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The Problems of Contemporary Education

The History of Education

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The Problems of Contemporary Education

Physical Activity of Slovak Adolescents during the "Second Wave" of Covid-19 Pandemic: A Cross-Sectional Study

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Abstract

Introduction: An active participation in physical activity is associated with several elements of successful aging, including psychosocial health and well-being. Not getting enough physical activity and increased psychosocial health problems are observed worldwide especially during the first year of Covid-19 pandemic and for that reason, the present study was aimed at analyzing and comparing physical activity of Slovak adolescents during the second wave of Covid-19 pandemic.

Material and Methods: Standardized measure to estimate the habitual practice of physical activity (IPAQ-SF) was carried out through intentional sampling of 2375 Slovak adolescents (54.56 % of them adolescent girls), aged 17-19 years (mean 18.10 ± 0.60 years), attending the last year of grammar and vocational secondary schools of Slovakia. Basic descriptive statistics, chi-square test (χ^2) and Two -Sample T-Test were used to analyze and compare the data.

Results: During the last seven days, on average, 60.55 % (n = 1438) of Slovak adolescents engaged in high physical activity and 23.60 % (n = 560) of them engaged in moderate physical activity. Low physical activity was reported by 15.85 % (n = 377) of Slovak adolescents and total physical activity, expressed in MET-minutes/week, was significantly ($p < 0.01$) higher among the Slovak adolescent boys (2670 MET) than girls (1795 MET).

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Discussions: Physical activity levels of adolescents worldwide (1.3 billion) are reducing during the Covid-19 pandemic due to lockdown restrictions; however the Slovak adolescents' physical activity levels during the second wave of Covid-19 pandemic are similar to pre-pandemic times.

Keywords: adolescence, Covid-19 pandemic, cross-sectional study, IPAQ-SF, physical activity, Slovakia.

1. Introduction

After only three months of existence (December, 2019), the SARS-CoV-2 virus, responsible for the coronavirus disease (Covid-19), has spread across the globe, and without the exception of Slovakia, caused the global pandemic (Rossi et al., 2021), officially declared on March 11, 2020 by the World Health Organization (Olaimat et al., 2022). When the Covid-19 pandemic has affected all countries in the world with wavering intensity, all levels of government have acted in a context of uncertainty and under heavy economic, fiscal and social pressure. By spring 2020, more than 3.5 billion of the world's population had experienced a "lockdown" with various containment measures, including social distancing policies, closure of schools, shops and leisure opportunities (Stockwell et al., 2021; Strain et al., 2022). Without an exception, Slovakia had adopted some of the strictest precautions in Europa. When these measures were taken in advance to prevent and slow down the spread of Covid-19, they came with negative consequences as individual were only permitted to leave their homes to shop for necessities, medical needs, travel to and from work. Because of being forced to stay at home, an increase of risk of social isolation occurred and created a barrier to engage in physical activity, while at the same time, increased a sedentary time during the lockdown due to more time spent at home (Stockwell et al., 2021; Runacres et al., 2021; Christensen et al., 2022). Engaging in physical activity can be a challenge due to staying at home, however, it is possible and very important to stay active, because of social isolation. Not engaging in physical activity comes with health issues and financial costs (Su et al., 2020; Torres et al., 2022). An adequate physical activity is medically proven to help in preventing and managing noncommunicable diseases (NCDs), including heart disease, stroke, diabetes and several cancers. Existing evidence shows that an adequate physical activity also helps psychosocial and musculoskeletal health (Antunes, Frontini, 2021; de Abreu et al., 2022), and therefore the adequate physical activity is suggested to provide protective alternatives against the Covid-19 (Jacob et al., 2021; Clemente-Suárez et al., 2022).

Social isolation and distancing (quarantine) measures are influencing the habits, in which individuals (adolescents) can engage in physical activity (Chtourou et al., 2020; Dor-Haim et al., 2021; Ghozy et al., 2021) and besides existing evidence shows a significant decrease of engaging in physical activity concurrent with an increase in sedentary time compared to pre-pandemic times (Bertrand et al., 2021; Gilbert et al., 2021; Luciano et al., 2021; Petersen et al., 2021; Stockwell et al., 2021; Ullah et al., 2021; Christensen et al., 2022; Dallolio et al., 2022; Elvén et al., 2022; Strain et al., 2022). Physical activity has been more important than ever during the global pandemic of Covid-19, however not engaging in physical activity is a global health problem and has been considered a global pandemic since 2012 (Kohl et al., 2012; Haseler, Haseler, 2022) and it is estimated that 1 in 3 adults and 3 in 4 adolescents worldwide did not meet the guidelines on physical activity before the Covid-19 pandemic and besides that 28 % of the world population remained physically inactive (Guthold et al., 2020). If the world's population physical activity levels continue to stagnate, even decrease during the Covid-19 pandemic, it will be a great challenge for the national agencies.

School physical education provides a context for regular physical and structured physical activity participation (Uddin et al., 2020) and for school-age children who do not engage in sports and are not engaging in any leisure-time physical activity, school physical education may play an important role in keeping them active (Bendíková, Nemček, 2017; Wiseman, Wier, 2017), however the global pandemic of Covid-19 has caused a global shutdown of school for months for more than 1 billion of school-age children (Hammerstein et al., 2021; Roe et al., 2021). And another existing evidence shows that 92 % of school-age children worldwide in more than 188 countries have been affected by shutdown of schools, the teaching process has continues through a distance learning (Korcz et al., 2021; Roe et al., 2021). Physical education teachers directed educational activities remotely via digital devices, including Skype, Google Meet and Microsoft Teams, however there was a significant uncertainty around the distance learning of physical education during the social

isolation and social distancing (Mercier et al., 2021; Blain et al., 2022). Distance learning of physical education was provided by sharing pictures and video recordings and live broadcasting of exercise instructions, while physical education teachers were in person responsible for creating of contents and design of online physical education lessons. Distance learning of physical education during a shutdown of schools has been affected by various factors, including limited space, family atmosphere and inadequate equipment (Escomes et al., 2021). During the second wave of global pandemic (Covid-19), many countries were more hesitant to shut down schools, which was not the case of Slovakia and situation associated with the distance learning of physical education was repeating.

Specific population group, which is affected hard by strong restrictive measures is adolescence (1.3 billion – 16 % of world' population). Adolescence represents a unique stage of human development and an important time for laying foundations of good health. Adolescents' health is a very strong predictor of adults' health (Singh et al., 2020). Adolescence represents a crucial period of human development because of hormonal changes, other interests arise in form of restriction of engaging in physical activity, and therefore adolescence represents an important stage in life for improving attitudes towards physical activity habits (Sember et al., 2020). Because many gaps remain in the literature, in terms of Slovak scale, the present cross-sectional study was aimed at analyzing and comparing physical activity of Slovak adolescents during the second wave of Covid-19 pandemic.

2. Materials and methods

Procedure Sample and Participant Selection

In accordance with the study aim, the present cross-sectional study involved 2375 Slovak adolescents (54.56 % of them adolescent girls, n = 1296), aged 17-19 years (mean 18.10 ± .60 years), attending the last year of grammar and vocational secondary schools of Slovakia. Slovak adolescents – target population (n = 2375) consisted of a convenience sample, recruited through various available sources, including Facebook (Meta) and Instagram (Kühne, Zindel, 2020; Purewal et al., 2021). Recruitment process was adjusted regularly (every 2 weeks) during the second wave (August, 2020 – March, 2021) of Covid-19 pandemic and aiming for an intentional sampling, regarding age, gender and year of study. 2375 correctly filled-in debriefing questionnaire forms of *International Physical Activity Questionnaire – Short Form (IPAQ-SF)* were included in the cross-sectional study interpretation process, however 0.42 % (n = 10) of debriefing questionnaire forms did not meet the inclusion criteria: (i) the target population should not have health issues (e.g., being sick (ill) for a long time and medical exempt from physical education); (ii) the target population should attend the last year of grammar and vocational secondary schools with official language in Slovakia. After meeting the inclusion criteria, the study group consisted of 2375 Slovak adolescents (n = 2375), divided into adolescent boys (body height 180.67 ± 9.2 cm, body weight 75.19 ± 13.23 kg and body mass index 22.98 ± 1.05) and adolescent girls (body height 167.14 ± 6.52 cm, body weight 59.30 ± 9.28 kg and body mass index 21.12 ± 0.85).

Assessments and Measures

A single-measure descriptive cross-sectional study was carried out and in order to determine physical activity levels among Slovak adolescents, a research instrument of standardized questionnaire *(IPAQ-SF)* was used. A standardized measure assesses the types of intensity of physical activity and sitting time that a target population (15 years of age and older) do as part of their daily lives are considered to estimate total physical activity in MET-min/week and time spent sitting (Masala et al., 2018; Tran et al., 2018; Lavelle et al., 2020). Metabolic equivalent of task (MET) is used to estimate an energy expenditure as reflected by oxygen consumption (metabolic cost) of physical activity – resting metabolic rate (Ács et al., 2020; Meh et al., 2022). All study data of physical activity was converted (MET-minutes/week) and multiplied the number of exercise minutes per day by number of exercise days per week by exercise intensity coefficient – MET: (i) vigorous physical activity – 8 MET; (ii) moderate physical activity – 4 MET; (iii) walking physical activity – 3.3 MET. 1 MET is equivalent to approximately 3.4 ml oxygen kg – 1 body weight/minute – 1. Standardized questionnaire of *IPAQ-SF* was scored according to already established methods, obtained at online available *website of IPAQ-SF* (www.ipaq.ki.se). According to established methods, the study group (n = 2375) was categorized into 3 groups, in terms of following criteria: (i) *High physical activity* – when total energy expenditure exceeds 1500 MET-

minutes/week, 3 or more days of vigorous physical activity of approximately 30 minutes/day, or almost every day of 30 minutes of moderate physical activity and walking (≥ 3000 MET-min/week); (ii) *Moderate physical activity* – when total energy expenditure ranges from 600 to 1500 MET-minutes/week, 3 or more days of intense physical activity of approximately 20 minutes, 5 and more days of moderate physical activity of approximately 30 minutes or combination of vigorous and moderate physical activity and walking (≥ 600 MET-min/week); *Low physical activity* – when total energy expenditure does not reach 600 MET-minutes/week.

IPAQ-SF is a dimension-based instrument, structured to capture physical activity in 4 generic dimensions, including vigorous and moderate physical activity, walking and sitting. *IPAQ-SF* was used purposely and consisted of 2 sections: (i) demographic information (basic) (age, gender, year of study, type of school and somatometry); (ii) open-ended questions surrounding Slovak adolescents' last 7 days of physical activity, concerned with (ii-i) physical activity associated with an occupation performed or at school; (ii-ii) physical activity at a home and around a house; (ii-iii) moving to different places and mobility during leisure time.

Procedures

A single-measure descriptive cross-sectional study was carried out. During the unlimited time of single session the study group (n = 2375) inscribed the standardized (online) questionnaire *(IPAQ-SF)*, which was available from August, 2020 to March, 2021 (the second wave of Covid-19 pandemic in Slovakia). Online feedback achieved from the unlimited time of single session did not indicate any potential issues with the cross-sectional design (technical) and *IPAQ-SF* (language). In case of not being full-age Slovak adolescent (boy/ girl), the debriefing questionnaire forms of *IPAQ-SF* were distributed (face-to-face) by authors after meeting the parental consent requirements in official language in Slovakia. Debriefing questionnaire forms of *IPAQ-SF* were not detecting personal information about the identity of study group (n = 2375). Incentives were not given for active participation (voluntary), however the study group (n = 2375) received the report with their personal results afterwards. Online version of *IPAQ-SF* was selected because of cost effectiveness, time saving, easy accessibility and constantly changing situation associated with the second wave of Covid-19 pandemic. Online creation and distribution was carried out by free online portal – Microsoft Forms, Office 365 (Microsoft Corp., Redmond, WA, USA).

Data Processing

All study data collected through correctly filled-in debriefing questionnaire forms of *IPAQ-SF* was tabulated (figure) in database designed precisely for cross-sectional design (study). In terms of incidence of responses, each item of study group (n = 2375) was analyzed, compared and evaluated by using the program of Tap3 – Gamo (Banská Bystrica, Slovakia). All study data of study group (n = 2375) was polled after cleaning, analyzed and compared by using the basic descriptive statistics, including median ($\tilde{x}$), multiplicity (n), arithmetic mean ($\bar{x}$) and percentage frequency analysis (%). Statistical differences between the Slovak adolescent boys (45.44 %, n = 1079) and girls (54.56 %, n = 1296) was evaluated by methods of inductive statistics, including chi-square test (χ^2) and Two-Sample T-Test Assuming Unequal Variances, of which the significance level (α) was .01 and .05 (McHugh, 2013).

When evaluating (summary) the physical activity (high level of physical activity, moderate level of physical activity and low level of physical activity), and in terms of adolescent boys and girls (Figure 1), we used the chi-square test (χ^2), of which the significance level (α) was 0.01 and 0.05. When evaluating median values and physical activity levels, in terms of adolescent boys and girls; MET-min/week (Figure 2), average time of physical activity/ day (Figure 3), number of days of physical activity (Figure 4), we used the homogeneity test of two-sample t-test assuming unequal variances, of which the significance level (α) was 0.01 and 0.05.

3. Results

In accordance with the study aim, Figure 1 illustrates the physical activity levels of Slovak adolescents (boys and girls) during the second wave of Covid-19 pandemic, expressed in Metabolic equivalent of task (MET-minutes/week) using the standardized *IPAQ-SF* questionnaire data (%). During the last seven days, on average 60.55 % (n = 1438) of Slovak adolescents exhibited high

physical activity levels and 23.60 % (n = 560) of them exhibited moderate physical activity levels. 15.85 % (n = 377) of Slovak adolescents exhibited low physical activity levels.

Deeper analysis of physical activity levels (Figure 1) showed increasingly larger number of Slovak adolescent boys who exhibited high physical activity levels (65.25 %, n = 704), compared to adolescent girls (55.86 %, n = 723) and another analysis showed decreasing lower number of adolescent boys who exhibited low physical activity levels (11.02 %, n = 119), compared to adolescent girls (20.68 %, n = 268). According to these results, the Slovak adolescent boys were more physically active than adolescent girls. Moderate physical activity levels revealed almost the same percentage values among the Slovak adolescent boys (23.73 %, n = 256) and girls (23.46 %, n = 304).

Taking into account the physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic, expressed in MET-min/week and using the *IPAQ-SF*, the intergroup difference of Slovak adolescents (n = 2375) revealed the statistical significance (p < 0.01).

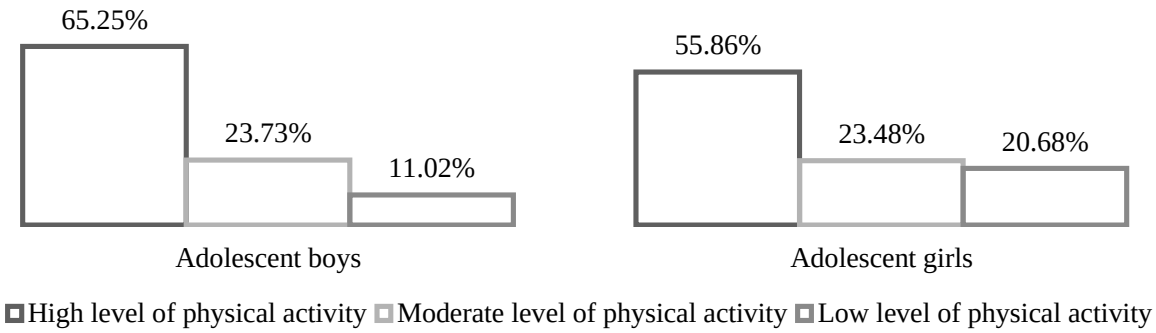

Fig. 1. Physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic, expressed in MET-min/week and using the IPAQ-SF (%)
Notes: ** – Statistical significance at the p < 0.01 level ($\chi^2_{(2)} = 42.29$; p = 6.567 E-10)

Physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic, expressed in MET-min/week illustrates Figure 2. Continuous indicator, expresses as median for physical activity/week by Slovak adolescent boys (n = 1079) was on level of 2670 MET-min/week, which was increasingly larger number (+ 875 MET-min/week), compared to adolescent girls (1795 MET-min/week). Taking into account the median value (total) (walking, moderate and vigorous –intensity activity), expressed in MET-min/week of Slovak adolescents during the second wave of Covid -19 pandemic, the intergroup difference of Slovak adolescents (n = 2375) revealed the statistical significance (p < 0.01).

Deeper analysis of physical activity levels (Figure 2) proved increasingly larger number of Slovak adolescent boys who exhibited vigorous-intensity activity (960 MET-min/week), moderate-intensity activity (480 MET-min/week) and walking (594 MET -min/week), compared to adolescent girls (vigorous-intensity activity – 720 MET-min/week, moderate-intensity activity – 320 MET-min/week and walking – 495 MET-min/week). Median values difference of Slovak adolescent boys and girls was ranging from 99 (walking) to 240 MET-min/week (vigorous-intensity activity). Taking into account the median values (individual) (walking, moderate and vigorous-intensity activity), expressed in MET-min/week of Slovak adolescents during the second wave of Covid-19 pandemic, the intergroup difference of Slovak adolescents (n = 2375) revealed the statistical significance (p < 0.01).

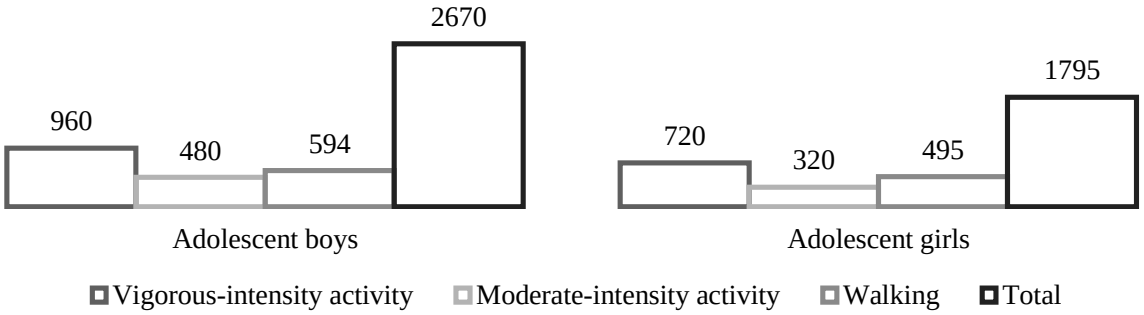

Fig. 2. Physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic, expressed in MET-min/week
Notes: ** – Statistical significance at the $p < 0.01$ level (Vigorous-intensity activity – **; $p < 0.01$; $p = 2.50$ E-22; Moderate-intensity activity – **; $p < 0.01$; $p = 2.07$ E-15; Walking – **; $p < 0.01$; $p = 3.54$ E-10; Total – **; $p < 0.01$ $p = 2.81$ E-32)

Median values in relation to time (min/day) spent in different physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic illustrates Figure 3. Comprehensive analysis of median values in relation to time spent in different physical activity levels proved increasingly larger number of Slovak adolescent boys who exhibited vigorous-intensity activity ($\tilde{x}$ = 60 min/day), moderate-intensity activity ($\tilde{x}$ = 60 min/day) and walking ($\tilde{x}$ = 60 min/day), compared to adolescent girls ($\tilde{x}$ = 30 min/day – vigorous-intensity activity, $\tilde{x}$ = 30 min/day – moderate-intensity activity and $\tilde{x}$ = 45 min/day – walking). Taking into account the median values (walking, moderate and vigorous-intensity activity) expressed in min/day of Slovak adolescents during the second wave of Covid-19 pandemic, the intergroup difference of Slovak adolescents (n = 2375) revealed the statistical significance ($p < 0.01$).

Deeper analysis of sitting position (Figure 3) revealed an increased incidence of sedentary behaviors because the median value of Slovak adolescent boys (n = 1079) was on level of 300 min/day, which was comparatively lower number (– 50 min/day), compared to adolescent girls ($\tilde{x}$ = 350 min/day). Taking into account the median values in relation to time (sitting position), expressed in min/day of Slovak adolescents during the second wave of Covid-19 pandemic the intergroup difference of Slovak adolescents (n = 2375) did not reveal the statistical significance ($p > 0.05$).

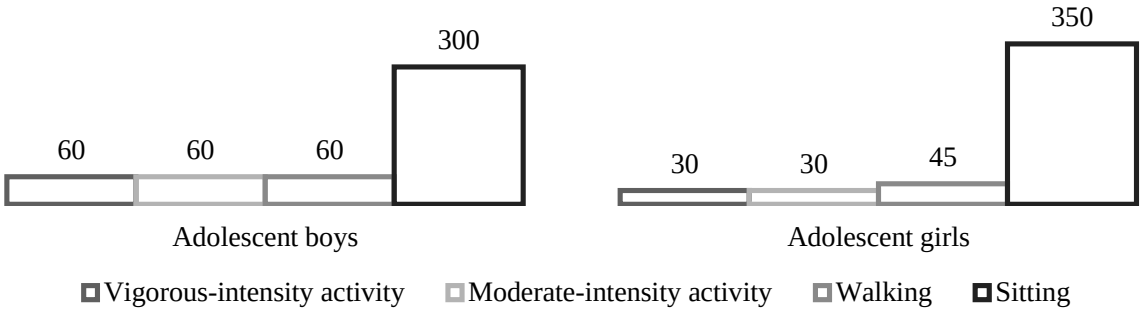

Fig. 3. Median values in relation to time (min/day) spent in different physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic
Notes: ** – Statistical significance at the $p < 0.01$ level (Vigorous-intensity activity – **; $p < 0.01$; $p = 9.29$ E-26; Moderate-intensity activity – **; $p < 0.01$; $p = 7.81$ E-20; Walking – **; $p < 0.01$; $p = 5.22$ E-05; Total – **; $p > 0.05$ $p = 0.22$)

Median values in relation to time (day/week) spent in different physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic illustrates Figure 4. Comprehensive analysis of median values in relation to time spent in different physical activity levels proved increasingly larger number of Slovak adolescent boys who exhibited vigorous-

intensity activity 3 days/week (60 min/day; $\tilde{x}$), compared to adolescent girls (3 days/week; 30 min/day; $\tilde{x}$). Median values in relation to time spent in walking and moderate-intensity activity reached the same values, equally among the Slovak adolescent boys and girls ($\tilde{x}$ = 2 days/week of moderate-intensity activity and $\tilde{x}$ = 4 days/week of walking). Despite that median values in relation to time, expressed in min/day, of walking and moderate-intensity activity of Slovak adolescent boys and girls was not equal, ranging from 15 min/day of walking to 30 min/day of moderate-intensity activity, in favor of Slovak adolescent boys. Taking into account the median values (walking, moderate and vigorous-intensity activity), expressed in day/week, of Slovak adolescents during the second wave of Covid-19 pandemic, the intergroup difference of Slovak adolescents (n = 2375) revealed the statistical significance ($p < 0.01$).

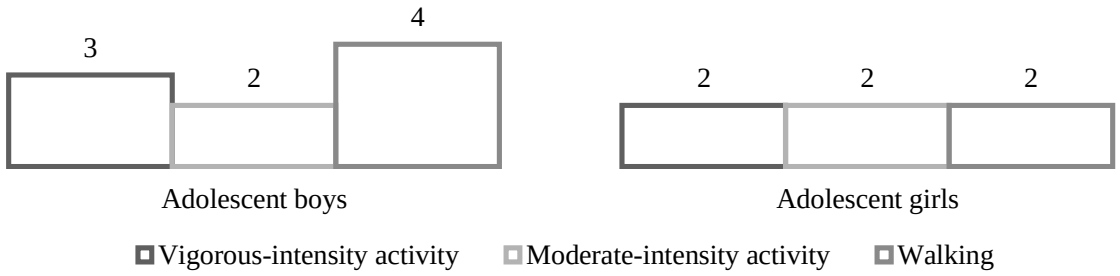

Fig. 4. Median values in relation to time (day/week) spent in different physical activity levels of Slovak adolescents during the second wave of Covid-19 pandemic
Notes: ** – Statistical significance at the $p < 0.01$ level (Vigorous-intensity activity – **; $p < 0.01$; $p = 8.96$ E-11; Moderate-intensity activity – **; $p < 0.01$; $p = 1.17$ E-09; Walking – **; $p < 0.01$; $p = 8.05$ E-04)

4. Discussion

When it comes to determining the physical activity levels of adolescents before and during the Covid-19 pandemic, the level of incidence is relatively strong, with an amazingly high number of carried out studies (see 1. Introduction). Existing evidence shows that globally, physical activity levels of adolescents have reduced during the Covid-19 pandemic because of various lockdown restrictions (Ferrante et al., 2021; Grimes et al., 2022; Kovacs et al., 2022), however different degrees of lockdowns in different countries, even regions within a country, across different dates and waves occurred, which is making it challenging to objectively evaluate it (Stockwell et al., 2021). Since the Covid-19 pandemic and various lockdown restrictions have caused closure of schools (e.g. physical education) and not engaging in organized sports, one would have expected lower levels of physical activity among the Slovak adolescents, however their physical activity levels have been comparable to pre-pandemic times. If an increase (slight) of physical activity levels has been determined, it occurred via engaging in outdoor play and unstructured activities (Lafave et al., 2021; Pelletier et al., 2021). Adolescents constitute one of the most vulnerable groups under the Covid-19 pandemic confinement measures in Slovakia. When compared with pre-pandemic physical activity levels of adolescents as reported by several authors (Kayapinar, 2012; Bergier et al., 2014; Bednarek et al., 2016; Nikolić et al., 2020), the Slovak adolescents exhibited similar levels of physical activity. During the last seven days, on average 60.55 % (n = 1438) of Slovak Adolescents exhibited high physical activity levels and 23.60 % (n = 560) of them exhibited moderate physical activity levels, which was not anticipated due to lockdown restrictions during the second wave of Covid-19 pandemic. Before the Covid-19 pandemic, comparable study carried out in Poland revealed that 35.55 % of adolescents (48.77 % of male and 31.35 % of female) exhibited high physical activity levels (Bergier et al., 2012). After a short time, the same author repeated the study and revealed that 71.98 % of Polish adolescents (76.18 % of male and 67.77 % of female) exhibited high physical activity levels (Bergier et al., 2014). Only 18.9 % of Serbian adolescents exhibited high physical activity levels (Nikolić et al., 2020). Strong restrictive measures to avoid the Covid-19 pandemic have negatively affected various life domains among the

adolescents worldwide and lowered their physical activity levels; in particular, 35.5 % of Nigerian adolescents (43.6 % of male and 21.2 % of female) exhibited high physical activity levels, which was lower by 25.05 %, compared to the Slovak adolescents (Ugwueze, Agbaje, 2022). An expected difference of 11.13 % of high physical activity levels was documented among the Italian adolescents before (41.76 %) and during (30.63 %) the Covid-19 pandemic (Maugeri et al., 2020).

Total physical activity, expressed in MET-min/week, of Slovak adolescent boys was 2670 MET-min/week, which was significantly larger number (+ 875 MET-min/week), compared to adolescent girls (1795 MET-min/week) ($p < 0.01$). Before the Covid-19 pandemic, total physical activity of Ukrainian adolescents was 3560 MET-min/week, while the Lithuanian adolescents' total physical activity was close to 5000 MET-min/week (Bergier et al., 2012, 2014). During the Covid-19 pandemic, total physical activity of Chinese adolescents was lower (1193.02 MET-min/week) than before the Covid-19 pandemic (Zhang et al., 2020). Similar tendency of lower total physical activity was documented among the Italian adolescents (1730 MET-min/week) (Tornaghi et al., 2020). 3 in 4 adolescents worldwide did not the guidelines on physical activity before the Covid-19 pandemic (Guthold et al., 2020). In 2020, the World Health Organization (WHO) guidelines and recommendations provided details for different age and population groups on how much physical activity is needed for good health. For substantial health benefits, the Slovak adolescents aged 17-19 years (mean 18.10 ± .60), should do at least: (i) 150-300 minutes of moderate-intensity aerobic activity; (ii) 75-150 minutes of vigorous-intensity aerobic activity; (iii) an equivalent combination of moderate- and vigorous-intensity aerobic activity/week. 65.25 % ($n = 704$) of Slovak adolescent boys reached the minimum of 75 minutes of vigorous-intensity aerobic activity throughout the week (3 days/week of 60 min/day; χ^2), while the adolescent girls did not reach the guidelines on physical activity. When compared with the Serbian adolescents (Nikolić et al., 2020), the majority of them reached the level of at least 30 minutes of moderate-intensity aerobic activity/5 days of week. On average, 94 % of Polish adolescents (96 % of male and 92 % of female) and 40 % of Turkish adolescents (79 % of male and 28 % of female) reached, even exceeded the minimum of 75 minutes of vigorous-intensity aerobic activity/week (Bednarek et al., 2016).

Our study revealed the gender difference, in which the Slovak adolescent boys were significantly more physically active than adolescent girls ($p < 0.01$), and that's in accordance with many previous studies (Mayo et al., 2020; Cowley et al., 2021; Pate et al., 2022; Ricardo et al., 2022). For more complete insight into the pattern of physical activity, it is required to separately analyze each physical activity domain. According to study results, among the Slovak adolescent girls dominated physical activity related with walking, while among the adolescent boys vigorous-intensity activity dominated. Several authors reported similar findings (Bergier et al., 2014; Bednarek et al., 2016; Maugeri et al., 2020; Nikolić et al., 2020; Zhang et al., 2020).

An insufficient level of physical activity recorded among the Slovak adolescents especially among the adolescent girls, suggests that it is necessary to pay attention to this specific population group, which was affected hard by strong restrictive measures during the second wave of Covid-19 pandemic. Therefore, there is an urgent need for national and global action aimed at increasing levels of physical activity; in particular with focus on adolescent girls.

5. Conclusion

Covid-19 pandemic, officially declared on March 11, 2020 by the World Health Organization (Rossi et al., 2021; Olaimat et al., 2020), has affected all countries in the world, including Slovakia, with wavering intensity, which was most noticeable within introducing a broad range of measures to limit physical contacts to prevent and slow down the Covid-19 pandemic. In accordance with the United Nations Report (2020), the Covid-19 pandemic has affected education systems worldwide (Tadesse, Muluye, 2020; Pokhrel, Chhetri, 2021) and caused the largest disruption to schooling in history. Despite of having administered one of the longest school closures globally, schooling in Slovakia was not adequately prepared for long-term teaching through remote access, which brought fundamental problems, including physical education. School physical education provides a context for regular and structured physical activity participation (Uddin et al., 2020) and represents the only opportunity of engaging in physical activity (Bali, 2016; Reif et al., 2021). According to results of present study, during the second wave of Covid-19 pandemic, on average, 60.55 % ($n = 1438$) of Slovak adolescents ($n = 2375$) engaged in high physical activity, with

increasingly larger number of Slovak adolescents boys (65.25 %, n = 704), compared to adolescent girls (55.86 %, n = 723), which we consider as a positive finding, however the *IPAQ-SF* overestimate physical activity levels to a greater extent (from 36 % to 173 %), compared to existing physical activity questionnaires (Lee et al., 2011; Roberts-Lewis et al., 2021), and therefore the absolute physical activity levels must be interpreted with a caution (Grimm et al., 2012; Wanner et al., 2016). When evaluating the absolute physical activity (median values), expressed in MET-min/week, median value ($\tilde{x}$) of absolute physical activity among the Slovak adolescent boys (n = 1079) was on level of 2670 MET-min/week, which was increasingly larger number (+ 875 MET-min/week), compared to adolescent girls (1795 MET-min/week) and revealed the statistical significance ($p < 0.01$), in terms of comparing the intergroup difference of Slovak adolescents (n = 2375) and their median values of walking, moderate and vigorous-intensity activity. Results of present study revealed the significant difference ($p < 0.01$), in terms of time (min/day and day/ week) spent in walking, moderate and vigorous-intensity activity and sitting position, within which the Slovak adolescent girls exhibited the increased levels of physical inactivity, compared to adolescent boys. During the last seven days, on average, 40 min/2x/week of Slovak adolescents (n = 2375) exhibited the vigorous-intensity activity, 50 min/2x/week of moderate-intensity activity, 55 min/3x/week of walking and sitting position of 330 min/day ($\tilde{x}$). Leading a sedentary lifestyle is becoming a major public health issue. An increased sedentary behavior of adolescents worldwide contributes to obesity and overweight and affects the "*social gradient of health*". In terms of regular engaging in physical activity, it is very necessary to pay a great attention to such a unique stage of human development and regularly identify their needs and attitudes in the current rapidly changing world.

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7. Conflict of interest

The authors report no conflict of interest.

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Relationship Between Classroom Management Strategy Focused on Student External Behaviour and Student Achievement in Low SES Schools: What Can Teachers Do?

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Abstract

Various international studies record a significant difference between the achievements of students from different socioeconomic status (SES), so it is necessary to look for measures that help create favorable conditions for higher achievements of all students, regardless of their socioeconomic background. The purpose of this study is to clarify the relationship between classroom management strategies focused on student external behaviour and student achievement in low SES schools, and what the teacher's work guidelines could be. The analysis of the learning data of four Lithuanian schools with an unfavourable SES context shows that the progress of students in subjects of mathematics and biology is not related to the teacher's praise, although such an intervention tool can be used if it is characterized by individual attention and care. It was also found that as the number of remarks sent by the mathematics teacher to the student and/or parents increases, the probability of getting a lower math grade increases, meaning that remarks are not effective for higher student achievement. We dare say that in order to create a favourable learning environment for students from low SES, teachers must first try to avoid classroom management problems (that is, student misbehaviour) by building good relationships with students, choosing an appropriate teaching strategy, adopting a growth mindset, and reducing working memory demands for the students who have these difficulties. Also, teachers must react appropriately when there are problems with students' behaviour. Interpersonal communication with students, individual attention to their needs are extremely important ways for teachers who work in schools with unfavourable SES contexts.

Keywords: classroom management, student external behaviour, student achievement, low SES schools, remark, praise.

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1. Introduction

Inequality in education is one of the main topics of educational research looking for answers to whether all students are provided with the right conditions for their higher achievements. There is a noticeable increase in the high- and low- socioeconomic environment (hereinafter – SES) students achievement gap for both mathematics and science between 2003 and 2015 (Broer et al, 2019) and 2019 the tendency of the research results remains the same. The socioeconomic status (SES) of students and their families has long been associated with the success at school (Hair et al., 2015; Lawsona, Farah, 2017). Research findings show that achievement gaps begin to emerge at an early age (Cloney et al., 2016), and that children from low SES families receive lower grades, perform worse on achievement tests, and achieve lower educational attainment on average than their peers from high SES families (Albert et al., 2020).

According to researchers (Jotterand, 2018; Lipina, Evers, 2017), there is a large list of protective and risk factors associated with the future cognitive, emotional and social achievements of children from low SES and based on developmental psychology and cognitive neuroscience research. These factors are of a very diverse nature, including individual factors of the mother (prenatal maternal health, mental health of parents), individual factors of the child (perinatal health, development disorders), family-level factors (quality of early attachment, level of stress at home, quality of parenting, early cognitive and learning stimulation at home, financial stressors on the family, lack of social mobility, family expectations about child development) and even systemic factors (access to health and social services, social and political stress). In the case of our study, it is important to identify factors that can be associated with the school level. The aforementioned researchers (Jotterand, 2018; Lipina Evers, 2017) indicate the level of stress in school, mental health of teachers, early cognitive and learning stimulation at educational contexts and social and cultural expectations about child development as protective or risk factors for low achievement of students from low SES.

Agirdag (2018) argues that the culture of learning in schools is indeed related to the SES composition of students. In other words, teachers' beliefs are related to the social and economic context of the school in which they work. It appears that teachers tend to believe more that their students are more teachable when they teach students from high SES than from low SES. According to this scientist (Agirdag, 2018), such research results are worrying because there are no objective reasons why students in a school where more socioeconomically disadvantaged children should be regarded as less teachable. Other researchers (Timmermans et al., 2016) point out that students from low SES schools may have different work habits and this affects teachers' beliefs and expectations. Teachers have higher expectations of students if they are self-confident and have good working (learning) habits.

Students' learning habits are very closely related to classroom management strategies as well. Effective classroom management involves ensuring active learning time for students by setting classroom rules and responding to students' misbehaviour accordingly. Many studies show that classroom management is one of the most significant factors influencing students' achievement (Müllera et al., 2018). Students' talking during lessons, throwing things or walking around the classroom at inappropriate times disrupts the learning process and are associated with low achievement or behaviour problems (Blank, Shavit, 2016; Le Blanc et al., 2007; Little, 2005). According to Wubells (2011), theoretically we can see six different approaches to classroom management: focused on external behaviour control, internal control, classroom ecology, discourse, curriculum and interpersonal relations. In this study, we focus on the control of the student's external behaviour, so now we will briefly present these main theoretical aspects.

The behavioral approach is perhaps the oldest research-based approach to classroom management (Landrum, Kauffmann, 2006). This theoretical approach can be linked to behaviourist principles of learning, where it is believed that positive reinforcement through the application of a stimulus (or reward) following a desired behaviour will reinforce the desired behaviour of the student. For example, teachers give praise to children when they behave well or complete certain tasks. Also, teachers, guided by this theory, can remove the (usually negatively experienced) stimulus in exchange for the desired behaviour of the student (do not assign homework if students complete assignments on time in class), ignore inappropriate student's behaviour, or apply certain punishment measures (recognizing that this is an extreme measure). According to

Brophy (2006), today teachers usually choose ways to increase desirable and decrease undesirable behaviour, that is, they apply certain credit systems, modeling, clear rules, praise and approval.

There is no unanimity in academic discourse regarding praise as an effective classroom management tool. On the one hand, Moore and co-authors (Moore et al., 2019) point out that there is currently insufficient evidence to classify teacher praise as an evidence-based practice, as no clear patterns have been identified as to when and why teacher praise can be effective. On the other hand, these researchers note that a meta-analysis of classroom management studies found that teacher praise was effective in nearly 70 percent of the 32 cases summarized in this review, and the average effect size suggests that teacher praise is an effective intervention. It turns out that teacher praise in certain cases is an effective measure and can increase appropriate student behaviour and engagement in the task (Haydon et al, 2020). Also, researchers (Caldarella et al., 2021) note that during adolescence, intervention measures (praise or remarks) in schools can be unsuccessful and due to the fact that they do not correspond to the increasing adolescents' desire to be respected, that is, to receive not public but rather individual, private encouragement.

When discussing separate groups of students, special attention is paid to the students with behavioural and emotional disorders, as their behaviour in the classroom usually presents challenges for teachers. Downs et al. (2019) study shows that students at risk of behavioural and emotional disorders are more sensitive to teacher praise or remarks than their peers. It has been observed that these students (with behavioral and emotional disorders) typically receive two to four times more remarks than praise (Haydon et al., 2020), even though remarks are ineffective (Caldarella et al., 2020). It appears that a 9:1 ratio of praise to remarks is needed to achieve similar levels of engagement in learning between students with behavioural and emotional disorders and their typical peers (Caldarella et al., 2019).

Summarizing the above mentioned arguments, it can be seen that the student-oriented classroom management strategy is not unambiguous and can be seen as controversial. However, Moore and co-authors (Moore et al., 2019) state that methodologically sound studies have not identified cases of negative effects of praise. Such research findings suggest that teachers can use praise as an easy-to-implement strategy for addressing student learning and behaviour problems in the classroom and recognizing that praise alone cannot be limited as a classroom management strategy. Thus, the problematic scientific question is whether there is a link between a relationship between classroom management strategies focused on student external behaviour and student achievement? This present study addresses this question and, based on data analytics, examines the relationship between classroom management strategies focused on student external behaviour and student achievement in low SES schools.

2. Methodology

The object of the study is the relationship between classroom management strategies and student achievement in low SES schools. In this study, the classroom management strategy focused on the student's external behaviour is operationalized as text messages written by the teacher, that is, praises and remarks on the student's learning or behaviour, and student progress is operationalized as the arithmetic mean of all grades obtained by the student in subjects of mathematics and biology. The subjects of mathematics and biology are chosen as disciplines of exact sciences that encourage the development of students' critical thinking and problem-solving skills.

Research ethics. The basic principles of research ethics were followed during the study. The researcher has already received depersonalized data from the electronic diary, that is, no individual data of a person (teacher, student or parent), i.e. names, surnames or other identifiers indicating the specific identity of a person were not provided to her. Prior to the study, unique numbers for each teacher, student, or parent were randomly generated in the database to identify the data.

The survey sample. Four secondary education schools were selected in three districts of Lithuania. Schools in these municipalities are classified as schools whose SES context is not very favourable. These are small schools, where about 40 % of students are from low-income households, receiving social support (free school meals). The selected students for the study where those who had grades in subjects of mathematics and biology in 2020–2021 (students who were in the system but did not receive grades were not included in the analysis). Thus, a total of

320 students in grades 7 to 10 were selected for the study in 4 schools. The distribution of students by school classes is presented in Table 1.

Table 1. The distribution of students by classes

Students' class	7	8	9	10
Number of students	90	97	70	63

The sample of research data. The information system of the electronic diaries of the 4 educational institutions selected for the study is managed by "ManoDienynas", therefore, based on this system, data covering the records of the 2020–2021 academic year of grades 7-10 was formed. The total amount of data is 548697 rows. Text messages written by mathematics and biology teachers to the students or their parents were also included in the data analysis. The message base included letters (only the subject of the letter is displayed), remarks/praises (the full text of the message is displayed, limited to 100 characters). In the data, information was provided in Lithuanian, a total of 6167 text messages.

Data analysis methods. In order to reveal the correlations of the classroom management strategy focused on the student's external behaviour with the students' progress in mathematics and biology, a simple (arithmetic) grade point average was calculated, including the assessments of class work, homework, project work, independent study and project work. The algorithm for setting the tone of text messages (compliments and remarks) was compiled in the following sequence:

1. The rows in the database were marked as text messages, and rows that were empty or did not match the research objective were filtered and removed (e.g., if the rows in the database provided did not contain text, the information was not related to the subject of the study, an email was provided but did not specify the subject of the email).

2. The compiled array of test messages is divided according to the words and phrases used by the teachers in a certain tone of the message:

- neutral (e.g. "control work", "distance learning", "free meals", "regarding wearing masks", "regarding the schedule");
- positive (praise);
- negative (remarks).

3. The author of the article compiled a dictionary of words with a certain semantic basis according to the pre-sorted tone of the array of text messages (for example, praises – "able", "worked", "is trying", "performed", remarks - "side activities", "does not listen", "does not perform").

4. The vector method based on Bag of words was used for the research. A single feature vector is created using all words in the dictionary. This feature vector is used to represent all the features in our collection. The number of characters is equal to the number of unique words in the dictionary. Each word becomes the meaning of the corresponding trait word (neutral = 0, positive = 1, negative = 2). If a word in the dictionary is not included in the pattern, it has a value of 0.

5. Each test message is converted into a vector with a set of attributes (1 word = 1 attribute).

6. A certain tone based on which words are more frequent in it is assigned to the message.

The accuracy of the developed algorithm in determining the mood of messages is equal to 81.59 percent. In order to clarify the relationship between the students' progress and the classroom management strategy focused on the student's external behaviour (praise, remarks), the Pearson correlation coefficient was calculated.

3. Results

General overview of all messages sent by teachers. The first aspect explored in the search for links between the classroom management strategy focused on student's external behaviour and students' achievement in low SES schools was a review of all reports to the student and/or his/her parents. The obtained research results are presented in Figure 1.

