
Practicing positivity	Motivating feedback	Feedback has a big impact. It doesn't matter who it is – fellow teachers, students, their parents or the school administration. I always try to transform even difficult, negative things into positive things through feedback – something that can be improved or something that can be learned from. LT GrB
		When there is a conflict in my class, I always ask: 'How can I help you?' instead of asking who is guilty. I have recognized that now my students use this approach independently in their conflicts. LV GrA
Strengthening mutuality	Collaboration/ cooperation	Cooperation is a necessary and important value in strengthening mutual solidarity between teachers and the educational relationship between teachers and students. It manifests itself in various contexts – in meetings, in solving problems, in making decisions, in discussions about teaching materials, in creating and implementing projects, and in many other activities. It means mutual trust. LT GrA
		Collaboration between subject teachers – parallel class teachers work together to develop tests and uniform requirements; exchange of experience and teaching materials between teachers. LV GrC
		When regulations are developed in the school, such as the school's internal rules, they are never adopted by management alone. All these documents are discussed collectively. Sometimes it is that something is on paper, but we see that in real life it does not work, then the school administration listens to the teachers and makes changes. Ability to cooperate – if you work as a teacher – it is impossible to do without it. Individualists cannot survive in this profession. LV GrB
	Support	Support is like a lifeline in school life. It is both practical, moral and social. For teachers it is important to be reinforced when they have to face professional problems. The support of school administration is important when teaches want to implement innovations and for teacher's reinforcement to the students when it is necessary to solve the issues in learning process and striving for achievements. Without it, you won't go anywhere and won't achieve the goals. LT GrC

Category	Subcategory	Quotes from interviews
		Due to mutual support during a meeting, even as a young teacher, I felt if I was working in the school for years. LV GrE
	Friendliness	Friendliness and support go hand in hand. I'm talking about professional friendliness. Especially among teachers. It is necessary when you need professional advice, when you just need a hearing about problems that have arisen. LT GrE
		There is always coffee in the morning, a snack left on the table as a greeting from a colleague. So, someone has thought of me. The feeling that we care about each other. LV GrB
	Openness	Communion, solidarity and mutual understanding are impossible without openness. Openness is inseparable from mutual trust and it strengthens the school community. When you can talk about a variety of topics, you can ask difficult questions and talk about it out loud without hesitation. When you know that you will not be condemned and punished. LT GrC
		There are no intrigues in our school, that could be typical of women's team. It makes life very easy. It's important to ask for help on time and help to each other. Sharing is much faster and more efficient than reading a book or finding it online. Learn to share and not be stingy with your skills and share. Be open. It makes everyday life much easier. LV GrC
	Learning from each other	Learning from each other is important when it is part of the school culture and that mutual learning is between teacher and student, between teachers, between student's parents and teacher, and between school administration and teacher. These are such important dyads to realize and become aware of. We learn by heart – both from innovations, and from mistakes, and from experiences. When we talk, we share feelings and emotions when we talk about experiences. LT GrA
		There are many students in the school, and we also learn from them – every day is like a day of professional development – every day there is a new situation, communication with colleagues, parents, problem solving, etc. LV GrC I work in this school for 40 years and I enjoy learning form young colleagues, they are more relaxed and difference in their attitude is visible. LV GrD
Improving communication	Sharing experiences through conversations	The value of peer-to-peer conversations at school is invaluable. It is important to find time and make time for it. It's not just about giving and receiving feedback, I mean just talking. During conversations, we learn to communicate clearly, accurately, and respectfully. Through conversations, we share experiences – all kinds – bad and good, and learn from them. LT GrD
		Teacher's room - if I want to meet a colleague, just talk or joke, I always go there in my spare time. This is a place where you can communicate with colleagues. This is how well-being can be created – through relationships, problem solving through communication with colleagues. LV GrB

Category	Subcategory	Quotes from interviews
	Listening and hearing various opinions and attitudes	It is not always easy to listen and hear different opinions and attitudes. Because they often do not match your personal ones. Therefore, it is an important communication tool for personal learning and development. And at the same time, it is also an instrument for the school community to learn to communicate. Yes, I mean conversations. About essential questions important to the school, teacher, and student. LT GrC
		I teach critical thinking through asking of opinions and substantiations. You must listen not only to the teacher, but also to your colleagues. LV GrE
	Listening to advice	We often say that we listen to advice, but do we do it as advised? This is where the important learning point comes in. And maybe even the moment of the teacher's commitment – to himself and the school community. When we ignore advice, we don't reflect on it, we don't improve. We get stuck in the cycle of our thinking and decisions, so after a while, we don't see progress, movement, and the results we achieve start to disappoint. LT GrE
		Even during the breaks, I was able to get advice from my colleague. LV GrA

Despite aforementioned similarities, LT and LV teachers see their empowerment through contribution to relationships with colleagues and students also from different positions.

Both LT and LV teachers speak about practicing positivity while they see it through different lenses:

- Only LT teachers highlight friendliness, which they treat as communication feature within the school culture with the focus on mutuality, respect, dignity and equal dialogue.

- Encouragement of creativity is noted exceptionally by LT teachers. They see creativity as a part of school culture, in which creative teaching and learning helps teachers and students to achieve goals and implement missions.

- Only LV teachers mention facilitation of positive relationships that are seen as emotional connection between the teacher and students in a classroom.

- Only LV teachers talk about encouragement of positive behavior with the focus on advantages.

- Exclusively LV teachers emphasize building of personal relationships with colleagues and students. This means, for example, to remember names of all students to make a personal contact and meaningful communication.

Strengthening mutuality for both, LT and LV teachers seem to be important, but it has different meaning for teachers from different countries:

- LV teachers give priority to personal responsibility, which is unavoidable by teacher either during working hours, after work or on weekends, e.g., the phone is not turned off, discussions are not postponed, substitution situations are rethought in advance.

- LT teachers are focused on learning from, in and for practice what means for them reflection through communication with colleagues, students and their parents, school administration in order to listen and hear opinions, attitudes, perceptions and recommendations.

Teachers from both countries highlight improvement of communication, but they authentically treat this:

- For LT teachers, it means providing and receiving feedback. When they talk about feedback with fellow teachers, then it emphasizes professional solidarity. In relation to students, this means increasing their motivation to learn and strive for better academic achievement.

- LV teachers accentuate recognition of teacher's personal self. Humanity is important for teachers, so they show to students their human side, which is imperfect. They believe that it helps to create more in-depth and personal connection with the students.

The Table 2 and Table 3 provide differences between LT and LV teachers based on their experiences and opinions, so it is logical that only examples of interview excerpts of LT teachers are given to one category, and only examples of interviews of LV teachers to the other.

Table 2. Teacher's empowerment through contribution to relationships with colleagues and students: differences between Latvian and Lithuanian teacher's experience-based perceptions, opinions and attitudes

Category	Subcategory	Quotes from interviews
Practicing positivity	Friendliness	Friendliness is an important communication feature of the school culture. It's not familiarity. It is an opportunity for the entire school community to learn equal dialogue, where there is no place for rudeness, status-based relationships. It is a human relationship in which the person himself must feel the limit of lack of respect. And that is not easy. It is a respectful and at the same time uplifting mutual communication, based on a focus on teaching and learning, realizing the meaning and value of both processes in the school. LT GrA
	Encouraging creativity	Encouraging creativity both in the work of the teacher, in the learning of students, and in the decisions of the school administration. That support of the culture of creativity, when the norm is to implement innovations, when various initiatives are supported. Such an environment is perfect for students to grow, for teachers to become stronger, and for the entire community to realize its missions and goals. LT GrC
	Facilitating positive relationships	I purposefully build a positive relationship with the class, and I have emotional connection with them; a good lesson is a good relationship. LV GrD
	Encouraging positive behavior	Positive behavior is emphasized. We focus on the positives rather than the negatives at school. LV GrC
	Building personal relationships	It may seem like a trifle to know the name of a colleague or student, but it's important for me. I really try to memorize my students' names, and I use them both in class and when meeting students in the hallway or outside of school. I see that some children are pleasantly surprised that I remember their name. LV GrE
Strengthening mutuality	Learning from, in and for practice	We learn from practice, in practice and for practice. The teacher's entire activity is professional, so that learning is related to social, value, ethical, physical and other aspects. It is based on self-reflection, self-analysis. It is great when there is an opportunity to reflect together with colleagues, students, school administration and with parents of students and receive advice, opinions, considerations through feedback. LT GrB
	Personal responsibility	I can't take the sick leave and turn off the phone, I have to be available and leave everything ready for my lessons so that a colleague doesn't have to prepare if there is a need to replace me. LV GrC

Improving communication	Providing and receiving feedback	Giving and receiving feedback is not just about intent or intention. It must be and remain one of the essential features of school culture. From my experience, I can say that the reciprocity helps me to show solidarity with my fellow teachers and my class relations with the students are great because of it. Students understand better, are more motivated, they feel respected because they are listened to and taken into account. And I am happier because I see better learning results. LT GrA
	Recognizing teacher's self	I often admit to students that I don't know, I'm wrong, I don't understand how it happened and then we try to deal with it together. Children also understand that I am just a human being. LV GrA

To answer the second research question about teacher power by emphasizing the teachers' use of positive discipline while working with students in a classroom, only some categories appeared with the same names, but their contents, according to the answers of LT and LV teachers, differ:

- Only LT teachers highlight creation of agreements. It includes of them development of general rules together, following agreed rules, changing rules by the agreement of both sides and assuming individual moral responsibility for breaking agreed rules.

- Both LT and LV teachers accentuate mutual reinforcement. For LT teachers, it includes listening to advice from both sides and discussing teaching and learning strengths and limitations. LV teachers incorporate into it the engaging students in sustaining discipline and involving 'external' participants, e.g., parents.

- Learning from experience is meaningful only for LT teachers. They emphasize here two aspects – discussing possible solutions for teaching /learning issues and seeing mistakes as opportunities for improvement.

- While structuring the educational environment is highlighted exceptionally by LV teachers. They accentuate here three components – visualizing the rules or expected structure, setting clear rules in a classroom and using proactive strategies to classroom management.

- Only LV teachers note the management of classroom with the focus on using audio signals, eye contact, empowering student leaders, practicing positive reinforcement, and integrating humor.

- Merely LV teachers mention experiencing the limits of communication through crossing boundaries, and motivating students through communion-based support.

Table 3. Teachers' power through using positive discipline for students: differences between Latvian and Lithuanian teachers' experience-based perceptions, opinions and attitudes

Category	Subcategory	Quotes from interviews
Creating agreements	Developing general rules together	It is important to agree on common rules with the students and follow them. It is not easy to develop them, because you need to agree on each one, find out the contexts of its operation and difficult situations. But talking and making decisions together lead to progress in communication, teaching and learning. LT GrB
	Following agreed rules	Following the rules developed together with the students is not a problem. Both I, as a teacher, and the students know and understand them. So if they do violate it, talking about the situation, although not easy, but is understandable for all parties involved. This contributes to the strengthening of mutual trust, mutual respect and solidarity in a classroom and beyond. LT GrE

Category	Subcategory	Quotes from interviews
	Changing rules by the agreement of both sides	We make the rules together. After all, they play a symbolic role in the relationship between teacher and students. Even if we change them, discuss, negotiate, there is no one-sided solution here. LT GrC
	Assuming individual moral responsibility for breaking agreed rules	If the rules are violated, individual moral responsibility is assumed. The rules are a kind of self-learning tool for both the teacher and the students. Therefore, their violation is often deliberate – a person who violates them knows in advance that he does not follow them. I like that you talk to the students, they rarely make excuses. We talk, they recognize their steps and we reflect on what we have learned from a specific situation. Such positivity does not cause tension and gives hope to the team that we are together in mutual respect. LT GrD
Mutual reinforcement	Listening to advice from both sides	I am a teacher. Therefore, I learn to listen not only to myself, but also to my students. My advice to students is often important. But I am also learning to listen to the advice of the students and not to consider them as wishes, but to see them as advice. This approach helps me to be more open and hear what the students are saying to me. LT GrA
	Discussing teaching and learning strengths and limitations	I initiate a weekly conversation with students about teaching and learning. This is how we learn to reflect together through ourselves and through others, about ourselves and about others openly, respectfully, with dignity. LT GrB
	Engaging students in sustaining discipline	If the situation is related to the class, then I turn to my class and ask how we can deal with this situation. LV GrC
	Involving 'external' participants	I have a problematic student, who breaks everything. We collaborate several colleagues as well as the support staff to solve this situation. LV GrC There is a responsiveness from parents. Most parents are supportive and willing to cooperate. LV GrE
Learning from experience	Discussing possible solutions for teaching /learning issues	I especially value discussions with students and fellow teachers about teaching and learning, successes and failures. When we share specific examples and experiences related to it. It's not just talking about techniques and wishes, it's a living conversation that reflects people, their actions, feelings, emotions, decisions and intentions. Then we can make wise decisions together. LT GrC
	Seeing mistakes as opportunities for improvement	I think seeing mistakes as opportunities and learning and improving is important. And for students, and teachers, and parents of students, and the school administration. Such thinking helps to change the culture of the school, where a mistake is not punished and it is not a tragedy. This is an opportunity. But again, it doesn't mean that the person shakes hands and travels down the same path. No, learning from mistakes requires a lot of willpower,

Category	Subcategory	Quotes from interviews
		awareness and focus. LT GrD
Structuring the educational environment	Visualizing the order for participation	We have pictograms to regulate the order who can speak. LV GrA
	Setting for clear rules in a classroom	The same rules apply to both teachers and students – If the students have to turn off the phones, then I also have to turn it off. LV GrB
	Using proactive breaks to calm down	To mitigate collective stress, I time to time switch in the deep concentration music. Children put their hands on the table, support your head and stay calm for 2–3 min relaxation. LV GrE
Managing classroom	Using audio signals	Clapping your hands if there is noise in the classroom; ringing a bell to draw attention. If my students are loud, I will fell silent/stop speaking. I say 'STOP' to interrupt escalation and rumination. LV GrA
	Using eye contact	I have the anaconda gaze when everyone understands that it will be bad now – when the teacher's eyes are cold and she is silent, then there is peace in the classroom. LV GrB
	Empowering student leaders	I try to get a student who is an authority in the class to be on my side. If successful, the student in the class also sets the tone and helps maintain order. Then it's easier, I'm not alone, but we're a team. LV GrC
	Practicing positive reinforcement	I promise that after a task it will be allowed to play. LV GrE
	Integrating humor	Sense of humor allows you to overcome difficulties. LV GrD
Experiencing the limits of communication	Crossing boundaries	I draw on the blackboard stripes indicating the level of my annoyance. When there are three stripes – I stop the lesson, and give a test on the matter that was to be learned that day. I choose hard questions to show them that they can't learn well without me. LV GrC
Motivating students	Communion-based support	I call parents not only when a student has done something wrong, but also when he has behaved well. And then usually the parents are surprised and the child really tries to behave well the next few days. LV GrA

5. Discussion

Findings revealed what empowerment means to teachers through their contribution to positive relationships in the school environment and highlighted what their power to use positive discipline in the classroom means for teachers.

The results of this qualitative research showed that LT and LV teachers have some similar experiences regarding empowerment through their contribution into positive relationships at school:

- By providing positive multidirectional feedback within the positive relationships with students, parents and fellow teachers at school: LV teachers especially focus on positive interaction with students within the classroom. Interaction between the teacher and school administration is not accentuated. Findings prove that insufficient involvement of school administration in positive interaction with teachers may reduce the amount of support provided for teachers, and teachers direct their essential attention to positive interactions with students (Mlalazi et al., 2016). LT teachers tend to rely on the community of the professional community of teachers, students and their parents, and make a positive contribution to it through communication. In this way, teachers feel safe as a recognized, accepted and trusted part of the professional teaching community and the school community (Folasade Akinyemi et al., 2020). As teachers are not empowered by school administration, they motivate themselves for empowerment, respectively teachers use their power to take control of their professional life and to take responsibility for their words, thoughts, actions and behavior.

- By strengthening mutuality and improving communication while performing activities, providing/receiving support and/or advice, communicating in a friendly and open manner, sharing experiences and attitudes, and learning from each other. Findings reveal that for LT and LV teachers, empowerment means sharing of feelings and actions, and relating to all members of the school community at all levels. The mutual relationship with fellow teachers here seems to be the most evident for teachers from both countries. It is in line with findings of other research that, for teachers, empowerment through mutuality means building professional relationships based on openness, trust, respect between all individuals involved within the school life (Rimm-Kaufman, Sandilos, 2023). Thus, support for teachers from their professional community at school means conversations, meetings, sharing expertise, and working collaboratively for improving teaching and the academic performance of students.

Results revealed that LT and LV teachers experience some differences in regard to empowerment through their contribution into positive relationships at school:

- Both LT and LV teachers are empowered through practicing positivity. However, for LT teachers it means friendly, respectful mutual communication as equal dialogue, and creativity through teaching and learning for achieving educational goals. Communication empowers teachers for decision-making and participation in changes, and building trust and loyalty (Hurley, 2006). While decision-making among empowered teachers has a significant impact on their job satisfaction and professional growth (Blasé, Blasé, 2001). For LV teachers, practicing of positivity means building of personal relationships, emotional connection and positive behavior in relation to fellow teachers and students. This finding indicates Latvian teachers' awareness of a key role of modeling of positivity, because previous research supports that students tend to be more motivated to learn and become engaged in the classroom when their teacher cares about them, and building of positive relationships leads to better teaching (Pianta et al., 2003; Sukawati et al., 2020; Williford, Wolcott, 2015).

- Findings showed that for both LT and LV teachers, strengthening mutuality is related to their empowerment. For LV teachers, it means personal responsibility, that in literature is associated with the opportunity to act autonomously and to be accountable for one's own actions (Chamberlin, 2008). For LT teachers, the mutuality means interconnectedness between learning and practice, reflection and communication. Teachers' reflection helps them to move from experiencing a lesson to understanding what happened and why. Reflecting teaching practices help teachers to see the wholeness of teaching and learning within the classroom and beyond (Tartari, 2018).

- Findings prove that for teachers from both countries, empowerment is inseparable from communication improvement. In their answers, Latvian teachers specifically address the role of personal self and humanness. LT teachers find meaning of their empowerment in provision and receiving of mutual feedback. Communication influences students' learning motivation and enhancement of their various abilities while understanding that learning is hard work (McCroskey, Richmond, 1983; Tartari, 2018). The focus from communication actions directed at students and teachers to communication actions exchanged with students and teachers is the component of the shift from being a student or teacher manager to being learner empowerer (Kiral, 2020; Tapia-Fonllem et al., 2020).

Regarding teachers' power through applying positive discipline for students, the findings revealed mostly differences between LT and LV teachers':

- For LT teachers, it means development of consensus, with students and teachers learning from experience. Through the consensus process and learning from experience, teachers gain a broader understanding of their students' needs, abilities, and concerns. Students learn how to participate responsibly in their classrooms, acquiring skills and attitudes that will serve them in life (Fin, 2012). Consensus-based decision-making is a dynamic approach to creating a learning community in the classroom. The key to consensus is the acceptance and validation of each person's point of view and way of operating in the world (Sartor, Young Brown, 2004).

- For both LT and LV teachers, power is related to mutual reinforcement. But for LT teachers it means the possibility to discuss learning/teaching and receive professional advice from fellow teachers. It is related to professionalism, which helps the teacher to gain the trust of parents, students, colleagues and school administrators. When the teacher has the integrity to communicate, and complete the job responsibilities with excellence, it gives students confidence in their abilities to guide learning and for teachers to manage a classroom (Buksnyte-Marmiene et al., 2022). LV teachers consider mutual reinforcement through engaging students in sustaining a positive learning environment. Developing a teacher's classroom management skills is the key to maintaining a respectful and learning-positive environment (Bej, 2016). The crucial role of building positive learning environments is supported by findings of other authors (Bradley et al., 2018; Hughes, Coplan, 2017).

6. Limitations

Opinions in focus groups are constructed collectively - it means a group process of collaboratively constructing a joint perspective, or argument, which emerges very much as a collective procedure which leads to consensus, rather than as any individual's view. The collective voice which emerges in this context may reflect individuals' already held opinions, or it may be an active product of the group interactions. It may not express the views of all the participants in the focus group (Smithson, 2000). Focus groups have the "feeling" that they are under a microscope. Participants with introverted personalities find it difficult to voice their opinion freely (Somekh, 2022). Focus groups consisted of samples of the professional teachers' communities from two countries, but these groups are biased representation of whole professional communities in LT and LV. Thus the opinions expressed by the participants might not represent the views of professional teachers' communities as a whole (Somekh, 2022) in two mentioned countries.

LQCA provided insights into the presence and patterns of content but did not provide a causal explanation for why certain content occurs or what is its impact on individuals (students, teachers), professional teachers' community or school community.

7. Conclusion

The current research was aimed at understanding two important aspects of teachers' professional wellbeing, namely empowerment and power through building positive relationships and implementation of positive discipline. Qualitative analysis of teachers' answers led to the following findings:

1. For teachers for both countries – Latvia and Lithuania – empowerment through their contribution to positive relationships means connectedness and specific qualities of communication and interactions such as motivating feedback, friendliness, openness, support, cooperativeness and collaboration in the school environment in order to promote effective and meaningful education. Teachers' practicing of positivity in relation to their empowerment through relationships is mainly focused on students and fellow teachers, and means the idea of how the teacher educates and influences the members of school community, not only what is taught. Thus, infusing positive relationships into teaching and learning, and also non-academic environments at school, allows wellbeing to be built in classrooms and teaching/learning subjects across all the school.

2. LV and LT teachers value the learning from each other in relation to strengthening mutuality in regard to their empowerment through contribution to positive relationships in the school environment. Learning from each other means social learning, which is an efficient way to learn things and enable participants of learning to get to know others better, and better understand how to behave within the school community. It means collaboration and cooperation, which include higher-level thinking, communication and leadership, self-management, self-confidence, responsibility and promotion of different kind of interactions within the school environment. So, learning from each other means connectedness between members of the school community and connecting the prior knowledge through sharing experiences, advice, listening and hearing

opinions and attitudes, and creating new knowledge and experiences. This process allows teachers and students to relate what they read and observe, what and how they experience, to themselves and the context in which they live and act.

3. Speaking of differences, LT teachers emphasize friendliness and creativity as qualities of relationships in regard to their empowerment. LV teachers emphasize facilitating positive relationships, behaving positively and personalizing relationships in the school environment. This finding reveals that Lithuanian teachers express their expectations for relationship improvement, while Latvian teachers talk about specific actions for fostering positive relationships in the school environment.