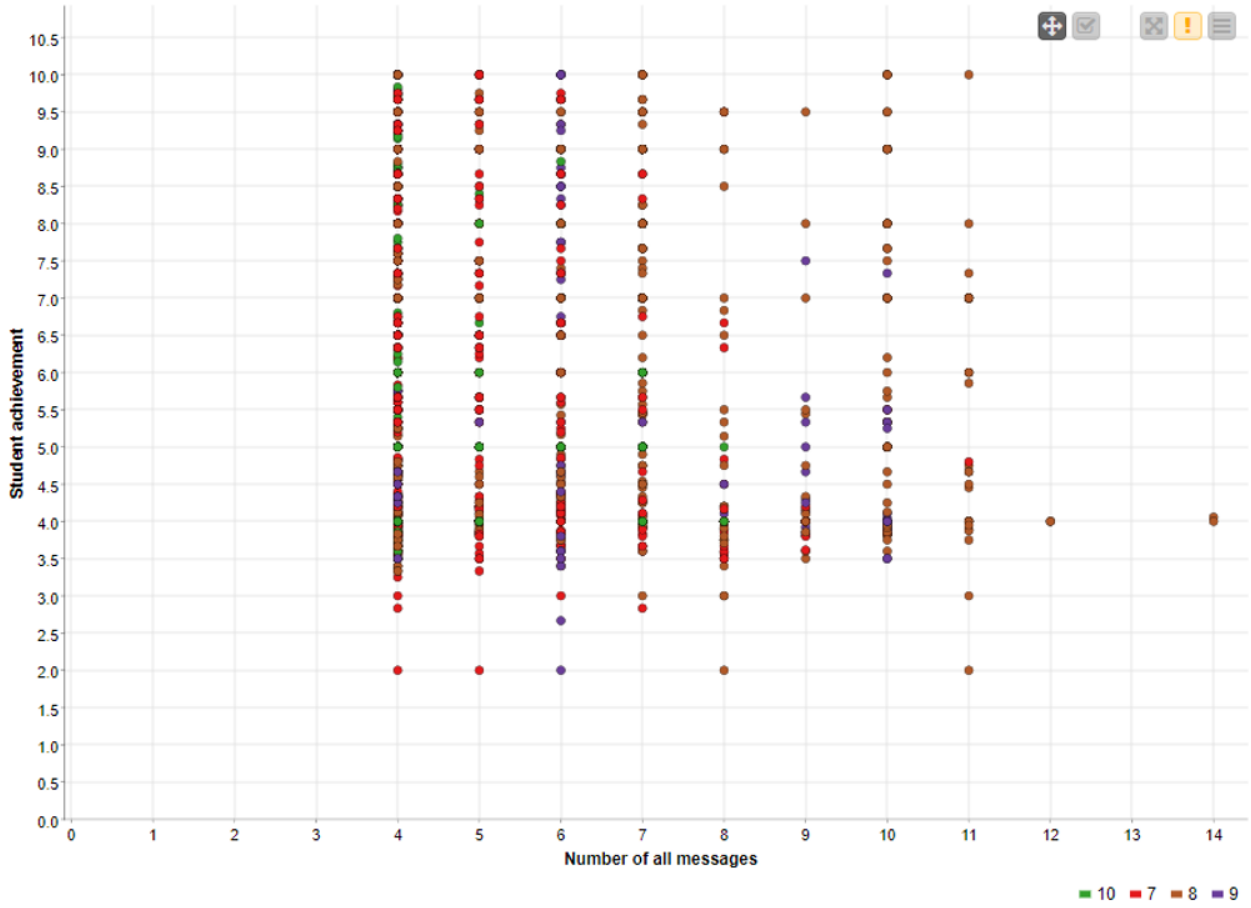

Fig. 1. Correlations between all messages sent by teachers and students' progress

The results of the study show that a larger proportion of 7-10th grade students received 4 to 7 messages per year, fewer students received 8 to 11 messages, and a few students received 12 or 14 messages. It is noticeable that students in the 7th and 10th grade received fewer messages, while their fellow students from the 8th and 9th grades received more. When assessing students' progress, it can be seen that the overall assessment of mathematics and biology is on a very wide scale, ranging from not advanced (2) to the highest (10). After conducting a correlation analysis of the number of all messages sent and the progress of students, it was found that the values of the correlation coefficient differed according to the subjects of mathematics and biology. The value of the correlation coefficient between the evaluation of the biology subject and the total number of messages is equal to 0.262, that is, the number of messages sent by the teacher to the parents or the student is weakly related to the progress of the students. In the aspect of mathematics subject, the value of the correlation coefficient is equal to 0.580, that is, this relationship is of moderate strength, which means that as the number of messages sent increases, the probability of students getting higher grades increases. It is necessary to pay attention to the fact that in both cases (biology and mathematics) all messages sent by the teacher (positive, neutral and negative) were counted. It was also established that 90 percent all messages consisted of messages sent by mathematics teachers and, accordingly, only 10 percent by biology teachers.

Associations between teacher-sent praise and students' achievement. Since teachers can encourage desirable behaviour and reduce undesirable behaviour by using praise, approval or remarks, the second aspect of the analysis was chosen to be messages with a positive tone, i.e., praise or encouragement. Examples of them are "Well done, she is doing great in studies, homework is always done and on time", "actively participates in classes", "makes an effort, completes tasks". The most common praises are related to classwork, independence, and effort. The relationships between praises and student achievement are shown in Figure 2.

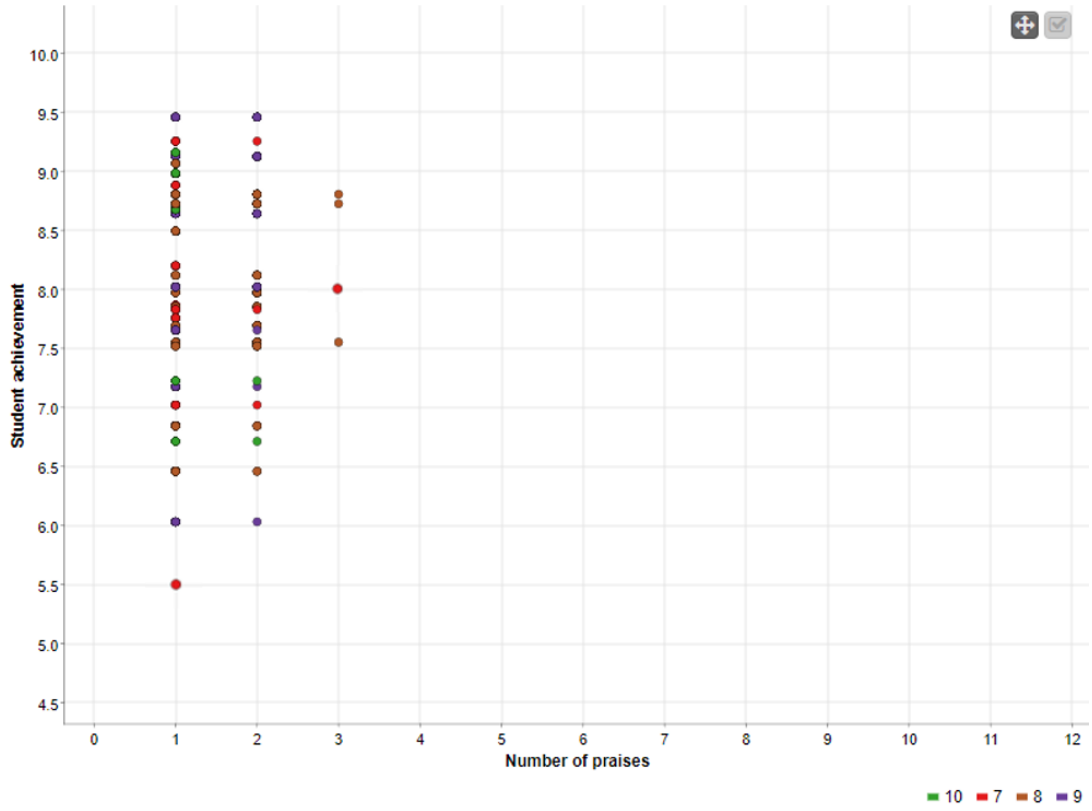

Fig. 2. Associations between teacher-sent praise and student achievement

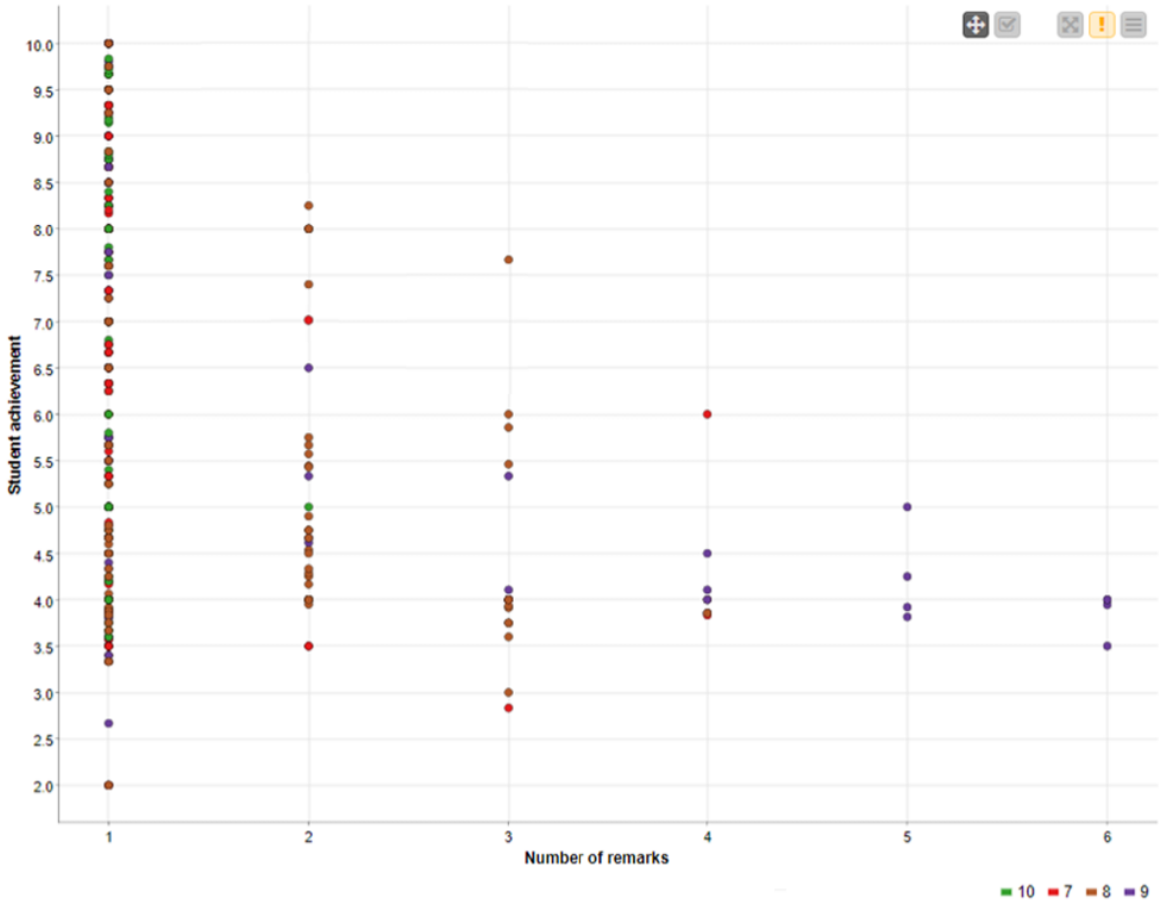

Fig. 3. Associations between teacher-sent remarks and students' achievement

As can be seen, teachers wrote praise or encouragement in the electronic diary from 1 to 3 times. More often, they were written for younger students (grades 7th-8th), while older students (grades 9th-10th) received them less or not at all. Students who received one or two praises, have mathematics and biology grades on a wide scale, ranging from 5.5 to 9.5. It should be emphasized that the students who received two praises each have no negative progress, while the four students who received 3 teacher praises each have a progress between 7.5 and 8.8. However, a correlational analysis of praise and student progress showed that there is no relationship between these variables. The value of the obtained correlation coefficient is equal to 0.067 (biology subject) and 0.132 (mathematics).

Associations between teacher-sent remarks and students' achievement. An in-depth analysis of the relationship between teachers' negative messages (remarks) in the electronic diary and students' progress was also carried out. The obtained research results are presented in Figure 3.

First of all, we would like to note that on the left side of the figure, it can be clearly seen a large proportion of students from different grades (from the youngest to the oldest) who have one note from the teacher in the electronic diary, however their progress in mathematics and biology covers almost the entire spectrum of evaluations: from the lowest, that is, negative, (2) to the highest (10). There is also a not so small group of students from different grades with two or three remarks each, whose progress is also in a wide range (from 2.8 to 8.3), but in this case the students do not have very high ratings (above 8.5) anymore. This tendency in learning outcomes is even more evident when looking at students with four, five or six remarks. Possible examples of remarks are "hardly participates in classes", "does not do homework", "does extracurricular activities", "makes noise, disturbs the whole class". The most common remarks are related to irresponsibility in performing assigned tasks, engaging in extraneous activities, and remarks regarding inappropriate behaviour. After conducting a correlational analysis of the data of all four schools, that is, the remarks written by the teachers in the electronic diary, and the student's progress, it was found that the coefficients of the correlation value differ according to the educational subjects. In the subject of biology, the correlation between remarks and student progress is weak (-0.207), and in the subject of mathematics it is stronger (-0.401). Hence, as the number of remarks sent by the mathematics teacher to the student and/or parent increases, the probability of receiving a lower math grade increases.

4. Discussion

The obtained research data allow us to say that the progress of students has no relationship with the student-centered classroom strategy. It was found that as the number of remarks sent by the mathematics teacher to the student and/or parent increases, the probability of receiving a lower math grade increases. Thus, remarks are not effective and likely do not motivate students to learn better, and there is also no correlation between teacher-written praise and student progress. Considering such research results, it is important to highlight several aspects.

First, in order to create a favourable learning environment for students from low SES, from our point of view, the teacher must first try to avoid classroom management problems (that is, students' undisciplined behaviour) by choosing the right teaching strategy. According to researchers (Clark et al., 2012), a decade of research has confirmed the need for direct, explicit teaching for low-achieving students who lack basic knowledge and skills. When teaching new curriculum and skills, teachers should use precise guidance, linking these students' learning practices with clear and precise feedback. According to Helmke (2012), leading the lesson in different ways and levels is a necessary condition for achieving the best learning outcomes without exhausting the students. The most important thing is that learning support is always offered according to the students' initial knowledge and abilities.

Second, when teaching low-SES students, teachers should adopt a growth mindset – the belief that students' abilities can be developed by encouraging and supporting their efforts. As stated in the introduction of this article, researchers (Agirdag, 2018) claim that there are no objective reasons why students in a school where more socioeconomically disadvantaged children study, should be regarded as less teachable. In line with our (Brandisauskiene et al., 2021) and other researchers' (Destin et al., 2019) research results, it can be seen that low SES students, when compared to their high SES peers, have less faith in their ability to develop and feel that as if their efforts were meaningless. However, these students will be more motivated to learn in school if they

perceive that their efforts can be accompanied by success (Browman et al., 2017). Therefore, we want to re-emphasize the importance of teacher expectations and appropriate behaviour when working with students from low SES: they need teacher support and academic support, belief in their abilities or mind-set interventions that can be effective (Sisk et al., 2018).

Third, teachers report that students who have discipline problems in class also show signs of working memory impairment (Alloway et al., 2012). This supports research findings that students' working memory difficulties affect not only academic achievement but also classroom functioning (Alloway et al., 2009). Consequently, in order to achieve high academic achievement, a student must concentrate and successfully complete a wide variety of structured learning tasks. However, if the students are unable to do this, they often fail in a variety of learning situations because they are unable to store and organize information in working memory, their learning progress will be slow, and their behaviour in the classroom will be problematic. As Alloway (2006) suggests, there is still no clear consensus on ways to improve working memory skills, but the learning progress of low SES students can be greatly improved by reducing working memory demands in the classroom. Given that students with poor working memory often fail to complete class activities simply because they forget what to do next, teachers can increase the likelihood of successful activity completion by frequently repeating clear, step-by-step instructions and asking students to repeat them out loud. Also, teachers can teach and encourage children to use certain memory aids, such as number lines, lists of words, formulas. It is especially important that these students are taught metacognitive strategies to cope with working memory failures, such as not being afraid to ask for forgotten information and to have confidence in their abilities even when they fail.

Fourth, the research results show that remarks are written more often for younger (7-9th grade) students. We would like to note that during this period students are teenagers and first of all it is necessary to build a good relationship with them in order to understand them. This should be the main attitude of teachers (and parents) to encourage adults to build a good relationship with them, listen respectfully and be listened to, as this is the only way to lay the foundation for their trust and openness.

Fifth, our research shows that praise is not effective because it has no bearing on student progress. There is also evidence in scientific literature to support this tendency. For example, Dweck (2017) points out that both favouring a person's personality and praising efforts do not affect achievement or have a negative effect, while Skipper, Douglas (2011) note that praise does not have a particularly unfavourable effect when one succeeds, but rather when one fails or there is an incomprehensible task. However, Sabey and colleagues (Sabey et al., 2018) argue that praise is effective when used strategically to achieve individualized student success. These researchers suggest that educators pay attention to how students respond to praise to ensure that this interaction has the intended effect. Haydon, Musti-Rao, Kennedy, Murphy, Hunter, and Boone (2020) suggest that when giving praise, the conditions for good praise should be met: link the praise to the student's behaviour that you want to reinforce, give it immediately after the student's appropriate behaviour, be close to the student to see all his/her subtle cues (e.g. a smile) and say a specific word of praise, drawing the student's attention, apply behavioural support consistently, predictably and provide informative feedback about the student's appropriate and specific behaviour, the success of learning activities. Praise can be one of the components of ongoing interaction between students and teachers if it is characterized by individual attention and care (Haydon et al., 2020).

Sixth, all the above mentioned activities of the teacher, related to both teacher's attitudes and teaching strategies, from our point of view, can create favourable conditions for learning. This should be the first and the most important goal of a teacher's work. The second goal is the appropriate teacher's reaction when there are already students' behavioural problems. If they are small, it is advisable for the teacher, who seeks to focus the attention of inattentive students, to simply be closer to these students, look them in the eyes, ask them to answer questions ("Martin, we solved this problem this way. How would you rate it?") or to name misbehaving students when presenting learning materials ("the next step in problem solving, Ann, is..."). In cases where misbehaviour is persistent or disrupts the teaching and learning process, the teacher must remind students of the rules and/or demand appropriate behaviour.

Finally, it is necessary to note that all actions of classroom management in educational practice must be selected taking into account the specific context and time. As stated by Wubells

(2011), in educational reality, in order to correct students' inappropriate behaviour, certain elements of various theoretical approaches (to the student's external behaviour, internal control, classroom ecology, discourse, curriculum and interpersonal relations) are usually integrated. According to the scientist, over the past three decades, a transition from behavioural classroom management methods to internal (ecological, curriculum, discourse-oriented and interpersonal) methods has been observed all over the world, therefore mutual communication with students, individual attention to their needs are extremely important methods of teacher's action.

We would also like to emphasize that the carried out analysis of learning data should be continued. Acknowledging the limitations of this study - only one out of six classroom management approaches was analysed, only written reports in the electronic diary were assessed, certain (distinct) groups of students were not taken into account (e.g. students with behavioural and emotional difficulties, and research shows that students from low SES are at risk for these disorders), it is clear that the field of research should be expanded. Classroom management is one of the most significant aspects of a teacher's quality performance and a complex phenomenon, so it is necessary to further delve into the content of classroom management strategies and their possible results.

5. Conclusion

A classroom management strategy focused on student external behaviour is one of six management approaches that a teacher can use to correct student misbehaviour. The analysis of the learning data of four Lithuanian schools with an unfavourable SES context shows that the progress of students in subjects of mathematics and biology is not related to the teacher's praise, although such an intervention tool can be used if it is characterized by individual attention and care. It was also found that as the number of remarks sent by the mathematics teacher to the student and/or parents increases, the probability of getting a lower math grade increases, meaning that remarks are not effective for higher student achievement. Analysis of the scientific literature shows that in order to create a favourable learning environment for students from low SES, teachers must first try to avoid classroom management problems by building good relationships with students, choosing an appropriate teaching strategy, adopting a growth mindset, and reducing working memory demands for the students who have these difficulties.

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Financial Well-Being Profile: An Empirical Study on Graduated Students

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Abstract

The general stability of a person is related to financial well-being, and is reflected in their physical, financial, mental health, including being happier, more confident and more productive at work. The general purpose of this work is to evaluate if the mean of the results of financial well-being in graduates from the Veracruz-Boca del Río conurbation differs from the value of the Consumer Financial Protection Bureau's average and to assess whether there are differences in the level of financial well-being through the characteristics of sex, career, institution and employment status. The research is quantitative and cross-sectional. The sample is made up of 50 graduates. For data collection, the Financial Well-Being Scale developed by the United States Consumer Financial Protection Bureau (CFPB) together with the participation of various experts and consumers, was used. The instrument consists of 10 items measured on a Likert scale. The first 6 items are designed to describe the financial situation of the individual, while the remaining 4 items measure the frequency with which individuals face certain situations. Since the results, we concluded that the graduates have a financial freedom reflecting a good financial education. This high percentage of subjects who have a medium to very high level generates that they have the ability to have good financial health that will allow them to deal with decisions in the financial area in their work environment. In addition, the results show that the level of financial well-being is not different among graduates according to age, marital status, employment status, career and institution.

Keywords: financial well-being, graduates, demographics variables.

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1. Introduction

The Covid 19 pandemic impacted economic activity, inflation and financial conditions. Economic challenges imply that there may be an undesirable effect in financial well-being (Banco de Mexico, 2020). Financial well – being is an indicator of the level of people's financial education and is related to economic growth (Compromiso Empresarial, 2014, cited by Vallejo Martinez, 2016). Hence, the intention of political governments and researchers is to ensure that people enjoy financial well-being.

The Consumer Financial Protection Bureau (CFPB, 2017) defines financial well-being as "a state of being in which a person can fully meet their current and ongoing financial obligations, can feel secure in their financial future, and can make options that allow them to enjoy life" (p. 6). Other authors (Sabri, Falahati, 2012) conceptualize it as "a financially healthy, happy, and worry-free state of being" that is generally based on a subjective assessment of one's financial situation. Mahendru (2020) defines financial well-being as "an individual's ability to quickly meet their current financial obligations and present and future needs, and their temperament toward financial freedom, today and tomorrow".

Kreutz, da Silva, Vieira and Dutra (2021) refer that financial well-being can be addressed under two approaches: Objective, one that uses as financial indicators: income, liquidity and financial information, and Subjective, approach that considers people's perceptions of their financial condition. According to the work carried out by Cardenas et al. (2020) report that Chile and Colombia are the countries with the highest rates of financial well-being in South America.

The differences in financial well-being are greater in the holders of formal savings products than in the owners of credit cards. In addition, they report that better financial education is associated with better rates of financial well-being. And some variables related to financial behavior have an important relationship with financial well-being, such as previous experience with the financial sector, the comparison of products between different financial institutions and the personal involvement in household financial decisions.

Higher levels of financial knowledge are associated with financial well-being and positive outcomes, such as participation in the stock market and planning for retirement; while low levels of financial literacy are related to financial stress and negative outcomes, such as debt accumulation (OECD, 2016). Today we live in a globalized world where technology and digital media have allowed greater access to financial services and products, which has made it easier for different savings, credit and investment operations to be carried out through applications and electronic banking (Ordonez, 2018).

According to the Analytical and Assessment Framework for Financial Literacy 2021 of the Program for International Student Assessment (PISA, 2021), digital financial services offer great possibilities for the integration of the poor and economically excluded populations into the formal financial system by overcoming barriers of infrastructure, reducing costs, offering faster and more timely transactions, and potentially providing a seamless experience tailored to individual needs (p. 9). However, if they lack basic and sufficient financial knowledge to make proper use of digital finance, it could represent various types of risks and fraud, as well as an imbalance in the financial well-being of each individual.

It is extremely important that in Mexico special attention be paid to the quality of financial education and the relevance it has in the different stages of Mexicans life, since 67 % of the population has a low level of financial education, according to the study carried out in 2020 "Private Financial Education Initiatives in Mexico: Supply, Demand and Opportunities for Improvement", carried out by Nacional Monte de Piedad in alliance with the Center for Competitiveness Studies of the Autonomous Technological Institute of Mexico (ITAM, 2020). This percentage is classified as 12 % deficient, 22 % weak and 33 % basic, which is worrying because these sectors of the population are the ones that most lack capacities and resources, and in turn, face the greatest risks.

According to the National Survey of Financial Inclusion 2018 carried out by the National Institute of Statistics and Geography (INEGI), 25 % of Mexicans are bachelor's degree graduates, 17.8 % of which don't know the existence of basic bank accounts, 20.9 % ignores savings protection insurance and 28.5 % do not compare financial products before contracting them. As INCyTU (2018) points out, taking up the National Bank of Mexico and the National Autonomous University of Mexico (Banamex and UNAM, 2014), young people identify their family as the best example for

their financial training, in addition, 50 % recognize not having the necessary knowledge to make decisions related to their finances.

We should also mention that Sabri, Cook and Gudmunson (2012) demonstrated the relationship between demographic factors and financial well-being, and show evidence that gender, student residence and place of origin were associated with the students' perception of financial well-being. In relation to gender, women have higher levels of financial well-being, and students who live within the university campus have a better level of financial well-being, in the same way that students who come from a city have a higher level of financial well-being than that of the students who come from rural areas.

Regarding the aforementioned Kreutz et al (2021) in his publication of the state of the art on financial well-being, he refers that different authors (Delafrooz, Paim, 2011; Diniz et al., 2014; Fraga et al., 2016, Gutter, Copur 2011) observed that people with higher incomes have a much better financial well-being. In this idea, Fauzi Zainir and Wan Marhaini Wan Ahmad (2019) found that the level of subjective financial well-being (SFWB) in 1867 Malaysian households is 5.2 on average out of 10, however, there is a significant difference in income level, households where income is low, score 4.3, average income households 5.1, and high income households are 6.2.

Regarding marital status, Diniz, Vieira, Potrich and Campara (2014) identified that there are significant differences in the averages in relation to the financial well-being factor. Thus, married people (average 2.935) have a better perception of financial well-being compared to singles (average 2.623) and the widowed/separated group (average 2.756), people with a high educational level present an average of 3,008, On the other hand, at basic levels (primary and secondary) the average is 2.791. In relation to income, people with higher incomes have a high level of financial well-being.

Financial well-being has also been analyzed by Mahdzan, Zainudin, Abd, Zainir and Ahmad, (2020), they focused on determining the financial well-being (FWB) of Malaysian households and constructing a subjective FWB index. The results reveal that households, on average, have a FWBI score of 46.83. The authors not only determined the financial index, but also identified if there was a difference with respect to income and report that households with low income have low levels of well-being (37.37), likewise households with medium income have a level of financial well-being of 46.11 and finally households where income is high, also have a high financial level (58.67).

At the same time, they present evidence that there is a significant difference between age, level of education and marital status. Older people have higher rates of financial well-being, and people with higher formal education report higher rates; Regarding marital status, married people show higher averages (48.04) compared to single, divorced or widowed people. Likewise, there is an association between the type of employment and financial well-being, the results show that those who were self-employed present higher scores with 48.29. However, it was found that the level of financial well-being did not differ significantly among the respondents in terms of religion, ethnicity, and residential area. From these exposed arguments, now the following objectives and hypotheses are established

2. Study Objectives

1. Determine the level of financial well-being in graduates from the Veracruz-Boca del Río conurbation area, evaluate whether the mean of the results of financial well-being in graduates from the Veracruz-Boca del Río conurbation area differs from the value of Consumer Finance Protection Bureau's average

2. Assess whether there are differences in the level of financial well-being through the characteristics of sex, career, institution and employment status.

Hypothesis

H_1: The mean of the results of financial well-being in the graduates of the Veracruz-Boca del Río conurbation, differs from the value of the mean defined by Consumer Finance Protection Bureau.

H_2: There are differences in the level of financial well-being in graduates from the Veracruz-Boca del Río conurbation in relation to the characteristics of sex, career, institution and employment status.

Justification

Through the results of this research, it will be possible to identify the subjects and the areas that show a lower level of financial well-being, and therefore focus on this group of subjects in a timely manner. The research will also contribute to the federal institutions since it will provide the level of financial well-being of a group of the population that is entering the world of work and whose actions will have an impact on the economic development of the country.

Design and Method

The research approach is quantitative, since the work uses numerical variables that need to be quantified by means of statistical methods, to obtain results. It is transversal because contact was established with the study population only at a certain moment of the research**.**

Sample

It is a non-probabilistic sample, since the process to choose the population was not mechanical or based on probability formulas, it was carried out based on the convenience of this study, for reasons of time and resources. The sample is made up of 50 graduates from the Veracruz-Boca del Río metropolitan area.

Instrument

The instrument used to obtain the data for this research is digital, generated through Google Forms and applied through social networks. This is the Financial Well-Being Scale developed by the United States Consumer Financial Protection Bureau (CFPB) together with the participation of various experts and consumers, ensuring its quality and reliability. The scale is built to make it possible to directly compare the scores of different people or to see how an individual's financial well-being changes over time (CFPB, 2015).

The instrument consists of 10 items measured on a Likert scale. The first 6 are designed to describe the financial situation of the individual, while the remaining 4 serve to measure the frequency with which individuals face certain situations (Table 1).

Table 1. Likert scale of financial well-being

items	ordinal scale 4 to 0	items	ordinal scale 0 to 4	items	ordinal scale 4 to 0
1, 2, 3, 4, 5 6	4= Totally 3 = Very good 2= To some extent 1= Very little 0 = Does not describe me at all.	7, 9, 8 and 10	0 = Always 1= often 2= sometimes 3= almost never 4= Never	8	4= Always 3= often 2= sometimes 1= almost never 0 = Never

Note: Scale obtained from consumerfinance.gov/financial-well-being

Based on the score obtained, it is possible to determine the level of financial well-being of an individual. The scale established for this study is presented in the Table 2; the average score according to Consumer Finance Protection Bureau is 54.

Table 2. Scale of the level of financial well-being

Score Range	Level
0-29	very low
30-37	low
38-49	low medium
50-57	high medium
58-67	high
68-100	very high

Note: Consumer Information Finance Protection Bureau

For the present study, the statistical techniques applied were: Student's t-test and factor analysis to identify the factors that interfere in the level of financial well-being in the selected sample, which processed in SPSS v25 software.

3. Results

The description of the demographic data of the study sample is presented. The Table 3 shows the distribution by gender, with whom the individual lives, marital status, employment status, area of study from which he graduated, educational institution and grouped age.

Table 3. Descriptive data of the graduates

Sex (%)		**It lives (%)**		
Female	Male	Alone	Parents	Partner
78 %	22 %	18	62 %	20 %
Civil status (%)			**Employment status (%)**	
Single	Married	Other	Employee	Unemployed
86 %	12 %	two	78 %	22 %
Institution (%)			**Age (%)**	
public	private	18-25	26-33	> 34
58 %	42 %	64 %	22%	14 %
		Bachelor		
PM-I	BQ-H	H-A	EA	Other
16 %	6 %	14 %	60 %	4 %

Note: PM-I = Physics, Mathematics and Engineering; BQ-H = Biology, chemistry and health, H *and* A = Humanities and art; EA=Economic-administrative; other

The predominant percentages in the sample indicate that 78 % is represented by female; 62 % live with their parents; 86 % are single; 78 % maintain an active work status; the area of study from which they graduated is economic-administrative by 60 %; the educational institution where they graduated stands out at the public level in 58 %; and the age range from 18 to 25 years in 64 %.

Level of financial well-being

Table 4 shows the level of financial well-being of the graduates based on their score. According to the results, a high percentage (90 %) have levels of financial well-being between medium high and very high.

Table 4. Level of Financial Well -being of the graduates

Score Range	Level	%
0-29	very low	0
30-37	low	0
38-49	low medium	10
50-57	high medium	22
58-67	high	48
68-100	very high	20

Research hypothesis

To corroborate the hypothesis that the mean of the results of financial well-being in the graduates of the Veracruz-Boca del Río conurbation, differs from the value of the mean of Consumer Finance Protection Bureau.

The results of the *t*-test allow us to verify that the mean financial well-being accepted by Consumer Finance Protection Bureau (M = 54) differs significantly from the financial well-being of graduates from the Veracruz-Boca del Río conurbation, since the value of *t* obtained is greater than the value in tables, in addition, the value of *p* (0.00) is less than 0.05 and the power of the test is

large (.540). Therefore, it is concluded that graduates from the Veracruz-Boca del Río conurbation have financial freedom that reflects a good financial education.

Table 5. Graduates' financial well-being t-test

Welfare		
Mean		43.94
Standard deviation		9,377
t boards (49 gl)		1.67
t sample(49 gl)		4,545
p-value		0.00
Confidence interval	Lower	Superior
95 %	3.10	8.02
r (Power)	.544	

Likewise, to test the hypothesis if there are differences in the level of financial well-being in graduates from the Veracruz-Boca del Río conurbation in relation to the characteristics of sex, career, institution and employment status, the ANOVA test was applied, since the variables meet the assumptions of normality, independence and homoscedasticity required in this test (Table 6).

Table 6. ANOVA Assumptions

variables	**r**	**Levene**	**Next.**	**Kolmogorov–Smirnov**		**Next.**	
	-0.074	.317	.576	Female	Male	Female	Male
Wellness-G				.987	.896	.931	.167
		.638	.428	Gender	career	Gender	career
Wellness-MS	0.087			.982	.922	.740	.517
		1,232	.273	employed	unemployed	employed	unemployed
Wellness-ES	-0.266			.974	.979	.509	.963
		.845	.363	Public	Private	Public	Private
Wellness-EI	-0.25			.967	.943	.473	.248
		2,126	.093	FM QBS	HE HAS	CE	FM QBS	HE HAS	CE
Wellness-CC	0.069			.843 .999	.941	.983	.843 .999	.941	.983

G = gender; MS = marital status; ES = employment status; IE = Educational Institution; C = college career

F statistic is summarized in the table. As can be seen in the table, an *F* statistic is obtained at 49 degrees of freedom for each group. Since the *F* values of the variables are less than the *F values* in tables, so the hypothesis is not rejected, in addition, the *p value* is greater than the value of 0.05, hence it is concluded that the level of financial well-being is different among graduates according to age, marital status, employment status, career and institution.

Table 7. ANOVA
BF _ Sex, marital status, employment status, area of study and institution

variables	F ($_{49\ gl}$)	f $_{boards}$	*p* -value	α value
Fw-b_ gender	.266	4,034	.609	0.05
Fw-b - MS	.704	3,183	.500	0.05
Fw-b - ES	3,652	4,085	.062	0.05
Fw-b -Career	.849	2,606	.502	0.05

Fw-b - EI	3,191	4,085	.080	0.05|

Fw-b = Financial well-being; G = gender; MS = marital status; ES = employment status; EI = Educational Institution; C = career

4. Conclusion

Due to the fact that the graduates are individuals who have entered the labor environment, this work focused on this sector of the population, to evaluate if the average of the results of financial well-being in the graduates of the metropolitan area Veracruz-Boca del Río, differs from the average value of Consumer Finance Protection Bureau. The level presented by this study population is between medium high to very high; it is important to highlight that a small percentage (10 %) presents medium low levels, but none presents very low levels. This means that the graduates have received a good financial education in their institutions that has made it easier for them to make intelligent financial decisions (Sebstad et al., 2006 cited by Vallejo-Trujillo, Martinez-Rangel, 2016).

This high percentage of subjects who have a medium to very high level generates that they have the ability to have good financial health and that will allow them to deal with decisions in the financial area in their work environment. The findings of this research are similar to the information provided by the OECD (2016) indicating that there is a relationship between well-being and financial knowledge.

In addition, this research provides elements that allow corroborating that the level of financial well-being of the graduates who have been the object of study is not different according to age, marital status, employment status, career and institution. Based on the results, it is convenient to promote research at a specific university to determine if this behavior occurs in students who are pursuing their degree. The average value of the level of financial well-being (43), which is within the low-medium range, indicates that higher education institutions still have room for improvement in terms of financial education.

The results of this research are not consistent with those reported by Sabri et al. *(*2012) who do not mention that women have higher levels, nor with those proposed by Kreutz et al. (2021) and Fauzi Zainir and Wan Marhaini Wan Ahmad (2019) who showed that people with high incomes have a high financial well-being. They were also inconsistent with those proposed by Diniz, Vieira, Potrich and Campara (2014) who published a difference between married and single, married people have a better level of financial well-being.

Final remarks

Based on the results, it is convenient to promote research at a specific university to determine if this behavior occurs in students who are pursuing their degree. The average value of the level of financial well-being (43), which is within the low-medium range, indicates that higher education institutions still have room for improvement in terms of financial education.

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Sleep Disorders and Patterns among Medical Students at the University of Health and Allied Sciences, Ghana

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Abstract

This study assesses the prevalence of sleep disorders and quality among medical students. A total of 221 (61.5 % males, 38.5 % females; mean±SD age = 22.07 ± 2.45 years) respondents were conveniently selected from all six levels using a cross-sectional survey design. The study results show that most medical students sleep after 11 pm and wake up after 6 am, with an average of 5hrs of sleep each night. They do not induce their sleep with pills, and their sleep quality is fairly good, with a latency of fewer than 15 minutes. There is little nocturnal wakening, if any, due mainly to the use of the washroom at night. Most of them experience daytime sleepiness, and a substantial number experience morning tiredness. The top 5 sleep disorders reported by the students are nightmares, narcolepsy, insomnia, restless leg syndrome/periodic leg movement disorder, and circadian rhythm disorders. The prevalence of sleep disorders and issues among medical students is high. There is a need for medical schools to recognise to assist students in developing healthy sleep patterns as they manage their academic workload. The university system must strengthen existing academic and social supports for student mental wellness. Our findings have implications for medical education, policy, and research in Ghana and beyond.

Keywords: sleep disorders, prevalence, sleep patterns, medical students, Ghana.

1. Introduction

Sleep is a physiological process necessary for optimal human function (Shattuck et al., 2019). Krueger et al. (2016) noted that sleep had been tagged with immune system response, restoration of brain energy, and removal of toxic by-products in the body amidst a lack of consensus on its

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functions. Consequently, disturbance in sleep can affect general health and quality of life (Mc Carthy, 2021). An individual's sleep may be influenced by various factors, including lifestyle, gender, age, and occupation (dos Santos et al., 2018; Mc Carthy, 2021; Oginska, Pokorski, 2006). Sleep problems are found to be more prevalent in women and increase gradually with age (Han et al., 2019).

Among university students, there is a high rate of sleep problems (Schlarb et al., 2017). This high rate of sleep problems has been found to be related to several factors like drug use, room quality, family issues, stress, and psychological challenges (Altun et al., 2012). Also, electronic devices such as cell phones and computers affect students' sleep hygiene (Hershner, Chervin, 2014). According to Sweileh et al. (2011), approximately 42 % of students went to bed after midnight, and 18 % woke up before 6 am worldwide. The effect is that students with sleep problems struggle to function and perform academically (Alapin et al., 2000; Schlarb et al., 2017; Trockel et al., 2000). According to World Health Organisation (WHO, 1998), the day after a night of poor sleep is disturbing as inadequate rest impairs the ability to think, handle stress, maintain a healthy immune system, and control emotions.

Sleep problems are particularly significant among medical students (Yassin et al., 2020) due to the daunting and challenging academic workload they are confronted with (Azad et al., 2015; Wong et al., 2005). Lawson et al. (2019) reported that 66 % of medical students at the University of Ghana went to bed between 10 pm and 12 am, 85 % woke up before 6 am, and the majority slept for an average of five hours per night. In effect, these students resort to using drugs to disrupt their sleep to keep them awake and meet academic demands (Hershner, Chervin, 2014).

This study is valuable because of the direct relationship between sleep and mental health (Kim, Dimsdale, 2007). Since these students become the medical workforce of the nation and the world at large, it is scary that their mental health is jeopardised by the process that makes them professionals. As such, the study sought to establish the prevalence and forms of sleep problems among medical students using a sample from a new medical school in Ghana.

2. Methods

Design

The study used a cross-sectional survey design to allow for the data collection from a broader range of medical students at the University of Health and Allied Sciences (UHAS), Ho, in the Volta Region of Ghana. Data were collected across all year groups of the student population in the school to present a more precise picture of the entire student body.

Population and sample

The study was conducted in the School of Medicine at UHAS. The UHAS school of medicine is situated at the Ho Teaching Hospital in the capital of the Volta region. The school has so far graduated two batches of medical students since its inception in 2014. It runs three programmes, namely medicine, physician assistantship, and dentistry. The total number of students in the school studying medicine is 409. All medical students (i.e., preclinical and clinical students) in UHAS who agreed to take part in the study were sampled. Overall, 221 Participants were conveniently sampled using Kish and Leslie formula (1965), assuming a non-response of 5 %.

Instruments

We used the SLEEP-50 and the Pittsburgh Sleep Quality Index (PSQI) as the main instruments for data collection. The PSQI is a self-rated questionnaire that assesses sleep quality and disturbances or patterns over a 1-month interval. It consists of 19 items with 7 subscales measuring subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency (total time in bed of sleep), sleep disturbances, use of sleep medication, and daytime dysfunction. The SLEEP-50 questionnaire, on the other hand, was used to assess sleep disorders among medical students.

Ethics

Ethical approval was obtained from the University of Health and Allied Sciences Research Ethics Committee to conduct the research among the students (REG number UHAS REC A.12[173]2-21). Participants signed a consent form before their participation. Strict confidentiality was upheld, and no coercion or inducement whatsoever was used. The study complied with the Helsinki declaration.

3. Results

Demographic data

The data were analysed using SPSS, and the results are presented in this section. A total of 221 medical students participated in the study, and Table 1 below presents their demographic information. Of the total participants, there were more males (136, 61.5 %) than females (85, 38.5 %), a mean age of 22.07 ± 2.45 years, 117 (52.9 %) preclinical year students and 104 (47.1 %) clinical year students. There were 186 (84.5 %) residing on campus, and 35 (15.8 %) were non-residents. Regarding the type of admission, 29 (13.1 %) students were regular students, while 192 (86.9 %) were full-fee-paying students. Some 47 (21.3 %) participants engaged in extra work at night.

Table 1. Demographic characteristics of participants

Characteristics	Frequency (n = 221)	Percentage (%)
Gender		
Male	136	61.5
Female	85	38.5
Year of Study		
Year 1	35	15.8
Year 2	29	13.1
Year 3	53	24.0
Year 4	30	13.6
Year 5	30	13.6
Year 6	44	19.9
Residential Status		
Resident	186	84.5
Non-resident	35	15.8
Type of Admission		
Regular	29	13.1
Fee-paying	192	86.9
Extra work at night		
Yes	47	21.3
No	174	78.7

Notes: Age (in years) [Mean, SD] = 22.07 ± 2.45

Sleep habits among medical students

This entails the time students go to bed at night and woke up in the morning, hence taking into consideration their average duration of night sleep, whether they take coffee at night and any sleeping pills.

Of the respondents, 62 (28 %) students went to bed before 11 pm. Also, 125 (56.6 %), forming the majority, went to bed between 11 pm and 1 am, with 34 (15.4 %) sleeping after 1 am. The average duration of sleep reported by students was 5.4 ± 1.1 hours. Thus, most respondents (138, 62.4 %) woke up between 5 am and 7 am and only 12 (5.4 %) students woke up after 8 am. Again, 6 (2.8 %) participants reported using medications to enable them to sleep at night. A total of 199 (90.1 %) participants reported that they never drank coffee at night.

Table 2. Summary of the Descriptive Statistics of Sleep habits of respondents

Variables	Frequency (n = 221)	Percentage (%)
Bedtime		
7 pm-9 pm	2	0.9
9 pm-11 pm	60	27.1
11 pm-1 am	125	56.6
After 1 am	34	15.4
Wake up time		
3 am-4 am	30	13.6

4 am-5 am	41	18.6
5 am-6 am	65	29.4
6 am-7 am	73	33.0
After 7 am	12	5.4
Coffee use at night		
Never	199	90.1
1 - 2 per week	9	4.1
3 - 4 per week	11	5.0
Almost nightly	2	0.9
Use of sleeping pills		
Never	215	97.3
1 - 2 per week	5	2.3
Almost nightly	1	0.5

Sleep quality and latency

Regarding sleep quality, as subjectively reported by participants, 13 (5.9 %) of respondents reported poor sleep quality, and 37 (16.7 %) reported their sleep quality to be bad. On the other hand, 32 (14.5 %) reported having an excellent sleep, and 139 (62.9 %) had satisfactory sleep, indicating a satisfactory sleep quality among respondents.

Time taken for students to fall asleep (sleep latency) showed that 106(48%) students had a sleep latency of < 15 minutes; 16-30 minutes reported by 84(38 %); 31-60 minutes by 22 (10 %); and 9 (4.1 %) reported having sleep latency of > 60 minutes.

Table 3. Sleep quality and sleep latency among medical students

Variables	**Frequency**	**Percentage**
Sleep quality		
Very good	32	14.5
Fairly good	139	62.9
Fairly bad	37	16.7
Very bad	13	5.9
Duration of sleep latency (in minutes)		
<15	106	48.0
16-30	84	38.0
31-60	22	10.0
>60	9	4.1

Sleep pattern

The finding in the following table presents the frequency of nocturnal awakenings. This reveals that 64 (29.0 %) never experienced it, 84 (37.1 %) reported experiencing it 1 – 2 times per night, 3-4 times per night was reported in 46 (20.8 %) respondents, and > 5 times per night in 9 (4.1 %). The nightly nocturnal awakenings were reported by 35 (15.8 %) due to noise, and 47 (21.3) indicated that it is due to washroom use.

Poor sleep at night may result in fatigue and sleepiness the next day. In this regard, 155(70.1) participants reported never having morning tiredness, and 45(20.3%) reported having morning tiredness daily. Daytime sleepiness during activities (DS) was reported never to have happened in 105 (47.5), whereas 58 (26.2 %) had it daily.

Forms of sleep disorders among medical students

Sleep disorders come in different forms. In this study, the disorders reported are presented in Table 5 below. The commonest sleep disorder reported is a nightmare (69.23 %). This was followed by narcolepsy (40.72 %), insomnia (23.08 %) and RLS (22.62 %). The other disorders recorded but which had low frequencies include sleepwalking (6.33 %), OSA (11.31 %) and CRDs (19.91 %).

Table 4. Summary of the descriptive statistics of sleep patterns

Variable	Frequency (Percentage)			
	Never	Nightly	1-2 nights/week	3-4 nights/week
Nocturnal Wakening	148 (66.1)	46 (20.8)	20(9.0)	9(4.1)
Cause of Nocturnal wakening				
Noise	135 (61.1)	35(15.8)	41(18.6)	10(4.5)
To use washroom	91 (41.2)	47(21.3)	68 (30.8)	15 (6.8)
	Never	Daily	1-2days/week	3-4days/week
Morning tiredness	155(70.1)	45(20.3)	11 (5.0)	10(4.5)
DS during activities	105 (47.5)	58 (26.2)	36 (16.3)	22(10)

Notes: DS – Daytime Sleepiness

Table 5. Summary of the descriptive statistics of forms of sleep disorders among medical students

Sleep disorders	Cut-off score for risk	Frequency	Percentage (%)
OSA	≥15	25	11.31
Insomnia	≥19	51	23.08
Narcolepsy	≥7	90	40.72
RLS/PLMD	≥7	50	22.62
CRDs	≥8	44	19.91
Sleepwalking	≥7	14	6.33
Nightmare	≥9	153	69.23

Notes: RLS – Restless Leg Syndrome, PLMD – Periodic Limb Movement Disorder, CRDs – Circadian Rhythm Disorders

In summary, the study revealed that most medical students sleep after 11 pm and wake up after 6 am with an average of 5hrs of sleep each night, and they do not induce their sleep with any pills. Additionally, their sleep quality is fairly good, with a latency of fewer than 15 minutes, with little nocturnal wakening and, if any at all, due mostly to washroom use at night. Finally, the majority experience daytime sleepiness and a substantial number (though less than half of them) experience morning tiredness. Medical students' top 5 sleep disorders are a nightmare, narcolepsy, insomnia, restless leg syndrome/periodic leg movement disorder and circadian rhythm disorders.

4. Discussion

Disturbance in sleep affects general life functioning, which is a good reason to explore and understand the situation among different segments of every population. The current population studied reported an average of 5 hours of sleep. Many of these students slept after 11 pm, resulting in tiredness and sleepiness during the day. This can affect their activities, such as attending lectures and undertaking personal studies. It may also result in emotions such as anger (Randler, Vollmer, 2013; Saghir et al., 2018), depression, and anxiety (Bauducco et al., 2016). Short and Louca (2015) indicated that even one night of sleep challenges results in changes in functioning. This points to the fact that many medical students may experience or exhibit poor interpersonal relationships towards and from their colleagues and other students. Unaddressed will affect their future working relations with other professionals and clients.

Medical students have a huge academic task that drains their energy each day. This can explain their short sleep latency since they will go to bed tired. Also, daytime sleepiness and morning tiredness could all feed into the latency period at night. It is worth noting that these experiences (huge academic tasks, daytime sleepiness, and morning tiredness) are significant factors in the academic journey of the medical student as these will derail their energy, attention, and effort during the day, leading to burnout and other significant mental health challenges

(Amaral et al., 2021). In effect, the medical student must pay close attention to these factors and employ strategies to manage them properly.

Very few of the students reported having excellent sleep. The majority reported having fairly good sleep, with some reporting bad sleep experiences. This notwithstanding, a significant number of students experience some sleep disorders. Notable among them are a nightmare, narcolepsy, insomnia, restless leg syndrome/periodic leg movement disorder, and circadian rhythm disorders, the top five. This is a confirmation of other studies that students generally experience sleep disorders (Gaultney, 2010), and this tends to be worse among medical students (Yassin et al., 2020). Sleep disorders are linked to sleep quality and pattern, in which the current population under study reported shorter sleep hours and fairly good sleep quality (Zafar, Ansari, 2020). These are significant issues of concern that school authorities, counsellors, and academic advisors must engage students to deal with (Wong et al., 2005) since they can affect their academic work (Yassin et al., 2020) and mental wellbeing (Guo et al., 2017; Randler, Vollmer, 2013; Saghir et al., 2018).

5. Conclusion

Sleep problems and disturbances exist significantly among medical students. In this new medical school in Ghana, students have reported shorter sleep hours and several sleep disorders. The cliché has been that medical school is demanding, so they are bound to experience sleep challenges. Meanwhile, these challenges are the recipe for doom for the soon-to-be doctors and the patients they will treat. If sleep problems are not good for the general population, then it is even more not for the medical student who will soon be entrusted live.

It is recommended that medical students recognise and devise strategies to manage their academic load and sleep adequately. They must utilise services that enhance their existence in school and provide social support for each other in school. The university system must create an avenue for support for students. Counselling and advisory mechanisms must be strengthened and resourced to cater for student needs.

6. Declaration of Competing Interest

The authors of the manuscript declare that there is no interest in conflict, and all reference materials were dully acknowledged.

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Does Higher Education Promote Human Capital Development: Comparison of Russia and OECD Countries

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Abstract

The aim of the study is to identify the key determinants of human capital in Russia compared to OECD states. This is done using the quantitative methodology, namely an OLS regression method. This method allows for indicating linear relationships between human capital represented by the human capital index developed by the World Bank and a set of factors potentially affecting this indicator. The explored factors include higher education enrolment, level of innovations, per capita income, inflation, unemployment rate, rankings of national universities and academic activity. The study is conducted for years 2010, 2012, 2017 and 2018 for which human capital index estimations are available.

The findings underline a significant and positive linkage between secondary and tertiary education enrolment and human capital. In addition, R&D expenditures appear to have a positive impact on human capital as well. This emphasises that investment in science-oriented higher education and innovations contribute to the economic wellbeing of future generations reflected by the human capital index. Also, some positive relationship between the university rankings and human capital is identified although not for all years.

The specific of Russian higher education is a huge gap between theoretic education and practice. The share of population with secondary and tertiary education and the number of published scientific articles is higher in Russia than the average across OECD. However, the share of practitioners in science and the percentage of R&D expenditures in GDP are significantly lower in Russia.

Keywords: human capital, higher education, R&D expenditures, innovation, economic growth.

1. Introduction

The present makes more and more demands to human actions, personal features, level of knowledge and quality of social interactions. The history of development of leading world economies evidences that economic growth and an increase in the life qualify of population are

possible only under the condition of the transition to the knowledge economy. In this case, the wellbeing of entire countries is determined not only by the abundance of their natural resources but mostly by technical innovations and the ability to implement and benefit from theoretical findings (Barro, Lee, 2013). This transition to the post-industrial economy is only possible if appropriate human resources are available. In this light, the quality of education becomes the key factor of forming human capital (Morrisson, Murtin, 2013).

Human capital was argued to be the most productive factor in the modern world capable to provide sustainable competitive advantage (Soukiazis, Antunes, 2012). Islam et al. argued that human capital is mostly created and developed within the educational system, especially in its upper levels (Rabiul Islam et al., 2014). Therefore, the main question of the study is to what extent higher education is able to contribute to the development of human capital. Accordingly, the aim of the study is to estimate the significance of the relationship between higher education factors and human capital.

2. Literature review

The theory of human capital was developed as an attempt to answer the question "Why are investments into education made and are they necessary?" The pioneers of this theory such as Becker (Becker, 1967) and Schultz (Schultz, 1988) suggested that it is necessary to invest into education and in the quality of human's life since it further leads to an increase in productivity at the state level and stimulates economic growth. The directions of such investment may include expenses on formal education at all levels, professional training and health. What is important, these expenditures increase future productivity at the expense of current consumption which is why they are considered as investment (Olugbenga, Campbell, 2013).

Three arguments were suggested in favour of investing in human capital (Babaola, 2003). First, the author suggested that further generations should be given opportunities to obtain knowledge generated and accumulated by previous generations. Second, future generations might find new ways of applying the knowledge based on new technologies. Third, education will encourage people to develop new ideas, technologies, methods and processes using creative approaches. Fagerland and Saha argued that investment in human capital would ultimately stimulate economic growth of the society and transition to the knowledge-based economy (Fagerland, Saha, 1997). In this vein, van den Berg also argued that more educated labour force would ensure positive externalities for the society (Van den Berg, 2001). One of the possible channels of this transformation of education into the economic growth is through development and implementation of innovations as human capital ensures more creative and technically complicated approaches to addressing social challenges.

In addition, patterns in returns from higher education were explored (Montenegro, Patrinos, 2014). They found a descending trend in returns in the sense that additional years of schooling ensured positive effects but the surplus from each additional year was decreasing. Along with that, the authors argued that tertiary education provided the highest returns. A positive relationship between education, human capital and economic indicators was revealed by Tanzharikova (Tanzharikova, 2012). Botev et al. (Botev et al., 2019) proposed a new measure for human capital and compared its relationship with education and economic productivity for a set of well-known economic models. The results evidenced that a newly proposed indicator performed well in the tested models and also reflected a significant relationship between human capital and economic growth.

3. Data and variables

This section presents the variables employed in the study and reveals their sources. Moreover, it explains what results are expected in the regression analysis. The analysis captures the period from 2010 to 2020. However, the required data were available only for 2010, 2017, 2018 and 2020, therefore only these years are explored. The matter is that the data for human capital measurements are available only for these years. Accordingly, the data sample includes all 36 OECD countries that entered this organisation before 2021 plus China and Russia. The latter country is included as the focus of the study is on the comparison of Russian indicators with those of the leading world economies. Meanwhile, China is included due to its consistent efforts of modernising its economy through innovations and technical progress. Besides, China has the second largest number of universities included in the top 1000 world universities, behind only the USA, according to the Centre

for World University Rankings (CWUR, 2022). Therefore, it looks that China can be included into the sample as one of the world's leading countries in the sphere of education.

The following variables are employed in the analysis. The dependent variable is the human capital index (HCI). This is a cross-country metric measuring the human capital that a child born today can expect to attain by her 18th birthday, given the risks of poor health and poor education prevailing in their country. The HCI brings together measures of different dimensions of human capital: health (child survival, stunting, and adult survival rates) and the quantity and quality of schooling (expected years of school and international test scores). Using estimates of the economic returns to education and health, the components are combined into an index that captures the expected productivity of a child born today as a future worker, relative to a benchmark of complete education and full health. The HCI ranges from 0 to 1, so that an HCI value of, for instance, 0.5 implies that a child born today will be only half as productive as a future worker as she would be if she enjoyed complete education and full health.

The education variables include secondary and tertiary school enrolment, state expenditures for research and development (R&D) as percentage of GDP, the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences and the university quality. Secondary and tertiary school enrolments are the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. These ratios show which part of the population have at least entered the secondary and tertiary education levels, respectively. The R&D expenditure reflects to which extent the state governments contribute to the development of science and innovations which in turn increase the level of productivity and thus contribute to human capital. The university quality variable is calculated as the number of universities included in the top 1000 ranking by CWUR. The number of research articles indirectly reflects the level of fundamental science in a country. In addition, the variables of the number of technicians and researchers per 1 million people are also included in the sample. These two variables demonstrate how many people in a country are involved in practical science and thus contribute to human capital development as well. It is expected that all these independent variables are positively connected with HCI which would mean that all of them contribute to human capital development.

Two control variables are also used in the analysis, namely per capita income growth and unemployment rate. The former is connected with human capital through the opportunities for self-development an individual obtains with higher income. On the other hand, this indicator reflects the level of life quality in a country which is directly connected with human capital. Meanwhile, the unemployment rate shows what portion of labour force remains beyond the official labour market and thus has less opportunities for enhancing their lives. The income growth rate is expected to be positively connected with human capital whereas the linkage between HCI and unemployment is expected to be negative.

The data for the analysis are taken from two sources. The data on university rankings are taken from CWUR (CWUR, 2022). The data for the remaining variables are taken in the World Development Indicators database (World Bank, 2022).

3. Methods

This section briefly describes the research design, outlines the research methods and provides the empirical model for the analysis.

Research Design

The study tests the hypotheses on the relationship between educational and R&D variables and human capital in Russia and OECD countries. To test these hypotheses, quantitative study is conducted which stipulates the use of mathematical and statistical methods of analysis. Secondary data are used in the study as these data have already been collected, refined and published for aims other than the aims of this study.

Research Methods

An ordinary least squares (OLS) regression analysis is employed for testing the research hypotheses. This procedure stipulates estimation of linear relationships between the dependent variable and a range of independent variables through determination of appropriate parameters of a fitted regression line which would be as close to real observations as possible. The overall sample

is examined using a panel regression analysis. As the data in the sample changes in two dimensions, namely between OECD countries and over time, the panel analysis looks to be the optimal method. Observations across countries may vary considerably so that the standard regression error term might be unable to account for the dependent variable variance. Thus, additional components should be introduced into the model to account for the excessive variance. This can be done through the use of either fixed effects (FE) or random effects (RE).

The FE specification suggests that observations across countries vary so significantly that dummy variables for each observation have to be used to distinguish between them. Meanwhile, the RE specification suggests that there is no need to introduce a large number of dummy variables, and it is possible to absorb excessive variance by introducing a single additional variable. This method consumes less degrees of freedom compared to the FE-specification and thus is easier to apply, but it may produce inconsistent outcomes. The Hausman specification test is conducted to determine which type of effects should be applied. The p-value of the test statistic is compared with the threshold level 0.05. If the p-value is higher than this level, then the null hypothesis suggesting that RE-model outcomes are consistent is accepted. In the opposite case, this hypothesis is rejected, and the FE-model is applied.

Besides conducting the panel analysis, cross-sectional analysis for particular years (2010, 2017, 2018 and 2020) is run. The matter is that while the data on HCI were available for these years, the data on university ranking staring only from 2012 were available. Also, the data on several variables in 2020 were unavailable as well. Besides, the analysis of a comparatively small sample for only four years and a substantial share of lacking observations would produce biased outcomes. The cross-sectional analysis in which data change only over countries add to the understanding of relationships between educational and scientific variables and the level of human capital in the entire sample.

Model

The model is specified as follows:

$$HCI_{i,t} = \beta_0 + \beta_1 Secondary_{i,t} + \beta_2 Tertiary_{i,t} + \beta_3 Researchers_{i,t} + \beta_4 Technicians_{i,t} + \beta_5 RD_{i,t} + \beta_6 Unemployment_{i,t} + \beta_7 Article_{i,t} + \beta_8 Income_{i,t} + \beta_9 University_{i,t} + \varepsilon_t$$

Where for country I and year t, Secondary is the secondary school enrolment, Tertiary is the tertiary school enrolment, Researchers is the number of researchers per 1m of population, Technicians is the number of technicians per 1m of population, RD is the R&D expenditure as % of GDP, Unemployment is the share of unemployed labour force, Article is the number of published scientific and technical articles, Income is the income per capita growth, University is the university quality, β_0 is the intercept, $\beta_1 - \beta_9$ are the regression coefficients, ε_t is the error term.

Hypotheses

The following hypotheses are tested in the study:

H01: There is no significant relationship between the share of population with higher education and human capital.

H02: There is no significant relationship between the quality of universities and human capital.

H03: There is no significant relationship between the level of practical research and human capital.

Although the research hypotheses are formulated to deny significant relationships between explored variables, this is done in line with the statistical test formulations. In fact, it is expected that all these variables are significant determinants of human capital.

4. Results

This section presents the outcomes of the analysis. First, the indicator values for Russia are compared with the corresponding average values for the remaining sample that includes all OECD countries and China. After that, the regression analysis is conducted. Finally, the obtained results are discussed in the light of the research aims and previous literature.

Comparison of Scientific Indicators in Russia and OECD

The analysis section starts with exploring the trends in the data. In particular, the mean variable values across the OECD + China sample are compared to those in Russia for different periods. In particular, the means for the entire sample are compared as well as means for each of

the explored years, namely 2010, 2017, 2018 and 2020. The mean values of the variables for the OECD countries and for Russia are presented in Table 1.

Table 1. Comparison of Indicators between OECD countries and Russia

Indicator	Total		2010		2017		2018		2020	
	Sample	Russia	Sample	Russia	Sample	Russia	Sample	Russia	Sample	Russia
Human capital index (HCI)	0.744	0.685	0.734	0.601	0.754	0.729	0.750	0.729	0.740	0.681
Secondary education enrolment (%)	111.9	103.6	104.4		115.2	103.4	115.3	103.8		
Tertiary education enrolment (%)	72.8	83.2	67.2		73.7	81.9	75.9	84.6		
Technicians per 1 m people	1 189	454	1 034	474	1 376	451	1 136	4 305	4 634	2 722
Researchers per 1 m people	4 150	2 852	3 499	3 098	4 212	2 822	438	2 784		
R&D expenditures (% of GDP)	1.98	1.08	1.8	1.1	1.9	1.1	2.0	1.0	2.2	1.1
Number of scientific articles	49 262	62 077								
Income per capita growth, %	0.53	4.52								
Unemployment, % of labour force	7.07	5.75								

Several cleat tendencies can be observed from the sample analysis. First, the values of HCI are consistently higher for OECD countries that in Russia. The highest mean value of HCI was in 2017, namely 0.754, whereas the lowest one in 2010, namely 0.734. Meanwhile, the highest HCI value in Russia was in 2017 and 2018, namely 0.729 which is quite close the OECD values, whereas the lowest HCI value was in 2010, namely 0.601. These values imply that although the index of human capital has been growing in Russia during the last decade, from 0.601 in 2010 to 0.729 in 2017 and 2018, it remained lower that the average across OECD countries. Remarkably, the highest average HCI values can be observed for Japan and South Korea, both equal to 0.826.

Secondary education enrolment in Russia was lower compared to the OECD average level, namely 103 % versus 111 %, respectively. What is interesting, tertiary education enrolment in Russia was over 10 % higher than the OECD average, 83 % against 72 %, respectively. Similarly, the average number of scientific articles equal to 62k was higher in Russia while this number was only 49k in OECD countries despite a huge contribution of the US where about 420k publications are made annually. Along with that, the number of technicians and researchers per 1 million people in Russia was 450 and 2850 specialists, respectively. This can be compared to over 2000 technicians and over 5000 researchers per million in Luxembourg, Switzerland or Scandinavian countries. In addition, the share of R&D expenditures in the Russian budget is almost twice lower than on average in OECD countries and three times lower than in Switzerland, Sweden and the US.

This likely reveals a large problem of the Russian science. While the share or tertiary education students and the number of scientific articles is higher than in the OECD, the number or science practitioners and R&D expenditures are much lower. This, in turn, points to a great gap between the theoretic research and practice and Russia. It looks that, a large number of theoretical developments are implemented in practice with lower intensity and efficiency than in the leading innovative economies of the world.

Regression Analysis

The main step of the analysis is the statistical estimation of the influence of scientific variables on the HCI. In this analysis, Russia is included into the overall sample. As mentioned in the Methodology section, several regressions are run. Specifically, a panel regression analysis is

conducted for the entire sample while a cross-sectional regression analysis is conducted for 2010, 2017, 2018 and 2020 separately. The outcomes of all regression models are presented in Table 2.

Table 2. Regression Analysis

Variable	Coefficient (Standard Error)					
	Total sample, FE	Total sample, RE	2010	2017	2018	2020
Secondary	0.002 (0.000) ***	0.002 (0.000) ***	0.000 (0.001)	0.002 (0.001) *	0.001 (0.000) **	
Tertiary	0.001 (0.000) **	0.001 (0.000)	0.001 (0.001)	0.000 (0.001)	0.001 (0.000) *	
Researchers						0.058 (0.017) ***
Technicians	0.020 (0.012)	0.022 (0.009) **	0.017 (0.015)	0.008 (0.014)		
RD	0.015 (0.009)	0.019 (0.007) ***	0.035 (0.020) *	0.027 (0.011) **	0.016 (0.007) **	0.006 (0.011)
Unemployment		0.000 (0.002)	-0.003 (0.002)	-0.005 (0.002) *	-0.003 (0.002)	
Article			0.007 (0.006)	0.009 (0.010)	-0.016 (0.011)	
Income			-0.001 (0.002)	0.005 (0.003)	0.009 (0.003) **	-0.002 (0.002)
University			0.001 (0.012)	0.030 (0.013) **	0.003 (0.007)	
_cons	0.265 (0.071) ***	0.304 (0.054) ***	0.430 (0.121) ***	0.343 (0.170) *	0.663 (0.106) ***	0.249 (0.130) *
R-squared	0.567	0.669	0.767	0.845	0.700	0.678
F-stat (p-value)	22.55 (0.000) ***	107.32 (0.000) ***	6.1 (0.003) ***	6.8 (0.003) ***	7.00 (0.000) ***	8.41 (0.000) ***

***significant at the 1 % level; **significant at the 5 % level; *significant at the 10 % level

Prior to analysing each model, it is necessary to explore their explanatory ability measured by two indicators, namely R-squared and the p-value of the F-statistics. R-squared indicates what

portion of the HCI variance can be explained using the independent variables in each model. All models have high explanatory power as R-squared varied between 0.567 and 0.845. This means that the constructed models were able to able between 56 % and 85 % of HCI variance.

As for the F-statistics, they test particular models for the presence of significant coefficients. The nature of the F-test is the following. The null hypothesis is that there are no significant coefficients, and the explanatory power of the model is not higher than that of the intercept-only model. However, if the null hypothesis is rejected, then the alternative hypothesis of the significance of at least one coefficient is accepted. This is checked by comparing the p-value of the F-statistic with the threshold level which is equal to 0.05 for the 5 % significance level. The tests showed that p-values were lower than 0.05 for all the models. Therefore, all of them contain significant coefficients that have to be determined using t-tests. T-tests are conducted using the same logic, but the significance of particular coefficients in a model is estimated.

First, the full sample was explored using a panel regression analysis. The analysis of the full model appeared to be impossible both for the FE and RE specifications. For the FE-model, the unemployment rate, number of scientific articles, income growth rate and the university variables were omitted because of multicollinearity. This can be explained by a small size of the sample and lacking observations. As for the RE-model, the insufficient number of observations was also the reason for the model test failure. Once the correlated variables were omitted, both models were analysed using a restrained number of variables including secondary and tertiary education enrolment, number of technicians per 1 m people and countries' R&D expenditures as percentage of GDP.

The FE-specification indicated that secondary and tertiary enrolments were significantly and positively related with human capital. Meanwhile, the RE-specification indicated that secondary education enrolment, share of technicians and R&D expenditures had a significant linkage with the human capital variable. The Hausman specification test showed that the RE-model results are inconsistent which means that the FE-model outcomes have to be used for the analysis.

Next, the cross-sectional regressions are run for each of the four explored years. For 2010, only the R&D expenditures are shown to have significant impact on HCI. The linkage was positive and significant but only at the 10 % level. For 2017, secondary school enrolment, R&D expenditures and university ranking were shown to have a positive and association with human capital. Meanwhile, a negative impact of unemployment at the 10% level was also detected. For 2018, both secondary and tertiary school enrolment as well as R&D expenditures and were shown to have a significant impact on human capital. In addition, per capita income growth was shown to have a positive influence on the dependent variable. For 2020, most observations for the variables for secondary and tertiary school enrolment and number of scientific articles and technicians were unavailable, so the regression model included only 5 independent variables. Accordingly, only the number of researchers per 1m people had a significant and positive effect on HCI.

5. Conclusion

The study aimed to determine the main determinants of human capital in Russia compared to OECD countries. The findings indicated a significant and positive relationship between involvement of population into the system of secondary and tertiary education and human capital. This is in line with the findings by Montenegro and Patrinos (2014) who also underlined a substantial role of higher education in the development of human capital. Also, the research detected a positive relationship between government spending on R&D and the level of human capital. This implies that investment in science-oriented higher education and innovations have a positive impact on the economic wellbeing of future generations represented by the HCI. Some positive linkage between the quality of universities and human capital has also been revealed although not for all years.

As for Russia, a gap between theoretic and practical education was revealed. In particular, the share of population with secondary and tertiary education and the number of published scientific articles were higher in Russia than the average across OECD countries whereas the concentration of practitioners in science represented by the number of technicians and researchers, and R&D expenditures were significantly lower in Russia. This finding might point to one of the most significant problems of the Russian science that inhibits the country's economic growth. The study showed that not only investments in human capital, but also the appropriate

implementation of theoretical developments is important. These findings can be interesting and useful for policy makers seeking the ways of stimulating innovative production in Russia.

Along with the findings, some limitations of the study should be underlined. First of all, the availability of data on HIC for only several years significantly limited the longitudinal scope of the research. Second, there is still no consensus in the academic science on how to measure and represent human capital. This is explained by the fact that while most researchers recognise the importance of this concept in the post-industrial economy and necessity of investing into development of human abilities, the particular factors comprising this concept are still debated.

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Quality of Educational Services in the Distance Format: Assessment of Moscow Higher Education Institutions' Students

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Abstract

The sphere of education was one of the first to experience the effects of the COVID-19 pandemic and responded to the introduced restrictions by transferring all educational activities to the distance learning format. The gist of the problem is to preserve the quality of educational services in the transition to the distance learning format.

The purpose of the study is to analyze students' assessment of the quality of educational services provided in the distance format by Moscow higher education institutions.

The authors report the results of a survey of students from two universities, the Moscow State University of Food Production and the Russian State Social University. The survey sample includes 423 MSUFP students and 350 RSSU students studying in the full-time, part-time, and extramural forms of study. The time frame for the study is March-May 2022.

The results obtained show that, according to students, the transition of the higher education system to distance learning during the COVID-19 pandemic was performed quite promptly and efficiently. However, the problem of the implementation of distance learning in teaching university students requires further work on both methods and technological instruments.

The research results demonstrate that preservation of the quality of educational services in the transition to distance learning depends on the level of students' learning motivation, their readiness for independent studies, reliable means of communication (computers, laptops, tablets), high-speed communication channels and digital infrastructure of higher education institutions, and much more.

The research findings suggest that the main problems faced by students as a result of the transition to distance learning can be classified into two groups. The first group is technical

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difficulties (Internet speed and quality of connection) and the lack of necessary gadgets (computer/tablet, and a headset for them), i.e. inability to communicate with the teacher. The second group includes problems of a personal nature: willpower, self-organization, motivation, and self-discipline.

Keywords: distance learning, quality of educational services, digital infrastructure, educational services, distance learning technologies.

1. Introduction

The sphere of education was one of the first to experience the effects of the COVID-19 pandemic and responded to the introduced restrictions by transferring all educational activities to the distance learning format.

Traditional education is changing. Digital instruments have become seriously and permanently embedded into it. The main issue now is to develop methods for working with these tools.

The rushed transition to full distance learning was made possible by the experience in the creation and use of distance learning technologies accumulated by Russian universities since the mid-1990s (Shtyhno et al., 2020).

In 1995, government officials approved the Concept of Creation and Development of a Unified System of Distance Education in Russia. Distance education (DE) is understood here as "a complex of educational services provided to the general public in the country and abroad by means of a specialized information and educational environment, at any distance from educational institutions".

The restrictions brought about by the COVID-19 pandemic essentially launched a new reform of the higher education system in Russia. Notably, these changes have affected both learning technologies and the content of educational programs.

To get an idea of the readiness of universities' digital infrastructure for the transition to distance learning, here are the facts and figures of the initial situation as of the middle of March 2020, taken from the study conducted by the National Research University Higher School of Economics (NRU HSE) "Digital Infrastructure of Russian Universities":

- 13 % of universities did not have even minimal infrastructure (no high-speed Internet access, no specialized data storage systems to host information systems);
- 11 % had digital infrastructure sufficient to fully organize online learning and host content on their own facilities;
- 44 % had licenses for software tools for synchronous group work (like ZOOM);
- 88.51 % of dormitories were provided with Internet access;
- 88 % of universities stated that they had digital learning management systems (LMS). This system was developed back in 2006 and by 2020 had undergone six upgrades but only 45 % of universities' indicators correspond to the real use of LMS for the organization of educational activities.

Thus, by the start of remote work, most universities did not have the infrastructure to support the deployment of full-fledged distance learning, and one in ten universities did not have even basic infrastructure to provide distance interaction.

The Russian State Social University (RSSU) is convinced that both face-to-face and remote access learning have their advantages and drawbacks. Moreover, digitalization at this university started quite a while ago. The factors considered as the benefits of distance learning include:

Accessibility – the opportunity to study without any attachment to the location of the educational institution and the student;

Flexibility – the opportunity to study on a flexible schedule and combine education with work;

Cost-effectiveness – the lack of time and financial expenses for transportation to visit the educational organization;

Cost – DE typically costs less than full-time, part-time, or extramural learning without the use of distance learning technologies.

The disadvantages of distance learning are the following: limited personal communication with teachers and other learners in the learning and out-of-classroom environment; dependence on technical and software to ensure the system of distance learning.

It should be pointed out that the first enrollment in educational programs of distance learning with the use of distance technology at the RSSU was in 2014. In 2019, this form of education was one of the most popular.

It is also important that currently, classes at the RSSU are conducted in an integrated format. Lectures are held in classrooms and broadcast on the Internet strictly according to the schedule, and the recordings are published in the electronic educational environment, which allows students to revisit the studied material at any time.

The Moscow State University of Food Production (MSUFP) founded in the 1930s is one of the oldest universities in Moscow. In 2009, the university launched its distance learning project in two specialties:

- Accounting, analysis, and audit (080109);
- Economics and management in the food industry (080502).

In line with the Recommendations for implementing the educational process to prevent the spread of the novel coronavirus infection (COVID-19), the MSUFP realized the educational process of students in every form of education in the following way:

- lectures were held in the distance format according to the schedule of classes.
- laboratory, seminar, and practical classes were held in person according to the schedule of classes in compliance with the sanitary requirements.

To use the e-learning environment, the MSUFP developed instructions for students and teachers on how to post educational materials, create test assignments, publish announcements, collect students' written works, and assign grades.

One of the biggest concerns of universities during the pandemic was a drop in the quality of education. Due to the varying readiness of staff and departments to transition to the online environment, insufficient technical equipment, and other difficulties, many students receive a completely different experience in the online environment. In this light, universities need to identify their weaknesses and develop appropriate methods for monitoring in the new environment.

Prior to the pandemic, many universities already had the experience of remote work with their students. However, the distance format is not that popular for the practices of extracurricular work with students, and many teachers face a new task – the need to involve the student community in the life of the university through online practices. This mission is especially valuable in a time of students' isolation – it is necessary to preserve the quality of the educational experience and the stable psychological climate and dynamic in the university, as well as to collect student feedback (Klyagin, 2020).

The following is an analysis of research publications that consider the aspects of the problem of higher education transitioning to the distance learning format and on which we rely in our research.

In a report by representatives of the rector community at a meeting of the Public Council under the Ministry of Science and Higher Education entitled "Lessons of the Stress Test: Russian Universities under Pandemic Conditions", it was noted, in particular, that "the experience of Russian universities has demonstrated the importance of digital technologies and the existence of issues that cannot be resolved in their absence. In this regard, it is necessary to accelerate the development of digital resources and relevant practices of the educational process, to improve the methodological qualifications of teachers, and to improve the digital infrastructure of universities".

The gist of the problem is to preserve the quality of educational services in the transition to a distance learning format.

The study goal is to establish students' opinions on the quality of educational services provided in the distance format by Moscow universities.

Research objectives

1. To study the role and significance of the transition to distance learning in higher education during the COVID-19 pandemic;
2. To build and analyze tables and charts based on the materials of the surveys conducted by RAEX Analytics, LLC and the All-Russian Public Opinion Research Center (VTsIOM), as well as student surveys at the MSUFP and RSSU;
3. To establish the advantages and disadvantages of distance learning as seen by students;
4. To identify the impact of distance learning on the quality of educational services;

5. To analyze the problems faced by students as a result of the transition to distance learning;

6. To identify the prospects for the development of distance learning.

The relevance of the topic under study owes to the transition to distance learning in view of the prevention of the spread of COVID-19.

Beginning March 14, 2020, the Order of the Ministry of Science and Higher Education of the Russian Federation, in order to prevent the spread of the novel coronavirus infection in the Russian Federation (Prikaz Ministerstva..., 2020) stipulated the need to ensure mediated (remote) interaction of students and faculty, including with the use of distance learning technologies, which continues to this day.

In less than two semesters, the Russian system of higher education underwent modernization. In such a short period of time, the sphere of higher education was radically transformed.

Thus, students face the need to learn how to master general cultural and professional competences through distance learning. Practice shows, however, that in most graduates, the general cultural competencies are developed insufficiently, and modern ICT and e-learning are only episodically used to improve students' competences.

2. Methods

The study is based on analytical, statistical, and forecasting materials of the Ministry of Science and Higher Education of the Russian Federation, publications on this topic, and our own observations and conclusions obtained during the study.

The research instruments include the methods of analysis, generalization of statistical data, and the comparative method, as well as the methods of synthesis, induction, and analogy.

In disclosing the problem under study, we relied on:

- The results of the survey of university students by RAEX Analytics, LLC – "Distance Education", 2020. The RAEX (RAEX Analytics) rating agency conducted a survey of more than 6,000 Russian students from 153 Russian universities and prepared the first national study on DE based on the data obtained, which was published on July 5, 2020.

- Data from a survey of university students conducted by VTsIOM "On satisfaction with the organization of distance education, on changes in the level of study load, and on the possible effects on the quality of education due to the transition to a distance learning format" published May 27, 2020.

An initiative all-Russian survey, which involved 800 students of Russian universities. The survey was conducted by telephone interview using stratified two-branch random sampling of landline and mobile numbers. The survey was conducted May 14-16, 2020. The margin of error was 3.5 %.

- In May 2022, we conducted a sociological study in the form of a survey of full-time, part-time, and extramural students at the MSUFP. The purpose of the study was to obtain students' assessment of the quality of educational services in the distance format.

Students' assessment of the organization of distance learning is directly connected to the quality of their own education, which is why the opinion of students as active participants in the learning process is highly valuable to universities. The survey followed strict methodological procedures and, above all, the anonymity of respondents.

In total, the survey was taken by 423 respondents.

The gender composition of the sample was:

- female – 58.6 %;
- male – 41.4 %.

The age distribution of the students: 18-20 years old – 29.3 %; 21-25 years old – 47.6 %; 26-30 years old – 11.3 %; 31-35 years old – 5.2 % 36-40 years old – 45 %; 41-50 years old – 2.1 %.

Form of study:

- full-time – 64.2 %;
- extramural – 35.8 %.

The indicated age and gender composition implies that the majority of the respondents studied full-time.

- In March 2022, we also conducted a survey of full-time, part-time, and extramural students at the RSSU. A total of 350 students took part in the survey.

The gender composition of the RSSU sample was:

- female – 53.2%;
- male – 46.8%.

The age of the students was: 18-20 years old – 37.3 %; 21-25 years old – 39.7 %; 26-30 years old – 9.3 %; 31-35 years old – 6.1 %; 36-40 years old – 5.3 %; 41-50 years old – 2.3 %.

Form of study:

- full-time – 74.6 %;
- extramural – 25.4 %.

Participants in the survey were mostly those studying full-time. The questionnaire for students to assess the quality of educational services provided in the distance form at the RSSU contained 25 questions about distance learning. The student survey was conducted to determine how the transition to distance learning has affected the quality of education.

The results of the study were analyzed by analyzing the relationship between the capabilities of students (MGUPP, RSSU, Moscow Universities) to use various components of electronic educational systems of training and the level of their provision.

The authors used the calculation method for the Pearson criterion χ2 (Tables 1-3).

Table 1. Analysis of conjugacy tables using the chi-square criterion of the MGUPP

Factorial feature	Effective feature		The amount
	ongoing	not being conducted	
Individual work with teachers using video chat	30	70	100
Viewing recordings of video lectures	68	32	100
Monitoring progress in your personal account	57	43	100
Viewing live lectures in online format (with the ability to ask questions)	90	10	100
Attending video seminars (group classes) online	86	14	100
Performing interactive tasks (tests, surveys, etc.).	79	21	100
Receiving tasks in your personal account	77	23	100
Correspondence with teachers, exchange of documents	89	11	100
Total	576	224	800

The number of degrees of freedom is 7. The value of the criterion χ2 is 143.254. The critical value of χ2 at the significance level $p = 0.01$ is 18.475. The relationship between the factorial and effective signs is statistically significant at the significance level $p < 0.01$.

Table 2. Analysis of conjugacy tables using the chi-square criterion of the RSSU

Factorial feature	Effective feature		The amount
	ongoing	not being conducted	
Individual work with teachers using video chat	32	68	100
Viewing recordings of video lectures	68	32	100
Monitoring progress in your personal account	53	47	100

Viewing live lectures in online format (with the ability to ask questions)	88	12	100
Attending video seminars (group classes) online	88	12	100
Performing interactive tasks (tests, surveys, etc.).	79	21	100
Receiving tasks in your personal account	78	22	100
Correspondence with teachers, exchange of documents	92	8	100
Total	578	222	800

The number of degrees of freedom is 7. The value of the criterion χ2 is 148.309. The critical value of χ2 at the significance level p = 0.01 is 18.475. The relationship between the factorial and effective signs is statistically significant at the significance level p < 0.01.

Table 3. Analysis of conjugacy tables using the chi-square criterion of Moscow universities

Factorial feature	Effective feature		The amount
	ongoing	not being conducted	
Individual work with teachers using video chat	32	68	100
Viewing recordings of video lectures	68	32	100
Monitoring progress in your personal account	57	43	100
Viewing live lectures in online format (with the ability to ask questions)	81	19	100
Attending video seminars (group classes) online	82	18	100
Performing interactive tasks (tests, surveys, etc.).	64	36	100
Receiving tasks in your personal account	64	36	100
Correspondence with teachers, exchange of documents	89	11	100
Total	537	263	800

The number of degrees of freedom is 7. The value of the criterion χ2 is 101.910. The critical value of χ2 at the significance level p = 0.01 is 18.475. The relationship between the factorial and effective signs is statistically significant at the significance level p<0.01.

3. Results

Below we provide data from a comparative analysis of surveys conducted by the rating agency RAEX, which covered more than 6,000 students at 153 Russian universities, and VTsIOM, which surveyed 800 students at Russian universities.

The weakest point in the transition to the distance learning format, according to experts, is the technical equipment of universities (computers, educational programs, application functionality, Internet, etc.). In surveys, over 70 % of students indicated satisfaction with equipment (from 72 % in the VTsIOM surveys to 75.4 % in the RAEX Analytics, LLC surveys), taking "Completely satisfied" and "Mostly satisfied" together. Only 5 to 6.7 % of students were completely dissatisfied with the technical equipment of their university.

The use of information technology provides maximum ease of continuous monitoring of the quality of the educational process by managers and employees of educational units during the school day and provides the opportunity for daily monitoring of each pair of classes held in accordance with the current schedule.

For example, in face-to-face classes, it takes time to visit each other's classes to share experiences, exercise supervision, and so on. In distance learning, on the other hand, it only requires joining the given academic group (for example, a team in the terminology of Microsoft Teams) to see all the students in attendance at the study session, conduct a verbal survey in the videoconference mode, assess the methodological actions of the teacher, assign different tasks, including projects, to each student, or perform current knowledge assessment or midterm attestation, etc., including with the use of test constructors (Safontseva, 2021).

Despite the common belief that distance learning is rapidly gaining momentum and is gradually replacing the traditional format, or at least competing with it, most respondents report that prior to March 2020, they did not have personal experience studying in the distance mode (68 %). Thus, in fact, only around one in three students had the experience of distance learning. Therefore, it can be argued that the significance and popularity of this new format of learning prior to the pandemic were somewhat overestimated.

Table 4. Distance learning opportunities available to students at the RSSU, MSUFP, and in Moscow in general (%)

	RSSU	MSUFP	Moscow Universities
Individual work with teachers via video chats	32	30	32
Viewing video recordings of the lectures	68	68	68
Control of academic performance in the personal account	53	57	57
Watching live lectures online (with the opportunity to ask questions)	88	90	81
Attending video seminars (group lessons) online	88	86	82
Completing interactive assignments (tests, surveys, etc.)	79	79	64
Receiving assignments in the personal account	78	77	64
Correspondence with teachers, exchange of documents	92	89	89

Source: compiled by the authors based on data from RAEX Analytics, LLC, RSSU, and MSUFP.

The results indicate that 89 % of students at Moscow universities report having access to correspondence with teachers. In turn, accessibility is noted by 89 % of students at the MSUFP by 92 % at the RSSU, which is 3 % higher than the Moscow average. Receiving assignments at their personal accounts are 78 % of RSSU students and 77 % of MSUFP students, while the average percentage across Moscow universities is much lower at 64 %.

The experience of completing interactive assignments (tests, surveys, etc.) is reported by 64 % of Moscow university students overall, while at the MSUFP and the RSSU, this value reaches 79 %, which is 15 % higher than the city average.

The situation with visual contact, on average across the Russian Federation, is not quite good – only 69 % of respondents can attend video seminars. However, the RSSU and the MSUFP provide much better accessibility to video seminars with 88 % and 86 %, respectively.

The availability of live online lectures (with the opportunity to ask questions) is noted by 90 % of MSUFP students and 88 % of RSSU students, the average across Moscow being 81 %.

Access to the recordings of video lectures: on average across Moscow, the recordings of lectures are available to two-thirds of students (68 %), at the RSSU – to 68 %, and at the MSUFP – to 68 %. Thus, almost half of students at Moscow universities have transitioned to the distance learning format. However, control over academic performance through the personal account is available to a little more than a half of students regardless of their place of study: at the RSSU – to 53 %; at the MSUFP – to 57 %, and in Moscow – to 57 %.

Finally, individual work with teachers via video chats is practiced by one in three Moscow university students (32 %), by 32 % at the RSSU, and by 30 % at the MSUFP.

In distance learning, the student works without any direct physical contact with teachers or groupmates, which is why they need to be more engaged and motivated to learn (Ivanova, Zhukova, 2016).

It is also worth noting that online learning requires the student to have not only a high level of motivation, but also the ability to self-study, and mastery of the skills necessary for this. Meanwhile, not every student is able to study on their own, especially if it requires mastering quite complex training courses. According to some data, only 5-10 % of students in the fully online format of education complete their studies successfully (Kolesnikova, 2019).

4. Discussion

Valery Falkov, Minister of Science and Higher Education of the Russian Federation, admitted that the quality of distance learning in the country as a whole is worse than that of full-time education. "Yes, the quality of distance learning differs from the quality of full-time education, because it's one thing when we communicate with you in person, and another thing when we communicate on TV. But it's a forced necessity, education didn't become extramural because of the transition to distance learning.

The main difference between full-time and extramural education is not in the lessons on the computer, but in the number of hours the teacher works with the student."

Analysis of university practices indicates that there have been several modes of organizing educational activities during the period of remote work:

- asynchronous or extramural (students study the material at their convenience, according to the deadlines set by the teacher);
- synchronous (simultaneous participation in a class, for example, in a webinar format);
- mixed (a combination of synchronous and asynchronous interaction, depending on the pedagogical objectives).

Independent evaluation of the quality of education is an assessment procedure based on information about the educational activities of organizations engaged in educational activities. Independent evaluation of the quality of education is represented by external and internal evaluation.

External evaluation is conducted by public experts (public accreditation, including professional-public and international accreditation).

Internal evaluation is conducted by the university itself, and each educational organization has its own internal system of education quality.

Objectives of the internal independent evaluation:

- improving the structure and updating the content of educational programs implemented in the educational organization;
- improvement of resource provision of the educational process;
- improving the competence and qualifications of teaching staff involved in the implementation of educational programs;
- increasing the motivation of students to successfully master educational programs;
- strengthening the interaction between the educational organization and social partners-employers on improving the training of students;
- combating corruption in the educational process (Rybina et al., 2020).

Here we should note the advantages and disadvantages of distance learning in universities at the present moment.