4. The use of positive discipline by teachers is seen differently by LT and LV teachers:

- Consensus formation is relevant specifically for LT teachers. They implement positive discipline through interactions between teachers themselves and between the teacher and student. Latvian teachers focus on communication and cooperation with students that is related to democratization of teaching and learning. Latvian teachers speak of different proactive classroom management strategies, which facilitate development and sustaining of positive learning environment.

- Mutual reinforcement is seen differently: LT teachers focus on mutual communication and learning from each other, while LV teachers engage students for sustaining a positive discipline in their classrooms, as well as involve fellow teachers and student parents for implementation of positive discipline. LT teachers create the dyadic trustful, group-related relationships with students as a basis for teaching and learning, while LV teachers use the potential of the school community; however, support of the school's administration is not mentioned.

- LT teachers relate positive discipline to learning from experience which means learning knowledge and skills through direct practice. This entails teachers and students reflecting on the experience they have had to identify new skills and knowledge that they can use, and is related to context and is sensitive to case or situation. Regarding their power to apply positive discipline, Latvian teachers highlight their individual responsibility for structuring the learning environment and managing the classroom, which is related to the teacher's professional expertise or teaching methodology.

Declaration of interest statement
The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Author Contributions
VŽ: key contribution to designing the research, arranging the research in Lithuania, collecting and analyzing data, writing. BM: arranging the research in Latvia, collecting and analyzing data, writing. Both authors contributed to the article and approved the submitted version.

Data Availability Statement
The datasets can be made available upon request by contacting Vilma Žydžiūnaite and Baiba Martinsone.

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The History of Education

John Amos Comenius (1592–1670): A Biographical Sketch

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Abstract

This work explores the academic and professional pedagogical activity of John Amos Comenius (1592–1670), widely regarded as the founder of modern pedagogy.

The principal sources for this study are relevant biographical studies, as well as Comenius's own works. In terms of methodology, use was made of content analysis, the biographical method, and synthesis.

The study's findings revealed J.A. Comenius to be a fundamental figure in the history of pedagogy. He pioneered the class-lesson system, which was revolutionary for his time and which is used to this day in most schools across the world.

Furthermore, Comenius was a proponent of a humanistic approach to education – something barely sought after in his time. This aspect has been pointed out by most of his biographers.

His didactic ideas are founded on principles of equality, democracy, and universality – these began to be implemented in education much later than his time, but today are honored in schools all over the world.

Keywords: John Amos Comenius, period 1592–1670, pedagogy, history of pedagogy, pedagogical science, didactics.

1. Introduction

John Amos Comenius was born in 1592 in the village of Nivnice in Moravia. He is chiefly famous as the founder of didactics, the branch of pedagogical science concerned with the theory of teaching and learning. A pastor, Comenius was wedded to the ideas of humanism, which pervaded

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all his work. He was a proponent of the class-lesson system, which humanity is still using successfully to this day.

2. Materials and methods

The principal sources for this study are relevant biographical studies, including those by J. Kvačala (Kvačala, 1892), P. Floss (Floss, 1970), A. Heyberger (Heyberger, 1928), J.V. Novák and J. Hendrich (Novák, Hendrich, 1932), K. Schaller (Schaller, 1962), R.F. Young (Young, 1932), R. Alt (Al't, 1959), J. Kopecký, J. Patočka, and J. Kyrášek (Kopecký et al., 1957), F. Kožik (Kožik, 1970), Ł. Kurdybacha (Kurdybacha, 1957), D.S. Larangé (Larangé, 2008), K. Veverková (Veverková, 2012), V. Stejskal (Steiskal, 1972), M.V. Kratochvíl (Kratokhvil, 1991), K.V. Yelnitsky (El'nitskii, 1893), A.A. Krasnovsky (Krasnovskii, 1953), S.V. Smolyanitsky (Smolyanitskii, 1987), D. Lordkipanidze (Lordkipanidze, 1970), and G.M. Kodzhaspirova (Коджаспирова, 2003), as well as Comenius's own works (Komenskii, 1982a; Komenskii, 1875; Komenskii, 1982b; Komenskii,, 1988; Komenskii, 1982c; Komenskii, 1982d).

In terms of methodology, use was made of content analysis, the biographical method, and synthesis.

3. Discussion

There is quite a large body of biographical research on J.A. Comenius, which suggests he was a person of great depth and his contribution to the development of pedagogical science as a whole and didactics in particular is immense.

The relevant historiography can be divided into four sections: 1) Russian prerevolutionary; 2) Russian Soviet-period; 3) Russian modern; 4) foreign.

It is to be noted straightaway that in the Russian historiography the scholar's name tends to be rendered in the Russo-Polish manner as 'Komenski', with the emphasis on the second syllable. This approach traces back to prerevolutionary Russian history, when Poland was part of the Russian Empire. In some of the Western literature, his name is rendered in the Czech manner as 'Komensky', with the emphasis on the first syllable.

During his lifetime, he was mainly known as Comenius – in keeping with the Latin tradition, dominant in Europe at the time. His father hailed from the village of Komňa in Moravia. From this village John Amos took his surname, which means 'a man from Komňa'.

The largest is the foreign historiography. Among the works of the 19th-century Czech historians, of particular note is J. Kvačala's 'Johann Amos Comenius: Sein Leben und seine Schrifte' (German: "John Amos Comenius: His Life and Writings"), released in Berlin in 1892 (Kvačala, 1892), which provides a detailed account of the scholar's life and his most notable writings.

The Czech scholar of German descent P. Floss explores in his monograph 'Jan Amos Komenský: Od divadla věcí k dramatu člověka' (Czech: "John Amos Comenius: From the Theater of Things to the Drama of Man") the humanistic ideas of Comenius, the materialism and idealism in his writings, and a few other philosophical aspects of his oeuvre (Floss, 1970).

A. Heyberger explores in her monograph 'Jean Amos Comenius (Komenský): Sa vie et son oeuvre d'éducateur' (French: "John Amos Comenius: His Life and Educational Work"), published in Paris in 1928, the academic-pedagogical aspects of his creative work and his teaching activity (Heyberger, 1928).

The Czech researchers J.V. Novák and J. Hendrich analyze in their biographical monograph 'Jan Amos Komenský: Jeho život a spisy' (Czech: "John Amos Comenius: His Life and Works"), published in Prague in 1932, the scholar's life's journey and most significant academic contributions (Novák, Hendrich, 1932).

K. Schaller provides in his monograph 'Die Pädagogik des Johann Amos Comenius und die Anfänge des pädagogischen Realismus im 17. Jahrhundert' (German: "The Pedagogy of John Amos Comenius and the Beginnings of Educational Realism in the 17th Century"), published in Hamburg in 1962, an analysis of the scholar's academic legacy in the field of pedagogy (Schaller, 1962).

R.F. Young offers in his monograph 'Comenius in England', published in Oxford in 1932, an in-depth analysis of the scholar's activity in England (Young, 1932).

The German researcher R. Alt explores in his fundamental work 'Der fortschrittliche Charakter der Pädagogik Komenskýs' (German: "The Progressive Character of Comenius's Pedagogy") the scholar's creative legacy and attempts to make the case for it being progressive in character (Al't, 1959).

A fairly detailed biographical sketch of John Amos Comenius is offered in the monograph 'Jan Amos Komenský: Nástin života a díla' (Czech: "John Amos Comenius: A Sketch of His Life and Work") by J. Kopecký, J. Patočka, and J. Kyrášek, published in Prague in 1957, which provides an in-depth analysis of the scholar's professional and creative endeavors (Kopecký et al., 1957). Similar in spirit is the monograph 'Světlo v temnotách: Bolestný a hrdinský život J.A. Komenského' (Czech: "A Light in the Darkness: The Painful and Heroic Life of John Amos Comenius") by F. Kožik, which explores the scholar's personal, creative, and professional issues (Kožik, 1970).

The Polish historian Ł. Kurdybacha provides in his monograph 'Działalność Jana Amosa Komeńskiego w Polsce' (Polish: "The Activity of John Amos Comenius in Poland"), released in Warsaw in 1957, an insight into the scholar's life's tough journey, including within Rzeczpospolita (Kurdybacha, 1957).

Among the foreign modern works, of particular note are the monograph 'La Parole de Dieu en Bohême et Moravie: La tradition de la prédication dans l'Unité des Frères de Jan Hus à Jan Amos Comenius' (French: "The Word of God in Bohemia and Moravia: The Tradition of Preaching in the Unity of the Brethren from John Hus to John Amos Comenius") by the French historian D.S. Larangé, which approaches creative work from a religious standpoint and discusses the transformation of the Hussites' ideas into Comenius's humanistic ideas (Larangé, 2008), and the work 'Comenius's Ideas as an Inspiration for Education in a Multicultural Society' by the Czech researcher K. Veverková (Veverková, 2012).

A discussion of the coverage of issues of nurture in the oeuvre of John Amos Comenius by V. Stejskal is provided in the monograph 'Nurture and the Arts: On John Amos Comenius' (Steiskal, 1972).

An analysis of the didactic aspects by M.V. Kratochvíl is provided in 'The Life of John Amos Comenius: A Book for the Teacher' (Kratokhvil, 1991).

Among the Russian prerevolutionary works, of particular note is the monograph 'John Amos Comenius and His Pedagogical Ideas: A Public Lecture Delivered on the Day of the Celebration of the 300th Anniversary of the Birth of J.A. Comenius in an Effort to Raise Funds for the Society for the Care of Primary Education in Omsk' by K.V. Yelnitsky, focused on the biographical and professional aspects of the scholar's activity (El'nitskii, 1893).

Among the works of the Soviet period, of prime interest are the monographs 'J.A. Comenius' by A.A. Krasnovsky (Krasnovskii, 1953), 'Three Centuries of John Amos Comenius' by S.V. Smolyanitsky (Smolyanitskii, 1987), and 'John Amos Comenius' by D. Lordkipanidze (Lordkipanidze, 1970). It is to be noted that the Soviet historiography is very well disposed toward Comenius, and there is even an aspiration to put his ideas into practice.

Among the modern fundamental works, worthy of particular mention is the work 'The History of Education and Pedagogical Thought: Tables, Diagrams, and Supportive Notes' by G.M. Kodzhaspirova (Kodzhaspirova, 2003). Comenius's work is also discussed in a number of scholarly articles (e.g., Kumarin, 1998 and Perezhovskaya, 2015).

Also most definitely worthy of note are the encyclopedic articles (e.g., BSE, 1969).

4. Results

Comenius (Figure 1) was born in a troublous time, when a plague was ravaging the world. The story goes that his parents and sisters died of bubonic plague. Taken in by the church, he was christened with the name Amos. He eventually became a priest. His innate passion for learning and science led him to receive an excellent education at the Herborn Academy and the University of Heidelberg.

A highly educated person, John Amos began his pedagogical activity in the city of Přerov. He studied the works of T. Campanella and other authors of the Renaissance era, which would shape his progressive humanistic views and determine his future in life and career. However, his journey toward pedagogical science did not start at once – this was preceded by his conduct of some research in geography.

Finding pedagogy to be his true vocation in life, Comenius commenced work on what would become his magnum opus – 'Didactica magna' (Latin: "The Great Didactic"), which he wrote in Czech.

Fig. 1. John Amos Comenius (1592–1670)

Compelled to immigrate to Poland due to religious persecution, Comenius took up employment in the city of Leszno, where he also wrote several textbooks. Arguably, it is at that moment in his life that he separated pedagogy from other sciences. During that period, he released 'The Door of Languages Unlocked' (1631), 'School of Infancy' (1632), 'Astronomy' (1632), 'Physics' (1633), and 'The Great Didactic' (1633–38).

It is during that period that Comenius made the case for the advisability of using the class-lesson system in schools. He believed that the use of this system would make education accessible to the widest section of the population, as well as help develop in learners a certain system of values that would be beneficial to the state (which was impossible to achieve under the home teacher-based education system, dominant at the time, whereby children's education was entrusted to home teachers whose views regarding the political world order did not always tally with the official standpoint).

However, amid the military conflicts in mid-17th-century Europe, the political elite seemed blind to the potential of Comenius's didactic ideas. Having moved to Holland, Comenius continued work on 'De rerum humanarum emendatione consultatio catholica' (Latin: "General Consultation on an Improvement of All Things Human"), in which he set forth a plan for reforming human society. However, his ideas would go largely unnoticed.

Comenius passed away in Amsterdam in 1670. It is only after his death that his ideas truly began to be valued. As an indication of appreciation, his likeness would appear on the 200 Czech koruna banknote and on stamps produced in the Federal Republic of Germany and the Soviet Union.

Let us now move on to an analysis of Comenius's creative legacy.

Without question, Comenius's magnum opus is 'The Great Didactic', in which he makes the case for the advisability of using the class-lesson system, which was revolutionary for his time (Komenskii, 1875). Comenius does so from a standpoint of students passing their knowledge along to others, describes the conditions for it to be effective, and lays down the methodological foundations of the class-lesson system. Furthermore, 'The Great Didactic', as is the case with his other writings, has a philosophical slant to it, with the work exploring the educational process, with its goals, objectives, methodology, etc. Many are convinced that it is in 'The Great Didactic' that both didactics in particular (as the branch of pedagogy focused on the theory of teaching and learning) and pedagogical science as a whole have their source.

The first experience of using the class-lesson system, which was untraditional at the time, was described in 'Schola pansophica' (Latin: "School of Pansophy") (Komenskii, 1982c), published in 1651. It was the result of his teaching in the town of Sárospatak. The Prince of Transylvania, George Rákóczi, embraced Comenius's ideas and suggested that the pedagogue implement the new system throughout Transylvania. Afterwards, a revised and enlarged version of 'School of Pansophy' was incorporated into his fundamental opus 'General Consultation on an Improvement of All Things Human', which Comenius began writing in 1644 and finished near the end of his life. One of its chapters, 'Panpedia', is devoted to the idea of lifelong education (Komenskii, 1988;

Komenskii, 2003). In fact, the term 'panpedia' has become a household term that refers to the principle of lifelong education.

Comenius was the first to make the case for and demonstrate the use of teaching aids in instruction. He also pioneered emotional involvement via dramatizing educational material. The medieval scholastic system of education was distinguished by the use of tedious and abstruse learning material, and Comenius was staunchly against this approach. As a proponent of play-based learning, he wrote several plays and published them in 'School as Play' (1656). His 'School of Infancy' (Komenskii, 1982b) and 'The World of Sensible Things Pictured' (Komenskii, 1982d) are indicative of the significance he assigned to the use of teaching aids in instruction.

Near the end of his life, Comenius completed his 'General Consultation on an Improvement of All Things Human', which he had started writing back in 1644. In that fundamental work, he searches for a path to prosperity for all humans and offers practical advice on how to improve the lives of common people. A pedagogue at the beginning of his creative path, he revealed himself as a philosopher at the end of it.

The scholar's creative path was concluded by the work 'Unum necessarium' (Latin: "The One Thing Needful") (1668), in which one detects a transformation of his philosophical ideas, with Comenius discoursing about humanism, humane nurture and education, and the need to implement the principles of humanism in the education system. In the latter years of his life, he would reveal himself as a true philosopher.

A highly creative and hardworking person, Comenius left behind a rich legacy of research, much of which was revolutionary for his time.

5. Conclusion

J.A. Comenius is a fundamental figure in the history of pedagogy. He pioneered the class-lesson system, which was revolutionary for his time and which is used to this day in most schools across the world.

Furthermore, Comenius was a proponent of a humanistic approach to education – something barely sought after in his time. This aspect has been pointed out by most of his biographers.

His didactic ideas are founded on principles of equality, democracy, and universality – these began to be implemented in education much later than his time, but today are honored in schools all over the world.

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A 355th Anniversary Tribute to the Eminent Russian Pedagogue L.F. Magnitsky (1669–1739): A Biography of His Life and Work

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Abstract

This work celebrates the 355th anniversary of the birth of the eminent Russian pedagogue Leonty Filippovich Magnitsky (1669–1739).

The principal sources for this work are biographical studies focusing on the scholar's life and work. In terms of methodology, use was made of content analysis, the biographical method, the historical-systems method, and synthesis.

The study's findings revealed that this preeminent Russian pedagogue and educationist owed his fame largely to his book 'Arithmetic' (to use the shortened title), Russia's first formal mathematics textbook. An expert in the methodology of teaching mathematics, a highly erudite specialist, and a solid philologist, L.F. Magnitsky devoted a significant portion of his career to teaching at the School of Mathematics and Navigation in Moscow, which he headed up in the latter years of his life.

Descended from an unprivileged social background, L.F. Magnitsky achieved everything in life through his own talent and hard work. Not only did his innate passion for learning and science earn him wealth and honors but it also garnered him his catchy surname. The scholar was expertly competent in mathematics, astronomy, navigation, and geodesy and had a command of several languages – Latin, Greek, Dutch, German, French, and Italian.

Keywords: Leonty Filippovich Magnitsky, period 1669–1739, biography, 'Arithmetic', pedagogy, Russian pedagogy, mathematics, Russian culture.

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1. Introduction

Leonty Filippovich Magnitsky (1669–1739) was one of Russia's first teacher-educationists, who rose to fame as the creator of the nation's first mathematics textbook. He was well-liked by Peter the Great – above all, owing to his erudition and ability to self-educate. L.F. Magnitsky's career path vividly reflected the approach to social policy pursued by the Czar, which placed a premium on people achieving recognition, career success, and financial prosperity based not on their social background but on their talents and service to the country and their hard work, integrity, and diligence.

The present work is dedicated to the 355th anniversary of the scholar's birth.

2. Materials and methods

The principal sources for this work are biographical studies focusing on the scholar's life and work during the reign of Peter the Great. These include the prerevolutionary monograph by D.D. Galanin, 'Magnitsky and His Arithmetic' (Galanin, 1914), the biographical collection by A.P. Schickman, 'Prominent Figures in National History: A Biographical Reference Book' (Shikman, 1997), the article 'Magnitsky, Leonty Filippovich' in *The Brockhaus and Efron Encyclopedic Dictionary* (Brokgauz-Efron, 1907), the article by T.N. Kameneva, 'Revisiting the History of the Publication of Magnitsky's 'Arithmetic'', which is part of a collection of scholarly articles concerned with history (Kameneva, 1984), the monograph by V.V. Zyablitsky and K.A. Balashova, 'Leonty Filippovich Magnitsky (300 Years)', dedicated to the 300th anniversary of his birth (Zyablitskii, Balashova, 1969), and the articles by I.K. Andronov, 'Leonty Filippovich Magnitsky, Russian Youth's First Mathematics Guru' (Andronov, 1969), and B.V. Gnedenko and I.B. Pogrebyssky, 'Leonty Magnitsky and His 'Arithmetic'' (Gnedenko, Pogrebysskii, 1969), both published in the journal *Matematika v Shkole*.

In addition, use was made of articles that are not devoted to Magnitsky specifically but analyze certain historical aspects and mention the scholar in passing. These include the articles by O.A. Savvina, 'The Spiritual-Moral Potential of the First Russian Mathematics Textbook' (Savvina, 2016), K.Ye. Kozlova, 'Education and Science Under Peter the Great' (Kozlova, 2022), and O.V. Golovina, 'Revisiting the History of Higher Mathematical Education in Russia' (Golovina, 2015). Special mention must also be made of 'A History of Russia From the Earliest Times', written by the eminent Russian historian S.M. Solov'yev (Solov'ev, 1879).

In terms of methodology, use was made of content analysis, the biographical method, the historical-systems method, and synthesis.

3. Discussion

There are relatively very few works that focus on L.F. Magnitsky specifically. The scholar's biography was researched with particular interest by prerevolutionary authors. Of particular note is the monograph by D.D. Galanin, 'Magnitsky and His Arithmetic' (Galanin, 1914), which provides an in-depth insight into the scholar's life, following it from his young years to the time he became nationally famous. It describes his career, exploring the key aspects of his teaching at the School of Mathematics and Navigation, tracing the history of the creation of his chief opus, 'Arithmetic, That Is to Say the Science of Numerals, Translated Into Slavic From Various Dialects and Collected Into One, and Divided Into Two Volumes', and discussing the actual book.

Also, there is some fairly extensive material on the scholar in the article 'Magnitsky, Leonty Filippovich' in *The Brockhaus and Efron Encyclopedic Dictionary* (Brokgauz-Efron, 1907), which provides a fairly detailed account of his life and career and touches upon the history of the creation of his 'Arithmetic', which is covered in a separate article in the encyclopedic dictionary. Many of the modern-day biographical articles on L.F. Magnitsky rely, to one degree or another, on the information from that encyclopedic dictionary.

Among the prerevolutionary works mentioning L.F. Magnitsky, of particular note is the fundamental opus by the eminent Russian historian S.M. Solov'yev, 'A History of Russia From the Earliest Times' (Solov'ev, 1879). Its Volume 15, which explores the reforms of Peter the Great and early-18th-century Russia as a whole, devotes some attention to the Czar's educational transformations as well – that is where L.F. Magnitsky is brought into focus.

A major contribution to the study of L.F. Magnitsky's life and work is the one made by Soviet historian-biographers. The Soviet pedagogical journal *Matematika v Shkole* carried several articles devoted to that. Specifically, I.K. Andronov focuses in the article 'Leonty Filippovich Magnitsky,

Russian Youth's First Mathematics Guru' (Andronov, 1969) on his biography's teaching aspect, dwelling upon the scholar's pedagogical activity at the School of Mathematics and Navigation. B.V. Gnedenko and I.B. Pogrebyssky, on the contrary, explore in the article 'Leonty Magnitsky and His 'Arithmetic'' L.F. Magnitsky's creative output – namely, his work 'Arithmetic' (Gnedenko, Pogrebysskii, 1969). It is worth noting that the above-mentioned articles are practically devoid of the ideological component of socialist propaganda and give high appraisal to the pedagogue for his role in the development of education in prerevolutionary Russia. Also worthy of mention is the article by T.N. Kameneva, 'Revisiting the History of the Publication of Magnitsky's 'Arithmetic'', published in the 48th issue of the collection of scholarly articles on pedagogy *Issledovaniya i Materialy* (Kameneva, 1984), which explores the process of creation of Russia's first formal mathematics textbook.