The advantages of distance learning in universities:

- Reduced costs of education. The most budget-friendly type of education in Russia is distance learning because the work time of teachers is reduced to a minimum, there is no need for printed teaching materials and manuals, and the cost of maintaining the educational institution and teachers is reduced.
- Reduced training time, which makes it possible not to miss classes. Mobile learning gives a new quality to learning, most fully reflects the trends in the education of a modern person, providing constant access to information at any time; it is a new toolkit in the formation of a person of the information society, where a new learning environment, independent of place and time, forms (Kuklev, 2009).

- Flexible work schedule. The student manages their own time and workload and creates their own work schedule.
- Students have no ties to their place of residence; all they need is a computer and a high-speed, stable Internet connection.
- The student can combine studies with their main occupation.
- Opportunity to study with a preferred number of people.
- A peaceful environment. Lack of subjectivity in knowledge assessment, decreased stress level while passing exams and tests.
- High degree of actualization of the materials. Active use of digital technologies, the Internet, and software allows for adjustments and timely updates of educational programs in the fastest possible way, following changes in the external environment (Dedyuhin et al., 2020).
- High results. This type of learning in some cases outperforms the traditional form of learning, having an individual approach at its core. When working independently, the student understands the material more deeply, successfully applies theoretical knowledge in practice, shows more interest because of the use of modern technologies, and has an opportunity to get an answer to each of their questions.
- Thus, the use of gadgets allows you to easily and quickly find the necessary information, save time, develop and progress, fix a certain moment, and organize fast and convenient communication (Kabanova, Vetrova, 2019).

Like any form of education, distance learning has a number of disadvantages at any level of education, some of which may also overlap.

Disadvantages of distance learning in higher education:

- Successful training requires self-control, strong willpower, and a sense of responsibility.
- Communication skills are not developed, since interaction with other people (teachers and groupmates) is brought to a minimum.
- Lack of live practice, which makes it more challenging to master the specialty. Modern digital technological tools do not fully compensate for the deficit of social interaction in the classroom (Frolova et al., 2020).
- Problems of authentication, it is almost impossible to verify whether the student performed the assignment on their own (Rybina et al., 2020).

Digital technologies, including those using remote access, allow employing a more individualized approach and adjusting the learning trajectory to the individual characteristics of the student.

Face-to-face learning provides the development of social interaction skills and gives an opportunity to better know the teacher's personality, to ensure an upbringing effect.

The task of a university is to develop a comprehensive educational system that incorporates both of these forms of learning with their respective benefits.

The experience of the past three months has formed a window of opportunity for the next step in the development of higher education. It has revealed the problems and tasks that cannot be addressed without digital technology and the distance format. Most faculty members and students tried the new features and were able to work in this mode. However, the limitations of this method are also clear. The accumulated fatigue poses the risk of a rollback of the system to the pre-digital format. In this context, it becomes vital to learn from the acquired difficult experience, to form a model of universities' operations minding the discovered opportunities and limitations, and to test this model and promote new practices in the higher education system, which could become more resistant to the new external challenges and more productive for the development of the Russian economy and society.

5. Conclusion

The results of the conducted study demonstrate that in the eyes of students, the transition to distance learning in the system of higher education during the COVID-19 pandemic was performed with enough promptness and efficiency. However, the problem of introducing distance learning in teaching university students requires additional elaboration of both methods and technical tools. Thus, 70 % of university students noted that individual work with teachers using video chat is not conducted.

At the same time, the overwhelming majority of respondents (88 %) noted the possibility of watching "live" lectures in online format, attending video seminars online. Almost every student (90 %) gave a positive assessment of such opportunities as correspondence with teachers, exchange of documents. Students of Moscow universities noted that one of the positive practices of using distance learning is performing interactive tasks, as well as receiving tasks in their personal account. Ambiguous assessments were given by respondents according to such criteria as monitoring progress in their personal account. Slightly less than half of the students surveyed noted that academic performance is not monitored, and at the same time, half of the respondents replied that teachers are monitored (47 % and 53 %, respectively).

The analysis of the assessment of educational process organization during the forced transition to distance learning suggests that online lectures (with the opportunity to ask questions) and seminars were organized primarily through distance learning technologies.

In the opinion of students, the advantages and disadvantages of distance learning include the following.

The advantages of distance learning:

- Reduced costs of education;
- Reduced time costs of education;
- Flexible learning schedule;
- No attachment to the place of residence, it is enough to have a computer and high-speed Internet;
- The student can combine study with their main occupation;
- Opportunity to study with a preferred number of people;
- Reduced stress levels when taking exams and credit works.

The drawbacks of distance learning:

- Not all students have enough self-control, willpower, and sense of responsibility.
- Minimal communication with teachers and other students, hence communication skills are not developed;
- Lack of live practice, difficulty in mastering the specialty.

In his interview with RIA News on December 28, 2020, the Russian Minister of Science and Higher Education Valery Falkov acknowledged that, in general, the quality of distance learning in the country was lower than that of face-to-face learning.

The main emphasis was placed on students' independent work and reporting on this work to the teacher.

The main problems encountered by students as a result of the transition to distance learning can be grouped into two groups. The first group includes problems of a technical nature (the speed of the Internet and the quality of connection) and the lack of necessary gadgets (computer/tablet, and a headset for them). The problem facing the students was the lack of technical equipment and the ability to communicate with the teacher. The second group includes problems of a personal nature: willpower, self-organization, motivation, and self-discipline.

This research is advised to be considered when designing and implementing distance learning.

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Home Learning Experiences Through the Covid-19 Pandemic

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Abstract

The COVID-19 pandemic has drastically affected the education process almost all over the world. Some countries closed their schools, Slovakia was among them (schools in Slovakia were closed intermittently for almost two years). Teachers faced the challenge of developing alternative educational practices through digital technologies. Students also faced personal, technological, and social challenges. Distance education, as a replacement of imparting and receiving knowledge, was in many aspects also very demanding for parents. It was necessary to overcome several technical problems (availability of appropriate and reliable Internet connection, provision of appropriate computer equipment and sufficient personal educational space for each member of family). An important role was also played by the student's ability to mobilize his own motivation for asynchronous and autonomous learning. The discussion with the professional public and the review of the relevant literature indicated that the teaching of mathematics is more sensitive to the interruption of attendance education. As the students themselves expressed: for the understanding of mathematical concepts, the personal presence of the teacher necessary and fundamentally affects the student's ability to obtain new knowledge and understand it. The testing of knowledge of students in Slovakia in 2022 at all levels of schools (after almost two years of distance learning) indicates that in the field of mathematics education there has been the biggest drop in knowledge compared to other subjects.

Our study focused on the analysis and uncovering of negative but also positive factors operating in the online teaching of mathematics, which significantly affect the results and level of knowledge of students at the university. Mapping and identification of problematic moments in this process helped us reveal the results of a survey (study) conducted among students of the 1st year of bachelor's studies at the University of Žilina.

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1. Introduction

The disease of COVID-19 and the related pandemic and the resulting closing of schools and school facilities fundamentally changed the way of education in Slovakia. In 2020 and 2021, high schools and universities were closed the longest. Elementary school students (students at the age of 6-10 years) studied online for the shortest time. Universities switched to the distance education regime at the beginning of March 2020. In this year, all teaching processes (lectures, exercises, testing and examination of students) took place in a distance form. Attendance teaching was resumed only in September 2021 for eight weeks, which was followed by the closing of universities again until March 2022.

In March 2020, pedagogical employees found themselves in a completely unique situation, practically overnight. They lacked experience, but also the appropriate technical support for providing quality online teaching. The competences of teachers with online teaching were minimal during this period. E-education was limited to the use of the Moodle system until 2020; through which we sent study materials to students, or sometimes conducted consultations and testing students.

Step by step, the schools adapted to the new conditions. At the University of Applied Sciences in Žilina, the necessary computing technology (tablets, cameras, microphones) was provided, and contact with students was realised in groups through a cooperative workspace Microsoft 365/Office 365, suitable for interactions at the workplace, teamwork, video conferences and file sharing.

Lectures, exercises and seminars were subsequently taking place in the form of video conferences, while the mathematics teacher explained the topic using a graphic tablet, which allowed him to flexibly share mathematical symbols and the necessary graphic elements. By using suitable mathematical software (for example, GeoGebra, Matlab, Graphmatica, etc.), it was possible to present graphs, equations, pictures necessary for high-quality teaching of mathematics. Of course, it required many hours of extra work from the teacher to prepare appropriate, precise and correct materials.

Full-time teaching at the University of Applied Sciences in Žilina was definitively resumed in March 2022. During this period, we held a group discussion with students to obtain feedback regarding online teaching. We were mainly interested in how students assess distance teaching of mathematics, what positives (or negatives) they observed. We were looking for answers to the following questions:

- how did students feel during online mathematics lessons?
- what were their conditions and what, according to them, was the most difficult about online teaching?
- how did they learn without the support of face-to-face contact with teachers and peers?
- to what extent were they able to learn and understand new topics in mathematics?
- would it be appropriate to implement some elements of distance learning in the teaching of mathematics in a daily form permanently?

To examine and evaluate students' opinions, we used a content-verified survey form (questionnaire), which served as a research tool. The sample set for our study consisted of 502 randomly selected first-year undergraduate students at the University of Žilina.

2. Literature review

The issue of the effectiveness of online mathematics education was addressed by many educators before the outbreak of the COVID-19 pandemic itself. This topic is relevant above all in connection with the lifelong, external, and individual education of students with special needs, whose opportunities attendance (in-person) education are limited. Howlett (2009) defined online learning as “the use of electronic technology and media to deliver, support and enhance learning and teaching and includes communication between students and teachers using online content”.

Berge et al. (2000) in their study recommend the following to teachers when teaching online:

- determine and select appropriate (accessible, adequate) hardware and software requirements for the chosen course,
- be available to students for consultation,
- be creative when interacting with students,

- provide regular feedback to students regarding course performance,
- listen to their concerns and problems,
- be proficient in using the capabilities of the online software used,
- use different teaching styles,
- encourage collaboration between students.

Several studies before the period of the COVID-19 pandemic reflected on important factors that have an impact on the results of students educated online. For example, Wadsworth et al. (2007) state that the results of students in online education were directly dependent on motivation, concentration, the student's ability to process and contextualize the information obtained. Interesting results are also presented by Kim et al. (2014), who confirmed the positive influence of motivation, a higher level of autonomous learning and metacognitive abilities of students for successful online mathematical education. We can therefore assume that the results of students in online teaching are conditioned by their ability to regulate their own learning (higher level of so-called autonomous learning, the ability to gain knowledge independently of the type of source). Kim et al. (2014) extended Güzeller and Akin's (2012) study to examine the impact of anxiety and other forms of academic emotions (anger, shame, boredom, enjoyment, and pride) on online mathematics learning outcomes.

During the COVID-19 pandemic, students and teachers also faced significant physical and psychological problems (Baticulon et al., 2021; Bringula et al., 2021). The continuous closure of schools and almost all institutions during the pandemic worsened the already existing and described phenomenon of the digital divide between students; students could not use public access to computers and the Internet (Baticulon et al., 2021). Thus, some students had difficulty engaging in online learning due to limited access to basic online resources. The students also emphasized that the online exam is not only about the correctness of the answers. They also must master the system to enter their answers correctly, which often adds to the stress level of the exam.

The sudden transition from attendance education to online education in March 2020 in Slovakia presented several challenges for all involved. They had to overcome difficulties:

- technical (related to hardware, software, internet connection)
- personal (related to learning style, stress on physical and mental health),
- institutional (administration of study resources, curricula, pedagogical skills)
- community (existing infrastructure problems).

We can also state that online teaching also has many advantages. However, its implementation requires access to suitable computer equipment, a good ability to use them, a reliable Internet connection, and a private (personal) learning space. In the distance learning process, we consider the student's ability to learn independently and acquire a relevant level of knowledge based on available resources to be decisive. The student must be able to watch the teacher's videos or various online resources with understanding. The independent, purposeful and active work of the student is necessary to achieve the set goals and good study results.

Based on a wide pedagogical discussion and available resources, we agree with several authors (Pynos, 2016; Glass, 2008) that mathematics is more sensitive to school dropouts than other subjects. We can see several reasons. Mathematics is almost always formally taught at school, in an attendance format, by explaining through a second person. To acquire mathematical literacy in the sense of being able to apply mathematics in practice, it is not enough just to learn mathematical concepts, formulas, algorithms. Their understanding in mutual context is essential. Parents are often unable to help their children with home tutoring (especially at higher levels of school). Let's also mention other factors:

- Stress and trauma from mathematics, which is very common even in attendance teaching of mathematics, can become even worse in connection with the pandemic and online teaching. Anxiety from maths is aggravated by the stress that is added to the student during online teaching.
- It can be challenging for teachers to realise attractive and effective teaching practices through remote platforms.
- The teacher is not able to apply online such important competencies as empathy, flexibility, kindness, he lacks feedback, he cannot see "into the student's soul" as in personal contact in the classroom. In the discussion, several teachers state how much they missed "eye contact" with the student when teaching, which can reveal so much about the students' understanding or lack of understanding when explaining a given topic

- A relatively large group of students needs the so-called peer group for understanding new mathematical terms. In this group they are discusing about things that are not clear. The need for a supportive peer group is absent in online teaching, and communication via the Internet when explaining mathematical problems is more complex (specific syntax and language of mathematics) than in other subjects.

3. Materials and methods

The selection group is consisted from the students of the University of Žilina in Žilina, who completed the subjects Mathematics 1 and Mathematics 2 in the form of online teaching. 502 students, randomly selected from three faculties of the University in Zilina were addressedin the survey (Faculty of Civil Engineering, Faculty of Operation and Economics of Transport and Communications, Faculty of Special Engineering).

The participants in both the quantitative and qualitative parts of the study were first-year bachelor's students. The survey was conducted after the students returned to face-to-face classes in March 2022. For the last two years, these online students completed most of their mathematics classes online. First, we held a group discussion with them regarding online teaching. Using the initial data obtained in this way, we created a 17-item questionnaire that collected information about the profiles of online students, their access to technological skills, their study habits and practices during online classes, current living conditions, and opinions on online teaching.

Using a 4-point (or 5-point) Likert scale, we asked respondents: (questions 3, 4) how difficult online teaching was for them; (questions 5,13) whether they had adequate technological security and personal space for online teaching; (questions 15,17) whether study resources and teachers' skills were adequate; (question 11) how they perceive students' assessment during online teaching. We also listed 9 negatives of online education (question 8) and asked respondents to select which they thought were relevant to their experience. In open-ended questions during the experiment, we explored any other barriers that students faced during online learning.

Research instrument

To process the obtained data, we first used a simple classification of quantitative signs. We used descriptive statistics tools to create an overview of the acquired data. We have compiled tables of the frequency distribution of the observed signs. We also used a graphic representation of the frequency distribution of the observed signs for a quick and clear presentation of the survey results.

In the second phase, we used the tools of causal analysis of statistical data. We found out the dependence between the technical, and personal background of the student and the level of acquired knowledge during online classes, and the dependence between the student's attitude towards online teaching and the obtained grade in mathematics at the end of the semester. To verify the dependence of two qualitative features A, and B, we used the χ^2 – test for contingency $k \times m$ tables. We carried out the investigation of the dependence between two qualitative features in two steps. First, we verified whether there is a statistically significant dependence between the observed characteristics. Subsequently, we assessed the intensity of statistical dependence within the given statistical set using the contingency coefficients C and Cramer's coefficient V; while valid

$$C = \sqrt{\frac{\chi^2}{\chi^2 + n}}, V = \frac{\chi^2}{min\{(k-1, m-1)\}.n};$$

χ^2 je Pearson test statistic, and $n = \sum_{i=1}^{k} \sum_{j=1}^{m} n_{ij}$.

Analysis of the quantitative characters

Personal attendance in learning process of the University of Zilina was definitively resumed in March 2022. In this period, we held a group discussion with students to gather their feedback about the time when they studied online. We were particularly interested in how students view the online distance learning of mathematics, what positives or negatives they observed. We were looking at questions like:

- How did students feel during the online learning of mathematics?
- What were the conditions for online study?
- What did they feel was the most difficult thing during online learning?
- How did they cope with learning without personal contact with teachers and peers?

- To what extent were they able to learn and understand new mathematics topics.
- Would they incorporate some aspects of online learning into the daily personal form of learning in school?

We used a content-verified questionnaire as our research tool to gather and evaluate the students' opinions. The group of respondents consisted of 502 randomly selected students of public transport and economy-related fields of the Faculty of Operation and Economics of Transport and Communications at the University of Zilina, where 40 % were male and 60 % female. We asked 17 questions, most of which required just one answer, some allowed more than one. We also considered the type of high school they studied before coming to the University of Zilina, where 41 % finished business school, 27 % vocation school and 32 % grammar school.

The first question concerning learning from home and the overall attitude towards it, as many as 29 % of students replied they studied "occasionally, irregularly". A little less students replied they "were discouraged, were not motivated to learn at all" (21 %), "I did not feel involved, it was difficult" (20 %) followed by more positive answers like "online learning was somewhat interesting" (12 %), "I quite liked it" (11 %) and "I liked it very much, online learning was great" (9 %).

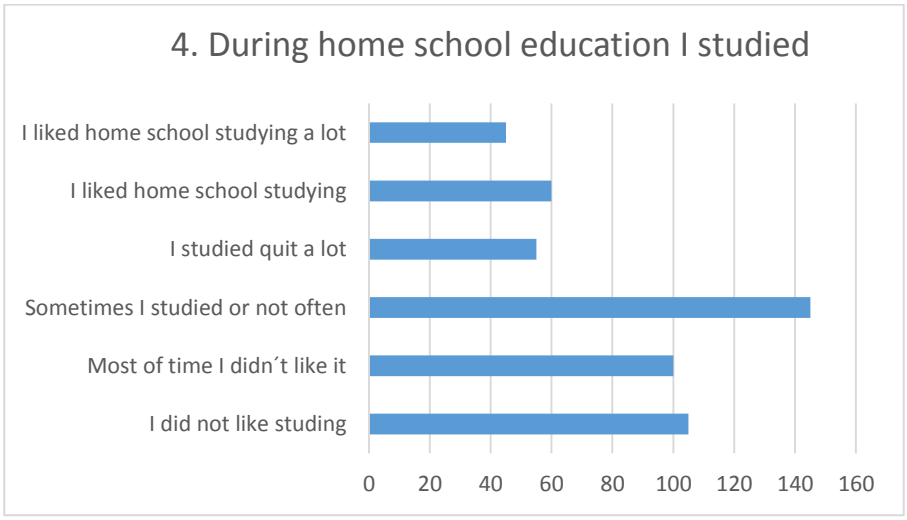

Fig. 1. Answers to the question: "During home school education I studied"

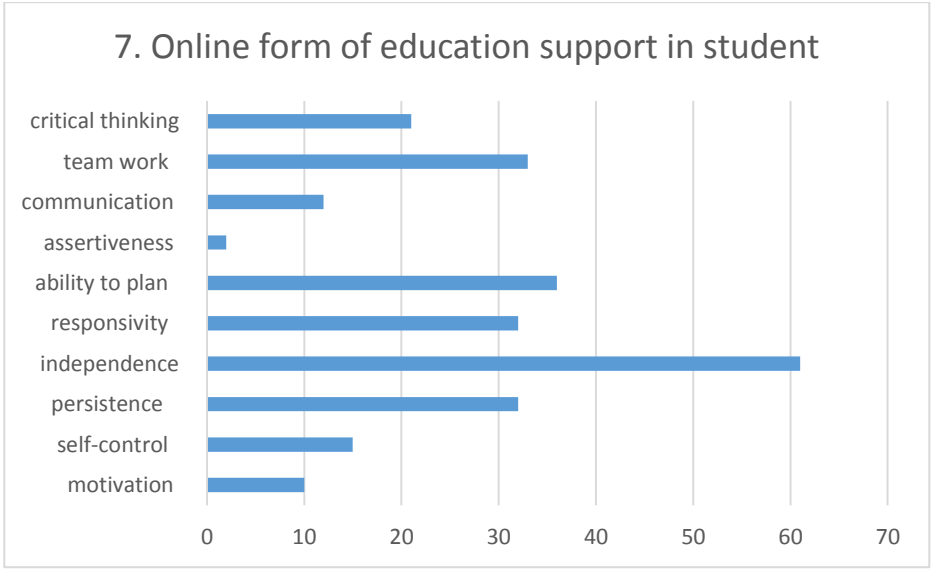

Fig. 2. Answers to the question: "Online form of education support in student"

Many households had to cope with the technical aspects of online learning concerning either the internet connection, hardware, or private space without being disturbed. Majority of students (63 %) responded their conditions for learning were "great" with stable internet connection, own hardware device and private space. Another group of 26 % of students responded their conditions were satisfactory. The last group (11 %) of students had only partially satisfactory or unsatisfactory conditions.

We were also interested in what personal traits or skills do the students feel being cultivated or boosted by the distance form of learning, they could pick more than one answer. Most of them (61 %) responded "self-sufficiency", followed by "ability to plan ahead" (36 %), "teamwork" (33 %), "persistence" (32 %), "responsibility" (32 %), "critical thinking" (21 %), "self-control" (15 %), "communication" (12 %), "motivation" (10 %) and only 2 % of students responded "assertiveness".

As with everything, the online learning process has its positive and negative aspects. We asked students how see the pros and cons and they could again pick more than one answer. The biggest downside (78 %) according to students was the "worsened ability to focus".

The fact that "teacher could not see students and react to their questions when they did not understand" bothered 38 % of the students. Up to 37 % of respondents felt "passivity, not being able to self-motivate and studying very little during this time". Another downside was the "lack of feedback" (33 %), "lagging behind in systematic study on student's part" (29 %), "lack of work in group and studying with peers" (29 %). Other downsides observed by students were "lack of communication with teachers" (27 %), "lack of complex overview about the studied topic" (20 %) and the last with 18 % was "quickly forgetting what we learned".

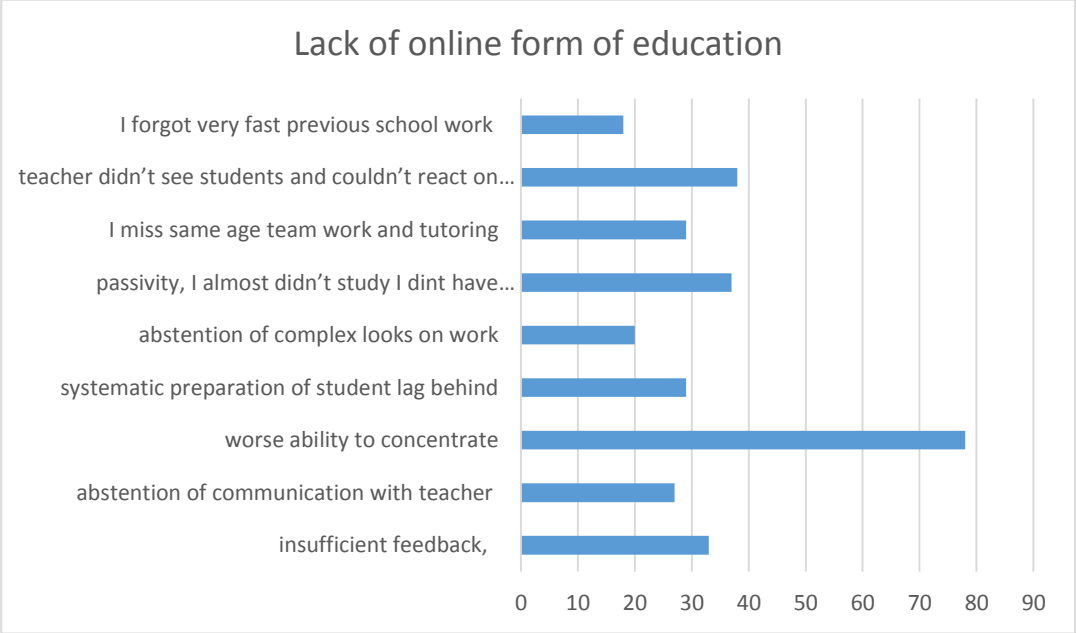

Fig. 3. Answers to the question: "Lack of online of education"

Testing and exams were naturally present even during the online learning period in the form of either online exams or face-to-face testing using computers or other devices with cameras. We wanted to know how students felt about testing and evaluation of their knowledge online. Again, they could pick more than one answer and 58 % of them felt that the trustworthiness of online testing is inferior to in-person testing, 33 % of students resorted to some form of cheating during exams and 24 % of them does not consider this form of testing to accurately reflect their true level of knowledge. Only 14 % of students considered this form of testing to be fair and trustworthy.

Students had to spend a lot of time using the computers or other electronic devices daily. Even so, 32 % of students stated they were dutifully sitting by the table and taking notes during the online lessons. Up to 66 % of them stated that they were taking notes irregularly, which can be attributed to the fact, that many teachers recorded the lessons and shared the materials to be

available anytime the students needed. Only 2 % of students stated that they did not work at all during online lessons.

Analysis of the qualitative characters

In the second stage of our study, we used a database of obtained data and implemented an analysis of qualitative signs. It was possible to analyse the dependence of several pairs of qualitative signs. Based on formulation of a research problem, we have stated the following hypotheses for the verification:

H_1: The level of the student's technological and study background and the achieved level of knowledge in mathematics are statistically significant dependent signs.

H_2: The relationship of the students to online education and the level of achieved knowledge in mathematics are statistically significant dependent signs

H_3: Student´s learning in an active position (working while sitting at a desk with a laptop, taking notes) during online education and the level of acquired knowledge are statistically significantly dependent signs.

We used χ^2 – test for contingency table k x m to verify dependence of each pair of the qualitative characters A and B. The character A was acquiring k categories and the character B was acquiring m categories. We tested the null hypothesis:

H_0: the characters A and B are independent versus H_i: the characters A and B are dependent.

The rejection region is $\chi^2 > \chi^2_\alpha\left((k-1),(m-1)\right)$, where $\chi^2_\alpha\left((k-1),(m-1)\right)$ is the critical value of χ^2 – distribution with $\left((k-1),(m-1)\right)$ degrees of freedom. We set a significance level $\alpha = 0{,}05$. The degree of statistical dependence between the observed qualitative characters A and B is assessed using the contingency coefficient C and the Cramer coefficient V.

Verification of H_1 hypothesis

The data obtained from 502 respondents, who formed an experimental group, were used in the verification process of the hypotheses. For n = 502 elements of a chosen group we observed qualitative signs A and B. Sign A indicates *the level of the student's technological and study background* and sign B indicates *the level of knowledge in mathematics:*

Sign A acquires levels A_1 = *excellent*, A_2 = *sufficient*, A_3 = *unsatisfactory*.

Sign B acquires levels B_1 = excellent, B_2 = *very good*, B_3 = *good*, B_4 = *satisfactory*, B_5 = *sufficient*, B_6 = *failed*.

As a test criterion we applied a statistic χ^2 (*chi – square test)*. To calculate the value of the testing statistic χ^2 we used Microsoft Excel. By inserting the function CHITEST for the input data we got the value χ^2 = 12,681 and the probability value $p = 0{,}24204$ in the output report. Since value p is larger than 0,05 on the level of significance α = 0,05 we do not reject a hypothesis about an independence of observed signs. That means *the level of the student's technological and study background* and *the level of knowledge in mathematics* during the online education *were* independent.

Verification of H_2 hypothesis

For n = 502 elements of a chosen group we observed qualitative signs A and B. Sign A was *the relationship of the students to online education* and *sign B* indicates *the level of knowledge in mathematics:*

Sign A acquires levels A_1 = *I enjoyed it very much*, A_2 = *it was fun*, A_3 = *I enjoyed it sometimes*, A_4 = *mostly not fun*, A_5 = *I didn't enjoy it at all*. Sign B acquires levels B_1 = *excellent*, B_2 = *very good*, B_3 = *good*, B_4 = *satisfactory*, B_5 = *sufficient*, B_6 = *failed*.

The test statistics is χ^2 = 127,53. The critical value with 20 degrees of freedom is χ^2_α (20) = 31,17. The probability value $p = 1{,}126.10^{-7}$ in the output report. The rejection region is χ^2 = 127,53 > 31,179 and thus we reject the null hypothesis about the independence of phenomena A, B. It is evident that the *relationship of the students to online education* of mathematics and level *of knowledge in mathematics* were dependent phenomena.

The value of contingency coefficient is $C = 0{,}4508$ and the value of Cramer coefficient is $V = 0{,}2525$. The value of these coefficient indicates that between the analysed qualitative characters A and B there exists the mild degree of connection.

Verification of H_3 hypothesis

For n = 502 elements of a chosen group we observed qualitative signs A and B. Sign A was style of student´s learning (an active position sitting at a desk with a laptop, taking notes) during online education and sign B indicates *the level of knowledge in mathematics:*

Sign A acquires levels A_1 = *always*, A_2 = *sometimes*, A_3 = *almost not at all*, A_4 = *mostly not fun*, A_5 = *I didn't enjoy it at all*. Sign B acquires levels B_1 = excellent, B_2 = *very good*, B_3 = *good*, B_4 = *satisfactory*, B_5 = *sufficient*, B_6 = *failed*.

The test statistics is $\chi^2 = 34{,}086$.The critical value with 10 degrees of freedom is $\chi^2_\alpha\,(10) = 18{,}3$. The probability value $p = 9{,}36.\,10^{-8}$ in the output report. The rejection region is $\chi^2 = 34{,}086 > 18{,}3$ and thus we reject the null hypothesis about the independence of phenomena *A, B*. It is evident that the *relationship of the students to online education* of mathematics and level *of knowledge in mathematics* were dependent phenomena. The value of contingency coefficient is $C = 0{,}2526$ and the value of Cramer coefficient is $V = 0{,}1846$. The value of these coefficient indicates that between the analysed qualitative characters *A* and *B* there exists the weak degree of connection.

4. Discussion

The responses of the respondents in the questionnaire, as well as private conversations with students, revealed to us the biggest problems during online teaching. Several of our results correspond with already published studies.

The authors of Baticulona et al. (2021) and Fabio et al. (2021) state that students had a big problem with personal learning space, which negatively affected their learning. Lack of privacy, limited study space was one of the most serious barriers to online teaching. The students, who do not have sufficient educational space, they are often interrupted during lessons and are thus in a disadvantaged situation.

Cavannaugh et al. (2009) reports on the problems caused by the lack of relevant study materials during online teaching. We have to definitely agree with him. Our interviews with several teachers confirmed similar problems in Slovakia as well. During the pandemic, teachers had to manage both online teaching (being available to students) and preparation of the materials, which was often very exhausting.

In a recent study Binti Abd Aziz et al. (2020) also explored barriers to online learning. They identified barriers in the area of students' attitudes, technological skills and personal skills. They evaluated the negative attitude of students towards the online form of education as a cardinal barrier. Our study also confirmed a significant dependence between the students' attitude to online education and the results achieved during the exam. It has been confirmed that the relationship to online teaching has a strong influence on the level motivation of the students and, consequently, on the level of acquired knowledge. This result was also confirmed by Pena-Bandalaria (2009) in her research in the Philippines. They also state that students who have a positive attitude towards self-study usually have no problem with online learning and logically achieve better results on the exam.

Fabito et al (2021) found that the lack of contact in clarifying topics through open discussion with the professor, was a major problem in online teaching. They state, and we have to completely agree with them, that neither teachers nor students were sufficiently prepared for such a drastic transition to the online space.

Interesting insights are provided by Benson (2001) and Fotiadou et al. (2017), who emphasize a strong positive relationship between excellent technical skills, online literacy and a well-developed autonomous learning ability and success in exams during online teaching.

Our results confirm that more than three quarters of students could not concentrate well during online classes, they lacked feedback and the possibility of direct communication with the teacher. It was difficult for them to understand the curriculum on their own. The majority of students said that the assessment during the online exam is not trustworthy (58 %) and more than 30% of students admitted to "cheating" during the exam.

Many students felt too frustrated and isolated during online teaching, and had low self-esteem. They did not believe that they could master the mathematics curriculum on their own.

The hypothesis about the dependence of the level of the learning space and the level of acquired knowledge could not be confirmed in our research. As many as 66 % of students rated their personal working conditions as excellent in the test, although in private conversations the majority emphasized a poor ability to concentrate, despite appropriate technical equipment. These results indicate that the problem in online teaching may be the lack of self-motivation, which implies a weak interest of the student in the topics covered and thus also a weak concentration during teaching.

Taking notes and working with printed materials during online teaching has also been shown to have little effect on math learning outcomes.

The results of our experiment are only limited in nature given the small sample size. It would be necessary to test the selected hypotheses on a larger sample of respondents.

In conclusion, we have some recommendations for the teachers themselves in the online teaching process: At the beginning of the lesson, students should be encouraged to take an "active attitude" during the lesson, work at the desk, take notes and try to participate in the lesson in the form of questions. Teachers must assure online students that online consultation is available if needed. Timely feedback on online students' work is strongly encouraged to maintain a positive view of their abilities. One-to-one feedback can be provided to inform online learners that they are performing well (or not well) compared to his/her peers.

5. Conclusion

Our study also proved that the teacher's personality, his computer literacy and the ability to engage students even "at a distance" have a decisive influence in online teaching. Teachers must be creative in delivering course content. For example, PowerPoint slides with a voice recording or a video from the previous lesson can be made available to students. These materials can be accessed at any time and the students with slow internet connections can watch the course at any time. The teachers can conduct synchronous learning sessions to answer the questions or clarifications. The teacher's unwavering dedication and understanding is suggested to help online students complete the course. In the study, we also revealed problems during online teaching that the teachers themselves cannot solve. The family members of the students need to understand that online students need space for physical learning and minimal distractions. Cooperation and understanding from family members is essential to create an environment conducive to online learning.

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Pedagogical and Psychological Conditions for the Organization of Independent Work of Students

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Abstract

The article discusses the scientific, regulatory, organizational and pedagogical foundations of self-organizational work and support for students in education in higher educational institutions. The key terms and principles of education are revealed; examples of the organization of vocational training are given. The legislative framework and regulatory documents regulating the implementation of the requirements of education in university levels are presented.

The student not only works fully, but also understands the essence of his individuality in the implementation of educational activities. The joint work of the teacher and the student will undoubtedly allow the student to increase the level of knowledge and develop as an individual person. On the basis of the cooperation between the student and the teacher, feedback is provided, a certain educational activity is actively carried out, and the actions performed are fixed by control and self-control.

In the context of credit learning technology, the subject-to-subject relationship is realized and the feedback between the teacher and the student is enhanced. The reproductive nature of learning becomes intense, creative.

The content component determines the content of the organization of independent work in the in-depth study of pedagogy. The main goal of the model will be the creation of a methodological system for organizing independent work of students in the conditions of a credit training system. Starting with the 2020 to 2022, there has been arranged and conducted a research of the self-organization process of students in four groups of Abay Kazakh National university. The aim of the study was to research the influence of a set of pedagogical measures for the enhancement of elements of self-organization work of students. The conducted research revealed the following: students of gr. Pedagogy and psychology -71 «b» and gr. Pedagogy and psychology -70 «b»

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(experimental groups) have higher indicators of the development of communication skills, high educational motivation, professional inclinations than boys and girls gr. Pedagogy and psychology -81 «b» and gr. Pedagogy and psychology -82 «b» (control groups). The empirical data were processed using standard methods of mathematical statistics.

Keywords: pedagogical and psychological conditions, organization, independent work, students.

1. Introduction

The purpose of the study. This article deals with the problem of formation of self-organization work of students and their skills enhancement. Also, functions of students' motivation, creative abilities needed by students to solve theoretical and practical problems were selected. In addition, the importance of "self-work" in the development of abilities of students and the types of skills and abilities needed by students in the development of self-work abilities are considered.

In order to solve the aim, we ask research questions.

What are the pedagogical and psychological conditions for the organization of independent work of students?

The cooperation of the teacher and the student will undoubtedly increase the level of education of the student and allow him to develop as an individual. Based on the cooperation of the student and the teacher, feedback is established, a specific learning activity is actively performed, and the performed activities are confirmed by monitoring and self-monitoring.

The procedural action component consists in the combination of the teaching activity of the teacher and the cognitive activity of the student. The pedagogical activity of the teacher is aimed at teaching in the pedagogical process of the University, creating effective conditions for the formation of the student as an individual, creative development. The main functions of pedagogical activity:

- manifested in the implementation of teaching, educational content;
- as an educator, disseminator of universal human and professional culture;
- organization and design of the organizational, educational and cognitive process, as a selector of the method, tool and form of training in accordance with the purpose and content of Higher Education;
- a researcher of theoretical and practical problems of the problem of research, professional activity, is seen as a seeker of effective ways to solve them.

The activities of the teacher and student are directed to the implementation of various types of educational work. The forms of Organization of educational work in higher educational institutions include lectures, practice classes, laboratory work, seminars, independent work of the student in the presence of a teacher. We classify them as classroom, extracurricular. At the same time, the organization of independent work in any form of training is considered one of the main components of the credit training system (Biglan, Smolkowski, 2002).

A properly constructed lecture session requires active work of the student from the beginning to the end. The level of lecture classes determines the effectiveness of almost all organizational methods and forms of the training system. The teacher is obliged to acquaint the student with the specifics of working on the lecture, the student learns to summarize the main idea, write briefly, sequentially, process and supplement the material (Cienfuegos, Monelli, 2011).

In this regard, the research methods were determined based on the specifics of experimental control, questionnaires, interviews and conversations with students and teachers of the level of formation of research competencies of future teachers and were based on experimental practice (Table 1).

Practice lessons. The organization of independent work in the practice lesson should be associated with the lecture and complement the practice flexibility. They are implemented through the joint action of the teacher and students. Here, due to the high level of autonomy of the student, the amount of work that falls on his share will be at a significant level (Enriquez, 2012).

The knowledge base accumulated by students in the first year is considered the source of initial knowledge in the discipline "methodology for solving complex problems from inorganic pedagogy" in the second year. That is, the topics de Broglie's equation, Heisenberg's theory of definiteness, Schrodinger's equation, Bohr's postulates, Bohr-Sommerfeld's theory, and radioactivity are taken as independent work in this special course. We offer tasks at each level to improve and consolidate the knowledge base of students on these topics.

Table 1. Methodology for studying the level of formation of the competence of self-organization of future teachers

Components Methods used	Components Methods used
1	2
Motivational	Questionnaire "Self-assessment of the level of formation of competencies of self-organization of future teachers";
Educational content	Questionnaire "Methodology of self-assessment of theoretical and methodological readiness of students for professional activity" (revised version of the methodology by Yu.V. Ryndina)

The degree of mastery of independent work is determined by control tasks. The tasks assigned to test the student's independent work are assigned differentiated by difficulty. The differentiated presentation of tasks by level is also one of the main components of humanistic training. Taking into account this circumstance, the teacher classifies the tasks into two levels. Tasks differentiated by level are presented in the appendix. The analysis of the result of completing the tasks assigned by the level in a special course also corresponded to the above. During the implementation of these works, we noticed that students strive for a high rating indicator (Tyler et al., 2013).

Laboratory work. Laboratory work is a logical continuation of practical classes and lectures. On the basis of independent work, students acquire certain skills, mastering certain techniques of independent work in non-standard conditions, in practice. All this is implemented only by the efforts and actions of students.

The purpose of laboratory classes is to form flexibility in the ability to apply the theoretical basis of the course in practice. The implementation of laboratory work is carried out by students independently. The teacher and the master of Education monitor and make adjustments between them. At the end of the laboratory work, students are instructed to complete a test task for 5-10 minutes (Krug et al., 2002).

Seminar lessons. The seminar lesson refers mainly to the type of lesson in which the level of activity of students is clearly expressed. Students should be able to disclose the educational material prepared on their own during the seminar. Therefore, the discussion of the main theoretical questions, exercise, and problem solving is carried out at the seminar classes. The student holds one of the grades B and A. This construction of the pricing policy encourages the student to constantly move only forward in the conditions of individual guiding independent work (Wessells, 2009).

The student remembers the nomenclature of the complex compound passed in the first year. Tasks are built by level (optional). Thus, we can activate the independent work of students in the workshop.

SIS conducted in the presence of a teacher is included in the schedule of classes as a form of training implemented in the conditions of the credit system. This type of lesson also gives good results by using various active methods (Stirna, 2012).

Improving the efficiency of the organization of independent work of a student directly depends on the use of various methods. The use of specially created active educational materials in the organization of independent work of students in the conditions of a credit training system allows them to master the discipline in depth.

The tools used in the organization of independent work of students in a higher educational institution can be attributed to training cards (Kornilov, 2018).

The use of educational cards in higher educational institutions creates conditions for the assimilation of knowledge when the teacher's assistance in the process of studying an academic discipline is insignificant, and the student's independence is high.

In the organization of independent work, elements of critical learning, interactive methods such as "brainstorming", "debate», «real situation", "Business game" are used.

A component that monitors and evaluates knowledge. In the conditions of the credit training system, an individual trajectory of students ' independent work is established. The implementation of this trajectory directly depends on the software of the block rating control system, the availability of a sufficient set of test tasks for knowledge control, the availability of E-teacher verification programs and the organization of assistance and control by the teacher (Wilson, Conyers, 2018).

Control of knowledge in the conditions of credit technology of training should be systematic, objective, public. Control, Verification of the result of training is designated in didactics as pedagogical diagnostics. Recently, instead of the concepts of "control", "diagnosis", the concept of "monitoring " has been increasingly used. Monitoring in the" teacher – learner" system is a set of constantly controlling diagnostic measures. These measures are coordinated with the purpose of the learning process and include the dynamics of the process of mastering the material by the student and its correction. We can mention three different forms of monitoring:

Psychological services for correction of the educational process are carried out through specialists.

Express Diagnostics. It is carried out by psychologists for further diagnostics of educational activities (Dwivedi et al., 2020).

It is conducted in order to determine the knowledge, skills, and business skills of graduates of an educational institution. Each independent work has control tasks, and their creation is carried out according to a certain scheme. First, the basic concepts and facts of the received topic subject to verification, the degree of their perception are determined. At the same time, the business and skills acquired on the topic are determined. And determining the purpose of control is the task of the entire control. Control tasks allow you to determine what the student needs to learn and master when the topic is finished reading.

Rating system the cumulative type rating system is based on rating measurements and determines the level of student performance, creativity.

The word rating is translated from English – grade, rating (or division into a certain class, category) (García-Morales, 2021).

The principles underlying the rating system do not negate the traditional principles of Higher Education (conscientiousness, in directionality, consistency, etc.). At the same time, it can be said that some of them will be displaced, others will be introduced, and the system will be updated. Then we will include the following principles among those that are more important:

activity-provides for the formation of the student as an active individual and ensures the development of intellectual abilities with creative thinking;

the intelligibility is to create tasks of different levels in such a way as to satisfy the interests of the entire contingent of students. Create an opportunity for mandatory and selectively responsive tasks to meet together;

praise is an assessment of the task performed by the student, the learning activity, for which everything is known corresponds to the score. Lack of punishment in the face of a strict dependence between the student taking advantage or losing it according to the score scored;

information – at the beginning of the semester, the student is informed about the conditions of the rating rating and constantly receives information about the amount of points scored by the student.

The invariance of the rating, emphasizing its specificity, gives rise to the following features:

- continuing education creates conditions for simplifying the control procedure;
- non-acceleration of the process of socialization, professional individualization of the student;
- creates an opportunity to master the quality of specialist development throughout the entire training period;
- since the rating system is universal, it is used in teaching any subject;
- the activity of students in their studies, public life, and the ability to organize increases;

- there are conditions for operationally flexing the complex of encouragement and stimulation. Allows you to accurately predict the level of knowledge of students in some temporary periods. Creates conditions for identifying the best students and identifying a leader, encouraging the student's active perception of knowledge, stimulating their work;

- creates conditions for determining the status of a student among co-educational groups, teachers and heads of educational institutions;

- allows you to effectively use the computer system in the educational process, use counter and organizer techniques;

- causes an increase in labor productivity of participants in the educational process;

- creates conditions for organizing the necessary environment for creating effective methodological training;

- gives students the freedom to choose the direction of training based on their abilities and interests, level of knowledge (democratization of the learning process).

All of the above components create conditions for the formation of students as individual individuals with deep knowledge (Ran, 2006).

2. Materials and methods

A set of research methods was used that corresponded to the goal, subject and tasks: theoretical methods – analysis, generalization, systematization of philosophical, psychological and pedagogical literature; modeling method; empirical - testing, questioning, experiment (stating, forming); statistical methods for processing results (Pearson's test %").

During the research the content and structure of independent activity of university students are revealed, which contributes to the understanding of the essence of this phenomenon by the subjects of the educational process:

- the features of the organization of independent activities of students of the faculties of the university are substantiated, which makes it possible to successfully implement an individually differentiated approach in the educational process;

- a model was developed for organizing independent activities of students of the faculties of the university, which serves as a theoretical basis for organizing this process in the practice of teaching students;

- a technology has been developed for organizing independent activity of students of the faculties of the university, contributing to the achievement of a higher level of development of independent activity of students;

-the pedagogical conditions that ensure the effectiveness of the organization of independent activities of students of faculties are determined and experimentally verified.

Organization and stages of research:

The experimental approbation of the developed model for the formation of self-organization competencies of future teachers in higher education in 2020–2022 took place in three stages among students of the Kazakh National Pedagogical University named after Abay (302). A total of 302 university students took part in the study, 160 boys and 142 girls.

Tasks of formation of competence of self-organization of future teachers: formation of special knowledge, research skills and skills; formation and development of scientific worldview and continuous development of personal and professional qualities, improvement of future professional and pedagogical activity, development of methodological culture of the future specialist, quality improvement.

The work was carried out for three years (2020–2022) on the basis of the Psychological and Pedagogical Faculty of the Kazakh National Pedagogical University named after Abay. The study was conducted in three stages. At the first stage (2020), the main theoretical approaches to the study of the problem were considered, methods for collecting empirical data were selected, the scheme of the study itself was clarified.

3. Results

Experimental work carried out on the organization of independent activities of students studying at the Abay Kazakh National Pedagogical university included the development of a technology for organizing students' independent activities, a description of the progress and results of experimental work on the implementation of the model and technology.

For the effective organization of independent activity, pedagogical conditions were identified and experimentally tested within the framework of the educational process of the faculty. These conditions were: subject-subject relations between students and teachers; increasing students' motivation for independent activity; educational and methodological support of independent activity; gradual complication of types of independent activity; management of independent activity on the basis of individualization of training; creation of a system of tasks of various levels of complexity; systematic diagnostics of the level of formation of independent activity of students.

The model and technology for organizing independent activities of students was tested in the course of experimental work at the Abay Kazakh National Pedagogical University in 2020–2022.

The purpose of the experimental work was to substantiate the complex of pedagogical conditions that ensure the effective implementation of the technology of organizing students' independent activities in the educational process of the university.

The experiment was carried out in two stages: ascertaining and forming. The purpose of the ascertaining stage of the experiment was to identify the initial level of formation of the main characteristics of independent activity of 1st year students of the Pedagogy and psychology faculty. The ascertaining stage of the experiment (2020) on the study of the level of formation of independent activity of pedagogy students showed that the least developed operational-activity and control-evaluative components of students' independent activity (the largest, in comparison with other components, percentage shares of the reproducing level of development independent activity). At the stage of the ascertaining experiment, the generalized results of diagnostics showed a high level of development of attention, memory, thinking in 16.6 % of students, an average level in 56.8 %, and a low level in 26.6 %. Most of the students showed an average level of development of cognitive abilities, and only one sixth of the students showed a high level.

The general result of the ascertaining experiment: in the control and experimental groups, students had a sufficient level of independent activity in all its components.

The formative stage of the experiment (2021) pursued the goal of testing the technology for organizing students' independent activities and implementing pedagogical conditions conducive to the effective organization of students' independent activities. The program of the formative experiment included the following: the study by students of the 1st year (2021–2020 academic year) of the academic discipline "Methods of organizing independent activities of students", the systemic involvement of students in the educational process, purposefully organized by teachers of the following disciplines: "General psychology", "General pedagogy". The teachers developed various types of independent work, involving a system of different types of independent activity (individually differentiated, frontal and group; work with a textbook, reference book and other printed manuals; compiling lecture notes, abstracts to the source; drawing up diagrams, graphs, tables; performing chemical experiments; solution of computational and qualitative problems; preparation of reports, abstracts, qualifying papers).

The work of teachers was based on the theory of the gradual formation of mental actions by P.Ya. Galperin.

An important condition for the productive independent activity of students was the practice-oriented and problematic nature of tasks with the systematic interaction of theoretical and practical components in training. The structure and composition of the educational and didactic complex of the academic discipline in the direction of "Pedagogy" included the following components: a textbook, educational and methodological support, information support tools, organization of educational and industrial practices and mandatory control and self-control. The effectiveness of independent activity of students was determined by its correct organization by the teacher, where his role gradually decreased.

At the first stage – the initial stage of the formation of the competence of self-organization of future teachers at the stage of experimental experiment, the components of the formation of the competence of self-organization of future teachers (motivational, cognitive, activity, volume-reflective), criteria and indicators, levels (basic, productive, creative, etc.) and determine the level of formation of the competence of self-organization of future teachers.

Diagnostics at the end of the formative stage of the experiment showed a positive dynamics in the development of the components of independent activity, both in the experimental and control groups. The proportion of students with a sufficient and creative level of development of the operational and activity and control and evaluation components of students' independent activities

has increased. The high level of the student's independent activity was manifested in the fact that the student could independently perform various educational-theoretical, educational-practical and other tasks without the help of a teacher; his activity was aimed at the process of activity, he strove for cooperation, for success.

The obtained data on the application of the Pearson's criterion 2 % allow us to state that as a result of the implementation of the developed model, the components of the independent activity of the students of the experimental group have been developed. The proportion of students with a low, reproducing level of development of the components of independent activity has decreased, while the share of students with a high, creative level of development of the components of independent activity has increased. Positive changes in the percentage distribution of the levels of development of independent activity of students were insignificant in the control group, and in the experimental group they were significant.

Readiness of students for independent activity; her motives; the need to overcome obstacles, the desire to achieve high results (self-improvement); orientation of students (to themselves, to interaction, to the task); the level of emotional state were important indicators of the effectiveness of independent activity of students of Abay Kazakh National Pedagogical university.

Identification of productive activity of students in obtaining knowledge (independent and control work and checks and inspections), analysis of curricula.

The main purpose of the defining stage was to determine the level of competence of self-organization and the actual situation of future teachers. In addition, the survey revealed the correctness of the tasks set, in particular, the expediency of forming the competence of self-organization of future teachers in the conditions of the university.

The descriptive experiment was aimed at determining the attitude of future teachers to the implementation of the competence of self-organization and the level of preparation for it.

1. The purpose of the questionnaire was to assess the level of understanding of the essence and properties of the competence of self-organization of future teachers.

The students of the experimental group evaluated the "research function as a multifaceted complex phenomenon" and expressed their opinion on the concept of "research competence":

- the path of personal and professional development;
- type of cognitive activity;
- the form of realization of a person's creative potential;
- the principle of improving the quality of educational services;
- method of reconstruction of pedagogical reality;
- Ways of mastering new pedagogical knowledge.

According to the results of the experimental experiment, 48 % of students believe that only people with high creative potential are engaged in self-organization competencies. A small number of students, 22 %, consider the implementation of self-organization competence as a way of personal development, and 19 % believe that it is an improvement in the quality of educational services. Only 11 % of students feel the need for scientific research to gain new knowledge and show the need for cognitive activity to fulfill research competencies.

The test "Self-assessment of the level of formation of competencies of self-organization of future teachers".

2. During the diagnostic experiment, one of the diagnostic tools was offered to students by the author's test.

The competence of self-organization of future teachers is considered as a condition for their professional development; the motives of future specialists were considered as the driving force of actions. The questionnaire data were presented, on the basis of which the motivation of students to perform self-organization competencies, the value attitude of students to research activities and the level of development of research skills were determined. Their totality allows us to determine the initial state of formation of the competence of self - organization of future teachers.

The results of the formation of the competence of self-organization of future teachers on the motivational component (according to A. Pakulina and S.M. Ketko)

Table 2. Self-organization of future teachers on the motivational component

Groups	By motivational component (levels) %					
	Creative		Productive		Basic	
	CG	EG	CG	EG	CG	EG
Number of students	4	5	28	29	35	37
Percent	5,9	7,1	41,9	40,8	52,2	52,1

The criteria of the motivational component of diagnostics competence of self-organization were determined according to the following set of methods.

Determination of the motivational component of the experiment results of the formation of the competence of self-organization of future teachers in the analysis, control, correction, creativity of the control group of 5.9 % and the experimental group of 7.1 %, the control group of the product 41.9 %, the experimental group 40.8 %, the control group at the initial level of 52.2 %, the experimental group 52.1 %.

To determine the level of formation of the competence of self-organization of future teachers according to the content-cognitive component, the level of content-cognitive knowledge of students was determined on the basis of the questionnaire of Yu.V. Ryndin "Self-assessment of theoretical and methodological readiness of students to professional activity".

According to the cognitive-content component, based on the principle of competence, the level of the content of knowledge about applied and fundamental research, the ability to master the complex of methodological, theoretical knowledge necessary for teachers was determined.

The results of the formation of the competence of self-organization of future teachers on the cognitive and content component of the descriptive experiment are 2.9 % in the control group, 2.82 % in the experimental group, 16.5 % in the control group, 18.5 % in the experimental group., 38 %, the control group at the initial level of 80.6 %, the experimental group 78.8 %.

According to the activity component, we have identified a system of research skills and abilities of future teachers and the ability to perform self-organization competencies, a methodology for assessing the level of competitiveness of an individual (Ryndina Yu.V.). The study is based on the updated methodology of Yu.V. Ryndina (Appendix-B), an activity component in the formation of self-organization competence the methodology of self-assessment of creative abilities.

Table 3. Results of the formation of the competence of self-organization of future teachers according to the cognitive and content component (according to the updated methodology of Yu.V. Ryndina)

Groups	Cognitive-content component (level)%					
	Creative		Productive		Basic	
	CG	EG	CG	EG	CG	EG
Number of students	2	2	11	13	54	56
Percent	2,9	2,82	16,5	18,38	80,6	78,8

The methodology of self-assessment of research and creative abilities was used, according to the results of processing the results of the methodology, the control group showed an initial level of 5.9 %, in the experimental group this indicator was 5.6 %, and in the control group – 23.9 %, and in the experimental group 25.4 %. A high level of personal creativity was revealed in 70 % of the control group and 69 % of the experimental group. The purpose of effective use of the method is to increase the ability of future teachers to keep up with the continuous development of innovative

research competencies in the field, using the knowledge, skills acquired in modern competitive and innovative conditions. universities in the formation of research competencies. Today, the training of teachers who are able to withstand high competition in the labor market and perform research competencies is in demand.

In order to form the competence of self-organization of future teachers, a number of preparatory activities were carried out for the participants of the experiment, corresponding to the content and specific tasks.

The content of the test task determines the level of competence of self-organization of future teachers. The tasks reflect the professional competence of the teacher, depending on the professional level and motivation of the participants to participate in teaching activities.

In accordance with the logic of the organization of experimental work, we consider the results of the formative and final stages of the pedagogical experiment. The result of the experimental work is a change in the attitude and understanding of the essence of the experimental group of students to strengthen research competence, which led to an increase in the quality of professional training of students.

4. Discussion

We have developed a model for organizing independent activities of students, including the goal (effective organization of students' independent activities); methodological approaches (systemic, activity-based, subjective, personality-oriented, competence-based, acmeological, integrative-differentiated): principles (reflection; taking into account the age characteristics of students, as well as individual intellectual abilities; developmental and creative orientation of activity; individualization of activity; algorithmization of activity; professional direction of activity, combination of external and internal control); components of independent activity; technology represented by stages and types of independent activities; individual trajectory and levels of formation (reproducing, sufficient, creative) of independent activity of students. The technology of organizing independent activity is carried out in the educational process of the university with the indirect participation of the teacher and the active participation of the student. The model indicates a set of pedagogical conditions (subject-subject relations between students and teachers; increasing students' motivation for independent activity; educational and methodological support of independent activity; gradual complication of types of independent activity; management of independent activity based on the individualization of training; creation of a system of tasks of various levels of complexity; systematic diagnostics of the level of formation of independent activity of students) and the result (increase in the level of formation of independent activity of students of natural faculties). After analyzing the main approaches to building the educational process at the university, we came to the conclusion that it is necessary to supplement traditional forms of education with interactive ones. The technology presented by us for organizing independent activity of students of the university includes a system of various types of independent activity, which can be both individually differentiated and frontal, group. The types of independent activities include: work with a textbook, reference book, printed manuals; compiling lecture notes, abstracts to the source; drawing up diagrams, graphs, tables; performance of chemical experiments; solution of computational and qualitative problems; preparation of reports, abstracts, qualifying works. This requires systematic involvement of students in educational and professional activities.

As you know, the teacher's control of the student's knowledge not only determines his success, but also creates conditions for effective mastering of the educational process. Analysis of the current state of the educational process privatizes the process of knowledge control, allowing to improve the content and forms of training. Take, for example, the task below.

Describe the complex compound K3[Fe(CN)6] by the VB method, determine the spatial configuration, hybridization type.

The operations to be performed to accomplish this task are:

A) it is necessary to know the theory of the valence bond method, which explains pedagogical communication.

B) in order to apply the theory in practice and describe a complex compound by the method of BB, it is necessary to know the sequence of its description (qualifications, flexibility skills) (Sun, Dai, 2002).

C) correctly complete the task and give the exact answer in order.

Depending on the value of each step in completing the task, the task weight is determined: 1 point + 0.75 points + 0.25 points = 2 points. That is, the weight of the task is determined by two points.

Thus, the student is informed about the results of each work performed on the basis of a system of rating knowledge assessment. From this, the student seeks to complete the assigned tasks on time, with quality, in order to raise his rating. Students are given control tasks divided into levels.

The result of the obtained control work shows that students are more likely to strive to complete the task of the upper level.

In conclusion, in the conditions of credit technology of training, the final results of independent work and independent work of the student in the presence of the teacher are summed up under the direct control of the teacher. The teacher, at the request of the students, can use any of the methods for controlling the final result given above.

So, we have created and described a model for the implementation of SSW and SSW in pedagogy in the context of credit learning technology.

Student under the supervision of the teacher:

Develops research skills;

Generalization and repetition of past materials;

Forms the skills of applying the acquired knowledge, complementing them, expanding them;

The teacher, taking into account the psychophysiological and academic performance of the student, gives directions for independent work and creates an opportunity for the development of their independence.

To teach the use of explanatory (scheme, table, thesis, etc.) materials that allow the teacher-student to effectively use their time in the course of joint activities with the student, to indicate ways to search for the necessary literature;

For the development of self-activity, independence, it is better to use the methods of problem narrative, creative search (Thomas, 2011).

The teacher helps the student to choose an individual task (term paper, abstract, scientific report, drawing up a sample lesson plan).

Be able to provide literature, work with them;

Effective methods and techniques, teach the ability to use ways to complete the task;

Advises individual or several students, coordinates the work of students with each other.

Since independent work (SIS) of students in higher educational institutions makes up the majority of the entire curriculum, its effectiveness depends on the correct construction of a model of Organization of independent work, developed in accordance with the requirements of the professional orientation of a specialist. However, the main requirements for the student are as follows:

Activation of the student's creative potential: in the process of independent implementation of the educational task, the student gets acquainted with the scientific literature, analysis of methods and mastering the technology of creativity.

Education of self-education and motivation for self-development: activation of the ability to creative activity, improvement of the quality of professional training, development of creative orientation in solving professional tasks, mastering methods and techniques of general and individual research, etc.

Increasing motivation for educational activities: activation of the position of the individual in the educational process, the basic attitude of subjective new knowledge, that is, the function of independent acquisition of knowledge, new and personal significance for a particular student (Wang, 2007).

The development of cognitive activity: an attempt to think independently, to find an independent direction in solving a task or problem, an attempt to independently acquire knowledge, a critical formation of opinions, the activity of the educational and cognitive process in the educational process, the activity of the teaching method of students is prioritized and realized by indirect interest.

In fulfilling the task of forming students ' abilities for independent work, a problem arises for the entire teaching staff. It is focused on the content of this work in a targeted manner, especially in the training of students. Such training involves the formation of its own modeling methods of educational activity, the determination of the most appropriate agenda for students, conscious

understanding of rational ways of working with educational material and its subsequent processing, mastering deep, as well as quick learning techniques, drawing up a plan for setting and solving various actions, summaries, educational and practical tasks. In this context, the approaches to the educational work proposed by A. K. Markova may be of great interest:

- methods of semantic processing of the text, enlarging the educational material, highlighting the original ideas, principles, laws from it, enumerating generalized ways of performing tasks, independently building a system of tasks for a certain category of schoolchildren;
- approaches to reading culture (for example, large syntagmas and "dynamic reading") and listening culture, shorter and more rational ways of writing (taking notes, plans, theses, synopsis, annotations, abstracts, reviews, general approaches to working with the book);
- general approaches to memorization (structuring educational material, using special techniques of mnemonics based on figurative and auditory memory);
- methods of concentration of attention, that is, based on the use of various types of independent supervision by a schoolboy, step-by-step verification of his work, the order of verification, the division of "units;
- general approaches to the search for additional information (work with bibliographic materials, references, catalogs, dictionaries, encyclopedias) and their storage in the home library;
- methods of preparing for exams, tests, seminars, laboratory classes; methods of rational organization of time, calculation and expenditure of it, correct alternation of Labor and study, oral and written difficult tasks, general rules of occupational hygiene (regime, walk, order in the Workplace, its brightness, etc.)". It is obvious that both general approaches to the organization of mental labor and specific approaches to educational work, for example, work with the text, are given here.

The formation of the latter will be one of the main prerequisites and the basis for independent work of students in all academic disciplines (Vasbiyeva, 2021).

Let us emphasize again that in general, the independent work of students is based on the point of view of educational activities, the correct Organization of classroom educational activities. In particular, it concerns the transition from the external supervision of the teacher to the self-supervision of the student, and from the external assessment to the formation of his self-esteem and their relationship, which, in turn, determines the improvement of control and assessment by the teacher.

The effective organization of independent work depends not only on the system of independent work, but also on the fulfillment of pedagogical conditions:

The correct combination of the volume of the student's classroom and independent work, the effective workload of the student, the correct construction of the schedule of classes, the teacher's consideration of the student's time, ability to perform, and coverage of educational and methodological literature in determining the complexity of independent work have a great impact on the result of the student's independent work.

Methodically, the correct Organization of independent work of the student in the classroom and beyond, the adequacy of the material and technical base of the educational institution, its employees to perform independent work. Proper performance of their functions by participants in the organization of independent work of students.

Providing the student with the necessary methodological materials in order to turn the process of independent work of students into a creative process. In the libraries of the educational institution there is a fund of necessary educational literature, electronic manuals and e-learning programs, and one of the strongest sources of information today is the internet. Computerization of the educational process creates conditions for the student to independently learn and work with sources of information, to conduct their own control, to use their time economically. Therefore, in the effective use of independent work, electronic textbooks, the content of which can be dynamically changed and updated with the latest scientific discoveries, and are flexible in use, are of great importance.

Organization of work on changing the relationship between the student and the teacher in the direction of the student's activity in his desire to learn independently, as well as the correct selection and use of effective methods, forms, types, means of organizing the student's independent work contributes to the result of the student's independent work. The use of didactic tools and new information technologies is of great importance in increasing the efficiency of independent work of

students and the student's motivation for its implementation. The purpose of each independent work should be clear, clear, its volume and content should be designed in such a way as to meet the educational goal, motivate the student to perform, and the student should have the conditions and opportunity to perform it. The tasks of the student's independent work should be such that they require the application of the acquired knowledge in a new situation, new self-education, increase the student's cognitive abilities (Duisekova, 2021).

Taking into account the specifics of the organization of independent work of students, that is, depending on the form of study (full-time, part-time), level of education, course of study, specialty, subject, place of execution.

Creating conditions for the disclosure of individual characteristics of students, the development of mental abilities in solving the problems of independent work of the student. This is directly related to the implementation of the model of organizing independent work of students. As a result, the creative personality of the student is formed, who has the skills and abilities to work independently, independently acquire knowledge, conduct scientific research in his professional activities, has analytical thinking, is able to control his actions, and as a result of his work makes his own control (Ziak, 2022).

We see the prospects for further study of the problem in a more detailed study of student's independent work from pedagogical and psychological sides. In the future it would be interesting if we could make comparative analyses between students of different countries to see how do they arrange and cope with this problem. In our opinion, it would be interesting to explore from another point of view to present more information for future enhancement. In addition to all above mentioned the discussed in this paper, in our opinion, brings a lot to the teachers of university so for the young scientists. The work considers only one of the aspects of the problem. Research in this direction can be continued. It could be a study not only of independent work on their own but also independent work under the supervision of teachers.

The study does not claim to be an exhaustive description of the problem under study, but gives grounds to outline some further prospects in this direction. The subject of a special study may be such aspects of the topic under consideration as the development of a set of competencies for the effective organization of independent work, the problem of individualization of training based on independent activity, etc.

5. Conclusion

In the chapter of the experimental work on the formation of the competence of self-organization of future teachers, we summarize the results of the experimental work, focusing on the pedagogical system and work aimed at determining the pedagogical conditions for the formation of the competence of self-organization of future students in higher education.

The methodical system of formation of competence of self-organization of future teachers is defined. Guided by the trends of modern educational processes, the methods of forming the competence of the self-organization of the teacher were used.

The analysis of the above data allows us to evaluate the effectiveness of the use of methodological support in the organization of a special course in order to form the competence of self-organization of teachers in higher education and draw the following conclusions:

- at the beginning of the experiment, a low level of formation of the competence of self-organization of future teachers was revealed;
- At the end of the experiment, there is an increase in the level of formation of the competence of self-organization of future teachers. This is explained by the effectiveness of the proposed methodological system for studying research activities in the innovative educational environment of the university and the formation of the competence of self-organization of future teachers;
- At the final stage of the study, the results of the students of the experimental and control groups were compared using methods of mathematical statistics.

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Augmented Reality Technology as a Means of Forming Master's Degree Students' Multicultural Competence

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Abstract

Higher education adapts to the challenges of globalization and new priorities of society, the values of students from different countries, expands the range of pedagogical technologies and the ways they are included in the educational process. To train highly qualified specialists, develop the multicultural competence as an integrated personal quality in higher education, blended learning, 3D modeling, augmented and virtual realities are used.

The paper investigates the problems and ways of using AR applications in the educational process and organization of practice, intercultural communication and joint activities of master's level students which are considered as important conditions of formation of a multicultural individual.

Methodology. The main idea of the study is determined by the principle of multicultural education which involves the acquisition of new knowledge, intercultural interaction, formation of a worldview, etc. in augmented reality. The software tool is the Zome application. The study of augmented reality technology and software takes place in a quest format. 42 students of the Vyatka State University, master's degree program in Pedagogical Education, were involved in the experiment.

Results. In the experimental group, master's degree students used AR tools to study theory, consolidate skills of intercultural communication and collaboration. The levels of multicultural competence formed were assessed, and statistically significant differences in the qualitative changes that occurred in the pedagogical system were revealed.

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In conclusion, the peculiarities of using augmented reality as a pedagogical technology to form master's degree students' multicultural competence and improve the quality of education in general are summarized.

Keywords: educational paradigm, intercultural communication, information environment, digital service, personality qualities, Zome.

1. Introduction

National identity and values, equality and pluralism of cultures on which the idea of multicultural environment is based are reflected in the UNESCO declarations on the problems of modern global strategies of education and integration. According to the relevant international legal acts and recommendations, students are considered to understand not only their roots of national identity (Burnet, 2008).

Multicultural learning environment is a new educational paradigm. Modern society challenges the importance of each of its components in terms of the development of an individual, the choice of appropriate pedagogical methods and means of influence.

Due to globalization, integrated socio-economic relations, intercultural communication, developed network collaboration, representatives of different countries, peoples, groups, etc. need to interact with each other.

At the same time, multiculturalism, tolerance, and responsibility are considered as necessary socially significant personal qualities in the information society. K.V. Gasymova notes that, when building a new educational paradigm, it is important to adhere to the principle of intercultural tolerance (Gasimova, 2019).

There are studies which claim that national didactic systems should meet various person's needs and capabilities, the demands of actively developing digital economy (Soboleva, Karavaev, 2020). As a consequence, highly qualified specialists with not only professional, but also general cultural competencies are required by modern labor market (Khazova, Khatit, 2015). For example, they are considered to be prepared to communicate interculturally, be tolerant, perceive social and cultural differences, etc. These requirements are reflected in federal educational documents.

G.A. Kameneva, T.A. Bondarenko convincingly prove that digital means of training university graduates have a powerful didactic potential to form foreign language competence, intercultural communication, develop the feelings of patriotism, person's emotional and volitional characteristics, etc. (Kameneva, Bondarenko, 2018). For this purpose, video materials, virtual walls, animation, electronic reference books, online excursions are used.

J. Martín-Gutiérrez, C.E. Mora consider augmented reality (AR) technology as one of the innovative pedagogical technologies that meet the demands of the digital economy and the processes of globalization (Martín-Gutiérrez et al., 2017).

Such digital services are included in order to improve the quality of assimilation of new theoretical material, enhance cognitive interest. Much less often, such services are applied to form a foreign language competence, intensify group communication and support teamwork. As a consequence, participants in the information and education interaction (future highly qualified specialists, teachers themselves) do not fully use the resources of AR technology to form in-demand general cultural competencies (intercultural communication, tolerance, patriotism, understanding the values of other nations, etc.). In addition, as M. Elphick notes, problems arise when appropriate applications are chosen and applied technically while developing and educating an individual (Elphick, 2018).

We agree with I.E. Shcherbakov, O.V. Karaseva, D.A. Gorbacheva that targeted methodological activities aimed to form graduates' digital competencies, focused on obtaining fundamental knowledge and in-depth skills in this field should be implemented at the master's level (Shcherbakov i dr., 2021).

Thus, there is a need to study augmented reality further as an innovative pedagogical technology in order to:

1. Include new teaching methods and tools to form higher education multicultural environment;

2. Effectively use AR in the educational and cognitive and professional activities of future highly qualified specialists (in particular, master's degree students).

The following hypotheses were accepted:

H0: the level of master's degree students' multicultural competence in the experimental group is statistically equal to the level obtained in the control group;

H1: the level in the experimental group is higher than the level of the control group.

1.2. Purpose and objectives of research

The purpose of the study is to understand and take into consideration the peculiarities of using augmented reality technology when training highly qualified specialists, developing multicultural competence as an integrated personal quality in higher education.

The study objectives are:

- to analyze current trends and problems of forming future specialists' multicultural competence;
- to identify prospects and possibilities of using AR technology in training students of higher educational institutions;
- to clarify the concept of "multicultural educational environment" in the context of digitalized society;
- to specify the didactic potential of augmented reality applications and tools while developing multicultural competence and demanded digital skills;
- to describe principles and directions of teacher's support for educational, cognitive and professional activities of master's level students when applying AR in accordance with its functions, challenges of globalization, labor market requirements, and higher education standards;
- to experimentally confirm that the proposed activity is effective when developing master's level students' multicultural competence.

2. Relevance

2.1. Literature review

In accordance with the purpose of the study, the literature was reviewed in two directions:

1) We identified how multicultural educational environment is formed under modern socio-economic conditions;

2) We described the range of applications of new digital technologies which are used to develop general cultural competencies and train highly qualified specialists of the future (including master's degree students).

2.1.1. Russian scientific and pedagogical literature review

A.L. Gavrikov, T.V. Mukhlaeva, when describing UNESCO activities within the framework of international cooperation, note that the organization performs such functions as: implementing promising research on forms of education, science, culture, and communication which are necessary in the world of the future; support for the promotion, transfer, and exchange of knowledge (Gavrikov, Mukhlaeva, 2017).

Federal documents in the field of Russian higher education determine the main competencies of in-demand specialists of the digital economy: respect for historical heritage and cultural traditions (Eskindarov et al., 2021), tolerant perception of differences between representatives of different nationalities, etc. As a result, teachers in the classroom are encouraged to actively apply pedagogical technologies to form appropriate general cultural competencies, patterns and values of social behavior in the globalizing world, multicultural communication skills and tolerance (Tikhonova i dr., 2018).

Within the first direction, it was also determined that multiculturalism, according to the conclusions of N.A. Astashova, S.K. Bondyreva, O.L. Zhuk, on the one hand, is a personality quality that allows a person to identify themselves as "an individual with their own culture and value system formed by tolerance towards other cultures and the culture of interethnic communication" (Astashova i dr., 2019). On the other hand, multiculturalism, e.g., according to O.A. Obdalova, O.V. Odegova, is considered as an important characteristic feature of modern education (Obdalova, Odegova, 2018).

S.A. Khazova, F.R. Khatit state that multicultural competence determines a person's ability to live and work effectively, interact in a multicultural society. As a consequence, cognitive,

motivational and value, activity and behavioral components should be distinguished (Khazova, Khatit, 2015).

Within the second direction, we noted that, under the conditions of the dynamically developing information society, the need to establish intercultural interaction with representatives of other countries is increasing (Serostanova, Choporova, 2020).

S.V. Volodenkov concludes that, due to modern information and communication technologies, the borders of states and, consequently, contacts between representatives of different cultures are expanding (Volodenkov, 2016). So, in order to bring peoples closer, a large number of chats, forums and platforms are being created to establish effective interaction between representatives of different cultures. According to E. V. Soboleva et al., innovative technical means, software applications bring the learning process to a qualitatively different level (Soboleva et al., 2020).

A.V. Grinshkun highlights the fact that the use of augmented reality technology while training highly qualified specialists allows overlaying computer graphics or text information into the content of the real physical world in the present time (Grinshkun, 2018). And, indeed, students feel that they can find informational virtual objects in real environment. These circumstances enhance students' interest, cognition, research, and creativity (Kotenko, 2020).

A.V. Ivanova also proposes the structure of augmented reality applications for university education. The designed structure includes the following modules: tracking cameras, object storage, visualization devices, and user interface (Ivanova, 2018).

According to N.N. Serostanova and E.I. Choporova, the use of AR technology meets the requirements of modern educational standards and, when effectively organized, intensifies the didactic process (Serostanova, Choporova, 2020).

M. Rumyantsev, I. Rudov confirm that currently higher educational institutions in Russia use AR and VR mainly when teaching natural science disciplines (Rumyantsev, Rudov, 2016).

In the digital environment, the teacher will have to learn how to organize and direct students' cognitive activity, build multicultural interaction, network collaboration, personalized presentation of the material using modern information technologies.

S.S. Kulikova, O.V. Yakovleva note that the problem of using new technologies when developing general cultural competencies and training highly qualified specialists of the future is of particular importance nowadays when education is designed to prepare a multilingual multicultural individual capable of using digital educational resources to enhance intercultural and interpersonal communication, be part of national and world cultures (Kulikova, Yakovleva, 2022). According to the authors, digital educational environment is a challenge of the new time, a condition, as well as a means of training a specialist of a new breed.

In order to warn teachers seeking to enrich their software and technical tools, A.L. Zhuravlev, T.A. Nestik, focus on potential risks, security threats and problems of personal development (Zhuravlev, Nestik, 2019). For example, when installing applications for AR, teachers must require from students to comply with security measures, maintain the integrity and confidentiality of information and must do it themselves.

So, on the one hand, developing multicultural educational environment, forming person's multicultural competence are the priorities of the country's policy in the international economic sphere; on the other hand, the use of augmented reality technology in education is supported by the provisions of the Education national project.

The Russian literature review allows identifying the problem that developing multicultural competence and in-demand digital skills of students who major in Pedagogical Education needs further study.

2.2. Foreign literature review

When studying the peculiarities of forming multicultural educational environment under modern socio-economic conditions, it was noted that most foreign scholars recognize the significant role of information technologies in terms of enhancing multilingual interaction and dialogue of cultures.

M.U. Nadeem, R. Mohammed, S. Dalib prove that the globalization of society is not only accelerating scientific and technological progress, intellectualizing all types of human activity, but also is creating a qualitatively new information environment (Nadeem et al., 2020). Within this environment, the person's creative potential is developed. For example, cloud services, according to

V. Maria-Diaz, M. López-Pérez, B. Fernandez-Robles, are effective tools to obtain all types of information (Marín-Díaz et al., 2020). And the widespread use of VR/ AR technologies contributes to developing the country's economy, significantly increases productivity and efficiency at industrial enterprises, forms new approaches to the learning process, improves the level of education, qualitatively increases the level of healthcare and makes medical care more accessible. In addition, VR/AR technologies create the state-of-the-art ways of communication (Thees et al., 2020).

M.U. Nadeem, R. Mohammed, S. Dalib also state that, in the context of forming a multicultural individual in information and education environment, in-demand specialists of the future need to master not only professional communication skills, but also various technical means of communication with colleagues (Nadeem et al., 2020).

Along with these directions, VR/AR applications and systems are also being widely used in education (Merchant et al., 2014).

For instance, according to T. Liao, such technical means of communication enhance foreign language communication, intensify, individualize and differentiate the learning process (Liao, 2020). However, as noted by R. Raisamo et al., virtual environments and software applications, like any means, have their advantages and disadvantages (Raisamo et al., 2019). The teacher's task is to optimally integrate them into the educational process and communication between all participants of the didactic process.

J. Bacca et al., when describing the range of applications of new digital technologies used to develop general cultural competencies and train highly qualified specialists of the future, argue that augmented reality technology has significant educational potential and is a universal tool of developing memory, attention, thinking (Bacca et al., 2019). This technology makes it possible to achieve a new form of digital managing and ordering data; a new quality of information visualization; a higher level of communication (Geng, Yamada, 2020).

J. Martin-Gutierrez claim that online courses, electronic diaries and textbooks, adaptive individual educational programs are becoming an integral part of the current learning process (Martin-Gutierrez, 2017).

However, according to M. Fan, A.N. Antle, J.L. Warren, teachers and students in higher education use augmented reality tools mainly to model or study phenomena and processes that are difficult to implement in real conditions (Fan et al., 2020).

Network etiquette, respect for the "virtual" interlocutor, and psychological comfort in intercultural communication are studied separately in foreign science (Auwalu et al., 2015).

So, despite the wide range of didactic possibilities of augmented reality technology in university education, training highly qualified specialists, developing general cultural competencies and socially significant personality qualities, there are a number of objective factors that must be taken into account when forming multicultural environment. First, teachers must be prepared to conduct a dialogue of cultures, be tolerant and perceive a different opinion. Second, it is necessary to understand the risks of using AR in terms of the psychological climate within the team, in which students of different nationalities can study. Third, it is difficult to choose an AR application that works as efficiently as possible to achieve the didactic goals.

Thus, there is an objective need to study the potential of augmented reality technology, taking into account training master's degree students to meet the requirements of the digital economy, the challenges of the globalizing society, as well as for the students' benefit.

3. Materials and methods

3.1. Theoretical and empirical methods

The following methods are used in the study: theoretical analysis and generalization of scientific literature on the problems of developing a person's multicultural competence in the context of globalization and informatization; the use of digital tools to improve the quality of higher education; the use of the AR technology potential when forming professional and general cultural competencies.

The main methodological idea of the study is determined by the key principle of multicultural education which implies assimilating knowledge about other cultures by master's level students, implementing effective intercultural interaction, forming a worldview, conducting a dialogue between representatives of different countries, nations, etc.

The Zome application which is an improved version of WallaMe is used as a software tool.

Augmented reality technology and Zome are applied using quest.

Independent and frontal laboratory work, mini-research and creative projects, demonstration, work according to instructions, gamification and m-learning are used at various stages of multicultural information and education interaction.

To obtain up-to-date information about the level of master's degree students' multicultural competence, empirical methods are used: monitoring the communication of all the interacting participants; analysis of messages and results of activities in Zome (virtual texts, the number and quality of images, the choice of geo-location); the number of attempts to find the right solution; time to study theoretical material in published work; the volume and correspondence of the audio files used, etc.

AR tools to design multicultural educational environment were directly studied when teaching Development and Application of Computer Games in Training. AR-tools to communicate in augmented environment of multicultural interaction were applied while teaching Foreign Language in Professional Activities, Interactive Educational Technologies in Specialized Training, Digital Environment of Technological Education. In total, 42 master's degree students (44.04.01., Pedagogical Education) were involved in the experiment. Experimental and control groups (21 students in each) were formed from these students using the author's testing.

The author's testing consisted of 60 tasks divided into blocks according to the components of multicultural competence. In each block, there were 2 tasks for free presentation/designing and 10 closed-form tasks (matching, selection/multiple choice, working with a text fragment, filling in gaps, etc.). Examples of tasks are presented in section 4.3.1.

During testing, adapted diagnostic materials by S.A. Khazova, F.R. Khatit were used. To diagnose the level of the multicultural competence step by step, S.A. Khazova, F.R. Khatit recommend to use the following methods (Khazova, Khatit, 2015):

1. The cognitive component of multicultural competence should be assessed using the results of monitoring students' knowledge in academic disciplines of the corresponding stage or the integrated assessment of the level of knowledge using specially developed tests.

2. The motivational and value component of multicultural competence should be assessed using:

- testing involving ranking of multicultural values mastered at a specific stage (a) and the assessment of the personal significance of multicultural values mastered at a specific stage (b);
- a questionnaire aimed at clarifying the relationship of stimuli (motives) that determine or may determine the students' activity in intercultural interaction;
- a questionnaire aimed at identifying the presence, strength, and orientation of students' interests regarding intercultural interaction.

Thus, an integrated set of cognitive, motivational and value, activity and behavioral, reflexive and evaluative components was taken into account in the author's testing.

The average age of respondents was 28 (53 % of girls and 47 % of boys). The number and composition of the sample were justified by the study specifics. When characterizing the relationships of the features under consideration, nonparametric statistical criteria are used, in particular, the Pearson's chi-square coefficient – $\chi 2$.

3.2. The base of research

The main purpose of the experiment was to test AR effectiveness in the master's level students' educational, cognitive and professional activities while developing their multicultural competence. 42 master's degree students (44.04.01 Pedagogical Education) were involved.

Using the entrance testing, we collected the required initial data about the students. The sample was not random. To fulfill the rules of probabilistic selection, the same teacher supervised the intellectually-directed and cognitive activities of all the master's level students when using AR applications. While networking in the multicultural educational environment, the specific features of future work were taken in account.

AR applications were studied and subsequently applied while teaching Foreign Language in Professional Activities, Interactive Educational Technologies in Specialized Training, Digital Environment of Technological Education, Development and Application of Computer Games in Training.

The teacher formulated research tasks, directed the master's level students' network interaction in multicultural educational environment, educational materials in augmented reality.

AR applications (building links between elements, adding images, various documents, uploading materials, exporting) were used in the same classrooms using the same hardware and software. The test was developed by the authors in accordance with the current standard of higher education in the given field.

3.3. Stages of research

The effectiveness of AR technology in the university environment aimed at educating a multicultural individual and improving the quality of education in general was evaluated during the pedagogical experiment.

The study was conducted in three stages.

At the preparatory stage, various software tools and applications supporting AR technology were analyzed. The following characteristics as criteria for selection were used: open access (free distribution), multilingualism, ability to work individually and in a group, presentation of information in various forms, information security in network collaboration.

As advantages of Zome, we note the possibility of networking, using maps and geo-positioning, adding images (including animation) and texts in various languages, protected account and access to interaction only with the interlocutor's consent, intuitive interface, free software distribution.

Further, the tasks to assess the master's degree students' level of multicultural competence were developed. It was taken into account that when studying the phenomenon of "a person's multicultural competence", an integrated set of cognitive, motivational and value, activity and behavioral, reflexive and evaluative components should be considered. A block of tasks to assess the quality of solving professional tasks by master's level students was also added. Examples of tasks are presented in section 4.3.1.

Students could get from 0 to 100 points for testing. According to the results, the levels were determined as follows: from 85 (inclusive) to 100 points were considered the "high" value, from 61 (inclusive) to 84 – "average", for other cases – "low".

The level of master's degree students' multicultural competence was determined using the results of the presented and discussed individual messages on geometrics and the results of the quest as a whole; the intensity of interaction in AR environment. The methodology to determine the level of master's degree students' multicultural competence is also described in section 4.3.1.

Thus, the collected data on 42 participants of information interaction made it possible to form experimental and control groups (21 master's level students in each).

Conditions for the formation of the control and experimental groups include an approximately equal number of boys and girls, similar factors in the motivation for intercultural communication and collaboration in AR; emotional responsiveness and attentiveness to the conversational partner; ability and readiness for multilingual information interaction; approximately the same user skills in working with digital technologies.

The second stage of the research is devoted to clarifying the principles and directions of teacher's support for master's level students' educational, cognitive, and professional activities when applying AR in accordance with its functions, the challenges of globalization, labor market requirements and higher education standards.

The third stage of the study involves experimental teaching and using AR applications in master's degree students' training.

4. Results

4.1. Clarifying basic concepts

Within the study, augmented reality (AR) is considered both as a learning technology and as information environment for personal development. Text information, graphics, video, 3D models, sound are used to interact with the user in augmented environment. AR was used in the experimental group training in order to solve the following tasks:

- to create additional conditions to study the basics and principles of forming cultural environment in all the diversity of norms, values, traditions, stereotypes; determine the

effectiveness of intercultural communication technologies; take into account the rules and peculiarities of business communication;

- to organize the communication process taking into account the cultural context to achieve the given result;
- to form skills of joint activity in various forms taking into account the peculiarities of the cultural environment;
- to study innovative technologies in accordance with the trends of globalized and integrated society, challenges of the digital economy, and labor market requirements;
- to apply digital technologies to analyze, take into consideration the diversity of interests, cultures in multilingual and intersectoral interaction;
- to use the capabilities of new software tools to highlight the intercultural diversity of society in socio-historical, ethical and philosophical contexts;
- to study the history of Russia and universal history, the place and role of Russia in the history of mankind and in the modern world;
- to forecast and find solutions to philosophical, socio-historical and ethical problems of modern society.

When selecting information resources, digital means for multicultural education, the principles of humanism and tolerance, practice-oriented interaction are used.

Augmented reality is a technology that includes virtual information in the real world which seems to coexist with the person within the same environment. The information received by the user is not perceived only visually. Both hearing and touch can be used what makes the feeling of "immersion" of augmented reality. AR tools allow replacing or supplementing existing spatial objects which combines computer-generated information with the real environment. Due to this, AR-based applications can work interactively in real time.

In order to come into contact with augmented reality, it is enough to have a smartphone, tablet, computer or AR glasses, which are the technical shell of the technology. Gadgets must have special software and a camera. If all the conditions are met, it is possible, e.g., to immerse in the Lewis Carroll's world, see a variety of ghost towns, visit the Island of Lost Ships and Nautilus. Due to the interactive guide, the user has a real opportunity to get acquainted with the history of various architectural structures, monuments, exhibits. Ordinary people can experience the world from that "fabulous" side, which existed, in their opinion, only in the Emerald City.

It is the analogous "glasses with green emerald glass" – the AR application – which allows students from different ethnic groups (representatives of different peoples) to find mutual understanding and equally emotionally perceive the "augmented" world.

To combine educational, cognitive and educational goals while training specialists, the Zome service was used. This is a messenger and augmented reality network with tools to create and share digital content anywhere in the world; it does not imply just being online.

4.2. Using AR in the university information and education environment to enhance multicultural interaction

AR applications were used in the experimental group to achieve the goals of personal development and obtain high-quality professional knowledge and skills. Augmented reality technology was applied in training master's level students in order to stimulate communication in multicultural environment, foreign language communication, research and creativity, find solutions to educational tasks, work out speech structures, etc.

As a result, after AR was included in the information and education environment of multicultural, intersectoral interaction, a software product was developed that allows supplementing the surrounding reality which is seen by the smartphone camera with virtual objects. In this case, new theoretical material is applied in practice, and additional conditions are created to develop person's emotional and volitional qualities, feelings of patriotism, and tolerance.

Within this study, the Zome application is not just a messenger/network for augmented reality where participants of information interaction can create and share their own digital content. The Zome environment in the experimental group is multicultural educational environment that promotes communication of representatives of different cultures in different languages, exchange of opinions and emotions, develops communication skills in the network (network etiquette both at

the household and professional level), supports information security measures, etc. The algorithm to use an augmented reality application is as follows:

Step 1. To download the application using any platform

- https://apps.apple.com/pl/app/zome-augmented-reality/id1382123356?l=ru,
- https://play.google.com/store/apps/details?id=com.zomecorp.zome&hl=ru&gl=US, and run it.

Step 2. To register. There are two ways to do this: using e-mail or phone number (for the user's convenience, there is a Sign Up button in the interface).

Step 3. To enter the main screen of the application. It looks like a regular phone camera. There are several working tools on the screen that help create one's own messages and search for other users' tags.

When studying new material within the discipline, in particular "Educational Quests: Use at Various Stages of the Educational Process", participants of the experimental group develop the quest content: the number of locations to find a solution, the content of each station. For example, the quest task is "to determine the year in which Charles Wheatstone, an English physicist, invented a stereoscope that allows users to "dive" into a three-dimensional image." The answer is 1837.

We describe the influence of the presented task on the formation of each of the components of the person's multicultural competence.

The students start their journey in the university classroom. They use the application to find a "superimposed" message on the wall – the text of the task. The background is the Rembrandt Museum signboard in Kirov. The task is to find the figure which is used in the Bible to denote one single true God. The correct answer is 1.