'Leonty Filippovich Magnitsky (300 Years)' by V.V. Zyablitsky and K.A. Balashova represents an insightful biographical study (Zyablitskii, Balashova, 1969). A tribute to the 300th anniversary of L.F. Magnitsky's birth, this fundamental study was published by the Kalinin City Branch of the All-Russian Society for the Protection of Monuments of History and Culture and explores the scholar's youth, the origination and evolution of his pedagogical and educational ideas, the process of creation of 'Arithmetic', and much more. Unfortunately, the monograph is not devoid of the ideological component. Nevertheless, it is a highly valuable source from a historical standpoint.

No modern-day fundamental biographical works on L.F. Magnitsky have been found, with only a few scholarly articles on him currently available (compared with publications geared to non-specialist readers that are available on the Internet). Of particular note is the monograph by A.P. Schickman, 'Prominent Figures in National History: A Biographical Reference Book' (Shikman, 1997), which analyzes the biographies of prominent figures in Russian history, including L.F. Magnitsky.

The article by O.A. Savvina explores the spiritual-moral potential of 'Arithmetic' (Savvina, 2016). The one by K.Ye. Kozlova, which analyzes education and science under Peter the Great, devotes some attention to the work of L.F. Magnitsky as well (Kozlova, 2022). O.V. Golovina mentions the scholar in her paper, focused on the history and evolution of higher mathematical education in Russia, presented at the 34th International Scholarly Seminar for Mathematics and Computer Science Teachers of Universities and Pedagogical Colleges (held in 2015 in Kaluga, Russia) (Golovina, 2015).

4. Results

L.F. Magnitsky's origins are shrouded in discrepancy, a fact pointed out by S.M. Solov'yev back in the 19th century. Some believe he was descended from peasants – and thus engaged in self-education while having to partake in agricultural chores and hunting. Others maintain he was descended from clergy and spent most of his childhood at the Nilov Monastery, where he was exposed to ecclesiastical literature.

Whatever the case, L.F. Magnitsky is known to have embarked on his career ladder via the ecclesiastical domain – a fairly literate person, he began service at the Joseph Volokolamsk Monastery (Malykh, Danilova, 2010: 85), and later served at the Simonov Monastery, preparing to be a priest.

The ecclesiastical leadership eventually sent the talented young man to the Slavic-Greek-Latin Academy (Malykh, Danilova, 2010: 85-86). Accustomed to gaining knowledge independently and driven by a predilection for mathematics, he was a zealous student and continued to self-educate.

According to his biographers, when L.F. Magnitsky met Peter the Great, the young monarch was so impressed with his talents (Baranskaya i dr., 2016: 125) that he gave him the surname Magnitsky for his ability to draw people to himself as a person of remarkable natural intellectual capacity with a penchant for self-education – drawing a parallel to the ability of magnets to attract iron.

In the 1690s, L.F. Magnitsky moved to Moscow, where he would make a living tutoring privately and continue to self-educate. In 1701, Peter the Great set up the School of Mathematics and Navigation, where L.F. Magnitsky was appointed as a full-time teacher – a step prompted by the desire to have a committed and well-qualified teaching staff at an institution of higher learning.

L.F. Magnitsky had worked as a mathematics teacher's assistant and later as a mathematics teacher himself, when he was approached with a request to create a textbook on mathematics and navigation (Malykh, Danilova, 2010: 87). The result was the book 'Arithmetic, That Is to Say the Science of Numerals, Translated Into Slavic From Various Dialects and Collected Into One, and

Divided Into Two Volumes', also known in short as 'Magnitsky's Arithmetic' (Malykh, Danilova, 2010: 92), which came out in 1703 and was published with a circulation of 2,400, an enormous figure for those times (Baranskaya i dr., 2016: 125). The first formal mathematics textbook in Russian history, the book was used as the main textbook for students of mathematical sciences up until the mid-18th century. Written in lively and easy-to-understand language, it, nevertheless, contained cutting-edge methodology, which the author largely engaged intuitively as someone highly erudite with a wide spectrum of knowledge (Ausheva, 2013: 112).

L.F. Magnitsky's accomplishments did not go unnoticed – and the following year Peter the Great ennobled him, granted him several villages in areas neighboring Moscow, and provided him with a personal home in the former capital. (Although Saint Petersburg became the country's new capital, Moscow would still remain at the heart of high-level political and economic decision-making in Russia.)

After setting up in Saint Petersburg in 1715 the Naval Academy, an industry-specific educational institution that was higher than the School of Navigation, the Czar kept Magnitsky in the school, where he would work as a senior lecturer and academic director (Malykh, Danilova, 2010: 90). In 1732, Anna Ioannovna would put him in charge of the school, and L.F. Magnitsky would remain in that position until his death in 1739.

L.F. Magnitsky was not a fan of leaving Moscow (not much of a traveler in general, unlike his patron, Peter the Great), focusing on his self-education instead (Kondrat'eva, Kondrat'eva, 2019). He had a working command of several languages: Greek, Latin, French (these three were taught at the Slavic-Greek-Latin Academy), Italian, German, and Dutch (these three he mastered on his own). He also mastered all by himself the following sciences: mathematics, navigation, astronomy, and geodesy. By way of translation from foreign languages, L.F. Magnitsky introduced into general circulation in Russia the following terms: multiplier, divisor, product, extraction of a root, million, billion, trillion, quadrillion, denominator, and fraction. Besides 'Arithmetic', L.F. Magnitsky wrote a few other scholarly works, including 'Tables of Logarithms and Sines, Tangents and Secants' (1703), 'Drawings and Designs for the Development Plan for an Earthwork in the City of Velikiye Luki' (1704), and 'Horizontal Tables for the Northern and Southern Latitudes' (1722).

The scholar is known to have been actively engaged in translating books into Russian.

5. Conclusion

This preeminent Russian pedagogue and educationist owed his fame largely to his book 'Arithmetic', Russia's first formal mathematics textbook.

An expert in the methodology of teaching mathematics, a highly erudite specialist, and a solid philologist, L.F. Magnitsky devoted a significant portion of his career to teaching at the School of Mathematics and Navigation in Moscow, which he headed up in the latter years of his life.

Descended from an unprivileged social background, L.F. Magnitsky achieved everything in life through his own talent and hard work. Not only did his innate passion for learning and science earn him wealth and honors but it also garnered him his catchy surname. The scholar was expertly competent in mathematics, astronomy, navigation, and geodesy and had a command of several languages – Latin, Greek, Dutch, German, French, and Italian.

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Vocational Education in the Kherson Governorate of the Russian Empire (the XVIII century end – the XX century beginning)

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Abstract

The article deals with evolution of vocational schools in the Kherson Governorate of the Russian Empire. The research comprises the period from the 18th century end till the 20th century beginning.

Within the given period, the Kherson Governorate founded leading educational institutions to prepare highly-skilled ship and train engineers, craftsmen, etc. for southern state regions.

As an example, the Kherson Governorate unfolded a range of comprehensive vocational schools in ship engineering. The main hub of these activities was Mykolaiv.

Besides, reforms provided a system of sea trade education. It was subdivided into institutions of several levels: sea trade schools of mechanical engineering, schools of long and short sailing, two-grade and basic schools. These entities provided commercial ships of sea and river sailing with specialists. The disadvantage of such a system was a small number of institutions to prepare marine engineers.

Also, there were new vocational schools in railway engineering (to operate trains and construct tracks).

Vocational schools of the Kherson Governorate corresponded to the Russian Empire development. Their main task was to provide the region with enough skilled specialists for local relevant industries. Simultaneously, the 20th century beginning showed an obvious inability of regional educational institutions to satisfy economy needs. Therefore, vocational schools required further improving.

Keywords: Ukraine, Kherson Governorate, Russian Empire, education, education policy, education reform, child labor, vocational education.

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1. Introduction

Having conquered the Circum-Pontic area, the Russian Empire starts its colonization. The empress granted territories to her favorites, nobles, officers, generals, landlords. Within 1775–1784, she granted 4.5 million dessiatinas. The government opened broad opportunities for foreigners' settlement. At the 18th century end, many Germans, Bulgarians, Greeks, Serbians, Armenians and other nationalities settled here.

The Southern Ukraine was populated quite quickly. Along with villages, new cities were founded: Oleksandrivsk (today Zaporizhzhia) in 1770; Katerynoslav (today Dnipro) in 1776; Kherson in 1778; Mariupol in 1779; Mykolaiv in 1789, Odesa in 1795. On the Crimean Peninsula, Sevastopol and Simferopol were created as important navy and administration centers of the Taurida Governorate (1783 and 1784, respectively). Here, enterprises were established for state military needs: cannon foundries in Mykolaiv, shipyards in Mykolaiv and Kherson. Consequently, first vocational schools of the Kherson Governorate were ship engineering and naval institutions. Railway and trade schools emerged only in the second half of the 19th century.

2. Materials and methods

The historical manuscript basis is published and previously unknown archives. It concerns standard acts of the second and third volumes in the Complete Collection of Laws of the Russian Empire (PSZRI-2; PSZRI-3). We also added various reports, decisions, memorandums, congress records of local authorities for regulating vocational education (Izvlecheniye iz zapiski, 1890; Ob ustroystve remeslennoy shkoly, 1882; Otchet, 1902; Pervyy okruzhnoy s"yezd, 1915; Svedeniya o remeslennom uchilishche, 1910). Besides, we included documents from state archives of the Mykolaiv, Odesa and Kherson Oblasts in Ukraine (GANO; GAOO; GAKhO) and those of the Russian State Navy Archive (RGA VMF) in Saint Petersburg.

General research and special historical methods were used. Induction and deduction accumulated necessary facts in sources. The objectivity method made it possible to properly analyze processes of developing vocational schools of the Kherson Governorate.

3. Discussion

Regardless of research topicality, today there are no complex studies on vocational education development in Ukraine or separate governorates. However, this issue attracted a scientific interest in some historical publications of the 19th century middle. Memoirs by A. Afanas'yev-Chuzhbinskiy (Afanas'yev-Chuzhbinskiy, 1859: 334-341; Afanas'yev-Chuzhbinskiy, 1861: 335-341) briefly report on establishment and development of the Kherson Commercial Sailing School. In particular, it dealt with academic activities and their disadvantages. S. Ogorodnikov (Ogorodnikov, 1900) describes foundation of the Naval Architecture School as the first local vocational institution. Most materials are dedicated to preparation of military navigators and officers.

The 20th century beginning saw the emergence of papers that defined the role of vocational schools of the Kherson Governorate within the all-imperial education system. Many Odesa works considered the relevance of local vocational schools. For example, a 1890 booklet of the Labor Society discussed its foundation reasons with unfolding a trade school (Izvlecheniye iz zapiski, 1890). In 1910, a sequel was printed, which let us trace almost the whole history of the trade school (Svedeniya o remeslennom uchilishche, 1910). The most comprehensive information is indicated in a guide to Odesa. Here, you can find all local vocational institutions and their status at the 20th century beginning (Uchebnyye zavedeniya g. Odessy, 1895).

We should focus on works by Vasiliy Vinogradov, a chief of the Department for Commercial Sailing Institutions. He produced a deep factual and statistical material on sailing education till 1912 (Vinogradov, 1908; Vinogradov, 1912). The researcher reviewed activities of sailing schools via archives of the Ministry for Commerce and Industry and the Ministry for Finances. He also paid attention to the Southern Ukraine with his report on financial conditions of all Circum-Pontic institutions, including the Odesa Commercial Sailing School. The latter was a top vocational school of the Russian Empire as for staff and study costs in 1910 (Vinogradov, 1912: 92-94).

Soviet historians usually ignored the vocational education development of the Kherson Governorate. However, the 1950-1980 period saw educational publications by N.N. Kuz'min, N.I. Barbashev, M.F. Puzanov, etc. Thus, the monograph by N.N. Kuz'min (Kuz'min, 1971) provided some data on the vocational education development in the Kherson Governorate. In particular, he talked about the Kherson and Odesa Commercial Sailing Schools, the Beryslav Nautical School,

the Odesa and Olviopol Railway Schools. However, this study is only fragmentary and superficial, which cannot clarify a real state of vocational education in the Kherson Governorate and other Ukrainian units of that period.

N.I. Barbashev considers the history of sailing education in the Russian Empire (Barbashev, 1959). He deals with evolution of the all-Russian sailing education for 200 years: academic activities, staff preparation, curriculum improvement. Unfortunately, there are only obscure mentions of sailing institutions in southern governorates.

In the 21st century, Ukrainian scientists joined the research of vocational education in the Kherson Governorate. Among them, we can discern a comprehensive paper by N.V. Slyusarenko (Slyusarenko, 2003). She represents the labor education in the Kherson Oblast for the 19th-20th centuries. Focusing on labor education in public schools of the Kherson Governorate before the Soviet period, the author analyzed vocational institutions as well.

Another source is the thesis by A.V. Chornyy (Chornyy, 2007) dedicated to pre-Soviet sailing education in the Southern Ukraine. Unfortunately, the author considers development of fleet rather than civil sailing. For the latter, he reported only on establishment and changing status.

Similar features can be found in works by S.M. Sytnyakivs′ka (Sytnyakivs′ka, 2009a; Sytnyakivs′ka, 2009b; Sytnyakivs′ka, 2010). She discussed vocational education in Ukraine and its southern regions. The Kherson Oblast and its vocational education are properly described in the thesis by Ya.A. Nahrybel′nyy (Nahrybel′nyy, 2012). One of the best papers is the thesis by M.V. Honchar (Honchar, 2015) who reported on the vocational education development in the Southern Ukraine within the second half of the 19th century and the beginning of the 20th century. He comprised all vocational institutions of the Taurida and Kherson Governorates with a prospect of future studies.

Some authors considered development of the local vocational education for separate institutions, branches or aspects (Naryzhnyy i dr., 1994; Pavlyk, 1997; Bohatchuk, 2009; Ryzheva, 2011; Vasylevych, 2012b; Khodakovs′kyy, 2007; Chorna, 2005; Trygub, Stepanchuk, 2024; Trygub, 2023; Trygub, Degtyarev, 2023). All these sources are superficial. They provide fragmentary data on history of certain institutions and majors.

4. Results

The first vocational entity of the Kherson Governorate was the Naval Architecture School founded in 1789. With an admission limit of 50 students, entrants were enrolled from admiralty settlements. The institution was affiliated to the Black Sea Navigation School in Mykolaiv. Only in 1800, the Naval Architecture School moved to Mykolaiv when a location issue was solved. For 1801, the school had 46 students: the first (15), the second (4) and the third (27) grades. They studied spelling, arithmetic, geometry, algebra, trigonometry, advanced mathematics, conic sections, mechanics, hydraulics, naval architecture and the English language. Unfortunately, the organization folded in 1803 while students were transferred to the Petersburg Naval Architecture School (Vasylevych, 2012b: 123). Till 1862, ship engineers were mainly trained in the imperial capital.

Defeat in the Crimean War 1853-1856 showed the country's need for upgrade of the Black Sea shipping via more skilled specialists. To provide a proper staff, their on-site preparation in Mykolaiv was required. According to the Order as of 25 June 1862 (PSZRI-2. T.37. №38401: 544), the Mykolaiv admiralty founded a vocational school on 3 June 1863 (RGA VMF. F.102. Op.1. D.17: 24).

This school consisted of three departments: the junior, middle and senior ones. The number of each unit was not limited; it depended on material resources. The institution comprised 300 students. After the 1867 budget cut, the maximum number of students was restricted to 200 persons; only literate ones could be admitted. In 1870, the school consisted of 175 students (RGA VMF. F. 102. Op. 1. D. 17: 25; RGA VMF. F. 102. Op. 1. D. 19: 39).

According to the Vocational School Regulation in the Mykolaiv Port, the institution was subdivided into three departments: the junior, middle and senior ones. The junior unit consisted of such courses as praying, reading, writing, two arithmetic rules and abacus using. The middle and senior units studied God's law, the Russian language, arithmetic, drawing, geometry, physics and mechanics. Optionally, history and geography could be taught (PSZRI-2. T. 37. №38401: 545).

On 22 May 1880, the emperor approved the new staff of the Mykolaiv Port Vocational School. On 2 July 1880, the Admiralty Council adopted the Charter and the Regulation on the Mykolaiv Port Vocational School. Correspondingly, the school comprised the preparatory and special departments with two grades for each. The total education duration was four years. The institution

trained skilled joiners, metalworkers, turners and blacksmiths. To acquaint students with different projects, the school workshop received production requests from state and private entities. Yearly, the number of students decreased: 154 (in 1882), 143 (in 1899), 44 (in 1913). Later, the school folded. The reason was the admiralty closure in 1911. Its buildings were leased to the Russian Ship Engineering Society where the Russud plant construction was started (PSZRI-2. T. 55. №60979: 295-297).

Another major of vocational education was commercial sailing. Preparation of professional sailors was started at the Kherson Gymnasium in 1814. At the second decade end, a navigation grade was affiliated to the gymnasium. However, it was further regarded as unreasonable and finally abolished on 8 December 1828 (PSZRI-2. T.3. № 2503: 1127-1128).

On 7 February 1834, Nicolas I adopted the Regulation on the Kherson Commercial Sailing School (PSZRI-2. T.9. №6788: 112-117). The entity folded on 1 October 1834. The Regulation treated preparation of navigators and skippers for private commercial ships and respective engineers as the main school task (PSZRI-2. T.9. №6788: 112; Khersonu 200 let: 6).

The school admitted boys 14-17 years of age. They came only from southern governorates with strict quotas: Kherson, Odesa and Taganrog – 4 persons each; Mykolaiv – 3 persons; Feodosiia and Izmail – 2 persons each; Rostov, Kerch, Yevpatoriia and Akkerman – 1 person each (PSZRI-2. T. 9. №6788: 112-113). For the first 20 years since its foundation, the institution graduated 83 navigators and 36 assistant navigators. 42 persons studied for their own money while 10 persons attended classes (Afanas'yev-Chuzhbinskiy, 1859: 330). In 1867, the organization folded. The remaining funds were used to open new nautical schools (PSZRI-2. T. 9. №44771: 1049).

On 27 June 1867, the Regulation on Nautical Schools was adopted (PSZRI-2. T. 9. №44771: 1048-1051). Correspondingly, any new sailing school foundations were entrusted to merchant, city and other communities if they needed navigators or skippers.

The above-mentioned Regulation defined establishment of many nautical schools within the Kherson Governorate. They were located in Odesa (1898–1901; the highest category), Kherson (1879–1902; category III), Beryslav (1873–1902; category I), Mykolaiv (1873-1902; category I-II). Another school was created in Kherson (1872–1879). Later, his category II was upgraded to category III (Vinogradov, 1912: 24; GANO. F. 139. Op. 1. D. 7: 87-93).

On 1 December 1872, a nautical school of category II was created in Kherson. On 11 September 1879, it was reorganized as an entity of category III (GAKhO. F. 212. Op. 1. D. 6: 68). In other words, the institution acquired the highest accreditation, which provided an opportunity to prepare navigators and skippers for coastal and long sailing. On the southern lands of the Russian Empire, it was regarded as one of the most successful schools in this major.

Within 1872–1902, the institution graduated over 2,000 people. There were 283 certified navigators. 94 individuals gained course attendance documents. Some persons joined commercial shipping as petty officers, boatswains, steersmen or simple sailors (GAKhO. F. 212. Op. 1. D. 67: 28).

On 1 July 1903, the Russian Imperial Reform of Sailing Education reorganized the Kherson Nautical School into the Short Sailing School. Further, it became the Alexander I Kherson Long Sailing School based on the Order as of 10 May 1904. It was funded by the city community. Within 1903-1917, the entity graduated 234 students (GAKhO. F.212. Op. 1. D. 71: 2; GAKhO. F. 212. Op. 1. D. 124: 56; GAKhO. F. 212. Op. 1. D.231: 12).

The Mykolaiv Nautical School unfolded on 4 December 1873. It was located in various rented buildings. The education here was free of charge. The school was funded by state and local authorities. Students lived in flats, dressed for own money. In 1874–1875, there were 15 students at this nautical school. Theory was later practiced on ships in the Black and Azov Seas.

In 1881, the institution passed under the jurisdiction of the Ministry for Public Education. Later, the Chief Department for Commercial Sailing and Ports controlled it. For 27 years (up to 1901), the nautical school graduated 165 coastal navigators (GANO. F. 139. Op. 1. D. 9: 67).

In June 1903, the Mykolaiv Two-Grade Nautical School was founded. The previous institution folded and provided the new entity with their remaining resources (money, textbooks, tools, furniture, etc.). Students could finish their education at the new school. Till 1 January 1908, there were 17 persons in the first grade and 11 persons in the second grade (Krykalova).

On 17 September 1873, a nautical school of category I emerged in Beryslav. Its two grades prepared coastal navigators and skippers for the Dnipro River. There, agriculture products, ore and coal were shipped to Black Sea ports.

In 1901, the entity admitted 24 students for three departments: junior (10 persons), middle (8 persons), senior (6 persons). Usually, they were local residents. The education was free of charge

(Heyko, 1999: 209).

On 1 August 1905, the school was reorganized as a two-grade navigation institution under the jurisdiction of the Ministry for Commerce and Industry. Simultaneously, less students entered the school. Only a few people graduated from the entity. The admission / graduation ratio was 13 / 0 (1905), 3 / 4 (1906), 2 / 5 (1907), 2 / 0 (1908), 0 / 3 (1909) (GAKhO. F. 18. Op. 1. D. 2: 45). Students came from peasant and bourgeois families of the Dnipro regions. Possible confessions were Orthodoxy, Catholicism and Judaism.

In 1909, only one student remained at the Beryslav school (GAKhO. F. 18. Op. 1. D. 2: 47). The World War I made authorities close the institution. The property was sent to the Oleshky Two-Grade Sailing School in the Taurida Governorate.

In Odesa, the largest Black Sea port city, sailing schools unfolded only on 1 July 1898. A new institution emerged on the basis of the Odesa Commercial School as separate merchant shipping grades (Otchet, 1902: 3-4). The school prepared long sailing navigators and assistant captains. The study duration was three years.

This entity had the highest category. All students lived in private plats for own money. They bought outfit and other items. The annual tuition fee was 125 rubles.

On 7 May 1901, the institution became the Odesa Commercial Sailing School. Here, the navigators and mechanical engineers were trained for long sailing ships (PSZRI-3. T. 21. №20039: 307-309).

Students were admitted according to results of entry examination. There were no social restrictions. Entrants had to be 16 years of age with a strong health.

Apart from diplomas, graduates were titled honorary citizens (if not nobles). Excellent graduates were awarded with golden and silver medals. Everybody could enter higher education institutions with a military discharge till 24 years of age (Chornyy, 2007: 143-145). Before the 1917 Revolution, the school graduated 160 navigators and up to 100 mechanical engineers (Istoriya Odesskogo morekhodnogo).

Therefore, reforms of the 19th-20th centuries generated a new system of commercial sailing education in the Kherson Governorate. It included schools (with majors of mechanical engineering, short and long shipping), grade institutions, courses, etc. They provided merchant fleet with specialists for short, long and river cruises. The disadvantage was lack of schools to prepare ship engineers.

The serfdom abolishment in 1861 led to a quick development of capitalism and farming. Consequently, broad railway networks emerged in the Russian Empire for the southern corn trade.

The Ukrainian railway construction was launched in 1863 with the Balta-Odesa track. Later, other tracks were built: Balta-Kriukov, Balta-Zhmerynka-Kyiv, Kursk-Kharkiv-Rostov, Kharkiv-Kremenchuk, Znamenka-Mykolaiv, Lozova-Sevastopol, etc. It ensured a regular communication with Baltic regions, Poland and the western state border. Also, the railway development established communication between port cities (Mykolaiv, Odesa), industrial centers (Luhansk, Bakhmut, Yasynuvata) and agricultural areas (the Kyiv, Katerynoslav, Podillia, Kharkiv Governorates). That resulted in a significant rise of commodity circulation.

The rapid railway construction required skilled staff. On 21 October 1871, a respective school unfolded in Odesa via the Russian Society for Shipping and Trade. It was the Odesa Railway Vocational School. In Ukrainian governorates, the first railways institutions were founded in Kharkiv and Kyiv (Puzanov, Tereshchenko, 1980: 17-18).

The Odesa school was located in the Peresyp region. Its admission limit was 100 persons. The entity trained technicians and engine drivers (Z choho vse rozpochynalos). Usually, it was children of the South-Western Railway workers who studied here. The acceptable age was 14 to 18 years. Kids enrolled in the first grade if they had graduation certificates from city, district or rural educational institutions under the Ministry for Public Education (Uchebnyye zavedeniya g. Odessy, 1895: 11).

In 1878, the school was renamed as the Odesa Technical Railway School and moved to a special building on the Odesa-Tovarna station. For 1877-1878, there was no school charter. It was adopted only on 25 February 1878 (Uchebnyye zavedeniya g. Odessy, 1895: 10).

The school building on the Odesa-Tovarna station had two stories. Together with the basement, they held 14 rooms: classrooms, workshops, service flats, a forge. In 1885, a two-story building was constructed for workshops. In 1891, a drawing house emerged (Z choho vse rozpochynalos).

Students were provided with outfit: a frock coat with a stand-up collar, trousers and buttons of the Railway Ministry. The school was patronized by the railway chief. Annually, he remitted

500 rubles from his salary to support poor students. As a priority, children of railmen were admitted if they had a preliminary four-grade education from public and city schools. Both persons from Odesa and line stations were enrolled. Non-local individuals could live in a 70-bed dormitory.

School graduates started as depot metalworkers. Later, they became engine drivers, assistant depot masters, carmen and chief car supervisors (Z choho vse rozpochynalos).

On 5 October 1917, the Provisional Government renamed the entity as the Secondary Mechanical-Technical Railway School. Within 1871-1900, over 2,000 specialists were prepared to construct the Odesa Railway (Vasylevych, 2012a: 164).

In spite of vast prospects, the new school could not satisfy an increasing demand for railmen. Therefore, the Odesa Railway shareholders founded a special rail construction school in 1873 near the Olviopol station of the Kherson Governorate (today's city of Pervomaisk). Since 1874, it was a railway vocational school (Bohatchuk, 2009: 20). The curriculum was similar to the Odesa variant.

The contingent comprised 60-107 students living in a dormitory. In ten years (1884), the school moved to Kyiv (Honchar, 2015: 113).

In 1878, the Railway Ministry held a meeting of railway societies and teachers. Having considered relevant education problems, the visitors adopted curriculum standards. After minister's ratification in August 1879, they were introduced in all railway schools of the Russian Empire (Bohatchuk, 2009: 20).

Through the lack of skilled employees, new railway entities unfolded in southern governorates. For example, the Mykolaiv Railway School emerged in 1894 under the jurisdiction of the Kharkiv-Mykolaiv Railway (Naryzhnyy i dr., 1994: 4).

Annually, 25-30 persons (above 13 years of age) were admitted from all social classes and confessions. Childrens of railmen were preferred. Curriculum elements, study duration and fees were equal to the Odesa and Olviopol institutions. The only difference was 1-year job training and focus on construction courses (Pavlyk, 1997: 26).

Till 1917, the Mykolaiv Railway School graduated over 500 railway engineers (Naryzhnyy i dr., 1994: 12).

Thus, a range of vocational entities was founded in the Kherson Governorate of the 19th-20th centuries. Their task was a special preparation of employees for railway construction and operation. The curricula were typical as in other education institutions of the Russian Empire. Usually, no curricula changes were made. Simultaneously, the railway education had proved its value via deep practical training of acquired skills.

Before the World War I, a small network of vocational schools existed in the Kherson Governorate. They were established within the last quarter of the 19th century and the beginning of the 20th century. The basis was the 1880-1990 legislative acts (Trygub et al., 2023a; Trygub, Degtyarev, Parkhomenko, 2023b).

One of the first such organizations since 1864 was the vocational school under the Labor Society. With the admission limit of 150 persons, it spread trade knowledge among poor Jews and prepared skilled specialists for industrial enterprises. The jurisdiction was controlled by the Ministry for Internal Affairs. The curriculum was regulated by the Ministry for Public Education. Free courses were offered for children 13-17 years of age with elementary education (Honchar, 2015: 90). Till the 19th century end, the entity became a leading vocational institution in the entire Kherson Governorate.

On 1 November 1891, the Odesa Department of the Imperial Technical Society founded the Odesa School of Construction Foremen. It prepared architects and builders (Tsubenko, 2013: 87). It was one of three construction schools within the Russian Empire. To establish this institution, the Odesa and Kherson authorities assigned 2,000 rubles each. The South-Western Railway Society paid 250 rubles. The Kishinev Council gave 250 rubles. The entity was subordinate to the trustee of the Odesa Educational District and director of public schools in the Kherson Governorate. The general management was conducted by the Trustee Council. The academic process was regulated by the Pedagogic Council. The school was headed by an inspector (Honchar, 2015: 123-125).

On 8 November 1892, the Odesa Jewish Community created another organization: the Vocational School under the Odesa Orphan Asylum. Thus, orphans with elementary background could enter the school to acquire professional skills. This entity of category I was subordinate to the Odesa City Public Administration (economic issues) and to the Kherson Directorate of Public Schools (academic issues). There were also five trustees from the City Duma to manage the school.

The institution head was the asylum chief (Uchebnyye zavedeniya g. Odessy, 1895: 24-25).

In 1892, the Odesa Municipal Vocational School was opened to commemorate Alexander II. Its was funded by the city council with subordination to the Ministry for Public Education.

In the 1890s beginning, the Ananiev community raised the question of unfolding a vocational school (GAOO. F. 42. Op. 35. D. 1015). Previously, this proposal came from the Ananiev mayor in 1881. Because of money lack, a more affordable variant was created in 1897: the Alexander II Vocational School (PSZRI-3. T. 16. № 1308: 520-521; PSZRI-3. T. 17. №14657: 637-638). Its charter was adopted only on 31 March 1899. In 1898, 65 persons studied at this organization (GAOO. F. 42. Op. 35. D. 1017: 139).

The state decision as of 17 November 1897 led to the Cesarevitch Alexey Odesa Vocational School. It was founded on 1 July 1898. 95 people studied here in 1913-1914 (Pamyatnaya knizhka, 1914: 421; PSZRI-3. T. 17. №14657: 637-638).

In 1899, the school provided part-time drawing courses for masters, apprentices and craftsmen. Funded by the Odesa Trade Society, the courses comprised up to 50 students for two years (Honchar, 2015: 123).

On 10 June 1899, the Jewish community under Elena Markovna Mendelevich established the Jewish Vocational School. In 1908, it became the E.M. Mendelevich Odesa Jewish Vocational School (GAOO. F.42. Op. 35. D. 1278: 47). In 1913-1914, 100 people studied here (Pamyatnaya knizhka, 1914: 421).

On 29 October 1909, some Kherson Jews opened the Four-Grade Jewish Vocational School. It prepared joiners, metalworker and blacksmiths. In 1913-1914, the school comprised 99 students (Pamyatnaya knizhka, 1914: 419).

Extra vocational schools emerged in the 1905-1910 period of the Kherson Governorate. They were located in Berezovka (1910), Bobrynets (1910) and Stepanivka (1905). In 1913-1914, they educated 48, 60 and 40 students, respectively (Pamyatnaya knizhka, 1914: 422). Almost all graduates worked at factories or plants. Some of them kept studying further. Vocational entities were affordable and popular. It was confirmed by the First Odesa District Congress on Vocational Education as of 3-10 August 1915 (Pervyy okruzhnoy s"yezd, 1915: 76-77).

5. Conclusion

We reviewed the vocational education in the Kherson Governorate of the 19th-20th centuries. Based on local economics, such schools prepared ship and railway engineers, craftsmen, etc. Southern regions increasingly demanded them.

For the researched period, we trace a range of vocational schools with the ship engineering major. The educational hub was located in Mykolaiv as a shipping center.

Besides, reforms produced a system of commercial sailing education. It comprised respective schools that prepared mechanical engineers, short and long navigation experts. Additionally, there were two-grade and elementary institutions. They provided commercial ships of sea and river sailing with specialists. The disadvantage of such a system was a small number of institutions to prepare marine engineers.

Simultaneously, new vocational schools prepared railway operators and constructors.

The 20th century beginning confirmed an obvious inability to satisfy economic needs. Consequently, vocational education required further development.

6. Acknowledgements

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Revisiting the Pedagogical Periodical Press in the Vilna Educational District (1862–1915)

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Abstract

This work examined the pedagogical periodical press in the Vilna Educational District in the period 1862–1915.

The study's source base incorporated narrowly specialized reference and encyclopedic works on the history of the Russian periodical press. In terms of methodology, use was made of content analysis to isolate a selection of periodicals published in 1862–1915 in the Vilna Educational District.

The study's findings revealed that there were five academic pedagogical periodicals published in the Vilna Educational District between 1862 and 1915. These journals were geographically distributed as follows: three published in Vilno, one – in Mogilev on the Dnieper, and one – in Grodno. Among them, the periodicals that were in operation for a relatively long time were *Tsirkulyar po Vilenskomu Uchebnomu Okrugu* and *Narodnoye Obrazovaniye v Vilenskom Uchebnom Okruge*, with both sustained through government funding and being in operation in Vilno up until the city was evacuated during World War I. Among the rest of the journals, of particular note is the periodical *Pedagogicheskiye Zapiski*, which was a supplement to the children's magazine *Zor'ka* – 18 issues of this journal were produced between 1905 and 1908. The remaining two publications, *Belorussky Uchitel'sky Vestnik* (published in Mogilev on the Dnieper) and *Pedagogicheskoye Delo* (Grodno), existed for relatively short periods of time, with fewer than 10 issues of each produced.

Keywords: pedagogical periodical press, Vilna Educational District, Russian Empire, period 1862–1915.

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1. Introduction

The Vilna Educational District, one of the oldest educational districts in the Russian Empire, was established in 1803, with Vilno as its administrative center. The district incorporated Vilna, Vitebsk, Grodno, Kovno, Minsk, Mogilev, and Kholm Governorates. In 1897, these areas had a combined population of approximately 11 million people (equally divided between the sexes), with 1.9 of these being urbanites (Naselenie..., 1898: 5-29). According to the study by A.A. Cherkasov, that same year, 1803, the district became home to a university of its own – Imperial Vilna University. The educational institution was, however, closed down in 1832 as a consequence of its students and instructors taking an active part in the November Uprising (Cherkasov, 2023: 1688).

2. Materials and methods

The study's source base incorporated narrowly specialized reference and encyclopedic works on the history of the Russian periodical press. Of particular note are the work by A.A. Cherkasov, which examines the academic and demographic potential of educational districts across the Russian Empire (Cherkasov, 2023), the reference book by A.G. Dement'yev (Russkaya periodicheskaya..., 1959), the work by N.N. Ablov, devoted to academic periodical publications (Ablov, 1937), and 'The Russian Pedagogical Encyclopedia', produced under the editorship of V.G. Panov (Rossiiskaya pedagogicheskaya..., 1993).

In terms of methodology, use was made of content analysis to isolate a selection of periodicals published in 1862–1915 in the Vilna Educational District. Another important method employed in the study was the retrospective method, the use of which helped construct the work based on a chronological sequence of events.

3. Literature review

The relevant historiography for this study may be divided into two groups: 1) historiography dealing with periodicals and editors in the Vilna Educational District; 2) historiography dealing with periodicals in other educational districts across the Russian Empire.

The first group is distinguished by fragmentariness. Nevertheless, the periodical press in the Vilna Educational District is mentioned in the work by S.V. Snapkovskaya, focused on the development of pedagogical journalism in Belarus in the early 20th century (Snapkovskaya, 2010); certain initiatives undertaken by the administration of the Vilna Educational District in the early 20th century are discussed in the work by S.I. Bus'ko (Bus'ko, 2021); the work by S.V. Snapkovskaya examines the conditions and factors governing the development of the social-pedagogical movement in Belarus in the early 20th century (Snapkovskaya, 2019).

As regards the historiography devoted to the periodical press in other educational districts across the Russian Empire, worthy of note are the following works: the one by V.D. Muzykant and colleagues, focused on pedagogical publications produced in the Kazan Educational District (Muzykant et al., 2022), the one by I.Yu. Cherkasova and colleagues, focused on pedagogical publications produced in the Orenburg Educational District (Cherkasova et al., 2023), and the ones by A.M. Mamadaliev and colleagues, focused on the periodical press in the Kiev (Mamadaliev et al., 2023), Kharkov (Mamadaliev et al., 2023a), Riga (Mamadaliev et al., 2023b), and Caucasus Educational Districts (Mamadaliev et al., 2022).

4. Results

According to the study by A.A. Cherkasov, there were five pedagogical periodicals produced in the Vilna Educational District, with three of these published in its administrative center, Vilno, one – in Mogilev on the Dnieper, and one – in Grodno.

The oldest of them was the departmental *Tsirkulyar po Vilenskomu Uchebnomu Okrugu* (Russian: "Vilna Educational District Bulletin"), produced in Vilno from 1862 to 1915 (Cherkasov, 2023: 1688). The journal was published by the office of the Trustee of the Vilno Educational District. Up to 1869, its name was *Tsirkulyar po Upravleniyu Vilenskim Uchebnym Okrugom* ("Vilna Educational District Administration Bulletin"). Published monthly, the journal was primarily focused on official materials in the area of public education and published ordinances from the Ministry of Public Education and decrees from the Trustee of the Vilno Educational District (Russkaya periodicheskaya..., 1959: 452).

In 1901, they added a supplement to the journal – *Narodnoye Obrazovaniye v Vilenskom Uchebnom Okruge* ("Public Education in the Vilna Educational District"). The supplement was

produced from 1901 to 1915 (Figure 1) (Cherkasov, 2023: 1688). Initially, the periodical came out six times a year. Starting in 1907, it was produced monthly. It had two major sections – official and unofficial. The unofficial section carried works on primary education, model lesson materials, articles on out-of-school education, practical advice on improving the infrastructure of lower and primary schools, information about school life in the district, local pedagogical news, and biographies of prominent pedagogues.
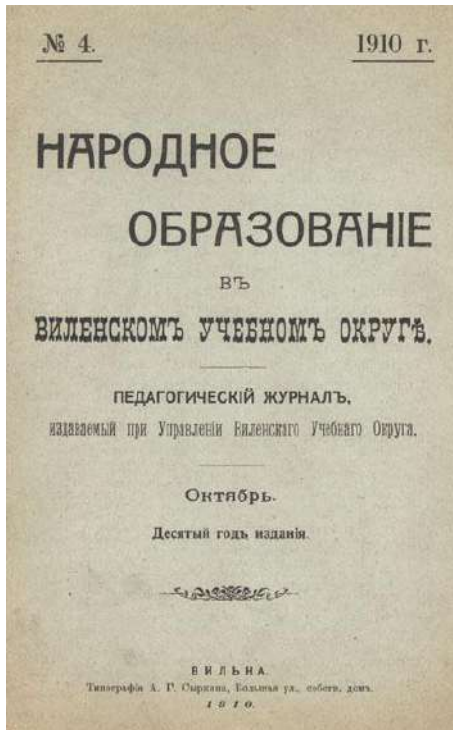

Fig. 1. Cover of the journal *Narodnoye Obrazovaniye v Vilenskom Uchebnom Okruge*. 1910. Issue 4.

The journal was edited by the district's officials and Trustee's aides. One of its editors was Vsevolod Aleksandrovich Flerov (1860–1919), a prominent Russian pedagogue and man of letters (Figure 2).

Fig. 2. Vsevolod Aleksandrovich Flerov (1860–1919)

V.A. Flerov was born on November 10, 1860, in Tver. Just like many Russian pedagogues at the time, he received his education through an ecclesiastical seminary. After graduating from Moscow Ecclesiastical Seminary, he worked at Tula Ecclesiastical School. Afterwards, from 1887 to 1895, he taught at Novotorzhskaya Teacher's Seminary. From 1895 to 1901, he worked as a public

schools inspector in Tver Governorate. In 1906, he was transferred to Vilno and appointed to the post of aide to the Trustee of the Vilna Educational District. That is where he engaged in editing the journal. In 1914, V.A. Flerov moved to Moscow, where he would lecture at Moscow Urban Folk School (Rossiiskaya pedagogicheskaya…, 1993).

From 1905 to 1908, they also published *Pedagogicheskiye Zapiski* ("Pedagogical Transactions") in Vilno (Cherkasov, 2023: 1688). This periodical was a supplement to *Zor'ka* ("Dawn"), a journal for children of primary- and secondary-school age. Its editor-publisher was S.A. Kovelyuk. Published monthly, it was concerned with issues of nurture and education and carried a variety of materials discussing novel ideas in the pedagogical process. The journal was welcome in secular and parochial educational institutions alike. In all, 18 issues of this periodical were produced (Snapkovskaya, 2010: 66).

The journal *Belorussky Uchitel'sky Vestnik* ("Belarusian Teacher's Herald") was produced from 1910 to 1911 in Mogilev on the Dnieper (Cherkasov, 2023: 1688). This monthly was geared toward teachers and specialists in the area of public education. Its editor-publisher was N.Ye. Kozlov. The journal maintained close ties with the Active and Former Teachers' Mutual Assistance Society in Mogilev Governorate. The journal's content was aligned to the wishes of public teachers in Mogilev Governorate expressed via a special survey conducted by the Society for Facilitating Unity Among Public Teachers and Assisting Them With Pedagogical Advice. The journal's staff comprised of local teachers. A significant portion of materials it carried were devoted to local school life. The periodical was launched in May 1910. Five issues of the journal were published since then before just one (Issue 6) was produced in 1911 – the year it ceased operation (Ablov, 1937: 80-81).

Lastly, there was *Pedagogicheskoye Delo* ("Pedagogical Business"), produced from 1911 to 1914 in Grodno (Cherkasov, 2023: 1688). The journal was published by the Grodno Pedagogical Society. At different times its editors-in-chief were V.O. Liders (Issues 1 through 4 in 1912), N.G. Ostroumov (starting from Issue 5 for 1912), and D.I. Kropotov (1913–1914). The journal's first issue came out in December 1911. It was stated in that issue that the journal was devoted to issues of education and teaching and was the only journal in Russia focused on accumulating best teaching practices and facilitating mutual assistance among teachers. The operation of the journal mainly depended on input from secondary school teachers. The periodical had two major sections – the pedagogical section (academic articles, coverage of general issues, bibliography, coverage of current events in local school life, and reports covering the work of the pedagogic society) and the section for students (literary and academic writings by students, including exemplary essays and short stories). However, a number of articles by students being found reactionary vis-à-vis government policy eventually led to a confrontation with the administration of the Vilna Educational District. As a consequence, the journal was urged to shut down its students' section. The periodical was on its fourth issue when V.O. Liders closed down the students' section and gave up editing the journal (Ablov, 1937: 86). The journal ceased publication shortly afterwards.

In September 1915, the Russian troops had to leave the administrative center of the Vilna Educational District, the city of Vilno, during the Great Retreat, as a result of which the periodicals *Tsirkulyar po Vilenskomu Uchebnomu Okrugu* and *Narodnoye Obrazovaniye v Vilenskom Uchebnom Okruge* ceased publication.

5. Conclusion

There were five academic pedagogical periodicals published in the Vilna Educational District between 1862 and 1915. These journals were geographically distributed as follows: three published in Vilno, one – in Mogilev on the Dnieper, and one – in Grodno. Among them, the periodicals that were in operation for a relatively long time were *Tsirkulyar po Vilenskomu Uchebnomu Okrugu* and *Narodnoye Obrazovaniye v Vilenskom Uchebnom Okruge*, with both sustained through government funding and being in operation in Vilno up until the city was evacuated during World War I. Among the rest of the journals, of particular note is the periodical *Pedagogicheskiye Zapiski*, which was a supplement to the children's magazine *Zor'ka* – 18 issues of this journal were produced between 1905 and 1908. The remaining two publications, *Belorussky Uchitel'sky Vestnik* (published in Mogilev on the Dnieper) and *Pedagogicheskoye Delo* (Grodno), existed for relatively short periods of time, with fewer than 10 issues of each produced.

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The System of Public Education in Samarkand Oblast in the Period Between the late 19th and early 20th centuries

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Abstract

This paper examines the system of public education in Samarkand Oblast, a province within the Russian Empire. It touches upon the ethnic composition of the region's population, details the religious, gender, and social-estate composition of its student body, and presents data concerning the operation of its educational institutions.

The work relies on two groups of sources: 1) archival materials from the Russian State Historical Archive (Saint Petersburg, Russia); 2) published documents. The second group is represented by the annual *Survey of Samarkand Oblast* and *Samarkand Oblast Reference Book*.