Then the students go to the Museum. On the facade, together with information on the museum history, Rembrandt's biography, a new task is given which says: if you put tangerines on a platter in a circle or an octagon, well-being gets an infinity symbol. As a hint to the next station, an audio recording of the bell ringing from the St. Trinity Church in the settlement of Makaryevskaya is used. The correct answer is 8.

At the bell tower of the St. Trinity Church, the students receive an augmented reality message "Third Person is a 2013 romantic drama film directed and written by Paul Haggis." The task is to determine the original quantitative numeral for the ordinal numeral from the film title, translate it into Russian. The next point of the quest is the cultural place where this film was released. The correct answer is 3.

At the fourth station (the Kolizeum cinema hall in Kirov), the students again find the text of the task using smartphones and the Zome application camera with the help of the QR code. The initial message contains the following sequence of attractions: the Lighthouse of Alexandria, the Hanging Gardens of Semiramis, the Statue of Zeus in Olympia, the Temple of Artemis in Ephesus, the Mausoleum in Halicarnassus, the Colossus of Rhodes, the Pyramid of Cheops. The correct answer is 7.

Thus, the participants of information interaction really immersed themselves in the multicultural educational environment supported by augmented reality. The students showed knowledge of the foreign language, their native land, world religion, culture, and art. The cognitive component was formed due to various ways of encoding information, conceptual structures and connections used.

When completing the quest tasks, the students made judgments, formulated statements, gave arguments, i.e. expressed their social stance.

While choosing the answer at the discussion stage and summing up the results, the reflexive evaluation component was developed.

During the journey through the stations, while distributing roles and functions, the conditions to enhance cooperation, joint activities and network collaboration (activity and behavioral component) were created.

Each of the areas of information interaction described corresponds to the specific task of the teacher's professional standard: to be able to give objective assessment; to possess knowledge of forms, teaching methods, and modern information technologies; to organize various types of extracurricular activities, etc.

To move the quest stations into the augmented reality, the participants of the experimental group performed the following actions:

- they created a group for information interaction, sent out requests and accepted invitations from all the quest participants;
- filled in the subject of the quest;
- added content (images, videos, text, sound, animation) using the buttons at the bottom of the screen;
- determined the location for the tag/message;
- set the time for the message to appear and disappear, the number of possible views by users using the Clock icon;
- set a password for the message using the Lock icon;
- checked the settings of all the elements for the message and clicked Send To button.

Thus, each master's level student performed the following roles: the role of a developer of their own quest for stations in augmented reality; an active quest participant in augmented reality, they were invited there through the Zome application.

The master's degree students in the experimental group studied and applied the following Zome features:

1. Creating message capsules with attachments for storage and distribution in space and time;
2. Setting the timer for the content to appear and disappear;
3. Creating individual maps (by profession, by cognitive interests);
4. Setting up the availability of messages when collaborating only to a certain group;
5. Limiting the number of message views;
6. Searching for the messages left in this location (inside it, the number of dots – left messages – is seen).

4.3. Experimental evaluation

4.3.1. The ascertaining stage of the experiment

At the first stage of the experiment, the materials specially developed by the author's team were used to evaluate the input. Below are the examples of tasks.

We took into account the provision that when studying the phenomenon of "a person's multicultural competence", an integrated set of cognitive, motivational and value, activity and behavioral, reflexive and evaluative components should be considered. A block of tasks to assess the quality of solving professional tasks by master's level students was also added.

Block 1 (motivational and value component). As a task to establish compliance, master's degree students are given several situations of communication between representatives of various professions, peoples, cultures. Situations are simultaneously presented in text/sound form and in images. It is required to match them. The correct completion of the task is estimated as 1 point.

An example of the free presentation task is when students are given a set of words: "Germany", "nation", "development", "culture", "thought". They are required to write a short story (at least seven sentences) using each of these words. The maximum mark for completing the task is 5 points.

Block 2 (activity and behavioral component). For example, when the task to select an answer from the list is considered, students are given a text from the field of intersectoral, intercultural interaction with missing words (set expressions). To fill in the gaps, students need to insert those words that, in their opinion, most accurately convey the interlocutors' emotions and feelings. The words to choose from are presented in a separate line. 1 point is given if the task is correctly completed.

An example of the free presentation task is as follows. In order to write the course paper, Maria needed to analyze at least ten information resources for learning English which could form personal educational results. Students are supposed to recommend Maria websites, Internet services, teaching materials, which, in their opinion, will allow her to solve the research tasks. The maximum score for completing the task is 5 points.

Block 3 (reflexive and evaluative component). For example, it is required to complete the sentence "Persons... are not allowed to teach" according to the norms of the current professional standard. In the first case, the master's level student receives multiple choice options. The correct completion of the task is estimated as 1 point. In the second case, the student independently constructs the answer. The maximum score for completing such a task is 5 points.

Block 4 (cognitive component). For example, students are given the task to select an answer from the list. From the suggested options, they choose what is traditionally eaten for breakfast, lunch, and dinner in a particular country. 1 point is given for the correct completion of the task.

As a free presentation task, students suggest their own version of the origin of Japan or construct their own version of the Pyramid of Cheops. The maximum score for completing the task is 5 points.

Block 5 (to assess the quality of educational results). For example, students work with a text. Using a fragment from K.Y. Polyakov's teaching materials, they note those factors that (according to the text) are disadvantages of the Roman numeral system. The correct completion of the task is estimated as 1 point.

To complete the free presentation task, students with the help of search engines for each of the given situations of intercultural (or intersectoral) interaction are to select materials: media publications, images, audio files, animated videos and analyze them by the following criteria: novelty, objectivity, reliability, tolerance, patriotism. The maximum score for completing the task is 5 points.

Master's degree students could get from 0 to 100 points for testing. According to the results, the levels were determined as follows: from 85 (inclusive) to 100 points were considered the "high" value, from 61 (inclusive) to 84 – "average", for other cases – "low". Thus, it was possible to collect data on 42 master's degree students, from which the experimental and control groups were formed (21 people in each). The experimental group consisted of 53 % of girls and 47 % of boys.

A set of criteria for evaluation is as follows: being motivated to perform multilingual (intercultural) communication and collaboration in AR; being emotionally responsive and attentive to the interlocutor; possessing systematic and integral knowledge about the language, the history of their country and other cultures; understanding the problems of modern society and the use of new digital technologies (in particular, AR) to solve them; the presence of their own reasoned points of view (positions /opinions) in the context of intercultural interaction; tolerant attitude; implementing measures to protect information; compliance with the rules of communication, network etiquette.

The high level of multicultural competence was determined if the master's degree student was strongly motivated; was able to design intercultural communication using AR technology; was emotionally responsive, attentive to the interlocutor regardless of their race, religion, etc.; used AR resources to gain knowledge about the specifics of the country's culture, history and took these facts into account when organizing foreign language communication; had their own moral stand in the context of intercultural interaction; performed measures to protect information in the AR application account and on the Internet; observed network etiquette.

The average level of multicultural competence was registered if the master's degree student was not always motivated to be involved in multilingual, intersectoral interaction; could design intercultural communication using AR technology only with the mentor's help; was emotionally responsive, attentive to the interlocutor, most often depending on their race, religion, etc.; rarely used AR resources to gain knowledge about the specifics of the country's culture, history and could not take these facts into account when organizing foreign language communication; the student was not always able to argue their own moral stand in the context of intercultural interaction; they could forget to take measures to protect information in the AR application account and on the Internet; sometimes they violated the rules of network etiquette.

The low level of multicultural competence was determined if the master's degree student was most often not motivated to be involved in multilingual, intersectoral interaction; experienced difficulties in designing intercultural communication using AR technology; in most cases, the student was not emotionally responsive, attentive to the interlocutor; used AR resources for entertainment, not for foreign language communication; did not seek to argue their own moral stand in the context of intercultural interaction; could forget to take measures to protect information in the AR application account and on the Internet; often violated the rules of network etiquette.

4.3.2. Forming stage of the experiment

This stage of the experiment was aimed to determine the options for using AR applications to stimulate communication in multicultural environment, foreign language communication, research and creativity, find solutions to educational tasks, work out speech structures, etc.

Using this application, the participants of the experiment could create message capsules with attachments that existed in space and time. The service made it easy to add a timer for the content to appear and disappear. Configuring availability of messages was also implemented. In particular, it was possible to send them not to all users, but only to a certain circle of people, e.g., by interests – a healthy lifestyle, learning the languages of the peoples of the North. The number of views of this capsule can also be limited. For instance, in order to collect information about the speed of execution (those who managed to do the task received a new task, those who did not manage the task, did not receive a new one). Zome helps create, explore and share knowledge and memories with each other.

The initiator of the project activity carried out preliminary methodological work with all the participants of the didactic process on mastering the functions of the AR application.

No special engineering skills or additional utilities are required to install the application. The interface is similar to Google Maps design and functions. To master the application successfully, minimal knowledge of English is sufficient ("message", 'subject", 'profile', 'welcome", "PM", "key", etc.).

Augmented reality technology was studied and Zome was applied in the experimental group using quest. Quest, as an organizational form of master's level students' educational and cognitive activity, makes it possible to use new digital means to provide new theoretical material (including foreign language), intercultural communication, develop responsibility, integrity, tolerance, and feelings of patriotism.

The master's degree students in the control group studied topics according to the curriculum in the traditional way through a series of lectures and seminars. In the classroom, the teacher used interactive simulators, text mazes, programming environments, multimedia presentations, cloud services and other Internet information resources.

After using augmented reality tools and methods to design multicultural information and education environment, another control event was held.

4.3.3. Control stage of the experiment

To assess the effectiveness of AR technology in the university environment aimed at fostering multicultural information and education environment, the control testing was held. The questions were developed in accordance with the principles described earlier.

The evaluation results before and after the experiment are presented in Table 1.

Table 1. Results of using AR applications in the educational process and organization of intercultural communication of master's level students

Level	Groups			
	Experimental group (21 master's degree students)		Control group (21 master's degree students)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
High	1	7	1	1
Average	9	11	10	13
Low	11	3	10	7

Using http://medstatistic.ru/calculators/calchit.html., the values of the criterion before ($\chi 2$observ.1) and after ($\chi 2$observ.2) experiment were calculated. For $\alpha = 0.05$ according to the distribution tables, the $\chi 2$crit is 5.99. Thus, we get: $\chi 2$observ.1 < $\chi 2$crit (0.10 < 5.99), and $\chi 2$observ. 2 > $\chi 2$crit (6.27 > 5.99). Consequently, the shift towards increasing the level of master's degree students' multicultural competence can be considered non-accidental.

5. Discussion

The sample of master's degree students was not probabilistic since the experimental and control groups were formed in such a way that the presence of the same personality qualities in each group was guaranteed, combining the motives of cognition, acceptance of the general and

specific in each culture as values; knowledge of laws, ways of life and development of the multicultural world; skills to apply them while educating a future student as a person of culture.

The experimental group consisted of 53 % of girls and 47 % of boys. Reason: there were 21 master's degree students in each group.

For diagnostics, the results of the input control event were taken into account. The participants selected for the experiment and the sample size are substantiated by the study specifics. In particular, the study of theoretical material on AR technologies, the use of interactive educational tools for professional multilingual interaction are included in the training program for a limited number of specialties.

When implementing the experiment, the basic principles of an educational quest were taken into account (setting the goal, inventing the plot, the venue of the quest, the presence of search activity tips, a variety of stages and tasks, thinking over the educational and cognitive trajectory), the functions of the service for modeling multicultural dialogue in the university's information and education environment.

Based on the quantitative analysis of the data obtained, it can be concluded that after the experiment was completed, 33 % of master's degree students in the experimental group had the "high" level of multicultural competence (7 students out of 21), while initially this percentage was equal to 5 % (1 undergraduate out of 21). The number of students with the "low" level significantly decreased from 52 % to 14 %. For the control group, there was no dynamics registered at the "high" level; after the experiment, 62 % (13 students out of 21) had the "average" level (initially, 10 respondents out of 21); the indicator for the "low" level changed from 48 % to 33 %.

While discussing the results on the development and content of the AR Zome application (virtual texts, the number and quality of images, the choice of geo-location), the choice of topics for intercultural communication, the number of attempts to find the right solution to the philosophical, socio-ethical problems of modern digital society, person's emotional and volitional qualities were evaluated. Summarizing the observation materials, we conclude that the participants of the network interaction in the educational environment of the experimental group highlighted the following Zome functions:

- activating various coding methods and forms of information presentation;
- setting up access to view messages when collaborating only for a specific group, e.g., by interests (for those interested in computer science, for travelers);
- moving through time and space, e.g., to post a message about Paris from home. Such a technique can be useful if world discoveries, international events are overviewed;
- limiting time and attempts to respond. For example, master's level students used this opportunity to collect information about the time spent and resources used to find the "secret key".

Among the disadvantages of the technology, the students of the experimental group noted users' excessive enthusiasm for the technology itself and the digital medium; fatigue in the eyes; dependence of the pace of work on the quality of the Internet or mobile connection; the functions of AR Zome largely depend on the smartphone model and the country for which the device was released.

Thus, the AR application (in particular, Zome) helped, on the one hand, create, explore and share theoretical knowledge and professional skills; on the other hand, the learning environment was enriched with augmented reality tools to exchange opinions, emotions, and memories among the representatives of different cultures, in different languages. To solve educational and cognitive tasks, the master's degree students of the experimental group needed to use such socially significant qualities as conscientiousness, attentiveness, empathy, responsibility, patriotism, and tolerance.

Thus, innovative pedagogical technologies (in particular, AR) allowed not only creating additional conditions to form professional competencies, but also developed intercultural communication, cooperation and international interaction (Burnet, 2008). The obtained conclusions about the didactic potential of AR technology in terms of improving the quality of education, the demanded digital skills are confirmed by A.V. Grinshkun (Grinshkun, 2018), J. Martín-Gutiérrez, C.E. Mora (Martín-Gutiérrez et al., 2017). In addition, it was possible to confirm the opinion of E. V. Tikhonova, A. S. Potapova, A.V. Krider regarding the didactic possibilities of digital services while developing general cultural competencies (tolerance, intercultural communication, etc.) (Tikhonova i dr., 2018).

6. Conclusion

Based on the analysis and generalized capabilities of AR technology to develop multicultural educational environment, the need to organize additional methodological work when training master's degree students as highly qualified specialists, the authors reasonably identify a promising direction in the new educational paradigm – the use of AR to form master's level students' multicultural competence.

The study revealed how augmented reality methods and tools that influence the level of multicultural competence as an integrated personal quality and improve the quality of education in general should be applied:

1. Modern AR applications make it possible to effectively simulate virtual environment for joint activities and dialogue of cultures, multilingual communication and collaboration due to the capabilities of the interface and built-in functions: language setting, geo-location, account setup and location access, data transmission in different formats. Due to these capabilities, AR digital services can be used while studying various cross-cultural and professional topics, intensify the educational process and increase the effectiveness of socio-cultural integration of students.
2. AR applications increase motivation, develop socially significant personality qualities (tolerance and patriotism, responsibility, emotional empathy, etc.).
3. Activities in augmented reality educational environment provide new resources to improve the quality of professional training. This is due to the increase in information interaction between participants of the didactic process, intersectoral communication. The roles of teachers and students are being transformed.
4. AR technology supports the principles of visibility, accessibility, completeness, interactivity while forming imaginative thinking and spatial imagination (3D visualization, adaptation to the specific needs of each user).

Innovative pedagogical technologies activate cognitive interest in fundamental scientific theory, modeling and search for solutions to cultural and historical, socio-economic problems.

5. AR environment allows implementing the "feedback' mechanism at a qualitatively different level. Augmented reality imposes "external" visual, audio and tactile signals on the "internal" field of human vision. Navigation data, remote projection make it possible to accompany epistemological processes.
6. When using AR services, perception and the nervous system (increased excitability, emotional burnout, headaches) may be overloaded. When working in digital environment, information protection measures, rules of network etiquette and professional communication should be carefully observed. When choosing an application, functions for delimiting access to personal data (geo-location, message history) should be available.
7. Digital applications are not an end in themselves in terms of their studying and practical application. Their use is justified by the logic of educational, cognitive activity in multicultural educational environment.
8. Augmented reality tools should not become tools to manipulate a representative of another culture, to implement terrorist intentions.

The conducted experiment confirmed the undoubted advantages of using augmented reality technology to organize and support students' design and creative activities aimed at studying scientific world discoveries and achievements, the peculiarities of different peoples, their mentality, etc.

As an important methodological recommendation, we note that all participants in intercultural communication are to be ready and able to objectively analyze and evaluate information they acquire from augmented reality environment.

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Financial Education in School of Business Students: Case Study from Veracruz, Mexico

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Abstract

The purpose of the study is to evaluate the knowledge level and behavior that business school students from Veracruz, Mexico have in relation to interest rates, inflation, savings, credit and budgeting. For the empirical study, a non-experimental quantitative cross-sectioned and descriptive design was followed. The test used was that of Moreno-García et al. (2017), which was answered by 309 undergraduate students from Veracruz, Mexico. Data measurement was performed using descriptive statistics, cross tables and the non-parametric test of proportions (Z). The main findings point to the fact that more students understand well the impact of inflation than the relationship between interest rates and bonds; that students do not consider that saving provides financial security; and that there is no gender difference in terms of saving behavior. Most of the business school students do not have a credit card, prefer debit cards and have acceptable practices in budget planning. In summary, the results of this study show a good level of financial knowledge in relation to interest rates, inflation, investment, credit, and show adequate behavior of savings and credit card, as well as the use of the budgets. However, it was expected that each item would have a greater number of correct answers, considering that the population under study has received training in mathematics, economics, and finance. It is noteworthy that, in relation to gender, there are more men who correctly answer the questions about inflation and it is women who have better practices in the use of their credit cards.

Keywords: business, college, financial education, students, Mexico.

1. Introduction

In an era of digitization, people at a very young age become financially active citizens in the economy (Andreou, Philip, 2018). Making effective financial decisions requires a level of

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knowledge that allows the understanding of financial concepts and risks (OECD, 2016). It is clear that financial education is necessary at all ages to avoid costly mistakes that can have long-term impacts (Wagner, 2019), especially in young people, among whom it is of great importance because it prepares future adults to comply with any profession or continued study at a university (Belás et al., 2016).

In Mexico, there have been findings reporting the existence of possible areas of opportunity in terms of financial knowledge among young people. On this, Moreno-García, García-Santillán and Gutiérrez-Delgado (2017), have carried out a study whose results confirm that the levels of financial education are low among young Mexicans. Only 6.6 % of the sample answered the three questions used to evaluate them and only 35 % answered two of them correctly. Results obtained by the OECD are similar: only 40 % of their sample had a sufficient level of financial knowledge and only 30 % were considered to have adequate financial attitudes. In aggregate terms, it is worrying that only 10 % of the young population have the three necessary components to make financial decisions and 22 % do not have any of the three proposed by the OECD (Villagómez, Hidalgo, 2017).

A precarious financial knowledge has also been observed among business students. These results were reported for Mexico by León, Hernández and Haro (2022) and in Colombia by Duque, González and Ramírez (2016). The foregoing is worrying: if these students find it complex, the difficulty will be greater for those belonging to other areas.

Making young people aware of the importance of financial education is essential to prepare them to manage their own financial resources (Lusardi, Mitchel, 2011). Increasing the knowledge in this age group in terms of savings, investment and other topics related to the financial system will lead to a more educated society capable of making sensible decisions about the use of tools that banks provide (León et al., 2022).

With these arguments, the following question arises: What is the financial knowledge level that undergraduate students from a business school have? It is specifically questioned whether students know how to calculate interest payments, if they understand the effect of inflation, whether they save to have economic security or not and whether they make good use of credit cards. The objective of the research is to evaluate the level of financial knowledge that undergraduate students from a business school have on the topics of interest, inflation, savings, credit cards and budgets.

2. Literature review

According to a study carried out in 2014, in which basic aspects of financial education were evaluated among Mexicans aged 15 and older, only 32 % of the participants have elementary knowledge on the subject (Klapper et al., 2014). CONSAR (2016) identified that Mexicans born after the 1980s and who are already active in the labor market spend more in the present without planning for the future.

Alvarado and Duana (2018) identified a lack of interest in planning for retirement and savings among Mexican adolescents. It should be noted that their results differ according to gender, since men consider saving to spend in the short term on perishable goods while women save to spend on durable goods. These results contrast with those obtained by Fisher (2010), Sarigül (2014), Lusardi (2019) and Osorno and Hernández (2021), who identified that the male population in Mexico has a greater financial culture compared to the female population, in addition to the fact that the latter also denotes less confidence in their knowledge.

Moreno-García, García-Santillán and Gutiérrez-Delgado (2017) identified that Mexican university students with formal instruction in topics related to finances nonetheless lack an adequate level of financial education regarding savings, the use of credit cards, the effect of inflation and the calculation of interest rates.

In Latin America, specifically in Argentina, Brazil, Chile and Colombia, university students generally lack basic financial knowledge and want to know more about these concepts with the intention of carrying out a responsible financial management that leads to adequate decisions in their daily lives (Gutiérrez, Delgadillo, 2018).

In Paraguay, accounting students at the National University of Pilar state that they allocate part of their income to savings: 45 % of them generate constant savings and 42.3 % occasional savings while the rest do not save. Of the latter, three main reasons are mentioned for not doing so:

one is lack of interest, another is lack of income and the last is dependence on their parents, which means that they do not consider saving as their own responsibility. Of the percentage that does save, only 14.5 % use bank accounts, the rest keeping it in savings accounts or piggy banks. Their main motivations to save occur in the following order: paying for their education, going on a trip, becoming independent from their parents or starting their own business and, finally, purchasing a product (Ramírez, Vázquez, 2021).

In Puerto Rico, it was found that students in general use credit cards correctly, but only 20 % use them regularly all the time. The students expressed that they rely on other people when they are unable to cover monthly expenses and almost 70 % of the surveyed sample stated that they save monthly. A third party is indifferent to using a credit or debit card to pay for their purchases and if they had the possibility of using a debit card, credit card or cash, only 9 % would use a credit card (Castro-González et al., 2014). In Brazil, credit card usage was the highest among a group of 769 university students, of which 71 % use at least one credit card and are mostly women. The results of this study show that having more credit cards increases the possibility of risky behavior and that knowing the interest rate would help reduce the risk (Mendes-Da-Silva et al., 2012).

In Chile, it was identified that male university students have more positive attitudes towards indebtedness than women, although, in general, an austere profile stood out in the sample. They are less prone to indebtedness since they are aware that their lack of credit is attributed to the lack of their own income and social awareness about avoiding indebtedness at an early age (Mansilla et al., 2016).

For Peruvian students belonging to the Marcelino Champagnat University, there is a mastery of basic financial knowledge in almost half of the sample, those in the business programs standing out from the rest of the degrees. Likewise, they had a score as a less dispersed group, which would indicate a more uniform knowledge on topics such as interest rates, investment, loans and inflation. Also, there is a higher level of knowledge in male students, those who work, those who use credit or debit cards and those who maintain a relationship of coexistence (Yaringaño, 2018). In the rest of the world, there is also interesting evidence on the levels of financial knowledge among young people.

Lusardi, Mitchell and Curto (2011) explored financial literacy in young Americans and found that only a third of the population had basic knowledge about interest rates, inflation and risk diversification, and that their levels of financial literacy were strongly related to their sociodemographic characteristics and the financial sophistication of their family. On the other hand, Turkish university students also have an inadequate level of financial education, topics related to investments being those where more attention is required (Sarigül, 2014).

For Sri Lankan business and management students, saving is influenced by the level of financial education and self-control, with the former being more influential (Tharanika, Andrew, 2017). Poles between 18 and 24 years old make decisions and plans with the priority of acquiring products in the short term (Swiecka, Wyszkowska-Kaniewska, 2019). In Georgia, 18-35-year-olds save to maintain status and a high standard of living, but do not save for the future and tend to spend (Chudzian et al., 2014).

In China, a study carried out by Yao and Meng (2018) explored factors related to the use of credit cards among students from ten universities. The results show that the economic dependence on parents and the level of financial education influence the credit card payment behavior of university students. They also identified that gender is not related to this behavior.

From theoretical and empirical arguments found in the literature review, the following statements are established as hypotheses:

Hi1. College students know how to calculate interest payments.

Hi2. College students understand the effect of inflation.

Hi3. College students consider that saving provides financial security.

Hi4. College students make good use of their credit card.

Hi5. College students often make a budget to plan their expenses.

3. Methodology

This is a non-experimental empirical study that is approached from the hypothetical-deductive, cross-sectioned and descriptive method. The participants were undergraduate students from the only business school in the state of Veracruz, Mexico. The sample is non-probabilistic by

self-determination, since, due to the conditions of confinement during the pandemic, the survey was sent in electronic format to the email accounts of the 431 students enrolled in the different degrees of UCC Business School. The electronic survey was sent in February 2021 and 309 students responded, making up a good magnitude database. To obtain the data, the survey used in Moreno-García et al. (2017) was used.

In the absence of multivariate normality in the data, descriptive analysis will be used through cross tables to determine the response frequencies by gender in each item. Likewise, for the hypothesis test, the non-parametric assertion test of Z proportions is used (Triola, 2004). To validate the reliability and internal consistency of the items, a Cronbach's alpha coefficient of 0.60 was obtained, which is slightly low, which is due to the multidimensional nature of the responses.

4. Results

Of the 309 participants, 55.34 % are women and 44.66% men. Their ages range between 18 and 28 years old, distributed as follows: 14.24 % (44 cases) of 18 years old, 30.42 % (94 cases) of 19 years old, 28.16 % of 20 years old (87 cases), 19.74 % (61 cases) of 21 years, 6.47 % (20 cases) of 22 years and the remaining 1 % is divided into three cases of 23, 24 and 28 years old.

In relation to the programs in which students are enrolled: 54.69 % (169 cases) are from international business, 18.45 % (57 cases) from business administration and management, 14.89 % (46 cases) from economics, and the remaining 11.97 % from accounting and finance. Of the total number of students who participated in the survey, 24.59 % (76 cases) are in the second semester; 40.13 % (124 cases) are enrolled in the fourth semester; 25.24 % (78 cases) are in the sixth semester; and the remaining 10.04 % (31 cases) are in the eighth semester. The results for each variable analyzed are presented below.

4.1. Interest rate calculation

Items 2 and 3 of the instrument allow us to know whether the students know how the interest rate behaves. The results are shown in Table 1.

Table 1. Interest rate behavior indicators

Item2. If the interest rate goes up, what will happen – normally – to the price of bonds?

Gender	Increase	* Decrease	Remains the same	No relationship between interest rate and bond price	I don't know	Total
Male	52	43	5	37	1	138
Female	56	53	8	51	3	171
Total	108	96	13	88	4	309

Item3. A 15-year mortgage typically requires higher monthly payments than a 30-year mortgage, but the total interest paid on the loan will be less.

Gender	*True	False	Rather not say	I don't know	Total
Male	90	33	14	1	138
Female	94	52	21	4	171
Total	184	85	35	5	309

* Correct answer

Interest rates and bond prices move in opposite directions. From the participants, 31 % knew about this behavior and answered correctly, 68 % gave an incorrect answer and 1 % answered that they did not know. This result shows that the vast majority of students are unaware of this basic principle in finance.

Item 3 yields results that allow us to appreciate that the majority answered correctly (184/309 = 59.54 %), that is, they know that the longer the financing period, the higher the interest payment will be. It is worth mentioning that 27 % gave an incorrect answer and the rest either did

not want to answer or answered that they did not know. Regarding gender, the results show very similar percentages of correct answers between men and women.

4.2. Inflation

Items 1 and 4 allow us to identify whether students understand the effect of inflation. Table 2 shows the results obtained.

Table 2. Inflation indicators

Item1. Imagine the interest rate in your savings account is 1 % annually and that inflation is 2 % annually. After a year, how much could you purchase with the money in the account?						
Gender	More than today	Exactly the same as today	*Less than today	I don't know	Rather not say	Total
Male	15	11	104	7	1	138
Female	16	23	113	16	3	171
Total	31	34	217	23	4	309

Item4. Are your savings protected against the current inflation?				
Gender	*Yes, if I invest in items that pay higher than the inflation	Yes, if the bank says I have a high yield	I don't know	Total
Male	82	13	43	138
Female	70	15	86	171
Total	152	28	129	309

* Correct answer

The results show that 70 % of the students know that if the inflation rate is higher than the interest rate, there is a loss in the purchasing power of the currency saved. Of the participants, 21 % gave an incorrect answer and the rest either did not know or preferred not to answer. The answer obtained in item 1 contrasts with that obtained in item 4, since the question goes in the same direction, in relation to how inflation affects savings. However, only 49 % answered correctly, that savings are protected only if they are invested in instruments that pay returns above inflation, 9 % giving an incorrect answer and 41 % answering that they did not know. Depending on gender, there is a higher percentage of men who answered both questions correctly (9 % more in item 1 and 19 % more in item 4) and a ratio of 2 to 1 of women with respect to men who said they did not know the answer.

4.3. Saving

Items 5 and 6 allow us to know what saving means for students. The results are shown in Table 3.

Table 3. Savings indicators

	Gender		
Item 5: What is saving?	Male	Female	Total
Save money	44	38	82
Have money for emergencies	4	6	10
Something for the future	24	31	55
Not spend	2	2	4
Have money available	13	19	32
Money in the bank	1	4	5
Economic security	44	69	113
Money accumulated to buy	6	2	8

Total	138	171	309

	Gender		
Item 6: How do you determine what you save?	Male	Female	Total
Save what is left over	27	38	65
Save when wanting to buy or do something	30	53	83
Have the habit of saving	78	75	153
My income is not enough to save	3	5	8
Total	138	171	309

The idea that saving is mainly for economic security was considered by 36.5 % of students, 61 % of those who gave this answer being men. The second most voted option (26.5 %) was that saving is saving money, 53 % of those who answered this being women. The highest percentage of participants state that they have the habit of saving (49.5 %), although more men than women gave this answer and 26 % save when they want to buy or do something. In this case, more women than men act in this way.

4.4. Investment

Table 4 shows what students understand by investment.

Table 4. Investment indicator

	Item 10. What is an investment?							
Gender	Purchase something to obtain a gain	Money in a business	Having profits	Future profits	Make money work	Purchase estate	A saving	Total
Male	25	2	36	24	47	3	1	138
Female	31	6	30	57	45	0	2	171
Total	56	8	66	81	92	3	3	309

Of the participants, 29.77 % consider that an investment is putting money to work (the most voted option by men), followed by 26.21 % who indicate that an investment represents a benefit in the future (the most voted option by women). The third most voted option was that an investment is linked to having future profits (21.36 %). The three response options follow the logic that investment involves achieving profitability within a given period.

4.5. Credit

Table 5 shows the results on the perception of the participants regarding credit and, of particular relevance, what they consider the main risk of requesting a loan.

Table 5. Perception about the credit topic indicator

	Item 12. What is credit for you?						
Gender	A loan	A loan paid off in installments	A debt	A loan generating interest	Help to solve a problem	Problems	Total
Male	24	25	26	57	6	0	138
Female	18	49	12	88	3	1	171
	42	74	38	145	9	1	309

Gender	Item 14. Which is the main risk when asking for credit?			
	Going into debt	Not paying and losing your property	Paying high interest rates or increases of	Total

			these	
Male	44	23	71	138
Female	54	27	90	171
Total	98	50	161	309

Of the participants, 47 % perceive credit as a loan that generates interest. It is worth mentioning that there are 54 % more women than men who respond in this way. The second most voted option is that credit is a loan that is paid off in installments (23.85 %). This option was chosen by more women than men. Regarding the main risk of requesting a loan, 52 % consider that it is paying high interest or facing increases in interest. In this answer there is practically no difference based on gender.

4.6. Credit card

Of the students, 63.75 % answered that they do not have a credit card. This percentage is equivalent to 197 students, of which 112 are women and 85 men. Table 6 shows the results of the 112 students (36.25 %) who have at least one credit card. Of this group that has a credit card, 52.67 % are women and the rest are men.

Table 6. Credit cards indicators

Item	Most answered option	Women		Men		Partial	partial/ total sample (112)
		cases	%	cases	%	cases	%
14. A How many credit cards do you have?	1 or 2	51	52.04	47	47.96	98	87.5
15. B When paying, what do you do more frequently?	Pay the whole balance	40	57.97	29	42.03	69	61.60
16. What is the main advantage of using a credit card?	a) Carrying less cash	19	59.37	13	40.63	32	28.57
	b) Unexpec-ted events	14	45.16	17	54.84	31	27.67
17. How do you prefer to handle your money?	Debit card	35	54.68	29	45.32	64	57.14
18. You or any other member at home carries out operations through:	Internet	29	52.72	26	47.28	55	49.10
19. Before choosing a credit card, do you compare the total annual cost?	Always	23	48.93	24	51.07	47	41.96
20. Do you have credit cards you do not use?	No. I cancel the ones I do not use	37	55.22	30	44.78	67	59.82
21. Do you know your due date of your credit card?	Yes, I register it so as not to pay interest	59	69.41	26	30.58	85	75.89

As can be seen in Table 6, some of the most significant data suggest the following: 87.5 % of students who have a credit card have one or two, 59.82 % cancel those cards that they do not use, and 41.96 % compare the total annual cost before acquiring one; 75.89 % keep in mind the payment due dates so as not to pay interest and 61.60 % usually pay the total balance of their card monthly. These behaviors are predominant in women (69.41 and 57.97 % respectively). The students identify that the main advantages of having a credit card are handling less cash (28.57 %), a response mostly given by women, and the possibility of covering unforeseen events (27.67 %), a response mostly given by men. Despite having a credit card, this population prefers to use a debit card (57.14 %) and carrying out their financial transactions online (49.10 %).

4.7. Budgeting

Table 7 shows the behavior of the students regarding the management of their money from the making of a budget.

Table 7. Budget indicators

Item	Most frequent answer	Women		Men		Par-tial	partial/total sample (309)
		cases	%	cases	%	cases	%
24. Do you tend to keep a record of your debts, expenses, income and savings?	Yes	107	52.97	95	47.03	202	65.37
25. Do you know how to make a budget?	Yes	106	50.48	104	49.52	210	67.96
26. Are the expenses made during last month within your financial possibilities?	Yes	151	54.91	124	45.09	275	89.00
27. Choose the most important priority in your budget:	Food	107	54.59	89	45.41	196	63.43

In relation to the issue of budgets, the results show the following: 65.37 % usually keep a record of their income, expenses, debts and savings and 67.96 % indicate that they know how to prepare a budget to plan the distribution of their money; 89 % made expenses that were within their economic possibilities in the previous month and 63 % have as the most important priority in their expenses the purchase of food. Regarding gender, the fact stands out that, in a very even way, men and women know how to prepare a budget; however, there are more women than men who keep track of their expenses and spend according to their capabilities.

4.8. Hypothesis testing

To test the hypotheses, the non-parametric procedure of Z proportions is used, in order to contrast the five working hypotheses established for this study. Results are shown in Table 8.

Table 8. Hypothesis test

H	x cases	n	Value $z = \frac{\hat{P} - p}{\sqrt{pq/n}}$	Critical value	P Value (1-critical value)	Decision
Hi1. College students know how to calculate interest payments.						
H1	88	309	-7.566	0.0001	1.000	Not reject Ho
H1	184	309	3.356	0.9996	0.000	Reject Ho
Hi2. College students understand the effect of inflation.						
H2	217	309	7.111	0.9990	0.001	Reject Ho
H2	152	309	-0.284	0.3897	0.610	Not reject Ho
Hi3. College students consider that saving provides financial security.						
H3	113	309	-4.722	0.3897	0.610	Not reject Ho
Hi4. College students make good use of their credit cards.						
H4	112	309	-4.835	0.0001	1.000	Not reject Ho
Hi5. College students often make a budget to plan their expenses.						
H5	202	309	5.404	0.9990	0.001	Reject Ho
H5	210	309	6.315	0.9990	0.001	Reject Ho
H5	275	309	13.710	0.9990	0.001	Reject Ho
H5	196	309	4.722	0.9990	0.001	Reject Ho

The summary described in Table 8 suggests the following: Regarding the test of the Hi1 hypothesis, which indicates that university students know how to calculate interest payments, two items are used separately for their assessment (item 2 and item 3). Item 2 questions the relationship between the interest rate and the price of the bonds. In this regard, there is no evidence to reject the null hypothesis, which suggests that the participants do not understand that the interest rate and the price of bonds have an inverse relationship. The contrast of item 3 indicates that the null hypothesis should be rejected, since most of the students consider that as mortgage paying time is reduced, less interest is paid.

For the Hi2 hypothesis test, which establishes that university students understand the effect of inflation, item 1 and item 4 are used. Item 1 questions the effect of inflation on purchasing power. The result suggests that there is evidence to reject the null hypothesis. This tells us that most of the participating students understand the effect of inflation. In relation to item 4, which asks if savings are protected against current inflation, the result does not give evidence to reject the null hypothesis, which indicates that it is not clear to students that one way to protect wealth is to invest in financial instruments that pay profits above inflation.

The Hi3 hypothesis test seeks to determine whether the student considers that saving is important to having financial security, for which item 5 is used, which asks what saving is. The result shows that there is no evidence to reject the null hypothesis, although of the 309 cases, 113 consider that saving gives economic security.

To test the Hi4 hypothesis, which states that university students make good use of their credit cards, it is required that students have one. However, only a minority (36.25 %) have a credit card. This prevents the development of the nonparametric test of Z proportions, which indicates that there is no evidence to support the rejection of the null hypothesis.

Finally, for the Hi5 hypothesis test, which indicates that university students usually prepare a budget to plan their expenses, items 24, 25, 26 and 27 were used. The result gives evidence of a

rejection in all cases of the null hypothesis. This allows us to think that most students know how to make a budget and are used to keeping track of their debts, expenses, income and savings. In addition, the majority stated that the expenses they made during the past month were within their economic means, which speaks of proper management of their income and expenses.

The results show that more business students respond well to the question about the effect of inflation (70 %) than those who know the relationship between the interest rate and the price of bonds (31 %). These results contrast with those of Lusardi, Mitchell and Curto (2011) and with those of Klapper, Lusardi and Van Oudheusden (2014), who identified that only 54 % of young Americans answered the question on inflation correctly; however, these studies are not comparable on the interest rates results because they have questions of different levels of difficulty.

The results also show that 49.5 % of the participants have the habit of saving, a percentage similar to that found in Paraguayan students by Ramírez and Vázquez (2021), low compared to the percentage of students who save in Puerto Rico (Castro-González et al., 2014) and high compared to results such as that of Alvarado and Duana (2018) who identified that Mexican adolescents are not interested in saving.

Regarding the perception towards credit, the results of the study are similar to those identified by Mansilla, Denegri and Álvarez (2016) in Chilean students, who have a favorable perception towards indebtedness and credit. As for credit cards, the fact stands out that students prefer debit cards and only a little more than a third have at least one credit card. Of those who use a credit card, 87.5 % do not have more than two, the percentage that pays before the deadline is high, so as not to generate interest, and they pay the full amount (75.8 and 61.6 %, respectively). According to the findings of Mendes Da-Silva et al. (2012) these practices reduce the possibility that students engage in risky behaviors.

Finally, the finding reported by Moreno-García, García-Santillán and Gutiérrez-Delgado (2017), in which they point out the low level of financial knowledge in young people on issues of savings, credit cards, inflation and the calculation of interest rates, does not agree with the results of this research, in which it was identified that among business school students there is a good level of knowledge of the financial variables analyzed and acceptable behavior in terms of savings, use of credit cards and budget preparation.

5. Conclusion

Considering the national and international evidence on the subject, the results of this research indicate that business school students from Veracruz, Mexico have a high level of knowledge regarding interest rates, inflation, investment and credit and show appropriate behavior in terms of savings, credit card use and budgeting. However, it would be expected that the percentages of correct answers would be higher considering that this population has received training in mathematics, economics and finance. With regard to gender, there are more men who answer the questions about inflation correctly and it is women who have better practices in the use of their credit cards.

For future research, it is suggested to investigate the influence that family financial practices have on young people and identify, depending on the program they study, whether the study-load of mathematics and financial subjects influences their level of knowledge and behavior.

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The Experience of BMSTU's Teachers on Remote Teaching Chemistry of Hearing Impaired Students in the Pandemic

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Abstract

This paper considers the experience of Bauman Moscow State Technical University (BMSTU) teachers on remote teaching chemistry hearing-impaired students under pandemic conditions. The key challenge for these students in a general-type university with a verbal form of teaching is the content accessibility of fundamental engineering disciplines, including chemistry. The statutory activity of BMSTU guarantees vocational rehabilitation for this category of students through inclusive education programs and special learning conditions, taking into account the individual limitations due to hearing impairment. Special face-to-face conditions provide an accessible learning environment through digital transformation of classrooms, the use of individual and group audiological facilities as well as supplementary cognitive-technological chemistry course accompanying the basic chemistry discipline. In the pandemic conditions, teachers were faced with the challenge of transferring face-to-face chemistry courses into a content-accessible format of webinars. Principles of designing webinars in chemistry for these students include taking into account their cognitive features of information perception in virtual environment; creating multimodal developmental environment in webinars; designing special teaching materials for classes using cognitive technologies and an interdisciplinary approach considering UDL guidelines. It is shown that the process of teaching chemistry to deaf and hearing impaired students in specially designed conditions for webinars develops their cognitive abilities and does not reduce their motivation to effectively acquire the university program in the discipline. Webinar technology provides them with the opportunity to master new relevant skills. These findings have been confirmed by the students' results in chemistry in distance learning conditions compared to the results in face-to-face learning conditions.

Keywords: hearing impaired students, cognitive limitations, content accessibility, cognitive technologies, interdisciplinary approach, multimodal virtual environment.

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1. Introduction

Bauman Moscow State Technical University (BMSTU) is a general-type university with a verbal form of education. BMSTU has been training engineers with hearing impairments of varying severity (deaf and hard-of-hearing) since 1934. The key challenge for these students is the limited content availability of educational resources on fundamental engineering disciplines, including chemistry. This problem is mainly caused both the level of basic training of these students due to the lack of special conditions in general education institutions, and the level of their individual cognitive development due to hearing loss (Stanevsky, 2017). According to the International Classification of Functioning, Disability and Health (International classification, 2001), cognitive or perceptual skills include the ability to understand, integrate and process abstract information; analyze and generalize; to draw appropriate conclusions. These complex processes cause difficulties in deaf and hard-of-hearing students. They depend on a set of cognitive functions important for learning process, including the ability to perceive and remember information, concentrate, learn, and communicate verbally, and all of them are limited among these students due to a hearing impairment.

In order to support students in their educational process, the statutory activities of BMSTU include vocational rehabilitation and rehabilitation services (GOST, 2010) for them. This means that any student with disabilities (hearing impairment) becomes a subject of educational activities and adaptive rehabilitation services in order to realize his/her professional educational needs (Oreshkina, Slitikov, 2020). Such services include the education of the deaf and hearing-impaired students through inclusive (adaptive) higher education programs and the creation of special learning conditions taking into account their individual cognitive limitations due to hearing impairment.

In face-to-face learning conditions, the problem of content accessibility of fundamental engineering disciplines can be solved by creating an accessible multimodal environment through special digital organization of classrooms, individual and group audiological (sound-amplifying) means, additional cognitive and technological subject courses accompanied by sign-language interpreting (Oreshkina, 2020). In destabilizing pandemic conditions, it became necessary to transform classroom studies in academic subjects, including chemistry, into a distant format with effective remote (online and offline) working conditions for deaf and hard-of-hearing students.

The purpose of this study to reveal the experience of BMSTU teachers on remote learning chemistry of the deaf and hard of hearing students in the pandemic. This experience is based on following:

- considering individual cognitive limitations and peculiarities of information perception in students with hearing problems of varying severity;
- special preparing educational materials for classes and presenting them to students taking into account their individual cognitive peculiarities and limitations;
- organizing an effective interaction between students and teacher while classes.

2. Literature review

The prerequisite for inclusive education in Russia and in the whole world has been the modern advances in science and technology. The UN Convention on the Rights of Persons with Disabilities ratified by the Russian Federation on 15.05.2012. (Federal Law 46-FZ), obliges States Parties to “ensure inclusive education at all levels”, “with effective measures for providing individualized support”, in educational conditions which facilitate knowledge acquisition and social development as much as possible through “reasonable accommodation”[1] and/or “universal design”[2] of the educational environment. In this regard, according to (Alekhina, 2016), professional education becomes inclusive when universities and colleges create conditions to support any student. In the Russian Federation, all FSES of higher education include requirements for the

[1] “Reasonable accommodation” means making necessary and appropriate modifications and adjustments, where necessary, to ensure that persons with disabilities enjoy all human rights and fundamental freedoms equally with others (Convention on the Rights of Persons with Disabilities, Section 2).