The study's findings revealed that in the period between the late 19th and early 20th centuries the development of the system of public education in Samarkand Oblast was attended by certain problems due to its distinctive characteristics as a region. The period witnessed a fourfold increase (from 8 to 32) in the number of Russian educational institutions in the region, and also during that period secondary education became accessible there to both boys and girls. A relatively smaller increase was posted by the region's Russian-indigenous schools – their number more than doubled (from 5 to 12). Due to the small size of the Russian population in Samarkand Oblast, the oblast's leadership would include in the statistics the figures for Muslim and Jewish ecclesiastical educational institutions there, although such schools were hardly ever included in reports on oblasts and governorates across the Russian Empire, as they had little to do with secular education.

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Consequently, Samarkand Oblast was one of the country's biggest underperformers in terms of public education, as 100,000 out of its 105,000 school-age children were not in school by 1915.

Keywords: public education, Samarkand Oblast, period 1894–1912, Russian Empire.

1. Introduction

Samarkand Oblast was founded in 1868, with its capital in the city of Samarkand. In 1875, the Turkestan Educational District was formed from Samarkand, Syr-Darya, and Fergana Oblasts (Cherkasov, 2023: 1690). As at 1897, Samarkand Oblast had a population of 857,000 people, with 135,000 of these being urban dwellers (Naselenie..., 1898: 5-29). The region's population had a fairly motley ethnic composition. As at 1916, it had a population of 978,000 people, with 521,000 of these being Uzbeks, 270,000 – Tajiks, 39,000 – Kazakhs, and only 27,000 – ethnic Russians (Zarubin, 1926: 24).

2. Materials and methods

The study's source base is founded on two groups of sources: 1) archival materials from the Russian State Historical Archive (Saint Petersburg, Russia); 2) published documents. The second group is represented by the annual *Survey of Samarkand Oblast* and *Samarkand Oblast Reference Book*.

Use in this study was, most importantly, made of the statistical method, which helped analyze the dynamics of the numbers of educational institutions and students in Samarkand Oblast in the period 1894–1912. The other method employed was the retrospective method, used in order to examine the relevant historical events in historical sequence.

3. Discussion

The historiography on imperial-period Samarkand Oblast is relatively thin. The relevant publications include the work by I.I. Zarubin, released in the early Soviet period, which examines some of the key characteristics of the region's population, including its size, ethnographic composition, and territorial distribution (Zarubin, 1926), the one by A.P. Ryzhova, focused on the celebration of the 300th anniversary of the Romanov House in Uzbekistan (Ryzhova, 2021), and the one by O.G. Pugovkina, which paints a historical portrait of N.S. Lykoshin, former Military Governor of Samarkand Oblast (Pugovkina, 2018). None of these publications address the system of public education in Samarkand Oblast, though.

In terms of Russia's Asian dominions, research has recently been conducted looking at the system of public education in Amur Oblast (Shevchenko et al., 2023) and Orenburg Governorate (Magsumov, Zulfugarzade, 2020; Magsumov et al., 2020). Other areas in the Russian Empire with a high concentration of indigenous people included some in the Caucasus, with that being a factor influencing the development of the regional system of public education (e.g., Sukhumi District (Mamadaliev et al., 2022) and Dagestan Oblast (Rajović et al., 2022; Rajović et al., 2022a; Rajović et al., 2022b)).

4. Results

The first statistics on Samarkand Oblast were published in 1893. However, the first statistics on the system of public education in the region appeared only in 1894.

As at 1894, the region had just 13 educational institutions – 8 Russian and 5 Russian-indigenous (Spravochnaya knizhka..., 1894: 26-28).

In 1896, the number of educational institutions in the region reached 14, following the establishment of another Russian-indigenous school there (Spravochnaya knizhka..., 1896: 29-30).

As at 1898, the region had 18 educational institutions (1 Mariinsky female four-grade facility, 1 urban four-grade facility with a boarding school within its grounds, 4 parish schools for both sexes, 1 parish one-grade female school, 1 parish one-grade male school, 1 male and 1 female two-grade rail schools, 8 Russian-indigenous schools, and 4 night schools for adults within the grounds of the urban schools). These educational institutions had a combined enrollment of 896 students (628 males and 241 females) (Obzor..., 1900: 79).

On January 18, 1899, Samarkand Mariinsky Four-Grade Female School was reorganized into a five-grade female gymnasium. Around the same time, a male four-grade progymnasium was also established there (Obzor..., 1900a: 144).

Consequently, the number of Russian educational institutions in the region reached 11 (1 female gymnasium, 1 male progymnasium, 1 urban four-grade school, 1 Pushkin urban female two-grade school, 1 Pushkin urban male two-grade school, 2 two-grade schools at Samarkand Railroad Station (one male and the other, female), and 4 parish schools for both sexes in the cities of Katta-Kurgan, Dzhizak, and Khodzhent and the village of Sretenskoye) (Obzor..., 1900a: 144). The Russian educational institutions had a combined enrollment of 703 (Obzor..., 1900a: 145). In terms of the religious composition of the student body in this sector, it was dominated by Orthodox Christians – 602, followed by Jews – 59, Muslims – 17, Lutherans – 11, Catholics – 9, and Armenian Gregorian Christians – 2, with members of other faiths numbering 9 (Obzor..., 1900a: 147).

At the same time, the number of Russian-indigenous schools in the region dropped from eight to seven. There were such schools in the cities of Samarkand, Katta-Kurgan, Dzhizak, Khodzhent, and Ura-Tyube and the aul of Dzhizak in Atakurgan Volost. These educational institutions had a combined enrollment of 414 (Obzor..., 1900a: 145).

In 1896, to help boost interest in attending the region's Russian-indigenous schools among the indigenous population, the Military Governor of Samarkand Oblast, Lieutenant General N.Ya. Rostovtsev, recommended in a report addressed to Emperor Nicholas II the opening of trade classes at them. The approval of the initiative resulted in the establishment within the grounds of Samarkand's Russian-indigenous schools of a boarding school equipped with a workshop (Obzor..., 1900a: 151).

In addition, the region had a large number of ecclesiastical schools (31 higher Muslim schools (madrasas), 1,615 lower Muslim schools (maktabs), and 11 lower Jewish schools (cheders)). These educational institutions had a combined enrollment of 15,565 (Obzor..., 1900a: 145). The region's ecclesiastical schools sector is worth dwelling on in more detail. As at 1899, higher Muslim schools (madrasas) there would not accept girls. There were an average of 68 students per madrasa. As regards lower ecclesiastical schools in the region, which *were* open to girls, the situation across its uyezds was as follows: Khodzhent Uyezd having the highest enrollment of female students (321 girls versus 3,214 boys, or about 10 % of the student body), followed by Samarkand Uyezd (350 girls vs 6,903 boys), Dzhizak Uyezd (30 girls vs 1,034 boys), and Katta-Kurgan Uyezd (4 girls vs 1,234 boys). The average figure per maktab was about 8 (Obzor..., 1900a: 146).

In 1900, the number of Russian-indigenous schools increased by two – one, a facility for Jewish children, was opened in Samarkand and the other, in the city of Pendzhikent (Samarkand Uyezd). In addition, at the behest of the Emperor, a boarding school for 25 students was established within the grounds of Atarabat Russian-Indigenous School in Dzhizak Uyezd (Obzor..., 1901: 21). On the whole, the region witnessed a sharp increase in the number of maktabs. As a reminder, as at 1899 there were 1,615 such schools. The figure was 1,913 as at 1900 (Obzor..., 1901: 22).

As at 1900, the region's Russian educational institutions had a combined enrollment of 780 students, its Russian-indigenous schools (inclusive of the night school) – 461 students, and its Muslim and Jewish ecclesiastical schools – 17,349 students (Obzor..., 1901: 23).

However, it is worth taking into account that the number of ecclesiastical indigenous educational institutions in the region was not constant, with the figure dropping to 1,795 in 1901 (Obzor..., 1902: 145). On the other hand, the number of Russian (11) and Russian-indigenous (9) educational institutions there remained unchanged (Obzor..., 1902: 145). The primary reason behind the sharp drop in the number of maktabs in the region was the complicated economic situation there. It is worth noting that in actual fact maktabs there were private ecclesiastical educational institutions established on the initiative of groups of individuals prepared to have an educational facility housed in their own home or a mosque. In good-harvest years, hundreds of such schools for 5–10 students would open in the region, while during poor-harvest times the sector would shrink substantially (Obzor..., 1902: 145).

As at 1901, the region's student body had the following ethnic composition: ethnic Russians – 703, Jews – 589, Poles – 22, Sarts – 16,449, Tatars – 2, Kyrgyz – 3, Armenians – 3, Persians – 1, and Germans – 16 (Obzor..., 1902: 146). It had the following social-estate composition: children of nobles and officials – 237, children of persons of ecclesiastical status – 3, children of urban dwellers – 493, children of rural dwellers – 16,457, and children of foreigners – 11 (Obzor..., 1902: 146).

In 1902, the city of Ura-Tyube became home to a Russian parish school. Thus, the region now had 13 Russian educational institutions. In addition, the number of Russian-indigenous schools in the region increased to 11. At the same time, the number of ecclesiastical indigenous schools there continued to drop, totaling 1,679 (Obzor..., 1903: 87). This must have been caused by locusts

destroying crops there. Despite the drop in the overall number of educational institutions in the region, the number of students there not only did not drop but actually increased – from 17,788 in 1901 to 18,307 in 1902 (Obzor…, 1903: 87). Note that such increases were posted by both Russian and Russian-indigenous schools, as well as ecclesiastical schools.

In 1903, Samarkand Male Progymnasium was reorganized into a gymnasium (Obzor…, 1904: 88). Thus, secondary education was now accessible in the region to both sexes. In addition, that same year the region became home to the following educational institutions: 1 school of gardening, winegrowing, and winemaking, run by the Ministry of Agriculture and State Property, 1 primary school (the region's first third-class private school), 1 parish school, and 223 lower indigenous literacy schools (maktabs) (Obzor…, 1904: 88). Despite the sharp increase in the number of educational institutions in the region, the number of students there increased relatively little – just by 128. As at 1903, the region had a student body of 18,435 (Obzor…, 1904: 89).

As at 1904, the region had 1,781 educational institutions (17 Russian schools with a combined enrollment of 1,321 (702 boys and 619 girls), 14 Russian-indigenous schools with a combined enrollment of 567 (559 boys and 8 girls), and 1,750 indigenous schools with a combined enrollment of 18,887 (18,332 boys and 555 girls)). There were a total of 20,775 students in the region (Obzor…, 1905: 102). The drop in the overall number of educational institutions in the region in the year under review was wholly down to its indigenous schools. In 1904, Russian parish schools were opened in the township of Fedorovsky and at Chernyayevo Railroad Station. In addition, the region became home to Russian-indigenous schools in the village of Zaamin and the village of Yany-Kurgan in Dzhizak Uyezd, as well as the village of Khalvai in Samarkand Uyezd (Obzor…, 1905: 103). It is also to be noted that in 1904 the region's indigenous educational institutions were divided into 83 madrasas, 1,657 maktabs, and 10 cheders (Obzor…, 1905: 103).

As at 1905, Samarkand Oblast had 1,891 educational institutions (19 Russian, 15 Russian-indigenous, and 1,857 indigenous), with a combined enrollment of 21,627 students (19,926 boys and 1,701 girls)) (Obzor…, 1906: 109). A notable fact is that the region's Russian schools sector had virtually attained a gender balance (194 boys and 780 girls), unlike the other two, which approximately had one girl per 20 boys (Obzor…, 1906: 109). In 1905, the number of educational institutions in the region increased by 110, while the number of students there increased by 852 (Obzor…, 1906: 109).

It is also worth noting that as at 1905 the region had a population of 1,026,391 people, with 171,065 of these (about one-sixth) being of school age. Given the region's total student body of 21,627 at the time, it can be concluded that just 12.6 % there were in school (Obzor…, 1906: 111).

In 1906, there was no increase in the numbers of Russian and Russian-indigenous schools there. Nevertheless, the region became home to an Armenian school, with the number of its indigenous schools increasing by 107. As a result, the total number of educational institutions there reached 1,998 schools, with a combined enrollment of 25,955 students (Obzor…, 1907: 67).

In 1907, the number of educational institutions in the region reached 2,016 schools, with a combined enrollment of 27,038 students (Obzor…, 1909: 60).

In 1908, the number of educational institutions in the region reached 2,118, an increase of 111, while there was a sharp drop in the size of the student body – by 2,820 students (10 %) (Obzor…, 1910: 57). At that time, the number of private primary educational institutions in Samarkand reached 3 (Obzor…, 1910: 57). The region's other uyezds had no private educational institutions.

In 1909, there was a drop in the number of educational institutions in the region – by 60 maktabs. Consequently, as at that year, the region had 2,058 educational institutions, with a combined enrollment of 25,270 students (Obzor…, 1912: 57).

In 1910, the total number of educational institutions in the region reached 2,177 (27 Russian, 14 Russian-indigenous, and 2,136 indigenous schools, inclusive of the Armenian school) (Obzor…, 1912a: 64). At that time, the region's Russian educational institutions had a combined enrollment of 2,606 students, with 820 of these attending its secondary educational institutions and the rest, its lower and primary schools (Obzor…, 1912a: 64). The region's Russian-indigenous schools had a combined enrollment of 417. Its Armenian school had a student body of 85. And its Muslim educational institutions had a combined enrollment of 20,493 students (Obzor…, 1912a: 64).

By 1912, the number of Russian educational institutions in the region continued to grow. At that time, Samarkand became home to a female progymnasium. The region also became home to a private second-class school (a lower educational institution) (Spravochnaya knizhka …, 1914:

27-31). The total number of educational institutions in the region reached 2,193 schools, with a combined enrollment of 26,000 (Spravochnaya knizhka ..., 1914: 31). However, secondary and lower education remained accessible in the region only in its capital, Samarkand.

Table 1. Numbers of Educational Institutions and Students in Samarkand Oblast in 1894–1912 (Spravochnaya knizhka..., 1894: 26-28; Spravochnaya knizhka..., 1896: 29-30; Obzor..., 1900: 79; Obzor..., 1900a: 144; Obzor..., 1901: 21-23; Obzor..., 1902: 145-146; Obzor..., 1903: 87; Obzor..., 1904: 89; Obzor..., 1905: 102; Obzor..., 1906: 111; Obzor..., 1907: 67; Obzor..., 1909: 60; Obzor..., 1910: 57; Obzor..., 1912: 57; Obzor..., 1912a: 64; Spravochnaya knizhka..., 1914: 27-31)

Year	Educational institutions				Students		
	Russian	Russian-indigenous	Indigenous	Total	Boys	Girls	Total
1894	8	5	-	13	-	-	-
1896	8	6	-	14	-	-	-
1898	10	8	-	18	628	241	869
1899	11	7	1,657	1,675	15,593	1,089	16,682
1900	11	8	1,894	1,913	17,752	837	18,589
1901	11	9	1,795	1,815	16,190	1,598	17,788
1902	13	11	1,679	1,703	-	-	18,307
1903	15	11	1,902	1,926	-	-	18,435
1904	17	14	1,750	1,781	19,593	1,182	20,775
1905	19	15	1,857	1,891	19,926	1,701	21,627
1906	19	14	1,965	1,998	24,152	1,803	25,955
1907	21	22	1,973	2,016	25,128	1,910	27,038
1908	23	15	2,080	2,118	22,511	1,707	24,218
1909	24	14	2,020	2,058	23,298	1,972	25,270
1910	27	14	2,136	2,177	21,932	1,929	23,861
1912	32	12	2,148	2,193	24,294	2,400	26,694

As evidenced in Table 1, no statistics were maintained in the 1890s for indigenous ecclesiastical schools in the region. The situation began to change only in 1899. However, there still were some gaps in the documentation (e.g., the lack of data on the student body's gender composition in 1902–1903). Table 1 increasingly demonstrates the growth of both Russian, Russian-native, and native Muslim schools. Furthermore, it was the Russian educational institutions that had the greatest dynamism, which were financed both from public funds and local budgets.

In 1915, when World War I was already under way, the Ministry of Public Education, in trying to assess the reach of secular educational institutions among school-age children, found that the region had 105,044 such children but only 4,417 were in school as at 1915 (RGIA. F. 733. Op. 207. D. 39. L. 1).

5. Conclusion
In the period between the late 19th and early 20th centuries, the development of the system of public education in Samarkand Oblast was attended by certain problems due to its distinctive characteristics as a region. The period witnessed a fourfold increase (from 8 to 32) in the number of Russian educational institutions in the region, and also during that period secondary education became accessible there to both boys and girls. A relatively smaller increase was posted by the region's Russian-indigenous schools – their number more than doubled (from 5 to 12). Due to the small size of the Russian population in Samarkand Oblast, the oblast's leadership would include in the statistics the figures for Muslim and Jewish ecclesiastical educational institutions there, although such schools were hardly ever included in reports on oblasts and governorates across the Russian Empire, as they had little to do with secular education. Consequently, Samarkand Oblast was one of the country's biggest underperformers in terms of public education, as 100,000 out of its 105,000 school-age children were not in school by 1915.

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The Public Education System in the Fergana Oblast in the Pre-Revolutionary Period

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Abstract
Building on wide-ranging statistical material, the work looks into the public education system in the Fergana Oblast in the pre-revolutionary period. The research materials included both archival resources from the Russian State Historical Archive, St. Petersburg, Russian Federation, and published collections of documents, which are represented by annual reviews of the Fergana Oblast, stretching over the period from 1887 to 1913. The work's methodology is based on system, statistical and chronological methods.

In conclusion, the authors come out with the following findings:

1.   In the pre-revolutionary period, the development of the public education system in the Fergana Oblast had unique local distinctions. Efforts by the Russian administration to introduce secular education were made in an unfriendly environment, where the Asian Muslim population took negatively any attempts to change the deep-rooted traditions of the local patriarchal society.

2.   In the period from 1887 to 1913, the Russian administration was able to found several gymnasiums and progymnasiums in the region, which made secondary education accessible both in the Oblast's center and in some district cities. Lower and primary education went along a similar path in the region.

3.   Despite the positive trends set by the launch of Russian and Russian-indigenous educational institutions, as the Russian population was insignificant in the region, it had some of the lowest indicators in the Russian Empire both in the number of secular educational institutions and in the number of children enrolled in them.

Keywords: public education, Russian Empire, Fergana Oblast, Turkestan Educational District, 1887–1913.

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1. Introduction

The Fergana Oblast was constituted in 1876, with an administrative center in the city, founded by the Russian administration, – Novy Margelan (later renamed Skobelev). We will not go deep into the history of the area, but it is worth noting that 20 years later, in 1898, the region witnessed an anti-Russian revolt on religious grounds, which was called the Andijan Uprising (Glushchenko, 2010: 531). With such destabilizing incidents, the system of secular public education was unable to develop rapidly in the region. Nevertheless, in the pre-revolutionary period, the Fergana Oblast, in terms of public education, was part of the Turkestan Educational District created in 1875 (Cherkasov, 2023: 1690). In 1897, the Fergana Oblast was home to slightly more than 1.5 million people and showed a major gender imbalance (850,000 men and 700,000 women). The Oblast had the largest population as compared to other regions in the Turkestan Educational District (Cherkasov, 2023: 1690). A glimpse into the ethnic mix which lived in the Fergana Oblast is offered by the materials of the First General Census of 1897. For example, of the 1.5 million population, the Sart language was native to the half (788,000 people), the Turkic-Tatar language was spoken by 260,000 people, Kara-Kyrgyz – by 200,000, Uzbek – by 153,000. By comparison, Russian was the native tongue for 10,000 people, of which only 25% were women (Pervaya Vseobshchaya..., 1904: 61).

Materials and methods

The materials for our research included archival resources from the Russian State Historical Archive, St. Petersburg, Russian Federation, and published collections of documents, which are represented by annual reviews of the Fergana Oblast, stretching over the period from 1887 to 1913.

The work's methodology is based on system, statistical and chronological methods. The system method enabled us to explore the public education system in the Fergana region, taking into consideration the characteristics of educational institutions, i.e. based on their types: secondary, lower, primary and religious Muslim educational institutions. The statistical method made it possible to analyze the progression of public education and identify its region-specific characteristics. The chronological method, in turn, helped us put together the general picture of public education in the region, following its chronological sequence.

3. Discussion

The historiographical overview of our research topic can be arranged into two groups. These are works that describe the Fergana Oblast and its public education system and works that study regional public education systems in the Russian Empire with a similar (overwhelming majority of the non-Russian population) demographic makeup.

The first group includes the work by S.S. Khamrakulov on how the printed media evolved in the Fergana Oblast in the pre-revolutionary period (Khamrakulov, 2017). We should also point at the work by A.A. Yusupov on trade and economic relations between Turkestan and Kashgar in the pre-revolutionary period (Yusupov, 2021). The work closest to our research subject belongs to M.V. Rygalova, which studied the history of regional education, using the Fergana Oblast reviews (Rygalova, 2019).

The second group features the work by N.A. Shevchenko et al. on the public education system of one of the Asian territories of the Russian Empire – the Amur Oblast (Shevchenko et al., 2023), research papers also addressed another similar territory – the Semirechenskaya Oblast (Magsumov et al., 2023), as for the studies dealing with non-Asian territories with a predominant non-Russian population, we should refer to the work by G. Rajović on the public education system of the Dagestan Oblast (Rajović et al., 2022; Rajović et al., 2022a; Rajović et al., 2022b).

4. Results

The public education system in Central Asia was formed by Russian and Russian-indigenous educational institutions. However, their number was so insignificant that regions in the Turkestan Educational District ubiquitously included figures on Muslim (religious) educational institutions in their reports, which had no relation to do with the secular model of education.

Russian-indigenous schools were opened in 1886, they taught reading and writing in the Russian and Sart languages to boys from the native population. The schools immediately opened evening courses to teach adults as well (Obzor..., 1893: 102).

In 1887, there was only one lower educational institution in the Fergana Oblast – the Russian city 4-year school for boys in Novy Margelan with its own carpentry and craft workshop. At the same time, for girls, the region provided only primary education, namely the city parish 2-year school for girls. In addition, there were four more 1-year parish schools for both genders. Overall, there were 6 Russian educational institutions in the region in 1887, which taught 93 boys and 84 girls (Obzor…, 1889: 51). Russian-indigenous educational institutions taught 147 boys in total (Obzor…, 1889: 51). As for indigenous religious educational institutions, they were divided into Muslim and Jewish ones, but the number of the latter was small (only two schools with 38 Jewish boys). Muslim religious educational institutions were, in turn, organized into three types: madrassas (higher education), the region had 171 such institutions with a total number of students 7,985 people (only for boys); mahtabs (lower education), there were 1,082 such institutions with 14,154 boys and 1,240 girls; and qarihanes (education for Koran reciters), where 660 boys studied (Obzor…, 1889: 52). The report also explained that public education in the region was solely controlled by the Muslim clergy, and it was the clergy that had significant funds. As a result, the indigenous population was educated exclusively in line with Islam and would hardly soon take "the bright path of science and progress" (Obzor…, 1889: 52). Looking ahead, we should say that the prophecy as a whole will be fulfilled, but first things first.