[2] "Universal design" means the design of objects, environments, programs and services in order to make them as usable as possible for all people without the need for adaptation or special design. It does not exclude, where appropriate, assistive devices for specific groups of persons with disabilities (Convention on the Rights of Persons with Disabilities, Section 2).

implementation of inclusive programs (IP) such as increasing the period of study, adapting forms, special procedures for mastering certain disciplines, providing adapted online educational resources, etc. This raises a crucial question about the methods and technologies for implementing these requirements.

A comparative analysis of approaches to creating an accessible environment for hearing-impaired students at BMSTU and technical universities in Germany, USA and Japan is discussed in (Oreshkina, 2016). It is shown that technical and technological solutions prevailed in technical universities of these countries, the basis for implementation of which was created by legal support, the most consistently and systematically developed in the USA. The Vocational Rehabilitation Act of 1973 established the right of people with disabilities to equal access to vocational education. The Americans with Disabilities Act of 1990 extended equal access to all aspects of American life. In 1988 the Technology Related Assistance Act of 1988 was passed. Its 1998 version introduced the term "universal design for learning (UDL)", and in the 2004 version, it guaranteed a technology support for people with disabilities in every state when receiving an education. In 2004 the Individuals with Disabilities Education Act (IDEA) was adopted. In 2008, the Higher Education Opportunity Act (HEOA) took into account the UDL principles. At the same time, information and technical support networks for people with different disabilities have been formed in universities and colleges nationwide to improve the accessibility of educational resources for this category of learners in online and offline formats. 21st Century Communications and Video Accessibility Act of 2010 and the FCC Code of Practice of 2013 and the FCC Code of Practice of 2013 solve these challenges by making a wide range of electronic devices and software more accessible to people with hearing and visual impairments. Microsoft has carried out a number of technological developments to make software accessible to people with disabilities of various nosologies. For example, (Accessibility in education; Products and services; Special education...) are designed to provide individualized support to learners with disabilities, including hearing and visual impaired, as well as support to their teachers and parents in distance learning conditions. In (Accessibility...), a set of technologies is provided to increase the accessibility of content for learners with disabilities of different nosologies, including hearing impaired learners. For the latter, the main technologies are presentations with real-time captioning and automatic generation of video subtitles. The development includes ways to create content that is accessible to all students, and tips for students to ensure their transition to distance learning. Six UDL principles for distance learning are discussed in (Rappolt-Schlichtmann, 2020). It is shown that online distance learning is a very special teaching environment. The use of digital materials and the connection to the learning process by virtual conferencing is essentially a digital transformation of the learning process. Both teachers and students may need additional time and support to learn how to teach, study and interact effectively in a virtual conditions. According to (Hodnett, 2020), when designing effective online learning, it is important to focus on making content accessible to all learners. In this regard, guidelines are provided. In (Posey "Lesson") the following options of distance learning in accordance with the principles of UDL are outlined: consideration of students' individual features, flexible optional approaches to each student; multiple ways of providing learning content, barrier-free didactics. As mentioned in (Posey "Universal"), UDL is a powerful approach to learning that allows the teacher to anticipate and plan the activities of all his/her learners from the very beginning of the class with the confidence that online educational resources are available for each student and all students are involved in the learning process. The leading principles of UDL such as participation, presentation, action and expression are focused on developing 'skilled', motivated, resourceful, ingenious, knowledgeable, strategic and goal-oriented learners. In (Elliot et al., 2013), online tutoring for hearing impaired students in engineering training programs in a virtual academic community is considered. Critical barriers in virtual mastering fundamental engineering disciplines for these students are highlighted. According to (Watson et al., 2007), deaf and hard-of-hearing students experience serious problems due to the limited accessibility of educational content. Advances in technology provide them with a substantial choice of support services, but individual differences still play an important role in how clearly students understand the information. Therefore, all students receive a comprehensive expert diagnosis, which identifies their individual differences and provides recommendations for their individual support and guidance in the learning process. A modern approach to organizing their learning includes digital transformation of the learning environment as well as academic

support for students using cognitive technology. Flexibility and creativity are important aspects of creating an accessible environment.

The partnership in the Project of creating Postsecondary Education Network International (PEN-International 2001–2010) of universities and colleges in the USA, Russia, Japan, China, etc., training hearing impaired people, promoted the unique experience of technological support of such students from universities and colleges of the USA to foreign universities and colleges. BMSTU was a founder of this unique Project along with the USA, Japan and China and its active participant. The Project created conditions for the exchange of local experience and technology transfer, which contributed to the development of Bauman approaches.

3. Materials and methods

Results in chemistry of BMSTU hearing impaired students from 2018 to 2021 have been used as the research material. Comparative analysis of results in face-to-face learning (from 2018 till autumn 2019) and distance learning (from spring 2020 till autumn 2020, autumn 2021) has been used as the research method.

The hearing-impaired students have been divided into two large groups: the hearing impaired and the deaf (a hearing loss of more than 90 dB in the main speech frequencies is defined as deafness). Some students focus on verbal communication, while others prefer sign language. Some students use both depending on the situation. Hearing-impaired students may use sound amplification devices (primarily hearing aids, cochlear implants) and/or lip-reading. The choice of communication method does not always depend on the degree of hearing loss; sometimes it is determined by the level of rehabilitation as well as previous phases of socialization. Thus, in terms of special educational needs, each student with a hearing impairment is unique.

Different degrees of hearing impairment among students with disabilities lead to limitations in the main life activity areas, including reduced ability to communicate, learn, self-control, orientation in the learning environment, etc. (Ministry of Labor). The relationship between the severity of hearing loss and the type of activity limitations is shown in Table 1.

Table 1. Relationships Between the Severity of Hearing Loss and the Type of Disability

<table>
<tr><th>No</th><th>Hearing Impairments, the Possibility of Correcting and Combining Them with a State of Speech Function</th><th>Type of Activity Limitation</th><th>Type of the Life Activity</th></tr>
<tr><td>1</td><td>Moderate hearing loss with the possibility of sufficient correction</td><td rowspan="4">Ability to:
1. Communicate;
2. Learn;
3. Navigate within education process;</td><td rowspan="2">1. The ability to communicate between people through the perception, processing, storage, reproduction and transmission of chemical information</td></tr>
<tr><td>2</td><td>Moderate hearing loss with insufficient correction</td></tr>
<tr><td>3</td><td rowspan="2">Combination of hearing impairment with a moderate speech impairment unrelated to voice disorder</td><td>2. The ability to purposefully organize activities to acquire knowledge, abilities, skills and competencies, to gain experience in activities (including professional, social and cultural ones), to apply chemical knowledge in everyday life and develop chemical abilities.</td></tr>
<tr><td></td><td>3. The ability to adequately perceive the personality and the environment, and to assess the situation in the learning process.</td></tr>
</table>

4	Severe hearing loss with insufficient or impossible correction	Ability to: 1. Communicate; 2. Learn; 3. Navigate; 4. Control behavior independently	4. The ability to self-evaluate and behave appropriately, taking into account social and legal, moral and ethical norms.
5	Combination of a hearing impairment with a severe speech impairment unrelated to voice disorder	Ability to: 1. Communicate; 2. Learn; 3. Navigate; 4. Control behavior independently; 5. Self-care (while learning) process)	5. An individual's ability to carry out every day learning activities independently.
6	Deafness		

As shown in Table 1, the mentioned types of disabilities are cognitive in nature, have varying degrees of severity and have a significant impact on the learning process of students with hearing impairment at a general-type university, both in normal and remote conditions. The level of pre-university training of these students in chemistry, largely due to the lack of special learning conditions in general educational organizations, also affects the acquisition of chemistry in higher education (Oreshkina, 2020).

The problem of content accessibility of both face-to-face and remote chemistry classes for hearing-impaired students at BMSTU is being solved using results of comprehensive expert diagnostic testing of students at the stage of their enrollment in inclusive programs (Oreshkina, 2018). Based on diagnostic results, cognitive disabilities and special educational needs of students are identified and, according to GOST R 53873-2010 and GOST R 53874-2017, individual packages of professional rehabilitation and habilitation services to support students in the learning process are formed, and adjusted as the students' progress along their educational trajectory (Oreshkina, Gurov, 2020). The methodological approach to solving the problem of content accessibility of distance learning in "Chemistry" is shown in Table 2. The development takes into account the guidelines for creating an accessible environment (Guide...) as well as guidelines of Universal Design for Learning (UDL). The proposed approach allows teachers to identify the cognitive needs of students with hearing impairment and to develop special educational services considering their individual characteristics and preferences.

Table 2. Methodological Approach to Solving the Problem of Content Accessibility of Remote Classes in Chemistry for Hearing Impaired Students at BMSTU

Cognitive Functions	Manifestation of Students' Disabilities	Special Educational	
		Students' Needs	Services for Content Accessibility
The ability to perceive information: the ability to recognize and interpret information	Difficulties in: - perception of information (recognizing words/terms quickly and accurately); - interpreting information; - limited vocabulary, rapid reading and writing skills.	High degree of perception and understanding of chemical information from a screen in a webinar format.	- Multi-sensory digital learning environment. - Assistive technical tools. - Cognitive learning technologies. - Techniques to enhance the perception of information in virtual environment. - A high level of literacy in chemical training texts. - Providing a thematic glossary.

Attention: ability to concentrate, switch, distribute attention.	Reduced ability to focus on important signals and information while ignoring distractions.	Providing information in advance about upcoming events and the time of action; availability of signals indicating the beginning and the end of an action.	- Providing enough time to perceive and respond to information adequately. - Providing information, commands and instructions in a form that attracts attention.
Ability to learn: ability to acquire knowledge, skills and competencies.	Reduced ability to perceive and reproduce chemical knowledge, skills and competencies as required by the educational standard.	Considering individual peculiarities of information perception and processing. Possibility to perceive educational information from screen by the most convenient way for a student. Semantic accessibility of educational materials in virtual environment.	Developing special conditions for webinars, including the creation of a multi-sensory learning environment through various methods of providing educational information; use of special teaching methods and technologies, teaching modes; assistive technical means and technologies; assistance of other persons (besides teaching staff): sign-language interpreter, technical specialist, psychologist.
Ability to remember information: ability to register, store and/or retrieve information if necessary.	Difficulties in: - memorizing and reproducing information; - weak actualization skills; low "survival" of knowledge; - reduced level of mental performance.	The ability to choose methods to obtain information from the screen (text, audio, video, sign language translation).	- A variety of ways and formats of providing information in a virtual environment (text, audio, video, sign language translation). - Work at an individual pace. - Cognitive education technologies: formation of operational thinking; transfer of information from one form of its presentation to another, etc.
Ability to verbal communication: the ability to reproduce and understand information.	Reduced ability to establish contacts between people by perceiving, processing and transmitting speech information (including Russian sign language).	Ensuring the proper level of understanding and self-expression by taking into account the peculiarities of communication, speech activity; literacy of written speech, understanding of symbols, terminology, and nomenclature.	- Service software, tablets, smartphones with speech recognition function, etc. - Assistive technical means and technologies of training and communication. - Providing educational information and instructions in a form that is easy to understand in the virtual environment.

4. Results and discussion

The problem of content accessibility of "Chemistry" for hearing-impaired students in both face-to-face and distance learning conditions has been achieved by taking into account their individual cognitive abilities and limitations identified during expert diagnostics of students at the

stage of enrolment in inclusive programs (Oreshkina, 2020; Oreshkina, Gurov, 2020) as well as their pre-university training level in chemistry.

Organization of distance learning classes in webinar format. During the pandemic period, remote teaching Chemistry for students with hearing impairment was carried out in online and offline formats. Students and teachers were provided with access to the electronic educational literature of the MSTU publishing house, to materials developed by teachers for online classes and independent work, posted on the digital platform "Electronic University" in the "Distance Learning" module.

Online classes in chemistry have been given in webinar format using the domestic "TrueConf" platform (TrueConf). Webinar is an effective multi-sensory digital environment, which realizes both hearing and visual perception of educational information due to the possibility to use different ways of presenting it to the students. Lectures and practical classes such as laboratory works and seminars on chemistry have been conducted in webinar format. All types of classes have been realized in oral and written form, supported by technicians and sign language interpreters, with a balance between the presentation of theoretical knowledge and its practical application (drawing up the results of laboratory experiments, solving problems on the topic).

Principles of designing effective webinars for hearing-impaired students include:

- taking into account individual cognitive peculiarities of students' perception of information;
- multimodality: a variety of sources for providing educational information (text, articulation, audio, video, sign language interpreting) and the correctness of their switching;
- effectiveness of communication between the teacher and students;
- content accessibility of learning materials to all students.

Taking into account the individual peculiarities of the perception of educational information by hearing impaired students provides for a variety of sources for its supplying to students in the classes (multimodality), including:

1) The teacher (his or her speech, facial expressions, articulation)- the main source of chemical knowledge at webinars;
2) A sign language interpreter who transmits the teacher's speech literally through Russian sign language, fingerspelling and articulation;
3) Text with equations and illustrations accompanied by the teacher's explanatory speech;
4) Video demonstration of selected pieces of thematic information with built-in subtitles and audio support.

Deaf and hard of hearing students rely mainly on the visual channel of information perception, through which they process all the information that comes to them not only in the educational process, but also in everyday life. In webinars, different forms of visual information can be presented at the same time: visual linguistic information (interpreting in RSL), visual teaching materials and participants' comments in "chat". In this case, students are under increased cognitive load due to the need to switch visual attention from a teacher or a sign language interpreter to presented educational materials that leads to a decrease of lessons' effectiveness (Online learning…).

In this regard, switching information sources by the teacher was carried out taking into account the possibility of such students to focus an attention simultaneously only on one preferred way to obtain information from the screen , such as:

- teacher (his sonorous speech, facial expressions and articulation);
- sign language interpreter (his hands and lips: gestures, fingerspelling and articulation);
- an educational text with formulas and illustrations or video with subtitles supported by sonorous teacher's comments, - without sign language interpreting.

Special significance on webinars was given to sound as a stimulus for hearing perception and the need for its processing by the brain to better understand the meaning of the provided educational information.

The teacher voices everything that he shows, writes, and draws. In this case, the content of the teacher's sonorous speech coincides both with the content of the text on the electronic materials presented by him, and with the content of all explanatory notes, inscriptions, formulas and drawings that he makes when analyzing students' works.

Experience has shown that synchronous voicing the information given by the teacher

significantly increases its uptake by hearing-impaired students.

Communication of students and teachers in training sessions.

Involving students in the process of online classes began with the procedure for testing the "TrueConf" system for its readiness for holding webinars: checking by the teacher the quality of broadcast of audio, video, texts and presentations; as well as the possibility to use chat (text, video) and group online discussions under the teacher's guidance.

Communication during webinars with the participation of deaf and hard-of-hearing students is an effective multisensory experience in which the mechanisms of their hearing and visual perception are implemented.

Communication between the teacher and students has been doing through voice and written speech, using chat or email, the "Whiteboard" application, and the sign language interpreter, if it was necessary.

At the webinar, the student was given the opportunity to complete assignments at an individual pace and style. He could send the completed task to the teacher after the end of the webinar and in this case, he always received a prompt response with a detailed analysis of the errors. To send educational materials, assignments and instructions to students and receive completed assignments from them, a digital platform was used, developed at BMSTU, which ensured uninterrupted communication between the teacher and students both during webinars and after them.

Clearly organized communication between the teacher and students during webinars contributed to the effectiveness of the classes. It included a strict sequence of checking completed individual tasks of students with their demonstration on the screen for analysis of errors and their subsequent correction by students. At the same time, the teacher's communication with both hard-of-hearing and deaf students has been carrying out mainly in the "chat"; the statements of each of the parties were reinforced by bringing clarifying formulas and reaction equations. It turned out that sign language interpreting in this situation was not a support: it distracts students' attention.

Psychological and cognitive unpreparedness of some deaf and hard of hearing students to work in the webinar format was revealed. As a rule, insecure students with poor reading and writing skills, poor basic training in chemistry, rapid fatigability, poor self-organization skills, suffering from the "scattered attention" syndrome, "dropped out" of group classes process and there was a need in additional individual lessons with them. It was found that the effectiveness of teacher-student communication is influenced by the students' reading and writing skills, their psychological readiness to communication with the teacher; the teacher's ability to promptly communicate with a particular student in the form of concise and single-digit oral and written statements, as well as the qualification of sign language interpreter (Online learning...).

The role of sign-language interpreter in a webinar.

The role of sign-language interpreter in a webinar is to facilitate communication between the teacher and hearing impaired students by interpreting sonorous speech into sign language and vice versa. The restrictive aspects of sign language interpreting in subject areas STEM disciplines are considered in (Oreshkina, 2018; Braun et al., 2018; Grooms, 2015; Marschark, 2005). During the chemistry webinars, the following restrictive features of sign language interpreting were noted.

1) The quality of the demonstration of gestures, dactyl and articulation of a sign language interpreter in online format is being affected by the speed of the Internet on the user's computer. If the speed is not high enough, gestures on the screen are "blurred" into a "tail" and are not perceived by the user.

2) A student who relies on sign language interpreting must simultaneously perform several actions:

- To recognize information from a sign language interpreter;
- To analyze it and record important points;
- To read quickly and perceive text information from the screen;
- To follow participants' comments in "chat".

As noted above, a student finds it difficult to simultaneously look at the interpreter and perceive the educational text from the screen. He/she is able to focus attention on preferred for him/her source of information on the screen with the possibility of losing significant information from the main source.

In this regard, special requirements for work of sign language interpreters in webinars' conditions have been determined.

The main source of chemical knowledge at webinars is a teacher.

Interpreters should request copies of training materials from the teacher in advance to be able to familiarize with the content of the lesson and coordinate with him/her their inclusion in the study process. The following situations should be taken into account. If on screen:

a) Only a teacher and a sign language interpreter, the sonorous teacher's speech is being accompanied by sign language interpreting;

b) Video clips with embedded subtitles and sonorous comments, participation of a sign language interpreter is not required;

c) Text materials with formulas and illustrations against background of the sonorous teacher's speech that explains their content, participation of a sign language interpreter is not required.

Features of preparing didactic material for webinars in chemistry with the deaf and hard-of-hearing students

Analysis of the problems of hearing impaired students in both face-to-face and distance learning in chemistry showed that the main difficulties are related to the general problem of perceiving and understanding the semantics of chemical information, including complex symbolism, terminology and nomenclature, which is exacerbated by their individual cognitive features and limitations. In online learning process, both voiced and textual information perception impairments are particularly pronounced due to reduced speed of perception and comprehension of incoming information, limited vocabulary, reading and writing skills, communication skills and mental work capacity (Oreshkina, 2020). In this regard, a key feature of webinars in chemistry for these students is their support by cognitive technologies, the main of which are (Oreshkina, 2019):

- developing operational (algorithmic) thinking skills;
- transferring information from one form of presentation to another;
- formation of conceptual apparatus in chemistry subject area (glossary technology), etc.

These technologies are used in the development of content-accessible study materials for classes in virtual environment.

Features of preparing didactic material for chemistry webinars. When preparing for the lesson, the teacher performs:

- conversion of classroom chemistry course material into visual content for webinars, taking into account the planned student activities in the classroom;
- online search and creation of video resources with subtitles for lectures and laboratory work;
- embedding videos of chemical experiments and subtitles, illustrations, photos in lesson content;
- developing materials for practical exercises using cognitive technology and an interdisciplinary approach.

Features of preparing teaching materials for lecture classes. Lectures' materials contain the main course outlines and concepts. They have been prepared and implemented by a teacher in the format of short (10-15 min) segments-quanta. The text fragments accompanied by sonorous teacher's explanations with sign language support are being combined with video fragments with built-in subtitles revealing the semantic content. In this way, transferring information from one form of its presentation to another are being realized. Each quantum begins with a glossary and ends with test questions that students must write answers within a specified period of time.

Features of preparing teaching materials for laboratory work. Laboratory work, as a fundamental part of many science disciplines, is particularly important for the experimental sciences, such as chemistry. It requires sufficient basic knowledge of the topic being studied for understanding mechanism of chemical reactions behavior.

Description of laboratory works include two parts: theoretical part, which contains necessary and sufficient description of theoretical basics on the study topic, and practical one, which includes instructions on how to carry out a series of experiments. Teachers have developed special workbooks to prepare students for works, their practical realization and registration of the results. Each workbook contains template of report form, which include a front sheet with the list of basic

concepts on the research topic that a student has to define while preparing for the work, and a practical part, which the student fills out while doing laboratory work. The latter consists of a series of experiments with a title and an algorithm for carrying out each experiment, including making equations of the ongoing reactions, observations, completing result tables, graphing, drawing conclusions, etc. The theoretical material on the topic of the upcoming laboratory work is sent to students in advance to prepare for the lesson. During the webinar, the teacher consistently demonstrates video clips of the experiments with subtitles and his/her own comments on them. Students record their observations, write down the equations of reactions, and formulate conclusions on the experiment results in the relevant sections of the worksheet. This is followed by a group discussion of the results.

Features of preparing teaching materials for chemistry seminars. Teacher's preparing for seminars includes developing practical tasks in "Chemistry" using cognitive technologies and interdisciplinary approach. An extremely significant technology for practical mastering chemistry by solving problems (as well as for doing laboratory work) turned out to be the technology of developing operational thinking: forming skills and abilities to algorithmize the process of solving a task.

From the course of computer science students know that an algorithm is a logical sequence of certain actions, leading to the problem solution, and the process of algorithm creation (algorithmization) is the decomposition of the problem into elementary actions or operations. In this regard, the formation of logical-algorithmic thinking abilities includes (Leskovets, 2006):

a) Solving the task according to the algorithm offered by the teacher;

b) Solving the task according to the familiar algorithm (dynamic recognition of the situation);

c) Solving the task according to self-created algorithm;

d) Creating several possible algorithms to solve the task and choosing the best one.

As a result, the skills expressed in the relevant competence, are being formed in students and implemented in carrying out and design of laboratory works, home works, project-research activities, etc. Applying this technology implements an interdisciplinary approach in which students use two or more disciplines to extend their understanding of a subject or problem beyond the limits achievable through a single discipline (Nyamapfene, 2020; Holley, 2017). This approach enables students to integrate their skills, knowledge, experience and procedures from different disciplines (chemistry, mathematics, computer science) to acquire new knowledge, understanding and skills that allow explaining and solving problems in chemistry. Such approach also promotes active, developing, independent learning (Ivankina, 2018).

Consider the use of the above-mentioned technology while preparing educational material for a seminar that includes the analysis of tasks on the topic "Electrochemical processes in solutions. Corrosion and protection of metals". Task's condition as follows:

"Determine the possibility of electrochemical corrosion of tin (Sn) in aerated aqueous solution at T = 298 K, at pointed values of the activity of corroding metal ion $a_{M^{Z+}} = 10^{-6}$ mol/l, pH = 8.4, and standard electrode potential $\varphi^0_{\frac{Sn^{2+}}{Sn}} = -0{,}136$ V by calculations of electromotive force (EMF) of corroding element and Gibbs energy $\Delta_r G_{298}$ of corrosion process. Give the equations for the anodic and cathodic processes and the current-producing reaction. Take the partial pressure of oxygen over the solution as standard" (Golubev et al., 2013).

According to (Golubev et al., 2018; Gurov, 2017) the possibility of electrochemical corrosion is determined by following factors:

1) The change in Gibbs energy: corrosion is a spontaneous process accompanied by its loss ($\Delta_{r\ corr}G_{298} < 0$);

2) The sign of the electromotive force (EMF) of the corrosive galvanic cell (E_{cgcell}), which is the potential difference between the cathode and the anode ($E_{cgcell} = \varphi_K - \varphi_A$). It is related to the Gibbs energy of the reaction by the following equation: $ZFE_{cgcell} = -\Delta_{rcorr}G_{298}$. Where Z is the number of electrons involved in the corrosive current-producing reaction (the lowest total multiple of the number of electrons in the anodic and cathodic processes); F is Faraday constant (96500 Cl/mol Eq.). As Z and F > 0, corrosion is possible if $E_{cgcell} > 0$;

3) Comparing the cathode φ_K and anode φ_A potentials: corrosion is possible if the cathode potential is greater than the anode one: $\varphi_K > \varphi_A$.

Electrochemical corrosion of metal in an aqueous medium is possible if the following conditions: 1) $\Delta_{r\,corr}G^{o}_{298} = -ZFE_{cgcell} < 0$; 2) $E_{cgcell} > 0$; 3) $\varphi_K > \varphi_A$.

Based on the above wording of the assignment, hearing impaired students will experience difficulties in completing the task due to the uncertain sequence of operations. It is not possible to calculate the EMF of the corrosion element and the Gibbs energy of the corrosion process without prior calculation of the electrode potentials of the cathode and anode, and for this purpose, it is necessary to write the equations of the anodic and cathodic processes. Therefore, it is important to start the solution by writing these equations. The verbal algorithm for solving problems meeting the above conditions includes the following logical sequence of actions:

1. Write the equations for the anodic process.
2. According to the corrosion conditions, write the cathodic process equation.
3. Write the equation for the total (current-producing) reaction.
4. Calculate the potentials of the anode and cathode electrodes under the given corrosion conditions using forms of the Nernst equation adapted for T = 298 K.
5. Calculate the EMF of the corrosive element.
6. Calculate the Gibbs energy Δ_rG_{298} of the corrosion process.
7. Determine the possibility of metal electrochemical corrosion.

Students can easily follow this algorithm if they represent the semantic content of each action. In this regard, the algorithm shown in Table 3 is useful. One column of the table presents the verbal sequence of actions depending on the conditions, and the other column presents the description of the content of each action in the chemistry language.

Table 3. Algorithm for Task Performance

No	Sequence of Actions	Content of Actions
1	Write the equation for the anodic process (–)A	Oxidation of the reducing agent (tin) (–)A(Sn): $Sn - 2e \rightarrow Sn^{2+}$
2	According to the corrosion conditions, write the cathodic process equation (+)K. As the medium is aerated and pH = 8.4 (alkaline), the cathodic process in the aqueous solution will proceed with oxygen depolarization:	Oxidant (oxygen) reduction (+)K(Sn): $O_2 + 2H_2O + 4e \rightarrow 4OH^-$
3	Write the equation for the current-producing reaction (CPR), taking into account the coefficients:	CPR: $2Sn + O_2 + 2H_2O \rightarrow 2Sn(OH)_2$; Z = 4
4	Calculate the anode potential (metal electrode) according to Nernst equation adapted for T = 298 K, taking into account the activity of the corroding metal ions:	$\varphi_A = \varphi_{\frac{Sn^{2+}}{Sn}} = \varphi^0_{\frac{Sn^{2+}}{Sn}} + \frac{0,059}{2}\lg a_{Sn^{2+}} =$: $= -0,136 + \frac{0,059\lg 10^{-6}}{2} = -0,313\ \text{B}$
	Calculate the cathode potential (oxygen electrode) according to the Nernst equation adapted for T = 298 K, taking into account that the medium is aerated, pH = 8.4 and the partial pressure of oxygen over the solution is standard (1 atm):	$\varphi_K = \varphi_{\frac{O_2,H_2O}{OH^-}} = 1,229 - 0,059\text{pH} + 0,0147\lg p_{O_2} =$ $= 1,229 - 0,059 \cdot 8,4 + 0,0147\lg 1 = 0,733\ \text{B}$
5	Calculate the EMF of the corrosive element:	$E_{cge} = \varphi_K - \varphi_A = 0,733 - (-0,313) =$ $= 1,05\ \text{B} > 0$
6	Calculate the Gibbs energy Δ_rG_{298} of the corrosion process, considering that Z = 4:	$\Delta_rG_{298} = -ZFE = -4 \cdot 96500 \cdot 1,05 =$ $= -405300\ \text{J} = -405,3\ \text{kJ} < 0$

7	Draw a conclusion about the possibility of electrochemical corrosion of tin by fulfilling the criteria: 1) $\Delta_{r\ corr}G_{298} < 0$; 2) $E_{cge} > 0$; 3) $\varphi_K > \varphi_A$	Conclusion: electrochemical corrosion of tin is possible because the following conditions are met: 1) $\Delta_{r\ corr}G_{298} < 0$; 2) $E_{cge} > 0$; 3) $\varphi_K > \varphi_A$

This algorithm realizes the technology of transferring information from one form of representation to another and helps students understand the content of particular actions. Then a verbal algorithm can be offered to students. They recognize commands and are able to execute them in the chemistry language. Algorithmization of solving process is based on the students' knowledge/understanding of terminology, which is facilitated by glossary technology (Oreshkina, 2019).

These technologies proved the effectiveness in teaching chemistry in a webinar format during the pandemic. In all types of classes, students' cognitive problems have been identified and successfully solved. The teacher performed a multifunctional mission, acting as a teacher, moderator, tutor, consultant and team leader. The teacher created and supported a positive environment in which all participants acted as a team and shared responsibility for the final results, confirming (Karpov, 2017; Patton, 2020).

These technologies meet the principles of universal design: they enhance the acquisition of information in chemistry, not only for hearing impaired students, but also for non-disabled students.

Approaches to assessing the progress of hearing-impaired students in a distance learning environment are similar to approaches used in traditional learning conditions. The BMSTU has a module-rating system for monitoring and evaluating students' knowledge. It provides evaluation of students' progress in all modules of chemistry course by summing up the points set for each type of required activities within the modules in accordance with the curriculum:

Carrying out and defending:

- laboratory work (3-5 points);
- homework assignments (10-15 points);

Activity during webinar (1-3 points), etc.

Assessing compulsory tasks performed by hearing impaired students is being carried out according to generally accepted criteria and taking into account the peculiarities of the developing their speech activity (Oreshkina, 2020). Intermediate certifying based on the results of semesters in the discipline takes in the form a credit (1st semester) and distributed examination (2nd semester). As the assessing scale it is adopted a 100-point system with a gradation of marks in accordance with the Regulations on current control and intermediate attestation of BMSTU. A student who has completed all the scheduled tasks and tests receives a final grade for the semester according to the scale in Table 4.

Table 4. Module-Rating System for Monitoring and Assessing the Knowledge of Hearing Impaired Students in Chemistry

Rating	Credit score	Distributed exam score[1]
85 – 100	pass	excellent
71 – 84	pass	good
60 – 70	pass	satisfactory
0 – 59	fail	poor

[1]A distributed examination is a type of intermediate assessment in which a student receives the entire set of points (100 points) for the current control activities.

Students' participation in webinars and their performance results are stored in the unified information system of BMSTU "Electronic University" (Moskalenko, 2010) and are available to students. The comparative results of academic performance in chemistry in face-to-face (2017–2019) and distance (2020–2021) learning conditions during the pandemic are presented below:

Table 5. The comparative results of academic performance in chemistry in face-to-face (2017–2019) and distance (2020–2021) learning conditions during the pandemic

Academic year	2016/17	2017/18	2018/19	2019/20 (spring)	2020/21 (autumn)
Average sum of points	74,0	79,0	82,0	82,0	80,0
Average score	4	4	4	4	4

Analysis of learning outcomes showed that effective webinars in chemistry with hearing-impaired students require the comprehensive solution: taking into account their individual perception of information in a virtual environment; creating content-accessible multimodal environment for all students by preparing special study materials based on cognitive technologies and interdisciplinary approach; involving all students in online learning process and keeping them active throughout the session by taking an optional approach to each student and ensuring a positive, creative atmosphere. According to the students themselves, this approach to remote learning the discipline “Chemistry” fully justified itself: students were able to understand goals, objectives and content of the classes, the teachers' guidelines, were able to understand the meaning of tasks and perform them according to established requirements. They felt steady help and support from the teacher and perceived all webinar' participants as a single team. A positive atmosphere and mutual support contributed to the success.

5. Conclusion

Distance learning is a very specific environment for teaching and learning “Chemistry”. Using digital materials and integrating them into the learning process through a virtual conference in webinar format is essentially a digital transformation of the learning process. Both teachers and learners need to be able to teach, learn and interact effectively in a virtual environment. Organizing learning process of “Chemistry” in webinar format for hearing impaired students is a forced measure that imposes a number of limitations. Students are not able to perform real laboratory works in a chemistry laboratory under the teacher's supervision, thus preventing them from developing skills to make experiments. For hearing impaired students, direct contact with a teacher to guide and correct their steps in the chemistry learning process is essential. Face-to-face classes, where students work within sight of the teacher and each other, create a “cumulative” effect in the acquisition of new knowledge, which is not sufficient in the distance format.

BMSTU’s experience confirms that development of accessible training materials for all types of classes and for all involved students based on considering their peculiarities of information perception from the screen is very important for conducting effective webinars on chemistry for this category of students. However, checking students' laboratory works and practical assignments with analysis and correction of mistakes is a significant additional load for the teacher, and supporting positive and creative atmosphere in webinars causes psychological stress. In general, the effectiveness of remote learning is being determined by the ratio of achieved results and labour input of all participants involved in the process.

Creating accessible multimodal environment in webinars for hearing impaired students by taking into account individual cognitive features of information perception and using cognitive learning technologies, based on interdisciplinary approach, does not reduce their motivation to study chemistry, develops their cognitive abilities and thus helps to make their performance in chemistry in remote learning equal to their performance in face-to-face classes. Current cognitive learning technologies based on interdisciplinary approach are an innovative development of BMSTU professors. They comply with the principles of UDL: facilitate the acquisition of information in chemistry not only by hearing-impaired students, but also by non-disabled students.

Webinars provide students with the opportunity to learn new professional skills that they can later use in their academic and professional careers.

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Training Mining Engineers in the Context of Sustainable Development: A Moral and Ethical Aspect

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Abstract

This article discusses some aspects of engineering education in the context of sustainable development. It is provides a brief analysis of the concept of sustainable development, examines the role of the engineer in modern society, and lists the key engineering competencies formulated by the most respected organizations in the field of engineering education. An approach to the formation of competencies of technical university graduates from the viewpoint of professional ethics of engineers is analyzed. The article also reveals the essence of professional ethics and presents examples of ethical codes of engineering societies in different countries. A comparative analysis of the Russian Federal State Educational Standards of the third generation in the specialty "Mining Engineering" from the position of ethical principles of professional activity of a mining engineer has been carried out. It is concluded that the requirements for the preparation of the modern mining engineer in terms of sustainable development and trends in the formation of the FSES of the third generation in the specialty "Mining Engineering" contradict each other. The article analyzes the results of questioning of first-year engineering students of Saint-Petersburg Mining University (Russia) of the norms of engineering ethics. The issue of insufficient ethical training of specialists in technical universities is raised. Attention on improving educational programs in technical areas and specialties is focused, as well as conducting further research to study the possibilities of the educational environment in the formation of moral and ethical competencies of future engineers.

Keywords: sustainable development, engineering education, professional competences, mining, engineering ethics.

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1. Introduction

The term "sustainable development" first appeared in the 1987 report "Our Common Future" of the UN World Commission on Environment and Development (UN Documents: Resolution..., 1987). According to this report, sustainable development provides a balance of interests of generations within the framework of the ecological paradigm (Yurak at al., 2020). Sustainable development means a model of human development in which current problems are solved without harming future generations (Litvinenko at al., 2020). The result of sustainable development is a stable economy based on the latest scientific developments and technological improvements, capable of adapting to the environment without destroying essential natural resources (Nedosekin at al., 2019).

The key figure in the concept of sustainable development is the engineer, because it is the engineer who, more than anyone else, is responsible to society for the creation of material goods, progress of human civilization and environmental protection (Goman, Shchetinina, 2019; Sudarikov at al., 2022). In order to achieve sustainable development using environmentally friendly technologies, it is necessary to expand the humanistic component of engineering education (Komissarova, Shcherbakova, 2017; Bakeeva at al., 2019; Mikeshin, 2021).

In view of the foregoing, the most influential organizations in the field of engineering education have outlined trends in the development of the system of the requirements for the engineer of the XXI century – students and graduates of technical universities need to form the following in-demand cross-industry professionally relevant skills and competencies:

- communicative competencies, including the ability to communicate with different target audiences, knowledge of several foreign languages, and intercultural features of communication;
- critical thinking and the ability to solve non-trivial problems;
- ability to work in a team in any position – from project manager to vendor;
- information management and lifelong learning skills;
- mastery of methods of techno-economic analysis;
- mastery of methods of ecological support of production and engineering protection of the environment;
- compliance with ethical norms and moral principles – the ability to comply with ethical norms and standards in professional activity and social interaction (Lider et al., 2020).

Based on the analysis of key engineering competencies of leading foreign universities, as well as the requirements for engineering competencies by certification bodies in Japan, Canada, the USA and the European Union, researchers (Rudskoy et al., 2020) have divided engineering competencies into the following categories: application of fundamental and specialized knowledge; analytics and decision-making; innovative development; leadership and teamwork; creativity; professional ethics, etc. The paper (Litvinenko at al., 2022) compares the competencies required by some international standards and the UK standard. The authors point out that the competency systems considered focus on engineering knowledge and its application for innovative purposes, mastery of standards and regulations, development of communication skills, ethical behavior, and commitment to sustainable development.

In Russia, in accordance with the Asia-Pacific Economic Cooperation (APEC) Professional Engineers Certification and Registration System and APEC Engineer Standard, the following categories of universal and professional competencies of an engineer are provided: meaningful application of universal and local knowledge; analysis of engineering problems; social responsibility; compliance with laws and regulations; ethics of engineering activities; communication; lifelong learning; engineering assessment; search and implementation of innovations (Perechen' universal'nykh..., 2011).

A comparative analysis of key engineering competencies shows their semantic identity, despite the differences in names. This fact testifies to similar directions in the improvement of engineering education in Russia and in foreign countries, therefore, it is advisable to apply international experience to improve the quality of training of engineering personnel.

Trends in the formation of the FSES. Professional ethics

Currently, the educational activities in Russian universities are based on the Federal State Educational Standards (FSES) focused on the competence approach. The essence of the competence approach lies in the fact that each current FSES provides a list of general cultural, general professional and professional competencies, i.e. certain properties that a specialist (bachelor, master) trained according to this standard should have. The Russian educational space

continues to research in the field of improving of higher education and professional competence of graduates (Sevostyanov, 2018). The structure of FSES is being amended and revised; the transition to FSES HE 3++, focused on professional standards, has taken place in the following field of study; have been developed and are planned for implementation FSES 4.

At the same time, such innovations in higher education have resulted in the exclusion from standards or modification of some of the most important requirements for the level of graduate knowledge and competencies. As you know, in FSES 3+ the number of declared competencies has been significantly reduced. In FSES HE 3++ there is a new name of competences – universal competences, which is an extension and a slightly different formulation of general cultural competences of FSES HE 3+.

In the paper (Rudskoy et al., 2020), based on the results of the analysis of published projects FSES HE 3++ in the area of engineering education, the authors identify 11 categories of general professional competencies: fundamental training, specialized competencies (competencies directly related to the training specialization), analytical, organizational and management, research, pedagogical, entrepreneurial competencies, etc. The authors also include professional ethics, a competence that is especially relevant, in our opinion, in the context of sustainable development, among the general professional competences that are common to the field of engineering education and technical sciences. Indeed, a modern engineer, along with the profound scientific and technical knowledge necessary to perform the functions associated with his or her professional activities, must know and comply with the norms of professional ethics (Verax, 2017).

Let us specify that professional ethics is a system of moral principles, norms and rules of behavior of a specialist, taking into account the peculiarities of his or her professional activity and a specific situation (Fleddermann, 2012). Engineering ethics is a set of ethical standards that apply to engineering (Martin, Schinzinge, 2010). Contemporary codes of ethics of engineering communities include norms regulating the “engineer – society”, “engineer – employer”, “engineer – customer”, and “engineer – other engineers” relationships. Thus, according to the US engineering community codes of ethics, engineering activities have a direct and significant impact on the quality of life for the entire community. Accordingly, the engineering profession requires impartiality, honesty, fairness, and must ensure the protection of the environment, the safety and well-being of society. Engineers must observe high principles of ethical behavior in accordance with the standards of professional standards (Michelfelder, Jones, 2013).

Codes of ethics for Russian engineers are set out in the APEC Engineer's Code of ethics and the Code of ethics for scientists and engineers developed by the Russian Union of Scientific and Engineering Public Organizations (RusUSEPO). According to the basic positions of professional ethics, a Russian engineer must be fair, polite and honest, communicate respectfully and without conflict with clients and employers, maintain secrecy, inspire colleagues and adequately respond to legitimate criticism, and strive to minimize the negative impact of technology on people, society and the environment. A professional engineer should not take part in an engineering project or a scientific or technical task if the project or task could be detrimental to society or the environment (Kodeks professional'noy..., 2011).

2. Materials and methods

The following methods were used in the work: theoretical analysis and generalization of scientific and methodological literature in the context of the professional ethics of future engineers, a survey of first-year engineering students.

In order to identify competencies that are directly related to the moral and ethical principles of the mining engineer’s professional activity, we analyzed the educational standards for the specialty “Mining Engineering”.

We emphasize that mining, as an integral part of the global economy, includes all types of technogenic impact on the earth’s crust, mainly the extraction of minerals, their primary processing and scientific research related to mining technology. A modern mining engineer is a specialist of the widest profile, who skillfully apply the latest information technologies, robotic and unmanned machines, remote sensing methods and classical knowledge of subsurface structure, geophysics and geotechnology (Trushko, Protosenya, 2019). This predetermines the attractiveness of

the profession of mining engineer, similarities in the key areas of mining technology development, as well as training systems in the leading mining countries of the world (Kuleckij et al., 2021).

A comparative analysis of curricula and programs of Russian and foreign universities, as well as opportunities for obtaining the qualification of "Mining Engineer" showed that the general idea of professional competencies required for a modern mining engineer is similar all over the world (Sishchuk et al., 2020). The differences lie in the proposed forms, training schemes and time to achieve the required level of competence. For example, universities in European countries, as well as the US, Canada, and Australia have a multi-level system of mining education: a bachelor – a master – a doctor of philosophy. In Russia, in accordance with the federal state educational standard "Mining Engineering", provides for monoengineering (without division into a Bachelor's and Master's programs) training of specialists in 12 specializations with a training period of 5 and a half years (Kazanin, Drebenstedt, 2017).

3. Results and discussion

The results of the comparative analysis of the Russian federal state educational standards of the third generation for the specialty 21.05.04 "Mining Engineering" (specialist level) in the context of moral and ethical principles are shown in Table 1. It should be noted that in the structure of the FSES of the third generation, the wording (content) of some competencies is repeated from generation to generation, i.e., there is a certain continuity.

To reduce the length of the table, it contains a list of categories and codes of competencies, as well as the content of only some categories of competencies, which, in our opinion, most fully reflect the norms of professional ethics of a mining engineer.

Table 1. Comparative characteristics of FSES (ethical aspect)

FSES	Category/ Competence code	Competence content
FSES 3 (Federal State Educational Standards for Higher Education in the following field of study (specialty) 130400 "Mining Engineering" (qualification "specialist") (FSES..., 2011)	General cultural competence (GCC) 17 items in total	- readiness to cooperate with colleagues and work in a team (GCC -4); - ability to negotiate, establish contacts, eliminate (resolve) conflicts of interest (GCC -5); - to carry out their activities in various spheres of public life on the basis of moral and legal norms accepted in society (GCC -8)
	General professional competence (GPC) 8 items in total	- knowledge of methods of rational and integrated development of georesource potential of the subsoil (GPC -8); - knowledge of the legal basis for subsoil use and safety of work in mining, mineral processing, construction and operation of subsurface structures (GPC -16)
FSES 3+ (Federal State Educational Standards for Higher Education in the specialty 21.05.04 "Mining Engineering") (specialist level), (FSES..., 2016)	General cultural competence (GCC) 4 items in total	- ability to use the basics of legal knowledge in various spheres of life (GCC -5); - readiness to act in non-standard situations, bear social and ethical responsibility for decisions made (GCC -6)
	General professional competence (GPC) 4 items in total	- readiness to lead a team in their professional area, tolerant of social, ethnic, religious and cultural differences (GPC -3); - readiness to use scientific laws and methods to assess the state of the environment in the functioning of production for operational exploration, extraction and processing of solid minerals, as well as in the construction and

FSES	Category/ Competence code	Competence content
		operation of subsurface facilities (GPC -6)
	Professional Competence (PC) 6 items in total	- readiness to demonstrate skills in development plans of measures to reduce the technogenic burden on the environment during operational exploration, extraction and processing of solid minerals, as well as the construction and operation of subsurface facilities (PC -5)
FSES 3++ (Federal State Educational Standards for Higher Education – Specialty "21.05.04 Mining Engineering") (FSES..., 2020)	Universal competence (UC) 3 items in total	Communication. UC-4. Ability to use modern communication technologies, including in foreign language(s), for academic and professional interaction Intercultural interaction. UC-5. Able to analyze and consider the diversity of cultures in the process of intercultural interaction
	General professional competence (GPC) 6 items in total	GPC-17. Ability to apply methods to ensure industrial safety, including emergency situations, during operational exploration, extraction and processing of solid minerals, construction and operation of subsurface facilities
	Professional competence (PCI) – established by the educational organization independently 1 item in total	PCI-9.1. Knowledge of strategy of complex and effective development of underground space, ways and technologies of safe development and use of subsurface area

As can be seen from Table 1, the total number of competencies that are directly related to the moral and ethical principles of a mining engineer's activity tends to decrease. So, if FSES HPE for the specialty 130400 "Mining Engineering" provided 17 general cultural and 8 professional competences (25 in total), then FSES 3+ contains 4 general cultural, 4 general professional and 6 professional competences (14 in total), and FSES HE 3++ contains 3 universal, 6 general professional and 1 professional competence (10 in total).