It is worth noting that no magazines, newspapers, or books were published in the region in 1887.

In 1890, the 2-year girls school in Novy Margelan was reorganized into a 4-year girls school. Thanks to this, lower education became available to girls as well. The remaining four Russian 1-year schools were located in cities Kokand, Namangan, Andijan and Osh. By this time, the 4-year boys city school had opened another workshop doing bookbinding. Overall, taking into account the 4-year boys school, the total number of Russian educational institutions did not change, although the student body increased to 240 people, of whom 126 were boys and 114 girls (the 4-year boys school had 79 students, the 4-year girls school had 76 students, other schools had 85 students) (Obzor…, 1893: 102).

In 1890, the enrollment in Russian-indigenous schools fell sharply from 151 people in 1889 to 82 (Obzor…, 1893: 103). Meanwhile indigenous schools boosted the number of students to 30,197, of which 2,411 were girls in 1,515 religious educational institutions (Obzor…, 1893: 104).

In 1892, the 4-year girls school carried the name Mariinsky School. The other five Russian educational institutions sustained no changes. At the same time, the number of Russian-indigenous schools grew to 6. All 12 educational institutions taught 437 students (283 boys and 154 girls) (Obzor…, 1894: 97). As for indigenous schools, they depended to significant extent from the economic situation of the region's population. Harvest years saw religious educational institutions opened on a massive scale, their number reached hundreds, and hundreds closed if crops failed. For example, in 1892, there were only 1,130 religious educational institutions in the region, and the number of students went down to 16,965 (Obzor…, 1894: 98).

By 1894, one of the 1-year parish schools, which was located in the Kokand city, had been reorganized into a 2-year school. The number of Russian educational institutions generally remained the same, which was also the case for Russian-indigenous schools. In Russian educational institutions alone, the total student body amounted to only 285 people. The 1,703 indigenous and Russian-indigenous schools included 5 Jewish schools, and their total enrollment was 36,172 people (Obzor…, 1896: 84).

By 1897, the number of Russian educational institutions reached 9, including 4-year boys city and 4-year girls Mariinsky schools, a 2-year boys city school in Kokand, four 1-year parish schools in Namangan, Andijan, Osh and the Pokrovsky village (Osh district), as well as two girls parish schools in Kokand and Novy Margelan. So, not only the region's administrative center, the Novy Margelan city, but also a district city, Kokand, now had its own boys and girls schools (Obzor…, 1899: 61). The number of Russian-indigenous primary schools also increased with the opening of a Russian-indigenous school with a boarding facility in Kokand (Obzor…, 1899: 62-63). In total, 16 Russian and Russian-indigenous educational institutions taught 574 people (405 boys and 169 girls) in 1897 (Obzor…, 1899: 62-63).

As for indigenous religious schools, in 1897, the region had 186 madrassas with 11,063 students, 159 qarihanes with 1,933 students and 1,585 mahtabs with 27,834 students, and in addition there were 6 Jewish schools with 215 students. In total, 1,936 indigenous educational institutions taught 41,045 students (Obzor…, 1899: 64).

By 1899, the 2-year city school in Kokand had been reorganized into a 4-year institution to make lower education available in the city of the Fergana Oblast as well. In addition, the total number of primary parish schools for students of both genders reached 7 (they operated in the cities, such as Namangan, Andijan and Osh as well as in Pokrovskoe, Uspenskoe, Blagoveshchenskoe and Nikolaevskoe villages), and two primary girls' parish schools were also located in Novy Margelan and Kokand (Obzor..., 1901: 243). Considering two 4-year schools in Novy Margelan, Russian educational institutions reached 12 in total. Russian-indigenous educational institutions increased to 8 (one Russian-indigenous school with a boarding facility and 7 primary Russian-indigenous schools) (Obzor..., 1901: 244-245). So, in total, Russian and Russian-indigenous educational institutions together reached 20 with a total student body numbering 918 children (686 boys and 232 girls) (Obzor..., 1901: 244-245). At the same time, 2,248 religious indigenous schools had 25,021 boys and 3,399 girls (Obzor..., 1901: 246-247).

On July 1, 1900, Novy Margelan saw the first progymnasium inaugurated in the city – the Novy Margelan 4-year boys progymnasium (Obzor..., 1901a: 117), and the total number of Russian educational institutions reached 14. The Kokand boys city school opened two craft classes – on carpentry and bookbinding (Obzor..., 1901a: 119). The number of Russian-indigenous educational institutions also grew – a Russian-indigenous school with a boarding facility was opened in Novy Margelan and another Russian-indigenous school in the region (Obzor..., 1901a: 117). In addition, there were 2,399 indigenous religious schools in the region, which provided education for 29,488 boys and 2,762 girls (Obzor..., 1901a: 118-119).

By 1904, the region's administrative center had made secondary education available for both boys and girls. This was the result of the boys progymnasium reorganized into a boys gymnasium and the 4-year Mariinsky school into the girls Mariinsky gymnasium (Obzor..., 1905: 103). The Oblast's secondary educational institutions taught 209 boys and 200 girls, while lower and primary institutions taught 1,443 people, of which 1,079 were males and 364 females (Obzor..., 1905: 104). The total number of Russian and Russian-indigenous educational institutions reached 38 in the region. Particular strong growth was demonstrated by Russian-indigenous educational institutions that, along with 17 Russian-indigenous schools, included 6 schools with evening courses for adults (Obzor..., 1905: 104). It is worth noting that the entire Fergana Oblast was able to offer only two city libraries – one in Novy Margelan and one in Namangan (Obzor..., 1905: 106).

In 1906, 274 boys and 291 girls studied in two gymnasiums (boys and girls ones) in Novy Margelan (Obzor..., 1908: 101). We should add that girls exceeded boys in one group of educational institutions for the first time. The other 15 Russian educational institutions were: 4-year school in Novy Margelan, 3-year school in Kokand, 11 parish primary schools and 2 private primary schools (in Novy Margelan and Andijan) (Obzor..., 1908: 102-103). The total enrollment in Russian educational institutions in 1906 amounted to 1,703 (929 boys and 774 girls) (Obzor..., 1908: prilozhenie 32). Russian-indigenous schools numbered 18 with 893 students (Obzor..., 1908: prilozhenie 32).

In 1907, the Fergana Oblast's administrative city, Novy Margelan, was renamed Skobelev.

By 1910, there had been already three secondary educational institutions in the region. In addition to two gymnasiums in Skobelev, an 8-year commercial school was launched in Kokand (Obzor..., 1910: 175). In 1910, the Oblast's all secondary educational institutions taught 962 students (592 boys and 370 girls) (Obzor..., 1910: 176). In addition, the region offered 4 lower educational institutions – 4-year city schools in Skobelev, Kokand, Namangan and Andijan – which had 249 students (Obzor..., 1910: 177), 9 parish city schools with 1,020 students, 11 parish rural schools with 627 students and 3 private primary institutions with 135 students (Obzor..., 1910: 177-180). In total, Russian educational institutions in 1910 taught 2,993 students of both genders. Russian-indigenous schools numbered 18. By 1910, it had become obvious to the Russian administration that Russian-indigenous schools were not popular with the local population, because several of the schools, for all the years of operation, did not graduate a single student after completing the full academic course, and many schools, had only a handful of graduates over the entire period of work (the Pop school had 3 graduates since 1902, Skobelev school – 5 graduates since 1900, Yangi-Kurgan school had not a single graduation since 1903) (Obzor..., 1910: 181). The key reason why Russian-indigenous schools were unpopular was the fanaticism of the Muslim population. In addition, indigenous inhabitants viewed children's education exclusively from a practical standpoint – on the one hand, they did not see the immediate benefits of educating children in a Russian-indigenous school, on the other, they realized that they would lack a worker in their family,

since the course of study was 4 years. Therefore, in most cases, children left school after they had barely learned to read, write and speak a little Russian (Obzor..., 1910: 181-182). Nevertheless, regional officials of the Ministry of Public Education made efforts to improve the situation.

In 1911, the number of secondary educational institutions in the region did not change. Three secondary school taught 926 boys in total (Obzor..., 1914: 118). The group of lower educational institutions also remained unchanged: 4 city schools taught 263 boys (Obzor..., 1914: 120). Nine parish city schools taught 1,135 people (Obzor..., 1914: 121), 13 parish rural schools 767 people (two such schools were opened in 1911) (Obzor..., 1914: 122). The number of private educational institutions also went up to 6 (186 children of both genders studied there) (Obzor..., 1914: 123). The number of Russian-indigenous schools did not change (18 schools) with 664 boys studying there (Obzor..., 1914: 124), in addition, evening courses at the schools were attended by 243 adults (Obzor..., 1914: 124). All in all, Russian and Russian-indigenous schools in 1911 had 4,184 students (Obzor..., 1914: 124). Indigenous educational institutions numbered 3,052, of which 10 were cheders (Jewish schools) (Obzor..., 1914: prilozhenie 25).

By 1913, there had already been 5 secondary educational institutions in the region: in addition to the Skobelev boys and girls gymnasiums and the Kokand commercial school, a girls city progymnasium was launched in Skobelev, and a girls progymnasium was also opened in Andijan (Obzor..., 1916: 132). In total, secondary educational institutions taught 1,207 children (708 boys and 499 girls) in 1913 (Obzor..., 1916: 133). The lower level was represented, as before, by four 4-year city schools that had 422 male students (Obzor..., 1916: 135). The primary level numbered 9 parish city schools with 1,323 students (825 boys and 498 girls) (Obzor..., 1916: 136), 21 parish rural schools with 1,123 students (700 boys and 423 girls) (Obzor..., 1916: 138), 5 private educational institutions (the number of students is not specified, but we should assume there were at least 150 students) (Obzor..., 1916: 138).

In the same year, the number of Russian-indigenous schools grew to 20 (Obzor..., 1916: 138), with the student body increasing to 1,008 (Obzor..., 1916: 139). Of the 1,008 students, 949 boys were Muslims, 25 Orthodox, and the rest had other faiths (Obzor..., 1916: 139). Thus, in 1913, the number of students in Russian and Russian-indigenous educational institutions reached 5,078 people (Obzor..., 1916: 140).

Of the 3,710 indigenous schools, 10 were Jewish cheders, and the rest were Muslim religious schools (Obzor..., 1916: prilozhenie 26). The total number of students was 51,783 (43,823 boys and 7,960 girls) (Obzor..., 1916: prilozhenie 26).

For illustrative purposes, Table 1 summarizes data on the number of educational institutions by type and size of their student body.

Table 1. Number of educational institutions and students in the Fergana Oblast in 1887–1913 (Obzor..., 1889: 51-52; Obzor..., 1893: 101-104; Obzor..., 1894: 96-98; Obzor..., 1896: 84; Obzor..., 1899: 61-64; Obzor..., 1901: 243-247; Obzor..., 1901a: 117-119; Obzor..., 1905: 103-105; Obzor..., 1908: 101-103, prilozhenie 32; Obzor..., 1910: 181-183; Obzor..., 1914: 123-124, prilozhenie 25; Obzor..., 1916: 132-140, prilozhenie 26)

Years	Educational institutions				Number of students		
	Russian	Russian-indigenous	Indigenous	Total	Boys	Girls	Total
1887	6	5	1,337	1,348	23077	1324	24401
1890	6	5	1,515	1526	27991	2525	30516
1892	6	6	1130	1142	15288	1704	17402
1894	6	6	1697	1705	32241	4216	36457
1897	9	7	1936	1952	-	-	41619
1899	12	8	2248	2268	25707	3631	29338
1900	14	10	2399	2423	30377	2864	33241
1904	15	23	2478	2516	-	-	34526
1906	17	18	2451	2486	36963	2176	39139
1910	30	18	2567	2615	36345	6959	43304
1911	34	18	3052	3104	45519	8590	54109
1913	44	20	3710	3774	47486	9380	56866

Although during the First World War in 1915, 186,285 school-age children lived in the Fergana Oblast, only 3,622 of them studied in Russian educational institutions at that time (RGIA. F. 733. Op. 207. D. 39. L. 1). For unknown reasons, enrollments of Russian-indigenous schools were not counted among the students.

5. Conclusion

Summing up the above, we would like to focus on the following aspects:

1.   In the pre-revolutionary period, the development of the public education system in the Fergana Oblast had unique local distinctions. Efforts by the Russian administration to introduce secular education were made in an unfriendly environment, where the Asian Muslim population took negatively any attempts to change the deep-rooted traditions of the local patriarchal society.

2.   In the period from 1887 to 1913, the Russian administration was able to found several gymnasiums and progymnasiums in the region, which made secondary education accessible both in the Oblast's center and in some district cities. Lower and primary education went along a similar path in the region.

3.   Despite the positive trends set by the launch of Russian and Russian-indigenous educational institutions, as the Russian population was insignificant in the region, it had some of the lowest indicators in the Russian Empire both in the number of secular educational institutions and in the number of children enrolled in them.

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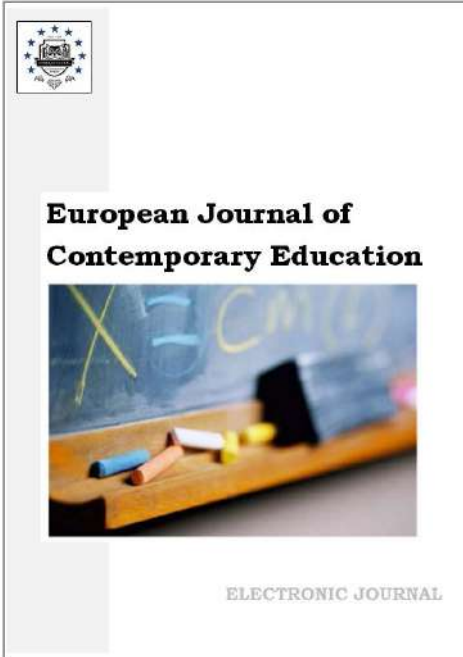
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ELECTRONIC JOURNAL

Staff Potential of the Kharkiv Imperial University at the Beginning of the 20th century (1900–1914)

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Abstract

Via analyzing ministry and institutional acts, the article defines some aspects of the Russian staff policy on the basis of the Kharkiv Imperial University in 1900-1914. Within this period, higher education was arranged according to principles of the 1884 Charter.

Sent to Russian imperial universities, the 1908 Academic Staff Draft Regulation by the Ministry of Public Education reduced their material support. This process affected academic and research activities with a subsequent staff lack and department tension at the Kharkiv Imperial University.

Reviewing the staff and its policy on the ministry and institution levels, we can note some peculiarities among faculties of the Kharkiv Imperial University. They differ in number of departments where the Medical Faculty leads.

Besides, another distinction between faculties of the Kharkiv Imperial University is a various department staff potential. Firstly, number of ordinary and extraordinary professors at departments was different. Most of them belonged to the Medical Faculty. Least of them worked for the Law Faculty. Secondly, there was an increasing number of common lecturers as well as part-time and overtime employees. The latter was obviously retraced among ordinary professors for all four faculties of the Kharkiv Imperial University.

Simultaneously, the Kharkiv Imperial University required more junior and middle-ranking lecturers (especially, privatdocents and auxiliary personnel – assistants, residents and laboratory workers). That exceeded the 1884 Charter norms and required a complex decision. One of promising mechanisms to settle the problem was the Academic Staff Draft Regulation by the Ministry of Public Education.

Keywords: education, higher education, education access, sustainable development in education, education policy, education reform, education potential.

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1. Introduction

In 1908, the Kharkiv Imperial University received an initial Academic Staff Draft Regulation by the Ministry of Public Education. The draft explanatory memorandum offered its staff and credit check via faculties and university administrations. The check mainly concerned clinical, laboratory or library assistants, keepers, residents, paramedics, supervisors. The same dealt with funds to maintain lecture rooms, laboratories, libraries and service buildings.

The Academic Staff Draft Regulation was considered by faculties and university administration. The results were sent to the Ministry of Public Education with a proper substantiation to raise certain aspects of staff and credits.

In spring 1909, the Kharkiv Imperial University received the revised document. In contrast to the previous version, it provided for no or almost no credits. The university administration reapplied to the Ministry of Public Education for credit increase at least to solve the most relevant staff problems (Bagalej, 1910: 4).

There was credit reduction to support junior lecturers via their discharge. Maintenance of service buildings were also underfunded. That could lead to bad consequences for academic, research and economic aspects of the university life.

Besides, members of some departments had academic overloads (as opposed to the university charter). For example, mathematic professors lectured for 9 instead of 6 hours while other departments had vacancies (Bagalej, 1910: 4-5).

Therefore, according to the draft, both whole universities and their staffs were underfunded. In such a case, institution maintenance required special funds while staff salaries were paid via university budgets. The obvious staff lack could be settled through a consolidated approach between authorities, ministries and universities.

2. Materials and methods

Apart from general works on higher education history in the Russian Empire, we used ministry and university materials. In particular, the 1884 University Charter was included. As a state act, this document regulated university activities in the Russian Empire. The new adopted charter reduced institutional autonomy.

Another important source was the Academic Staff Draft Regulation by the Ministry of Public Education. It coordinated organizational, procedural, financial and other aspects of universities in the Russian Empire.

Also, formal reports of the Kharkiv Imperial University defined main directions in its staff policy. Such reports describe the university structure, its faculty teaching staff, service workers, etc.

As a methodological basis, we used the historicism, objectivity and social approach principles. The first one analyzed the topic within the historical context (the 1884 University Charter, governmental initiatives, education policy, etc.). The second one based the authors' opinion on verifiable historical facts. The third one considered the research problem within a broad social practice (in particular, the university is interpreted via the social history categories).

Additionally, the article applied the system analysis methodology. Here, higher education was regarded as interrelated elements that have respective links to government policies.

The retrospective method defined reasons, consequences and tendencies in the staff policy of the Kharkiv Imperial University with its relations to the 1884 Charter and the Academic Staff Draft Regulation.

The idiographic method described the staff potential of the Kharkiv Imperial University at the beginning of the 20th century within real historical processes.

3. Discussion

Science, culture and education are important components of social history. They contribute to considering state transformations. As already ineffective, the Marxist history methodology is one-sided with economic determination of social processes. On the contrary, it is social history researches that are instrumental in understanding development directions of separate regions within the global context.

From this perspective, the Russian Empire history may be analyzed from various aspects: political processes and transformations, new territories, wars, scientific and geographic discoveries, etc.

One of such relevant aspects on the state, regional and local levels of the Russian Empire is education and science. For the Ukrainian areas within the Russian Empire, we can also regard universities and their communities as "soft power" and "representatives of enlightened bureaucracy" (Lebid, Shevchenko, 2021b).

The Kharkiv Imperial University is one of the oldest educational institutions in Ukraine. It laid a foundation of the domestic higher education and formed the imperial identity. Consequently, the home higher education history may be treated as an all-imperial, social-political or social-economic process (Lebid, Shevchenko, 2021a; Lebid, Shevchenko, 2021b; Lebid, Lobko, 2022; Rossijskie universitety..., 1998; Vishlenkova, 2013; Zhukovskaya, 2011).

The history of the Kharkiv Imperial University may be represented as an institutional evolution within the urban development. Surely, the university promotes the city development attracting intellectual and material investments. It is the university that produces a paradigm of values and social patterns as well as attracts innovations (Bagalej, Miller, 1993; Bagalej, Miller, 1903; Lejbfrejd, 1998; Olejnik, 2017; Zhukovskaya, 2011).

Some aspects of the Ukrainian higher education history can be analyzed via structural and functional features of study and research at university (Andreasov, 1952; Fiziko-matematicheskij, 1908; Istoriko-filologicheskij, 1908; Izmajlov, 1955; Lebid, 2021a; Lebid, Lobko, 2022; Mchedlov-Petrosyan, 2004; Yuridicheskij, 1908).

A great interest is hidden in the biographical approach to the higher education history. It may determine role of certain scientists, teachers, institutional and ministry managers, etc. in development of the university education and state policy (Bogdashina i dr., 2012; Krasovickij, 2004; Lebid, Shevchenko, 2021b; Lebid, Stepanov, 2023; Lebid, 2022a; Lebid, Lobko, 2022).

Another focus is the procedural element in the organization of study and research at university. Their review defines peculiarities of academic and public activities among professors and lecturers. The same deals with functions of laboratories, circles, workshops to upgrade skills of students and teachers. That demonstrates a high recognition of university graduates, a great social effect of the university as "a science temple" (Bagalej, 1910; Kucher, 1980; Lebid, Shevchenko, 2021a; Lebid, 2022b; Rossijskie universitety..., 1998).

A significant component of the university social history is analysis of the legal framework. It can retrace the creation and development of higher education from the governmental perspective, namely in terms of political and social features (Dneprov, 2017; Pamyatnaya knizhka..., 1862−1917; Protokoly zasedanij Soveta..., 1862−1912; Ustav..., 1911; Zanyatiya..., 1913; Zapiski..., 1902; Zapiski..., 1915).

4. Results

Before the wartime, the Kharkiv Imperial University comprised four faculties. They were the Historical-Philological, Physical-Mathematical, Law and Medical Faculties. The 1884 Charter defined structure, staffs, curricula and other issues of imperial universities. Respectively, four faculties at the Kharkiv Imperial University consisted of over 50 departments before the World War I began (Table 1).

Table 1. List of departments at the Kharkiv Imperial University (Pamyatnaya knizhka..., 1862−1917; Protokoly zasedanij Soveta..., 1862−1912; Zapiski..., 1902; Zapiski..., 1915)

Faculties	1901	1914
The Historical-Philological Faculty	10	10
The Physical-Mathematical Faculty	11	11
The Law Faculty	12	12
The Medical Faculty	24	23
Total	**57**	**56**

As we see, the department structure of the Kharkiv Imperial University was practically the same within 1901−1914. Most departments belonged to the Medical Faculty. The least number of departments was typical for the Historical-Philological Faculty. Simultaneously, the Department of Children's Diseases was abolished within the given period at the Medical Faculty.

Besides, there was an all-university unit – the Department of Theology. It admitted Orthodox students of all faculties (Zapiski..., 1902: 2; Zapiski..., 1915: 2).

There was no separate department of foreign languages at the Kharkiv Imperial University. However, students could attend linguistic courses (German, French, English, Italian). They were taught by four lecturers from the Historical-Philological Faculty. Therefore, in 1901, the Kharkiv Imperial University comprised 57 faculty departments, one all-university department and linguistic courses. In 1914, the institution consisted of 56 faculty departments, one all-university department and linguistic courses.

Moreover, the 1884 Charter defined a precise number of teaching and auxiliary staff among university faculties (Ustav, 1911). That was provided for by Article 60 (Table 2):

Table 2. Staff at the Kharkiv Imperial University, according to the 1884 Charter (Pamyatnaya knizhka..., 1862–1917; Protokoly zasedanij Soveta..., 1862–1912; Zapiski..., 1902; Zapiski..., 1915)

Faculties	Ordinary professors	Extraordinary professors	Lecturers
The Historical-Philological Faculty	12	5	4
The Physical-Mathematical Faculty	12	5	–
The Law Faculty	11	4	–
The Medical Faculty	14	9	–
Total	**49**	**23**	**4**

Also, the Charter provided for prosectors, assistants, laboratory employees, residents and other auxiliary persons. Usually, they worked at the Physical-Mathematical and Medical Faculties.

In 1901, the Kharkiv Imperial University had the following staff situation (Tables 3-6):

Table 3. Staff of the Historical-Philological Faculty at the Kharkiv Imperial University (Pamyatnaya knizhka..., 1862–1917; Protokoly zasedanij Soveta..., 1862–1912; Zapiski.., 1902; Zapiski..., 1915)

Staff	1901	1914
Ordinary professors	14(3)	12(6)
Extraordinary professors	3	6
Privatdocents	7	10
Lecturers	4	4
Auxiliary employees	–	–
Total	**28**	**32**

The brackets indicate part-time and/or overtime employees. Staff of the Physical-Mathematical Faculty is represented in Table 4:

Table 4. Staff of the Physical-Mathematical Faculty at the Kharkiv Imperial University (Pamyatnaya knizhka..., 1862–1917; Protokoly zasedanij Soveta..., 1862–1912; Zapiski..., 1902; Zapiski..., 1915)

Staff	1901	1914
Ordinary professors	14(5)	19(8)
Extraordinary professors	2	6(1)
Privatdocents	12	19
Lecturers	–	–
Auxiliary employees	12	33
Total	**40**	**77**

Among auxiliary personnel of the Physical-Mathematical Faculty, there were laboratory workers, assistants, gardeners and astronomers.

Staff of the Law Faculty is represented in Table 5:

Table 5. Staff of the Law Faculty at the Kharkiv Imperial University (Pamyatnaya knizhka, 1862–1917; Protokoly zasedanij Soveta…, 1862–1912; Zapiski…, 1902; Zapiski…, 1915)

Staff	1901	1914
Ordinary professors	6(1)	6(2)
Extraordinary professors	2	9
Privatdocents	7	5
Lecturers	–	–
Auxiliary employees	–	1
Total	**15**	**21**

For the Law Faculty, there was one new auxiliary staff member in 1914. It was a study keeper. Staff of the Medical Faculty is demonstrated in Table 6:

Table 6. Staff of the Medical Faculty at the Kharkiv Imperial University (Pamyatnaya knizhka…, 1862–1917; Protokoly zasedanij Soveta…, 1862–1912; Zapiski…, 1902; Zapiski…, 1915)

Staff	1901	1914
Ordinary professors	23(10)	20(11)
Extraordinary professors	6(3)	12(1)
Privatdocents	24	29
Lecturers	–	–
Auxiliary employees	69	89
Total	**122**	**150**

Among auxiliary personnel of the Medical Faculty, there were prosectors, residents, full-time and part-time laboratory workers, their assistants.

So, we see the quantitative differentiation of faculty teaching staff at the Kharkiv Imperial University. Most professors and lecturers belonged to the Medical Faculty. Least members worked for the Law Faculty. Both of them correlate with number of respective departments. The Medical Faculty units were twice as many. The same dealt with number of professors and lecturers at the Medical Faculty in contrast to other units.

Within the whole university structure, we should underline the Physical-Mathematical and Medical Faculties. Here, there were many auxiliary employees: laboratory workers, assistants, etc. Such a staff category was practically absent at other two faculties (except for the law one with a study keeper's position). It was determined by work peculiarities in mineralogical, physiological, surgical and other rooms of these units. Within them, auxiliary employees supported research and curricula among members of the Kharkiv Imperial University.

Besides, we see a stable staff rise (professors, lecturers and auxiliary persons) for the given period. In 1901-1914, there was a gradual increase of professors and lecturers among units: 28 to 32 (the Historical-Philological Faculty), 28 to 44 (the Physical-Mathematical Faculty), 15 to 20 (the Law Faculty), 53 to 61 (the Medical Faculty). However, there was no change of ordinary professors at the Law Faculty. A slight reduction was typical for the Historical-Philological and Medical Faculties. A small growth was at the Physical-Mathematical Faculty.

Meanwhile, there was a prominent increase of part-time and overtime ordinary professors among all units of the Kharkiv Imperial University. The same concerns extraordinary professors and privatdocents. The latter rose at all faculties (except for the Law Faculty with a smaller number of privatdocents till 1914)

The systematized data are shown in Table 7.

Apart from the above-mentioned persons, the 1884 Charter and staff regulations of the Kharkiv Imperial University provided for positions of paramedic, deacon, linen keeper, student secretary, etc. In the table, we observe that institutional needs exceed the charter ones. That concerns the auxiliary staff, especially residents, laboratory workers, assistants. These positions were part-time (including privatdocents).

Table 6. Staff of the Kharkiv Imperial University (Pamyatnaya knizhka…, 1862–1917; Protokoly zasedanij Soveta…, 1862–1912; Zapiski…, 1902; Zapiski…, 1915)

Position	Number according to the 1884 Charter	Actually in 1901		Actually in 1914	
		Full-time	Part-time	Full-time	Part-time
Theology professor	1	1	–	1	–
Ordinary professor	49	37	19	28	27
Acting ordinary professor	–	1	–	2	–
Extraordinary professor	23	6	3	11	1
Acting extraordinary professor	–	7	–	20	1
Privatdocent	–	–	52	–	63
Lecturer	4	4	–	4	–
Prosector (acting one as well)	6	5	–	6	–
Resident	11	10	21	11	25
Assistant (acting one as well)	4	3	15	4	21
Astronomer	1	1	–	–	–
Pharmacist	1	1	–	1	1
Pharmacist student	3	3	–	3	2
Mechanician	1	1	–	1	–
Preparator	1	–	1	1	1
Librarian	1	1	–	1	–
Librarian assistant	3	3	–	3	–
Laboratory worker	12	12	5	13	26
Taxidermist	1	–	1	1	–
Gardener	1	1	–	1	–
Executor	1	1	–	1	–
Doctor	1	1	–	1	–
Treasurer	1	1	–	1	–
Accountant	1	1	–	1	–

Along with formal charter rules, current problems determined the staff situation of the Kharkiv Imperial University as well. In 1901, V.A. Ulyanitskiy, an ordinary professor at the Department of International Law and state councilor, moved to the Tomsk Imperial University. V.S. Gulevich, an extraordinary professor at the Department of Medical Chemistry and collegiate councilor, moved to the Moscow University. E.A. Neznamov, a privatdocent and collegiate councilor, was appointed an extraordinary professor at the Warsaw University (Zapiski…, 1902: 8).

Additionally, staff changes occurred because of death among employees: P.P. Semyonov-Tyan-Shansky (a privy councilor and honored university member), V.I. Lamanskiy (an academician). Some employees were discharged: M.F. Ivanov (a veterinary master), D.F. Garkushevskiy (a student inspector assistant). There were 30-year service retirees: P.E. Leykfeld (an honored ordinary professor), A.V. Reprev (an ordinary professor). Also, the staff visited foreign events (V.Ya. Danilevskiy, L.O. Struve, K.N. Yarosh), represented the institution as delegates (A.M. Lyapunov, V.A. Steklov, I.P. Skvortsov), headed examination boards (N.O. Kuplevaskiy, V.Ya. Danilevskiy).

5. Conclusion

Teaching and auxiliary staff of the Kharkiv Imperial University demonstrated active participation in research, study and public events. A significant potential and ambitions of the university community did not meet the 1884 Charter requirements to a certain extent. The latter especially concerns the institutional staff policy.

Academic activities of professors and lecturers, their relevant researches and public life demanded material support, proper tools for development of social and human capital. Moreover, the state and regional staff reserves had to be created.

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Some Features of Cherkas Global University's Publication Activity: A Response to the Challenges of the "Soviet Division of Scientific Labour"

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Abstract

The article is devoted to analyzing the ten-year publication activity of Cherkas Global University. The author concludes that the most popular publications of Cherkas Global University are devoted to the regional history of the Russian Empire (first of all, the history of regional education systems). At the same time, from purely historical articles the most demanded are works on the history of the Caucasus and Ukraine. The article concludes that this is due to the genesis of Cherkas Global University, which originally emerged in the Caucasus, in Sochi, and its evolution, during which several Ukrainian scholars became employees of Cherkas Global University. The article relates the activities of Cherkas Global University to the peculiarities of the "Soviet division of scientific labour" identified by M. von Hagen: the clear division of Soviet historical science into center and periphery, with the center, which uses most of its resources, dealing with imperial/Soviet history, and regional history being provincialized. It is shown that the work of Cherkas Global University is a form of reaction of regional scholars to such a "system of division of scientific labour", which did not lose its relevance with the collapse of the USSR. Cherkas Global University helps historians from the regions, who in Soviet times were the scientific periphery, to demonstrate their research in the international arena. Such an opportunity is available not only to Cherkas Global University staff, but also to other scholars: the journal published by Cherkas Global University "Bylye Gody" actively publishes research by authors not only from Ukraine and the Caucasus, but also from Kazakhstan, Siberia, Kalmykia, the Urals, the Don, and so on. The author assumes that such results were achieved due to the focus on international cooperation, networked cooperation, and a move away from dependence on the authorities of a particular state.

Keywords: Cherkas Global University, division of scientific labour, publication activity, international cooperation.

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1. Introduction

Ten years ago, in 2014, Cherkas Global University (former name – International Network Center for Fundamental and Applied Research) started its publication activity. During this time Cherkas Global University became a prominent and rather unusual scientific research organization for the post-Soviet space, it has implemented several projects, published 507 articles indexed in Scopus, Cherkas Global University moved from Sochi (Russian Federation) to Bratislava (Slovakia), and then to Washington D.C. (USA), but it and its journals continue to play an important role in the post-Soviet space. This article is devoted to the analysis of some features of Cherkas Global University's publication activity in the context of the problems of division of labour in post-Soviet science.

2. Discussion

Thus far, several articles on the history of Cherkas Global University have been published. The most interesting and significant of them provide unique information about the history of its activities (Cherkasova, 2023; Taran, 2021), but they do not analyze Cherkas Global University as an extremely rare example of networked cooperation in the post-Soviet space. The activities of Cherkas Global University in the context of post-Soviet science have not been analyzed either.

3. Materials and methods

In our article, we will rely on the description of the problems of the "Soviet division of scientific labour" proposed by M. von Hagen (von Hagen, 2000: 57-58). Having analyzed the most cited publications of Cherkas Global University employees, we will relate their topics and the history of Cherkas Global University to these problems. On this basis, we will try to determine the place that Cherkas Global University and its oldest journal "Bylye Gody" occupy in the post-Soviet scientific landscape. The main sources for this purpose will be the articles mentioned above about Cherkas Global University and materials from the Scopus and RSCI (Russian Science Citation Index) databases (materials from the databases were additionally updated just before the article's publication, in February 2024).

4. Results

Features of the most cited articles

We find it most revealing to analyze which publications of Cherkas Global University scholars are most in demand. It is noteworthy that all five most cited articles are published in the most important journals of Cherkas Global University ("Bylye Gody" and "European Journal of Contemporary Education", both in Slovakia), and they are devoted to pedagogical topics. These are articles by N.A. Shevchenko, E.V. Vidishcheva, O.V. Emelyanova "The establishment of the system of public education in the Caucasus (1802–1917 years): The characteristic features" (Shevchenko et al., 2016) (64 citations), A.A. Cherkasov, S.N. Bratanovskii, L.A. Koroleva, L.G. Zimovets "Development of school education in the Vologda governorate (1725–1917). Part 1" (Cherkasov et al., 2019a) (56 citations), A.A. Cherkasov, S.N. Bratanovskii, L.A. Koroleva, L.G. Zimovets "Development of the school education system in the province of Vologda (1725–1917). Part 2" (Cherkasov et al., 2015b) (49 citations), V.S. Molchanova, L.L. Balanyuk, E.V. Vidishcheva, I.I. Potapova "The development of primary education on the Cossack territories in 1803-1917 years (on the example of the Kuban region). Part 1" (Molchanova et al., 2019) (48 citations) and V.S. Molchanova, L.L. Balanyuk, E.V. Vidishcheva, I.I. Potapova "The development of primary education on the Cossack territories in 1803–1917 years (on the example of the Kuban region). Part 3" (Molchanova et al., 2020) (47 citations). The high citation rate of such articles is explained by the fact that they are part of a large-scale project Laboratory of Professional and Pedagogical Training of Cherkas Global University, which publishes articles on the education system in different regions of the Russian Empire. Accordingly, the very logic of such a project presupposes mutual references within its constituent articles, which are also cited by external authors (Barabash et al., 2021: 726-737; Danielyan, 2022: 101).

The overwhelming majority of the most cited articles by Cherkas Global University staff are similar: they are devoted to pedagogical topics and published in the journals "Bylye Gody" and "European Journal of Contemporary Education". Articles on other topics appear only in the top 20 articles of Cherkas Global University staff in terms of citations. These are the articles published in "Bylye Gody" and devoted to the problems of demography of the Caucasus in the nineteenth

century: articles by A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova "The demographic characteristics of the tribes of the Black sea region in the first half of the nineteenth century" (Cherkasov et al., 2016b) (26 citations) and A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova "Demographic characteristics of the aristocratic Abkhazia in 1800-1860 years" (Cherkasov et al., 2016a) (26 citations). On the other hand, the most cited article published by the scholars of Cherkas Global University not in "Bylye Gody" and "European Journal of Contemporary Education" is also devoted to the system of education in one of the regions of the Russian Empire: it is the article by A.A. Cherkasov, L.A. Koroleva, S.N. Bratanovskii "The system of public education on the territory of. The system of public education on the territory of the Black Sea province in 1896-1917. Part 1" (Cherkasov et al., 2020) (24 citations), published in the journal "Vestnik Sankt-Peterburgskogo Universiteta, Istoriya " (Russian Federation).

For comparison, the fundamental collection of documents on slavery in the Caucasus in the 19th century, "Circassian Slave Narratives (Collection of Documents)", prepared by Cherkas Global University head A.A. Cherkasov (Cherkasov, 2020), currently has only 22 citations.

Thus, we can state that, on the one hand, some publications of Cherkas Global University scholars have quite high citation rates but, on the other hand, there is a serious disproportion between the activities of Cherkas Global University and the topics of the most cited publications. The Laboratory of Professional and Pedagogical Training of Cherkas Global University project, which publishes articles on the education system in different regions of the Russian Empire, has a strong impact on citation rates, bringing to the top of the ranking exclusively articles on the history of pedagogy in the Russian Empire. Therefore, it seems logical for us to analyze separately the citation rate of publications of Cherkas Global University scholars without taking into account articles on similar topics.

The most cited articles excluding the articles on pedagogy in the Russian Empire

In such an analysis, the most cited articles are the above-mentioned articles on the problems of the demography of the Caucasus in the 19th century, published in "Bylye Gody" and cited 26 times each: A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova «The demographic characteristics of the tribes of the Black sea region in the first half of the XIX century» and A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova «Demographic characteristics of the aristocratic Abkhazia in 1800–1860 years». The next most cited articles were also published in "Bylye Gody" and are devoted to the Caucasus of the 19th century: these are articles by A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova «The Losses of the Russian army during the Caucasian war (1801–1864): Historical and statistical research» (Cherkasov et al., 2017b) (24 citations) and A.A. Cherkasov, M. Smigel, S.N. Bratanovskii, V.S. Molchanova «Jikis and Jiketi in conditions of war and peace (1840–1860 years)» (Cherkasov et al., 2015b) (23 citations). Such attention to the Caucasus is logically linked to the fact that Cherkas Global University was originally founded in Sochi, Russian Federation, as a society of military history enthusiasts (Cherkasova, 2022: 1040-1041). Accordingly, it is logical that the Cherkas Global University scholars turned to the history of the Caucasus War, a major military conflict in which main events took place in the Caucasus (unlike, for example, the First and Second World Wars, which affected the Caucasus, but which main events took place in other regions).

However, it is extremely unexpected that the most frequently cited article by Cherkas Global University scholars that is not related to the history of pedagogy of the Russian Empire and the history of the Caucasus is the article devoted to the results of the study carried to investigate network cooperation of small cities: Z. Mingaleva, M. Sheresheva, M. Oborin, T. Gvarliani «Networking of small cities to gain sustainability» (Mingaleva et al., 2017), published in the journal «Entrepreneurship and Sustainability Issues» (Lithuania, later removed from Scopus) (20 citations). Taking into account that only one of the co-authors of this article indicated Cherkas Global University as an affiliation, and this was not her only affiliation, it can be stated that the publication is on the periphery of Cherkas Global University research, which is not generally focused on socio-economic topics, but it turned out to be quite in demand.

It is much more logical that the most cited article by Cherkas Global University scholars, which is not related to the topics of the history of pedagogy of the Russian Empire, the history of the Caucasus, and economics, turns out to be devoted to the history of Ukraine: it is the article «Justice System of Northeastern Ukraine and the Influence of Russian Judicial Practice (middle XVII – XVIII centuries)» (Degtyarev et al., 2019) (18 citations), which was published in "Bylye

Gody". In general, the Cherkas Global University scholars have quite a few publications on the history of Ukraine, but they are mostly related to the history of Ukrainian pedagogy. Nevertheless, some of these articles, with high citation rates, go beyond the history of pedagogy and concern also the history of journalism (published in "European Journal of Contemporary Education" article by S.I. Degtyarev, V.M. Zavhorodnia, L.G. Polyakova "On the establishment of the Ruthenian (Ukrainian) University in Austria-Hungary and its coverage in "Kievskaya starina" journal" (Degtyarev et al., 2018), which has 10 citations) or the history of bureaucracy (published in "Bylye Gody" the article by A.E. Lebid, N.A. Shevchenko "Ukrainian "enlightened bureaucracy" in the System of Higher Education of the Russian Empire in the century" (Lebid, Shevchenko, 2021), which has 7 citations). Again, we should link the interest in Ukrainian topics to the specifics of Cherkas Global University, whose staff includes several Ukrainian scholars (in particular, S.I. Degtyarev, since 2022 – editor-in-chief of "Bylye Gody").

Thus, the most popular publications of Cherkas Global University scholars, excluding pedagogical publications, are those on the Caucasus and Ukraine of the New Age, i.e. on regions that were historically part of the Russian Empire, but had their specificity and were affected by counter-imperial national movements. At the same time, among the publications of the Cherkas Global University scholars, there are also works on the history of other regions of the Russian Empire, which had their specificity and were affected by counter-imperial national movements: first of all, on the history of Central Asia (the most popular article is by T.A. Magsumov, M.S. Nizamova, S.F. Artemova, R.M. Allalyev "The Akhal-Teke expeditions of 1879–1881 years: Historical and statistical study. Part 1" (Magsumov et al., 2019), published in "Bylye Gody" and having 13 citations) and the Cossack Don (the most popular article is A.Y. Peretyatko, "The dark side of the Emancipation Reform of 1861 on the Don region: The history of the resettlement of one of the peasant communities according to the material of atamanskaya kontselyariya" (Peretyatko, 2016), also published in "Bylye Gody" and having 7 citations). The articles by Cherkas Global University scholars on the history of education in these regions are even more cited (the most popular article is by A.Y. Peretyatko, T.E. Zulfugarzade "Higher and secondary education of the Don Cossacks in the context of the epoch: The time of the great reforms" (Peretyatko, Zulfugarzade, 2017), published in the European Journal of Contemporary Education and having 35 citations).

In this context, the logic of the Laboratory of Professional and Pedagogical Training of Cherkas Global University project, which publishes articles on the education system in different regions of the Russian Empire, becomes more understandable. The problem of education in the Russian Empire is in principle highly debatable and politicized, connected with fundamental questions about the effectiveness of this state and its colonial character. It is quite logical that historians, mainly engaged in regional topics of the Russian Empire, had the idea of a project to study education in its regions.

History of the regions

Thus, the publication activity of Cherkas Global University scholars is primarily related to the study of the history of the peripheral regions of the Russian Empire. It should be noted that this is potentially the most important and interesting topic, the lack of study of which is explained by several factors, including social factors. In 1995 the major American Slavicist M. von Hagen, explaining the reasons for the poor development of Ukrainian history, made several critical statements about the "Soviet division of scientific labour", which can be summarized as follows:

1) "The centers of intellectual life in the USSR were Moscow and, to a much lesser extent, Leningrad and Novosibirsk" (von Hagen, 2000: 57).

2) "Kyiv (as well as other provincial – A.P.) scholars had significantly less access to the international historical community, and even some of their most important historical sources were requisitioned by Moscow and Leningrad archives and libraries» (von Hagen, 2000: 58).

3) "Members of the academic establishment wrote about the more "noble" topics of imperial and Soviet history" (von Hagen, 2000: 58).

4) "The provincialization of Ukrainian history set the template for all other "national minorities" (von Hagen, 2000: 58).

Thus, in addition to political censorship and a direct ban on the study of a whole range of topics, the USSR formed a scientific society with a clear division into centre and periphery, with scientific resources concentrated in the centre, which dealt with issues of general imperial history. According to M. von Hagen, this (in addition to several other factors) led to the fact that even

Ukraine (the largest of the USSR republics except for Russia), after gaining independence, had to "rethink the historicity of its state", i.e. there was the following important question: "Should Ukraine have a history?" (von Hagen, 2000: 59: 59) (current events show that for some of Ukraine's neighbours this question is still relevant – and they are trying to prove with all their might, including the military, that it should be answered negatively).

At the same time, Ukraine was by no means the most poorly historically studied region of the USSR. Another major Austrian Slavicist A. Kappeler, singled out "Belarusians, Bessarabian Romanians and Caucasian Muslims" (Kappeler, 2000: 25) as poorly studied ethnic groups and regions of the Russian Empire in the early 1990s. In our opinion, it was an even more difficult matter to study the history of the regions populated predominantly by Russians in the modern sense, but which had obvious specificity in the imperial period (Siberia, territories of Cossack troops). Meanwhile, in 2000 A. Kappeler wrote: "The study of individual regions of the tsarist empire, their polyethnic population and their relations with the imperial centre can be considered as one of the most important areas of international research" (Kappeler, 2000: 29).

It is in such a context that the activities of Cherkas Global University should be considered. This organization emerged in the post-Soviet space, but it gradually acquired an atypical character. As mentioned above, Cherkas Global University was originally founded in Sochi as a society of military history enthusiasts. In a similar form, this society ("Semyonovsky Leib Guard Regiment military historical organization") functioned in 1992–1997 but did not actually conduct scientific work, being engaged in educational and pedagogical activities (Taran, 2021: 1079-1081). Then, from 2006 to 2012 the student research club "Historical Local Studies" functioned at the Sochi State University of Tourism and Recreation (since 2011 – Sochi State University) headed by the organizer of the "Semyonovsky Leib Guard Regiment military historical organization" Doctor of Historical Sciences A.A. Cherkasov (Taran, 2021: 1081). A.A. Cherkasov proposed to create a research institute at Sochi State University, but this was not done due to lack of funding, and the student research club "Historical Local Studies" was closed due to the termination of student enrollment in the relevant program (Taran, 2021: 1081). Thus, we are faced with the specifics of the "division of scientific labour", but no longer Soviet, but Russian, which M. von Hagen wrote about: a small provincial university in the post-Soviet space often simply does not have the resources to implement ambitious research projects.

However, in such a situation, A.A. Cherkasov tried to change this system of division of labour by creating a private research organization "International Network Center for Fundamental and Applied Research" in 2014, which was transformed into Cherkas Global University in 2021 (Taran, 2021: 1081). The original idea of the organization was networked cooperation, i.e. cooperation of geographically dispersed researchers (Tarakanov, Ponomareva, 2019: 985). Thus, Sochi researchers actually tried to solve two problems of the "division of scientific labour" formed in the Soviet period, which were highlighted by M. von Hagen: firstly, a specialized research organization was created on the periphery of the Russian system of science, and, secondly, it was initially aimed at cooperation with representatives of other regions and countries. At the same time, the researchers did not intend to abandon their regional topics, instead actively publishing articles on the history of the regions of the former Russian Empire, rather than the empire as a whole, on the pages of the journal "Bylye Gody", which by this time had entered the most important international citation systems.

"Bylye Gody" as a platform for historians from the regions of the post-Soviet space

It is quite natural that, as a result, "Bylye Gody" became one of the most important journals for historians in southern Russia. It is equally logical that this approach attracted to Cherkas Global University specialists in the history of other historical regions of the Russian Empire besides the Caucasus, particularly Ukraine. Thus, the activities of Cherkas Global University can be seen as one of the responses of post-Soviet historians to the challenge of provincialism and the fact that capitals have traditionally been the centers of historical research. In this respect, it is significant that the Ukrainian scholars of Cherkas Global University are associated with the relatively small town of Sumy, rather than Kyiv, Kharkiv or Odessa (Our-staff).

To illustrate this situation, we considered it possible to turn to the Russian journal indexing system RSCI, as it is the largest in the post-Soviet space. We took data from four post-Soviet journals with a high rating in Scopus: "Vestnik Sankt-Peterburgskogo Universiteta, Istoriya" (Vestnik Sankt-Peterburgskogo...) (a classical university journal); "Ab Imperio" (Ab Imperio)

(the most important journal dealing with imperial and regional topics); "Bylye Gody" (Bylye gody) and "Science Journal of Volgograd State University. History. Area Studies. International Relations" (Vestnik volgogradskogo...) (another historical journal of the South of Russia included in Scopus). The system includes the following data on a comparable number of articles from these journals: "Vestnik Sankt-Peterburgskogo Universiteta, Istoriya" – 2098 articles; "Ab Imperio" – 1550 articles; "Bylye Gody" – 2000 articles; "Vestnik Volgo" – 2000 articles; "Science Journal of Volgograd State University. History. Area Studies. International Relations" – 1662 articles.

However, the affiliation of the authors of the articles differs dramatically. "Vestnik Sankt-Peterburgskogo Universiteta, Istoriya" is predictably absolutely dominated by the scholars of Saint Petersburg State University – 979 publications, while the scholars of Saint Petersburg Institute of History of the Russian Academy of Sciences, who are the second in this indicator, are represented by 40 publications. A similar, although somewhat less pronounced situation in the "Science Journal of Volgograd State University. History. Area Studies. International Relations": 552 publications by the scholars of Volgograd State University, the second place is taken by the staff of Saint Petersburg State University with 67 publications (characteristically, even in the regional edition the second place after the staff of the organization that publishes the journal was taken by authors from one of the scientific capitals of Russia). But in "Ab Imperio" the situation is quite different: the most represented scholars of Kazan (Volga Region) Federal University published total of 44 articles in it, followed by Moscow and St. Petersburg institutions (from 32 publications, the European University in Saint Petersburg, to 17 publications, M.V. Lomonosov Moscow State University) occupying up to the 9th place, except for the fifth place taken by Voronezh State University with 19 publications. Next come the well-known Central European University and the University of Michigan, having 16 and 15 publications respectively. Finally, the "Bylye Gody" also have no obvious disproportion in favour of the graduating institution, but at the same time they give the greatest representation of the periphery of post-Soviet science, primarily South Russian: Cherkas Global University staff with 288 publications is predictably on first place, but then Volgograd State University with 212 publications and Sochi State University with 173 publications, and on the top ten still, besides Moscow and St. Petersburg institutions, are Siberian Federal University with 131 publications, Southern Scientific Center of the Russian Academy of Sciences with 58 publications, and National Research Tomsk State University with 56 publications. Among non-Russian organizations (except for Cherkas Global University itself), the highest ranking is not any American or European university, but Al-Farabi Kazakh National University with 51 publications.

Thus, first of all, the activities of Cherkas Global University allow historians from those regions, which in Soviet times were peripheral to Soviet historical science, to present themselves more actively in the international arena, including publications in journals that are in international databases. At the same time, such opportunities are expanding not only for the scholars of Cherkas Global University but also for provincial historians of the post-Soviet space as a whole. It should be noted that the last issue of the journal "Bylye Gody" presented several works by authors from Kazakhstan on the history of their country (Shaygozova et al., 2023; Shotanova et al., 2023; Uzhkenov et al, 2023), as well as authors from Russian regions on the history of these regions (for example, Siberia (Kovalev et al., 2023; Gryaznukhin et al., 2023), the Urals (Shumkin, Ustinov, 2023), Kalmykia (Tepkeev, Kamandzhaev, 2023), the Cossack Don (Trut, Voskoboynikov, 2023), and the Caucasus (Avdeev et al., 2023).

International cooperation of Cherkas Global University

On the other hand, scholars of Cherkas Global University regularly make publications in journals of different countries and regions. As previously stated, among the cited articles of Cherkas Global University scholars are Slovak, Russian, and Lithuanian journals. We should add to them a number of journals that published articles by Cherkas Global University scholars that were cited 5 times or more: Georgian journal «Bulletin of the Georgian National Academy of Sciences» (most-cited article A.A. Cherkasov, V.I. Menkovsky, V.G. Ivantsov, A.A. Ryabtsev, V.S. Molchanova, O.V. Natolochnaya "The "nobility" and "commoners" in ubykh society: The reasons behind the social conflict" (Cherkasov et al., 2014), 19 citations), Slovenian journal «Annales, Series Historia et Sociologia» (most-cited article A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova «The list of captives from the Turkish vessel belifte as a source of information on the slave trade in the north-western caucasus in the early 19th century» (Cherkasov

et al., 2017a), 17 citations), Moldovan journal «Rusin» (most-cited article T.A. Magsumov «The Jigets: A great history of a small people» (Magsumov, 2016), 16 citations), American journal (published by Cherkas Global University) «International Journal of Media and Information Literacy» (most-cited article A.E. Lebid, N.A. Shevchenko «Cultivating the skills of systems thinking in the context of fostering the basic and professional competencies associated with media education and media literacy» (Lebid, Shevchenko, 2020), 15 citations), Romanian journal «Terra Sebus» (most-cited article T.A. Magsumov «Vocational school and studying youth in the Russian revolution of 1905» (Magsumov, 2018a), 13 citations), Romanian journal «Brukenthal. Acta Musei» (most-cited article A.A. Cherkasov, V.G. Ivantsov, M. Smigel, V.S. Molchanova «The daily life and morals of circassian society: A historical-comparative investigation based on sources from the period between the mid-16th and the first half of the 19th centuries» (Cherkasov et al., 2015a), 12 citations), Turkish «Journal of Social Studies Education Research» (most-cited article T. Aminov, T. Magsumov, R. Sayakhov, V. Yepaneshnikov, I. Nasipov, V. Aitov «Pedagogical potential of muslim religious sources in overcoming physical and mental and psychological trials» (Aminov et al., 2018), 10 citations), Russian «Woman in Russian Society» (most cited article T.A. Magsumov «Gender Re(e)volution of commercial schools in Russia in the early XX century» (Magsumov, 2018b), 9 citations) и Slovak journal «Muzeologia a Kulturne Dedicstvo» (most-cited article – M. Šmigel, A. Cherkasov, M. Kmet «Life and traditions of Caucasian Circassians: Historical-comparative probe of travelogues of European travellers from the beginning of the 16th century to the half of the 19th century» (Šmigel et al., 2017), 5 citations).

Such international cooperation is carried out due to constant contact with universities and research organizations of different countries. At different times Cherkas Global University has signed cooperation agreements with Ivane Javakhishvili Tbilisi State University and Telavi State University (Georgia), Faculty of Philosophy at Matej Bel University (Slovakia), University of Novi Sad (Serbia), Lithuanian Sports University (Lithuania), Southern Scientific Center of the Russian Academy of Sciences (Russian Federation) и KAD International (Ghana) (Cherkasova, 2023: 321). Together with the Centre for Behaviour & Wellness Advocacy, LBG (former KAD International) Cherkas Global University publishes «Journal of Advocacy, Research and Education», which was included in Scopus in 2024 (JARE).

The existence of international ties and the focus on international activities allowed Cherkas Global University to relocate to the USA in 2018 and its publishing house to Slovakia (Cherkasova, 2023: 322-323). Further events in Eastern Europe demonstrated the correctness of such a move and the importance of the independence of the community of historians from the Russian authorities. In 2021, Cherkas Global University even co-organized the Second International Scientific and Methodological Conference "The Values-Based Approach in Education and the Challenges of the European Integration Process" (May 28–29, 2021, Sumy, Ukraine) (Cherkasova, 2023: 325). Thanks to such a policy, scholars from Ukraine continue to work actively among its researchers, despite the initial emergence of the organization in Sochi.

5. Conclusion

Thus, the most important reason for the results achieved by Cherkas Global University was its attempt to move away from the traditional division of scientific labour in the post-Soviet space by giving a voice on the international stage to historians from regions that had previously been peripheral to Soviet historical science, and whose scholars had fewer resources for research and fewer prospects for presenting the results of research on the history of their region to the wider scientific community. Cherkas Global University proposed a networked cooperation of scholars from such regions, focused on international cooperation and not tied to the state, and this form of activity has proven to be viable. It is important to realize that it often does not replace but complements traditional state research and pedagogical institutions, where many Cherkas Global University employees continue to work. At the same time, this form of scientific interaction can be in demand not only in the post-Soviet space and not only among historians, as evidenced by the cooperation between Cherkas Global University and the Centre for Behaviour & Wellness Advocacy, LBG.

At the same time, we believe it is important to emphasize that Cherkas Global University's successes have a downside. To what extent are scientists from peripheral regions able to compete in the long term with scientists from traditional scientific centers? The regional aspect of the history of the Russian Empire should certainly be studied, and historians from the regions should also find

their place in this process, but how are they prepared for constant competition at the global level? In the case of Cherkas Global University, this issue is particularly acute because it was created by historians from the periphery, who still play key roles in this organization. The expansion of Cherkas Global University's geography and subject matter raises other questions. Will Cherkas Global University journals without historical sections be as successful? Will Cherkas Global University be able to continue building networked cooperation in the context of a war that has divided Eastern Europe? Nevertheless, the very fact that we pose such questions shows that the first decade of Cherkas Global University's publishing activity has been a success.

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ELECTRONIC JOURNAL

The Organizational Activity of Cherkas Global University: the Annual International Contest *Slavery in the Past and Present*

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Abstract

This work explores the history of the creation and staging by Cherkas Global University of *Slavery in the Past and Present*, an annual international contest for the best scholarly work among academic/pedagogical workers.

The principal sources for this study are relevant published documents – above all, 'Cherkas Global University (1992–2022): A Collection of Documents', published in 2022 to celebrate the institution's 30th anniversary.

The study's findings revealed that the *Slavery in the Past and Present* contest, aimed at promoting research into slavery, was first held in 2020. The winning works would be published in the open-access thematic journal *Slavery: Theory and Practice*, produced by Cherkas Global University Press. The winners would each receive a cash prize and a diploma. The four annual events held between 2020 and 2023 each selected five winners, with these having represented the following nations: USA, Ghana, Ukraine, Slovakia, Uzbekistan, and Russia. The activities revealed a keen interest in the history of slavery among researchers from around the globe, which suggests optimistic prospects for the future of this contest. On February 14, 2024, the fifth *Slavery in the Past and Present* contest was declared open for entries.

Keywords: Cherkas Global University, annual international contest, *Slavery in the Past and Present*, year 2020.

1. Introduction

Many academic/educational institutions find it important to organize regional, national, and international contests for the best scholarly work on a topic that falls within the area they specialize in. One of such topics with Cherkas Global University is the history of slavery, with the Laboratory for World Civilizations being the unit therein concerned with such research. As a reminder, it is this unit that helped produce the fundamental 851-page collection of documents 'The Circassian

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Slave Narratives', which describes slavery in Circassia in 1792–1861 based on an analysis of 1,200 documents (Cherkasov, 2020: 1415-2266). In 2020, to help increase interest in the history of slavery within the international academic/pedagogical community, Cherkas Global University launched *Slavery in the Past and Present*, an annual international contest for the best scholarly work (Cherkas Global University..., 2022: 164).

2. Materials and methods

The principal sources for this study are relevant published documents – above all, 'Cherkas Global University (1992–2022): A Collection of Documents' (Cherkas Global University..., 2022), published in 2022 to celebrate the institution's 30th anniversary, as well as information letters for the contest published on the organizers' websites.

This being the first attempt at exploring the experience of staging the *Slavery in the Past and Present* contest, use was made of the historical/chronological and source-studies methods. The use of these methods helped conduct an internal criticism of contest documents and bring to light various details regarding the contest's evolution (e.g., dating of major contest events or changes to the prize scheme).

3. Discussion

The historiography on the subject of this study is inseparably linked with the historiography devoted to Cherkas Global University. The first publication specifically focused on this organization came out in 2019 – in conjunction with the fifth anniversary of the International Network Center for Fundamental and Applied Research (Tarakanov, Ponomareva, 2019).

The period 2021–2023 saw the production of a whole host of publications devoted to Cherkas Global University. These include the summarizing work by I.Yu. Cherkasova devoted to the organization's 30th anniversary (Cherkasova, 2022), which does mention the staging of *Slavery in the Past and Present*, the work by K.V. Taran, which examines the history of Cherkas Global University in the period 1992–2014, i.e. before the establishment of the International Network Center (Taran, 2021), and the work by G. Rajović, which treats the newspaper *Vestnik Leib-Gvardii* as a historical source (Rajović, 2021). As a reminder, the above-mentioned newspaper was the first mass medium produced by the university's publishing house. In 2022, A.A. Cherkasova examined the history of the *Vestnik Leib-Gvardii* newspaper as well (Cherkasova, 2022a). At the same time, A.A. Cherkasova has attempted to paint a general picture of the work of the university's sports society – through the example of the Rifle Association (Cherkasova, 2022b) and the Hiking Club (Cherkasova, 2023).

In addition, there is a publication detailing the activity of the P.A. Cherkasov Fundamental Electronic Library over the period 1992–2023 (Cherkasova, 2023a), and there is one focused on the international activity of Cherkas Global University (Cherkasova, 2023b).

As regards the actual topic of this study, pieces about the results of the *Slavery in the Past and Present* contest in 2020–2023 were published in the journal *Slavery: Theory and Practice* (Cherkasov, 2020a; Taran, 2021a; Cherkasov, 2022; Cherkasov, 2023), generating a fair amount of media buzz around it.

4. Results

On July 10, 2020, Cherkas Global University declared the annual international contest *Slavery in the Past and Present* open for entries for the first time. The contest had several organizers: East European Historical Society, International Network Center for Fundamental and Applied Research (Cherkas Global University's predecessor; transformed into Cherkas Global University in 2021), and KAD International (Ghana) (transformed into the Center for Behavior and Wellness Advocacy in 2023) (Cherkas Global University..., 2022: 164). (This same organizer lineup has endured unchanged since the contest was first held in 2020 – as have Russian and English as the contest's working languages.) To provide participating researchers with some support amid the pandemic, a prize purse of $2,250 was set up for the contest (Cherkasova, 2022: 1042). Initially, the prize purse was to be distributed as follows: first place – $1,000, second place – $750, and third place – $500.

The admission of works to the first contest was to end on November 15, 2020, and the judges were to announce the results and the winners as early as November 30 (Cherkas Global University..., 2022: 164).

As of November 15, 2020, applications for the contest had been received from researchers based in five countries: USA, Russia, Slovakia, Ukraine, and Ghana. The contest eventually would have not three prize-winning spots but five – with the prize purse getting distributed among the winners in equal amounts ($450). The best works were published in *Slavery: Theory and Practice*, an open-access journal produced by Cherkas Global University Press (launched in 2016). It also ran a piece about the results of the competition (Cherkasov, 2020a).

The winners of the first contest included the well-known specialists in the history of slavery S.L. Dudarev (Russia), Yu.Yu. Klychnikov (Russia), M. Šmigeľ (Slovakia), and A.Yu. Peretyatko (USA) (Cherkasov, 2020a: 3). Apart from the prize money, all five winners received a diploma.

Satisfied with the way the first *Slavery in the Past and Present* contest went, Cherkas Global University declared on February 14, 2021, the second such contest open for entries, with corresponding information letters posted on the organizers' websites, as well as distributed via a targeted mail-out. Entries for the contest would be accepted until October 15, 2021, with October 23 set as the date for announcement of the results (Cherkas Global University…, 2022: 167). While the prize purse remained the same ($2,250), a change was being contemplated in the manner of distributing the prize money – selecting three best works and awarding the three winners with cash prizes of $1,000, $750, and $500, respectively, as opposed to selecting five best works and distributing the prize purse among the five winners in equal amounts of $450, as was done previously (Cherkas Global University…, 2022: 169).

The second contest featured participants from four countries: Russia, USA, Ghana, and Ukraine. The prize money was once again divided equally among the top five contestants (Taran, 2021a: 66). The winners were S.L. Dudarev (Russia), A.Yu. Peretyatko (USA), A.V. Goncharenko (Ukraine), I.A. rmachkov (Russia), and Ye.V. Kravtsova (Russia) (Taran, 2021a: 66-67). The winning works were published in *Slavery: Theory and Practice*. The tradition of publishing a winning work in that journal would carry on into the future.

On February 17, 2022, Cherkas Global University declared the third *Slavery in the Past and Present* contest open for entries (Cherkas Global University…, 2022: 172). While the deadline for receipt of applications was still the 15th day of the month (October 15), the date for announcement of the results this time was December 2, which had been planned to dovetail with the observance of International Day for the Abolition of Slavery (celebrated since 1949) (Cherkas Global University…, 2022: 172).

As of October 15, 2022, applications for the contest had been received from participants from four countries: USA, Uzbekistan (debut appearance), Ukraine, and Russia. On December 2, 2022, the judges announced the winners: S.L. Dudarev (Russia), A.Yu. Peretyatko (USA), A.V. Goncharenko (Ukraine), F.J. Tadjieva (Uzbekistan), and A.A. Golovlev (Russia) (Cherkasov, 2022: 96). Each of the winners received a cash prize and a diploma.

The fourth *Slavery in the Past and Present* contest was declared open for entries on February 17, 2023. The prize purse remained the same (Cherkasov, 2023: 87). Entries for the contest would, likewise, be accepted until October 15, with the date for announcement of the results being set for December 2, i.e. International Day for the Abolition of Slavery. Applications for the contest were received from participants from five countries: USA, Uzbekistan, Ukraine, Slovakia, and Russia. The winners were F.J. Tadjieva (Uzbekistan), M. Šmigeľ (Slovakia), V.M. Zavhorodnia (Ukraine), S.N. Nikitin (Russia), and A.Ye. Lebid (Ukraine and USA) (Cherkasov, 2023: 87-88). The winning works were published in *Slavery: Theory and Practice*.

In January 2024, the journal *Slavery: Theory and Practice* was accepted to be indexed in EBSCO, which should help boost the recognizability of both the journal itself and works by *Slavery in the Past and Present* contestants published in it.

Lastly, on February 14, 2024, Cherkas Global University declared the fifth *Slavery in the Past and Present* contest open for entries. The organizer lineup and prize money remain the same. Entries for the contest will be accepted until October 14, 2024. (For details, visit the event's official page – https://cherkasgu.net/news/the-5th-international-competition.html.)

5. Conclusion
The annual international contest *Slavery in the Past and Present*, aimed at promoting research into slavery, was first held in 2020. The winning works would be published in the open-access thematic journal *Slavery: Theory and Practice*, produced by Cherkas Global University

Press. The winners would each receive a cash prize and a diploma. The four annual events held between 2020 and 2023 each selected five winners, with these having represented the following nations: USA, Ghana, Ukraine, Slovakia, Uzbekistan, and Russia. The activities revealed a keen interest in the history of slavery among researchers from around the globe, which suggests optimistic prospects for the future of this contest. On February 14, 2024, the fifth *Slavery in the Past and Present* contest was declared open for entries.

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