As a result, it can be concluded that the requirements for the preparation of the modern mining engineer in terms of sustainable development and trends in the formation of the FSES of the third generation contradict each other. In addition, we must note that at the moment engineering ethics, as a relevant applied discipline, in technical universities is only in its development stage. Very few educational programs explore normative and ethical aspects in combination with engineering and social sciences (Van den Hoven, 2016).

As part of this study, in order to determine the level of knowledge of basic principles of professional ethics, a survey was conducted among first-year engineering students of Saint-Petersburg Mining University (Russia).

90 students-future engineers took part in the empirical study: 47 students of mining faculty (31 boys and 16 girls of 17–19 years old) and 43 students of faculty of geological prospecting (28 boys and 15 girls of 17–19 years old). Qualification of graduates – mining engineer (specialist) and mining engineer-geologist (specialist) respectively. As it is seen from the sampling group, the most part of the students are lads. These figures correspond to the general data on the sphere of national engineering education systems.

The survey included questions about the norms of engineering ethics, ways of forming professional and ethical principles, etc. (Ovchinnikova, Bykova, 2019).

According to the results of the questionnaire survey, 35 % of students of mining faculty and 40 % of students of geological prospecting do not know the meaning of the term "engineering

ethics". 42 % of respondents were at a loss to answer the question "Give the definition of the term "engineering ethics".

Table 2 presents the results of a comparative analysis of the opinions of freshmen on the norms of the professional ethics of the engineer. Students were required to rank the 15 moral and ethical qualities proposed in the questionnaire according to the following principle: the most important quality was assigned number 1, the second most important quality was number 2, and so on.

Table 2. Results of questioning of first-year students

Standards of engineering ethics	Mining engineers n = 47			Mining engineers-geologist n = 43		
	Average	Rank	Median	Average	Rank	Median
Honesty	10,49	5	5	10,11	5	5
Diligence	11,2	3	6	10,63	4	4
Punctuality	7,7	9	8	8,34	8	9
Organization	10,91	4	4	10,7	3	4,5
Tactfulness	5,98	11	11	7,1	11	11
Decency	6,9	10	11	7,26	10	10
Responsibility	11,8	2	6	10,96	2	4
Professionalism	12,84	1	1	13	1	2
Mindfulness	8,98	6	5	9,93	6	7
Politeness	5,4	13	12	6,08	15	11
Sociability	4,49	14	11	6,85	12	13
High self-discipline	7,85	8	10	7,66	9	8
Self-criticism	4,39	15	11	6,64	13	12
Adherence to principles	5,48	12	10	6,44	14	11
Discipline	7	7	9	8,62	7	7,5

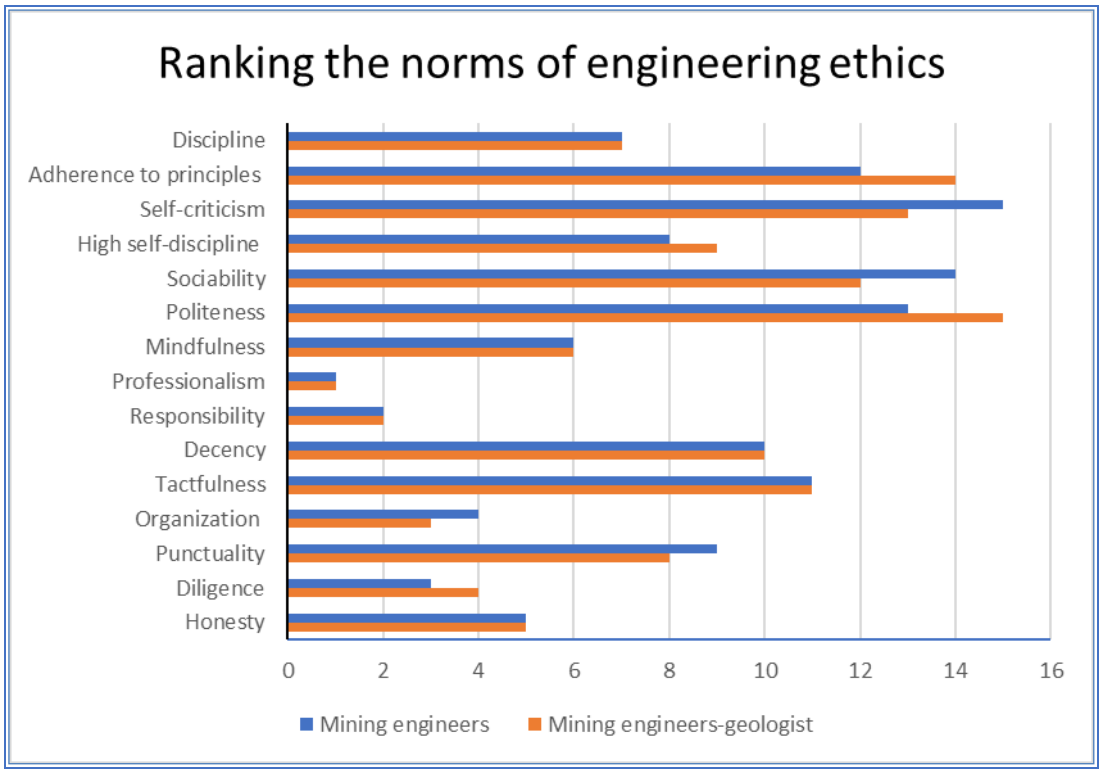

Fig. 1. Ranking the norms of engineering ethics

The empirical data obtained in the course of the experiment were analyzed using the methods of mathematical statistics. To interpret the results, we used the nonparametric Student's t-test to compare the medians of two independent samples. The calculated value of Student's t-criterion is 0.96. The critical value of Student's t-test is 2.048 at a significance level of $\alpha = 0.05$. Therefore, the differences between the samples are not statistically significant.

Consequently, if at the level of comparison of individual factors there are slight differences in ranks (Table 2), then in general the understanding of the norms of engineering ethics among students of mining faculty and geological exploration faculty does has no significant differences (identical).

Thus, first-year students consider professionalism, responsibility, organization, diligence to be the most significant norms of engineering ethics. At the same time, such significant moral and ethical qualities as politeness, integrity, communicativeness, and self-criticism received a low rating and maximum numbers, respectively (Figure 1).

This fact indicates the need to include the course "Engineering Ethics" in the educational programs of technical universities as an optional course or a separate unit within such disciplines as "Introduction to Specialty", "Mining and Industrial Environmental Sciences", etc. To achieve a new level and quality of engineering education, the need to explore the potential of the educational environment in the formation of moral and ethical competencies of specialists in the field of engineering, a key profession in the concept of sustainable development, acquires particular importance (Ali et al., 2021; Fernández-López, 2022).

4. Conclusion

The transition to sustainable development has posed new challenges to the system of higher mining education (Sigareva et al., 2018). On the one hand, globalization and the rapid development of technology are constantly increasing demands on the quality of labor of the mineral sector and the constant improvement of their skills (Kretschmann et al., 2020). On the other hand, the transition to sustainable development implies the need for rational use of raw materials and protection of the environment. This requires improving the training of mining engineers in order to develop innovative competencies of future miners (Sveshnikova et al., 2022).

The training of Russian engineering personnel in accordance with international requirements and standards within the framework of the competency-based approach is directly related to the formation of ethical principles of future engineers' professional activities. Analysis of the FSES of the third generation in the specialty "Mining Engineering" revealed a tendency to reduce the number of competencies aimed at the formation and development of professional ethics. In addition, the results of the study revealed a lack of knowledge of basic standards of engineering ethics among first-year students of the Mining University.

In the conditions of sustainable development of the mineral sector of the industry, joint efforts of all stakeholders are required, so that the formation of moral and ethical principles occupies an important place in the training of future mining engineers.

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Implementation of Blended Learning Model to the Non-English Major Students in EFL Setting in the Russian Arctic

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Abstract

The article considers a blended teaching of English to non-English major students in the Russian Arctic. The relevance of this study is due to the fact that new technologies are being introduced into the education system in order to improve the quality of education. Blended learning is understood as a hybrid learning integrating online education and in person education. The article provides an overview of the research conducted on blended learning abroad in the context of English as a foreign language (EFL). It presents a blended learning model that consists of 3 blocks: methodology, learning process and assessment of learning outcomes. In general, this model consists of face-to-face instruction and digital platform Skyes. The pilot training was conducted to prove the effectiveness of the discussed blended learning model. 100 non-English major bachelor students of the 1st year students from the North-Eastern Federal University, the Arctic State Institute of Culture and Arts and the Arctic State Agrotechnological University took part in the pilot training. The students were divided into 2 experimental and 2 control groups of 25 students. The students of the control groups attended traditional classes with a distance learning format while the students of the experimental groups studied English in a blended learning format. The pilot training lasted for one semester. During the training 4 English skills were tested in students: 1) listening 2) vocabulary 3) grammar 4) reading. The results before and after the pilot training are presented. The results of pilot training prove the effectiveness of the implemented blended learning model in comparison with face-to-face instruction.

Keywords: blended learning, EFL, face-to-face instruction, blended learning model, English skills, e-learning.

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1. Introduction

Modern language education, including teaching English as a foreign language (EFL), is being transformed based on the active use of new information technologies (online tools, web technologies and Internet technologies). This transformation of the education system in general, and EFL learning process, in particular has been accelerated in terms of COVID-19 pandemic. With the development of new learning tools, the modes of learning are likewise changing. In this regard, blended learning has become a popular mode of teaching at universities worldwide.

As the researchers testify, blended learning has grown into a significant factor for the development of higher education by integrating features and benefits of technology and traditional learning education (Zhang, Zhu, 2018). Blended learning being understood as web-based and face-to-face instruction exemplifies an entirely new model that can transform both teaching and learning (Moskal et al., 2011: 13; Horton, 2002; Osguthorpe, Graham, 2003). Similarly, blended learning refers to an in-person education combined with online opportunities, and the online materials are presented either in a distant way or in the traditional classroom (Thompson et al., 2019).

The increasing volume of online teaching suggests that online course delivery formats will be used significantly in higher education. As it is stated in the research, the growing number of students taking online courses implies that blended learning will increase in proportion in higher education (Aslanian, Clinefelter, 2013). The educational system under reform necessitates a development of a blended learning model which affects training process, learning outcomes and perspectives of learning. This leads to a paradigm change in the EFL learning and teaching and reflects a significant influence of innovative approaches (Dziuban et al., 2018).

In the field of teaching EFL, the practitioners are challenged with finding an effective way to create a blended learning environment for students at the tertiary level. Blended learning represents the use of new educational methodologies and activities, which accentuate student-centered active learning along with a more traditional approach which is a teacher-centered approach (O'Connor et al., 2011). More specifically, blended learning is regarded as an "enriched, student centered learning experiences made possible by the harmonious integration of various strategies, achieved by combining face-to-face interaction with information and communication technology" (Torrisi-Steele, 2004: 366). As a teaching method, blended learning offers students flexible class schedules, network development, collaborative work with peers, active and reflective learning via the use of technology (Villalon, Rasmussen, 2017). Blended learning implements the advantages and teaching/learning processes of synchronous and asynchronous distance teaching so that learners and teachers and students can engage in educational activities in synchronous and asynchronous online situations (Bosch, Laubscher, 2019).

In terms of EFL education, blended learning is interpreted as more "individualized learning experience, more personalized learning support", "independent and collaborative learning", "student engagement in learning", more practice of the target language beyond the classroom, and flexible study (Marsh, 2012: 4-5). Thoroughly blended learning is "a hybrid model of e-learning that allows coexistence of conventional face-to-face teaching methods and e-learning activities and resources in a single course" (Littlejohn, Pegler, 2007: 26). A successful blended learning model comprises an initial face-to-face meeting, weekly online assessments and synchronous chat, asynchronous discussions, e-mail, and a final face-to-face meeting with a final examination (Martyn, 2003).

An effective way to implement blended learning is to develop a teaching model. The model includes face-to-face learning activities between teachers and students in the classroom and online activities. Outside of the classroom, students can access additional curriculum resources and do homework through the Internet platform (Sharpe et al., 2006). Teachers can also develop and upload instructional materials including text, audios, images, videos, and animation files on the Internet platform preliminarily so that students can start studying at their own pace (Bosch, Laubscher, 2019; Dziuban et al., 2018).

Recent research studies have explored the effect of blended learning on students' attitude, motivation to learn English and their academic performance at the universities. A study on students' attitude towards asynchronous distance learning and blended learning was conducted at a Turkish university. The first group was trained in asynchronous distance learning, the second group was trained in blended learning. The results demonstrated that the first group of students

was dissatisfied with the teaching content in asynchronous distance learning. The second group of students was satisfied with their courses via blended learning (Gunes, 2019).

As it was found out, blended learning positively influences students' learning performance as well as motivates them to practice the language more authentically by giving them enough time and space inside and outside the classrooms. This learning flexibility grants them a dynamic language input and upgrades their language proficiency (Oweis, 2018). Moreover, students' positive acceptance of a blended learning enhances their motivation and achievement in comparison with offline classes (Akkoyunlu, Soylu, 2016). Similarly, when learners have a positive attitude towards the implementation of blended learning approaches in their classrooms, they show better academic achievements in English courses (Akbarov et al., 2018).

The main goal of the EFL pilot teaching to be discussed in this article was to assess the effectiveness of blended learning model implementation into teaching practice at the tertiary level. To achieve this goal, the pilot study represents a quasi-experimental training that uses a pretest-posttest research design to measure the progress in the participants' performance. The four English language skills were tested: Listening, Reading, Vocabulary and Grammar.

The relevance of this pilot training is due the fact that the latest transformation in the higher education system requires development of the effective blended learning model in the EFL setting. Students' increasing the level of EFL competence at the tertiary level should be optimized through the integration of a blended learning model and traditional training in the education process.

While teaching students in the pilot training, we put forward two hypotheses:

Hypothesis$_0$. There is no difference in test scores between students who were trained in a blended learning context and students who took conventional distance learning.

Hypothesis$_1$. There is a significant difference in test scores between students who were trained in a blended learning context and students who took conventional distance learning.

The scientific novelty of this pilot study is the development of the EFL blended learning model for non-English major students (Engineering students) when teaching English at a university.

2. Materials and methods

Participants and Context

A group of 100 EFL university learners who participated in the present pilot study are bachelor students of the North-Eastern Federal University, Arctic State Agrotechnological University and Arctic State Institute of Culture and Arts, Russia. The participants are majoring in Engineering and predominantly native speakers of Yakutian language attending a "General English" course. For the purpose of pilot training, students with the Pre-Intermediate level (A2) are selected as this level proved to be the most common according to the results of the placement test. Subsequently, the 100 students of Pre-Intermediate level are divided into an experimental group of 50 students and a control group of 50 students in the first year of compulsory EFL learning. Specifically, 10 of the participants are females and 90 males, all aged 18 to 22.

Research Method

The present study includes pilot teaching of Engineering students; analysis of EFL pilot teaching; methods of observation – direct observation of students' performance, control of the students' progress; diagnostic method: sets of tests (placement test and progress tests); methods of mathematical statistics, qualitative analysis of the pilot study data and summarizing the outcomes of the pilot training.

The teaching of English as a foreign language is based on communicative approach (Wilkins, 1983; Candlin, 1976; Widdowson, 1978; Humes, 1971), competence-based approach (Egbert, Shahrokni, 2019; Dragoo, Barrows, 2016; Henri et al., 2017), and the theory of learner autonomy (Holec, 1981; Little, 1991; O'Leary, 2014).

Instruments

The instruments of the pilot training were two sets of tests held at the beginning and at the end of semester. Two sets of tests were utilized. Each set of tests contains a pretest and a posttest. The first set of tests (Language Hub placement test) was employed to determine the participants' English proficiency level, with the mean score of 27 (that is A2 CEFR level).

The second set of tests (progress tests) was made by teachers in "Test Generator" on units of the coursebook "Language Hub". Progress tests monitor improvements in English skills in

Listening, Grammar, Vocabulary, and Reading prior to and after the pilot training. The students performed tests online.

The "Listening" part consisted of 2 tracks and 15 multiple choice questions. The "Reading" part included 3 texts and 25 multiple choice, gap filling and matching tasks. The "Grammar" part was composed of 30 multiple choice questions. The "Vocabulary" part contained 30 multiple choice questions. The maximum score is 100 points. The score distribution is shown in Table 1.

Table 1. The score distribution

№	Total score	Grade
1	95-100	A (Excellent)
2	85-94,9	B (Excellent)
3	75-84,9	C (Good)
4	65-74,9	D (Good)
5	55-64,9	Fairly
6	25-54,9	Poor
7	0-24,9	Very poor

Teaching materials

The course "General English" is accepted by the curriculum conducted for 3 semesters during the 1st and 2nd of study at the university. In the first semester, the training is held in four units: "Family", "People", "'Food" and "Sports". Students studied vocabulary and grammar and performed assignments in reading and listening.

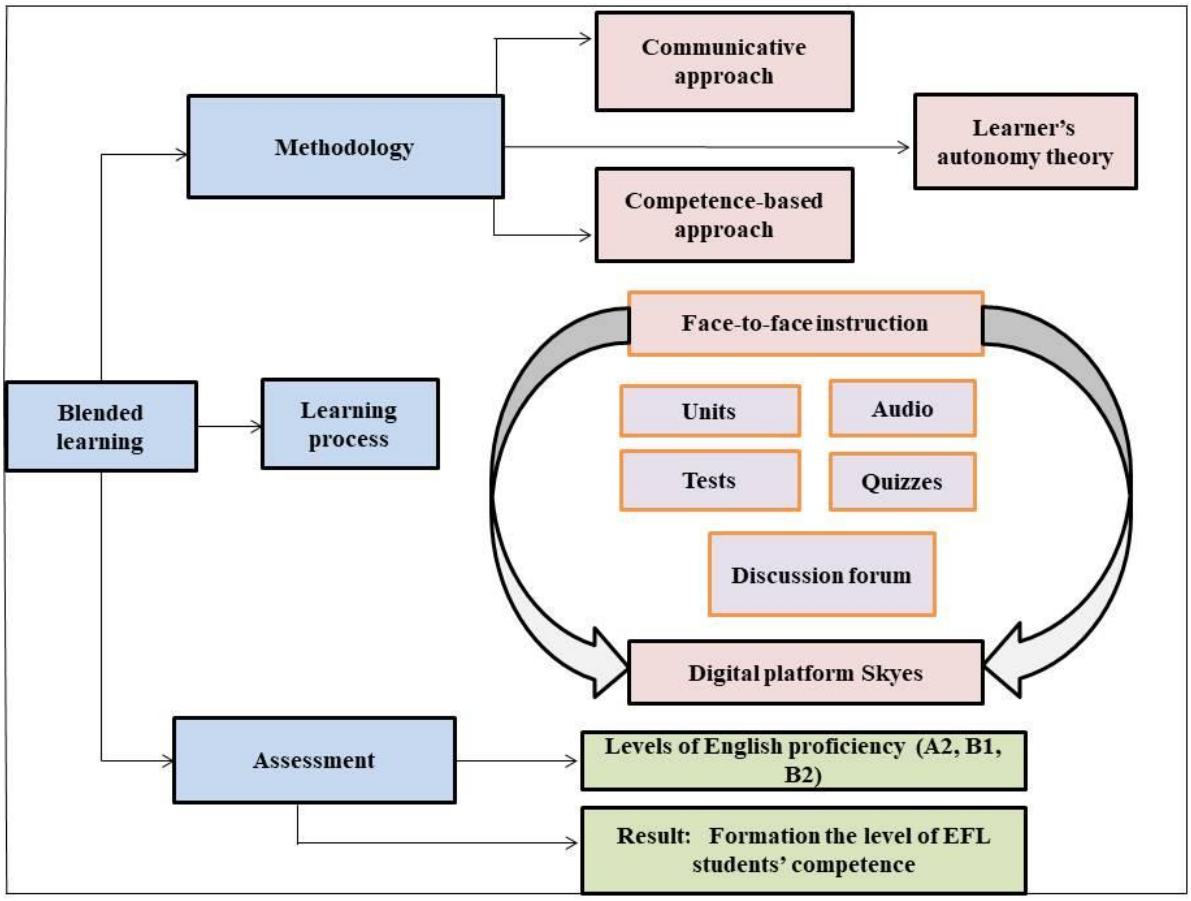

Fig. 1. Blended English learning model

The digital platform Skyes is a digital learning system that allows instructors to create virtual classrooms to give assignments to students for unsupervised study. It has synchronous and asynchronous online learning activities. The students did assignments in 4 units such as "Family", "People", "Food" and "Sports". The students have traditional classes on Monday, Wednesday and Friday, and online classes on Tuesday and Thursday via Skyes.

The blended learning model consists of 3 interconnected blocks: 1. Methodology (communicative, competence-based approaches, learner's autonomy); 2. Learning process (face-to-face instruction, digital platform Skyes); 3. Assessment (improving levels of students' English proficiency). See Figure 1.

Procedure

The four teachers held lessons in this pilot training. The 100 students were divided into 2 experimental and 2 control groups. Each group was divided into 25 students.

During the first semester the students received online treatment on the digital platform Skyes. The students are required to practice pronunciation, to do grammar exercises, to read short articles, to learn new vocabulary, and to do listening assignments. In grammar, students performed grammar exercises. Specifically, the following grammar themes are studied such as to be, possessive adjectives, adjectives, have got, adverbs of frequency, active voice, modals, present, past and future forms. New words on the units are practiced in reading and grammar assignments. The target vocabulary is given to students according to the units. In reading, students read short articles and completed pre-text, text and post-text reading tasks. In listening, students listened to audio files and completed before listening and after listening tasks.

Face-to-face instruction was conducted by 4 teachers of English in four groups. The classroom hours made up 72 hours a semester. Overall, 36 lessons were conducted.

In classrooms the students were introduced to new units, teaching materials, and tasks. Accordingly, they continued doing exercises in listening, learning new vocabulary on new topics, practicing grammar on English tenses in active and passive voice, and making up dialogues on the digital platform Skyes. The students were asked to role-play in the classroom.

Statistical analysis

The first set of tests "Language Hub placement test" has 70 items. The participants were given a 45-minute test. The placement test was carried out once at the beginning of the semester and determined the students' level of English proficiency. According to the test, most of the students turned out to have the A2 level. Therefore, we chose 100 students of Pre-Intermediate level for the pilot training. At the end of the semester we did not test the level of English proficiency since we were aware that it will not change for one semester.

The second set of tests, the Progress test, was held at the end of semester to compare the test score results after the pilot training in experimental and control groups. Progress tests were made on instructional materials on the coursebook units. The progress test assessed four English skills such as Listening, Grammar, Vocabulary and Reading. To prove the significance of posttest score results, we performed the Wilcoxon-Mann-Whitney test for independent samples.

Table 2. Listening pretest and posttest scores

Pretest							
Experimental groups	7.86	8.5	3.4698	1.8627	4	11	50
Control groups	4.22	4	3.4812	1.8658	0	8	50
Posttest							
Experimental groups	18.76	18.5	25.2473	5.0247	10	25	50
Control groups	9.76	9	18.3902	4.2884	5	20	50

Further, the results of the pretest and the posttest on English language skills will be presented in detail. The Table 2 shows the average score of students in listening in experimental and control groups. As it is seen from the table, the average score of students in experimental groups and control groups was equal at the beginning of semester. At the end of semester, a Mann-Whitney U Test found out that the difference between the means was statistically significant (U = 9.5; Z = -8.54834; p = 0,0001 < 0,01). The mean score of the listening post-test (x = 18,76) of experimental groups was higher than the mean score of the listening post-test of control groups (x = 9,76).

The Table 3 shows the results of the pretest of the posttest in reading. At the beginning, the difference between the average scores of the experimental and control groups is practically the same. A Mann-Whitney U revealed a statistically significant difference between the mean scores of the tests (U = 62; Z = -8.18641; p = 0,0001 < 0,01). The mean score of the reading post-test in the experimental group (x = 24,06) was higher than the mean score of the reading posttest in the control group (x = 15,86). As the data demonstrate, the students' performance in reading from experimental groups is better than students from control groups.

Table 3. Reading pretest and posttest scores

Groups	Mean	Median	Variance	Standard Deviation	Minimum	Maximum	Count
Pretest							
Experimental groups	9.62	10	4.322	2.079	5	13	50
Control groups	9.14	9	4.123	2.03	5	13	50
Posttest							
Experimental groups	24.06	25	4.4657	2.1132	16	25	50
Control groups	15.86	16	11.9596	3.4583	10	20	50

Table 4 shows the results of the pretest and posttest on grammar in both discussed groups. According to the table, the difference between the mean scores was statistically significant (U = 55.2; Z = -7.09029; p = 00001 < 0,05). The mean score of the grammar posttest in the experimental group (x=26.84) was higher than the mean score of the grammar posttest in the control group (x = 17.88). This result showed that there was a positive effect of implementing the EFL blended learning model.

Table 4. Grammar pretest and posttest scores

Groups	Mean	Median	Variance	Standard Deviation	Minimum	Maximum	Count
Pretest scores							
Experimental groups	10.8	10	6.286	2.507	8	15	50
Control groups	10.94	10	5.894	2.428	8	15	50
Posttest							
Experimental groups	26.84	28	11.9739	3.4603	18	30	50
Control groups	17.88	17.5	29.0731	5.3919	10	29	50

The Table 5 shows the outcomes of the pretest and posttest on vocabulary. The posttest score results on vocabulary demonstrated that the mean score in the experimental groups is higher than

in control groups. A Mann-Whitney U found out there was a statistically significant difference between the two groups in terms of vocabulary acquisition (U = 61,6; Z = -6.9145; p > 00001 < 0,05). The post-test mean score (x = 28.2) of the experimental group was higher than the control group's mean score (x = 19.66).

Table 5. Vocabulary pretest and posttest scores

Groups	Mean	Median	Variance	Standard Deviation	Minimum	Maximum	Count
Pretest							
Experimental groups	14.46	15.5	14.213	3.77	9	19	50
Control groups	13.94	15	12.098	3.478	9	19	50
Posttest							
Experimental groups	28.2	30	8.2041	2.8643	20	30	50
Control groups	19.66	17.5	32.2698	5.6807	812	30	50

Overall, this pilot training lasted for one semester and demonstrated that the implementation of the EFL blended learning model proved to be effective. The careful distribution of assignments online/offline and the systematic conduct of classes in person and on the digital platform Skyes contributed to improving English language skills. The organization of learning process in person and through the digital platform Skyes as a system allowed improving the students' performance. Thus, the students who were trained in blended learning showed better performance than the students who were exposed to traditional distance learning.

3. Discussion

This pilot training is part of other studies that discussed and developed an effective model of blended learning for university students in EFL settings. This emphasizes the relevance and importance of improving students' level of English proficiency in many countries.

First, to achieve good results on EFL training, one must devise an effective blended learning model. This model is to include methodology, the learning process and predictive learning outcomes. In order to check the effectiveness of the model, it is necessary to test the model on control and experimental groups of students. The developed blended learning model is an English language teaching system. Good academic results are achieved through the systematization of tasks, assignments, tests, quizzes online and offline and in-person examination. This system has a clear goal of what students should achieve upon completion of each unit, in particular and the course, in general. The obtained results are consistent with the results of EFL studies in which the blended learning model was applied. For instance, the use of a blended learning model leads to the increase of students' posttests scores in the experimental and controlled groups when learning English. Both groups in the research received the same learning materials, but with a different way of teaching (Pammu et al., 2021).

This pilot training synchronizes with previous studies conducted in different countries when teaching EFL, proving that the blended learning model is more effective than traditional training. Specifically, the blended learning model creates a digital learning environment where students have access to materials and unlimited practice time. The digital environment itself implies independent study of an EFL outside of class and extracurricular time. This gives higher scores in the experimental group than in the control group. Thus, a connection was established between online learning and face-to-face meeting, which helped maintain the unity of the course (Yu, Du, 2019).

In line with the previously conducted research, with the model having its own structure and containing the goals of teaching English, students' skills are improved in four English skills such as listening, reading, speaking and writing due to the increased time for studying materials outside the classroom. Such effective model requires an online course on the digital environment and face-to-face meetings (Kolegova, Almani, 2021). Better academic achievement in their ESL blended learning course compared to students in traditional face-to-face learning mode was observed in the research undertaken in China (Zhang, Zhu, 2018). Such high results are achieved by students due to the interactivity of exercises, a variety of tasks to perform and the use of active learning methods during blended learning.

In accordance with the present results, previous studies conducted by Alipour (2020) and Djiwandono (2018) have demonstrated that the blended learning has resulted in the development of learners' vocabulary acquisition.

An increase in the level of understanding of an EFL text occurs due to additional materials for reading online. Particularly, this is facilitated by a more conscious acquisition of a large amount of vocabulary and grammar by students. Students pay more attention to reading texts in English. Students were often given reading assignments in order to prepare a short oral presentation on the material they read. Therefore, students show good reading scores compared to other English skills.

The result of this study was in line with the result of the research studies conducted by Ghazizadeh and Fatemipour (2004), and Herlindayana et al. (2017), and showing that listening and reading skills have been improved as a result of the application of blended learning model. The digital platform Skyes is uploaded with audio files that contain the vocabulary acquired on various topics. This platform provides a lot more audio files for the development of listening skills. In subsequent classes, the vocabulary is monitored and tested from audio materials. Therefore, students are immersed in vocabulary and grammar both online and in the classroom. It was also in favor of the result of the study conducted by Masita (2016), and Each and Suppasetseree (2021) proving that there was a positive relationship between blended learning and listening skills.

According to the model, the pilot training proves to be intensive and tense, affecting all discussed English skills. Training, practice and control are carried out online and in the classroom. Presentation of instructional materials online and offline lead to the situation that the students learn more both in individual units and throughout its course.

The improvement of students' grammatical skills was due to a variety of interactive exercises and tasks with pictures and audio files. When teaching English, we tried to involve all kinds of human feelings so that students would memorize the instructional material better. Subsequently, grammar is practiced in listening, reading and writing. This pilot training echoed other studies in which grammatical skills are improving as a result of implementing blended learning (Bataineh et al., 2019).

The developed blended learning model has shown its effectiveness in teaching/learning. This is confirmed by the performance of the control and experimental groups in this pilot study. However, the study under discussion has a number of limitations such as the duration of study, the coverage of students, the location of study and the context of study in one region of the country. In particular, the number of students is limited to 100 students. The training was conducted in three tertiary education institutions only in one region of the country. The duration of study lasted one semester. In addition, students of the same level of English proficiency, namely of the pre-intermediate level, participated in experiential learning. Moreover, the units on which students were taught were few.

Meanwhile, the prospectivity for developing a blended learning model should count several factors. First of all, a large number of students is needed to ensure the validity of the study. It is necessary to cover many diverse units while teaching English to students. Furthermore, students with different levels of English proficiency should be involved in pilot training. It is desirable that students be of different majors, so that English is not their major subject.

It is recommended to conduct research in different regions of the country to create an efficient digital blended learning model. The further prospects of developing a blended learning model contribute to the digitalization of EFL teaching. The digital learning environment for the university should be based on a blended learning model that proves to be effective in classrooms. The development of a reliable model of blended learning for students assists in finding a balance

between online and offline training in the process of the digitalization of education. Such a blended learning model will distribute training tasks for face-to-face lessons and for digital classes.

4. Conclusion

In this pilot study we checked the non-English major students' performance in four English skills: Listening, Grammar, Vocabulary and Reading in one semester. The students in experimental groups received treatment in blended learning while the students from control groups were taught English in the traditional way with asynchronous distance learning. In the pilot study 4 teachers of English took part, conducting classes in English online and offline.

The findings of the pilot study expose empirical support to the implementation of EFL blended learning model in comparison with traditional asynchronous distance teaching at the universities of the Republic of Sakha, North-Eastern Federal University, the Arctic State Institute of Culture and Arts and the Arctic State Agrotechnological University. However, it should be noted that our study has some limitations. Firstly, a small number of participants assume that the results generally may not be very representative of EFL learners. Secondly, the pilot study was conducted for a limited period of time. Thirdly, the pilot study took place within three universities in Russia's Arctic region.

The pilot study has demonstrated that the blended learning model of teaching English using the digital platform Skyes and face-to-face instruction proved to be effective in this teaching context. Moreover, it has been found that university EFL learners mostly like to study English intensively both in online and face-to-face format.

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Students' Conflicts, Causes and Ways of Solution in Physical Education Lessons

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Abstract

School is one of the most important institutions of human socialization where students learn different behaviour models quickly on communicating with others. Thus, conflicts among children, adolescents and young people are unavoidable in the modern school, but the outcomes of this phenomenon can often be determined by the cognition of the characteristics and essence of the conflict as a phenomenon and process. Successful socialization of young people in schools is impossible without known any ways of conflict solution and trying to manage them. The purpose of this research was to reveal the inclination of 15-16-year-old students to conflicts as well as determine the causes of conflicts and peculiarities of the choice of behaviour strategies in physical education lessons. 325 students from comprehensive schools of the big Lithuanian cities, 172 girls and 153 boys participated in the research. The results of the research showed that students-girls and boys that participate in physical education lessons have an inclination to conflicts. The girls emphasized the main causes for conflicts: blank contents of the teachers' communication, tactless, rough, authoritarian style of work and insufficient attention and sensitivity to the students. Meanwhile, the boys indicated the teachers' disregard for the students, non-observation of the unity of words and acts and the teachers' dishonesty and lying. Moreover, the results of the conflict research revealed the 15-16-year-old students-girls choose cooperation first and search for compromises second in conflict situations. Meanwhile, the boys of the same age indicated competition first and chose the strategy of conflict avoidance second.

Keywords: students, conflicts and their causes, strategies of conflict solution.

1. Introduction

School is one of the most important institutions of human socialization where students learn different behaviour models on communicating with contemporaries. Thus, the day at school without any bigger or smaller conflicts is rare. The problematic field is emphasized by the fact that

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conflicts are unavoidable at school because students spend there plenty of time, so they get to various situations full of objections, surprises, and if their opinions on different interests disagree, they are sometimes defended in the least human ways, by experiencing positive or negative emotions. According to Ignatavičienė, Račelytė (2003), students' disagreements are often caused by competition, leadership, mobbing, dishonesty in interpersonal relations, unobjective assessment by teachers and other causes.

Most scientific studies (Palujanskienė, Uzdila, 2004; Čiuladienė, 2006; 2007; Butovskayan et al., 2007; Danuta et al., 2018; Wei et al., 2020) state that conflicts are characteristic to all age periods and the period of adolescence is not an exception. According to G. Čiuladienė (2006; 2007), conflicts are the main feature of adolescence because it is often rebelled against others, especially adults (Hodges et al., 2020; Yao, Enright, 2018), parents (Hamamci, 2007), there is a wish to show they are personalities with their desires and opinions. Moreover, G. Čiuladienė (2007) states that adolescents' conflicts are very emotional and more expressed than those among adults. Authors Hodges et al. (2020); Wang et al. (2017) recognize in their works the topics of conflicts remains relevant in the modern school because students come to school from various families, with different characters and temperaments. Some students are quiet, peaceful, disciplined and friendly, others, on the contrary, like conflicting, demonstrate rough and aggressive behaviour. For example, some students often start using the calmness and quietness of others because they know they will defeat these friends easily. In the school environment, adolescents are also inclined to conflict, even with teachers. However, conflicts among students are still the biggest problem at schools. Although students are inclined to an excessive reaction to most words or acts, there is no conflict without reason. After performing the scientific research, G. Čiuladienė (2006) determined that conflict behaviour of students is mostly affected by disappointment and state of tension as they are unable to satisfy certain needs, realize goals and cope with difficulties. Thus, unless conflicts are reacted in time, painful consequences can occur later. Teachers have to help to solve conflicts at school, so they should understand the causes for conflicts, their consequences and ways of solution (Wang et al., 2014).

On analysing conflicts in the context of the school environment, a few main causes for conflicts among adolescents could be emphasized. First, adolescents lack the teachers' understanding and emotional support. Moreover, they feel anger and disappointment when their classmates ignore the wishes and goals of students. It was determined in the research (Čiuladienė, 2006; Čiuladienė, 2007) that every third adolescent feels he/she is not understood by an adult and ever fifth one – by his/her classmates. Adolescents state they often lack the sensitivity of their friends and teachers. Unfortunately, students hardly get a word of compassion and consolation from the nearest people (classmates, parents or even teachers). Thus, the arising disappointment with the environment and people that are nearby every day causes negative behaviour and conflicts among students in the end. Thus, students have a different reaction to invading feelings and different behaviour due to inner dissatisfaction and it causes conflicts.

After performing the research, it was revealed girls and boys behave differently during conflicts (Goštautas, Rakauskienė, 2006). Most students-girls try to solve conflict situations in a friendly way. Meanwhile, boys are inclined to fight and curse and it means boys demonstrate physical aggression during conflicts more often. Nevertheless, both girls and boys are inclined to runaround, dispute, shout or even revenge.

According to Goštautas, Rakauskienė (2006), Yeh (2011), Lim, Ang (2009), conflicts among adolescents are often manifested with aggressive behaviour. Similar insights are given by G. Čiuladienė (2006) that accentuates the following behaviour of adolescents during conflicts: threatening, damage to things of other students, sneering at failures of others. Although the analysis of the sources of scientific literature helped to reveal that most research analyses adolescents' conflicts in the daily or school activity, there was a lack of scientific publications analysing adolescents' conflicts, their causes and strategies of their solution in lessons. In our case, physical education lessons were chosen to analyse these topics. Considering a constant dynamical kind of physical education lessons, there are intense emotional situations, striving for the victory, demonstration of the advantage and it reveals students' character and personality, besides, it causes favourable conditions for conflicts (Hills et al., 2006; Bujosa et al., 2018). One of the assumptions for the solution of students' conflicts is a comprehensive analysis of their causes and revelation of the peculiarities of their course. Taking into account these scientific discussions,

it was tried to assess the inclination of 15-16-year-old middle-school-aged students to conflicts, determine the causes for conflicts and choice of behaviour strategies in physical education lessons. The ground of the scientific topics of this research is a search for these answers.

2. Materials and methods

2.1. Measures

In order to reveal the analysed topics, the questionnaire *"Inclination to conflicts"* was chosen (Miškinis, 2002). The questionnaire consists of 10 statements, each statement has three variants of answers: answer "a" – 4 points; "b" - 2 points; "c" - 0 points. The obtained results are interpreted in the following way: 31-40 points – the researched dislikes conflicts, avoids complicated situations easily, but his/her passiveness does not raise his/her authority in the eyes of others; 30-21 points – the researched is a tactful person, his/her results inspire the respect of others; 20-1 points – the person likes conflicts, looks for a pretext to dispute and is often meticulous.

The questionnaire by K. Thomas *"Choice of the behaviour strategy in a conflict situation"* was used in order to assess five possible behaviour strategies (Raigorodskii, 2000). K. Thomas's questionnaire contains 12 statements about the person's behaviour in a conflict situation. Each of them defines one of five ways of conflict regulation. The following behaviour strategies in conflict situations are accentuated: *competition, adaptation, compromise, avoidance and cooperation*.

Competition is an attempt to satisfy the own interests to the prejudice of another person. *Adaptation* is the sacrifice of the own interests for another person. *Compromise* is an agreement between the representatives of opposite opinions and interests reached in the way of mutual concessions. *Avoidance* is the lack of the tendency of satisfaction of the own interests. *Cooperation* is understood as finding of the alternative between the participants of the situation that satisfies the interests of the both parties completely.

All the statements are matched differently to 30 pairs. The researched is asked to choose the statement of each pair that characterizes his/her behaviour in a conflict situation better. Each chosen statement defines one of the accentuated ways of conflict regulation. 1-12 points can be obtained in each scale. According to the number of points, the expression of the type of reaction is determined: 1-3 points – the type of a conflict reaction is hardly characteristic; 4-7 points – characteristic averagely; 8-12 points – very characteristic.

The methodology *"Causes for students' conflicts"* was also applied (Miškinis, 2002). This methodology enabled assessing the causes for conflicts in physical education lessons in the opinion of students. The methodology consists of eleven statements. Each statement can be assessed with 1-5 points. The researched has to choose one variant of the answer that is the best one for him/her: 1 – very seldom, 2 – seldom, 3 – sometimes, 4 – often, 5 – very often.

2.2. Participants and organization of research

15-16-year-old students-adolescents were chosen for the research. This period was chosen as it is complicated, full of contradictions of physical and psychical development and it is defined as an age period of crises, difficulties, contradictions, conflicts and searches or period of identity or role confusion (Augis, Kočiūnas, 1993). A random selection was applied and students of all the Lithuanian cities had equal possibilities to get to the researched sample. The researched were chosen randomly, according to the tables of random numbers from the list of schools of the Lithuanian cities. Just the students from schools of the biggest Lithuanian cities participated in the research. The sample of the researched consisted of 325 15-16-year-old students. The research took place in eight Lithuanian comprehensive schools. The researched were distributed according to gender: 172 girls and 153 boys. The age mean of the girls was 15,62 ± .74, of the boys – 15,28 ± .51. The data that was necessary for the research was collected for two months. Before starting the questionnaire, the researched were explained the goal and relevance of the research and requirements of the methodology. The anonymity of the researched was guaranteed in order to obtain sincere and authentic answers from the respondents. The head of each school was asked to perform the research in a certain institution, the research was also coordinated with the physical education lessons and oral agreements were obtained from all the researched. All the participants were interviewed after physical education lessons.

2.3. Statistical Analyses

The statistical analysis was applied to analyse the results of the research: in order to determine the statistical significance of differences between the group data, the criterion of *chi*

square (χ^2) was used. In order to compare the results of the both groups, the statistical reliability of differences between the mean values of indicators of the main conflict causes was calculated for the both groups. For the analysis of the research data, the *criterion of Student t* was used and we tried to compare the means of the researched groups. The obtained data was considered significant statistically if it complied with the significance level $p < .05$, 95 percent reliability. The arithmetic mean *($\bar{x}$)*, the standard deviation *(SD)* and the percent expression were calculated in order to compare the research data. The program package SPSS 26.0 was used for the analysis of the research data.

3. Results

By applying the questionnaire by K. Miškinis, it was tried to assess the inclination of 15-16-year-old students to conflicts in physical education lessons. The research data revealed the students participating in physical education lessons are inclined to conflicts.

Table 1. Distribution of students according to their inclination to conflicts in physical education lessons (in numbers and percent)

Researched	Inclination to conflicts						$\chi^2(2)$; p
	Passiveness		Tactfulness		Inclination to conflicts		
	n	percent	n	percent	n	percent	
Girls	64	37.2	73	42.4	35	20.4	22.8 $p < .05$
Boys	38	24.8	46	30.1	69	45.1	

For example, 42.4 percent of the students-girls indicated they are tactful. It allows supposing girls are able to behave tactfully in different conflict situations and solve their problems in physical education lessons without losing the equilibrium. However, even 45.1 percent of the boys were inclined to conflicts more often than the girls of the same age – 20.3 percent. According to the inclination to conflicts, a statistically reliable difference was determined – $\chi^2(2) = 22.8$; $p > .05$. Taking this into account, it can be assumed students-boys are more inclined to confrontation during a conflict, do not want to take responsibility for their problems and tend to accuse others more often (Table 1).

In order to reveal and compare the causes for students' conflicts in physical education lessons, the means of conflict causes and the standard deviations were calculated and the criterion of Student t was applied for the determination of differences between the groups.

The results of the research revealed the assessment of causes for conflicts was different among the 15-16-year-old girls and boys. The girls indicated the following main causes for conflicts in physical education lessons: blank contents of the teachers' communication, tactless, rough, authoritarian style of work and insufficient attention and sensitivity to the students.

Table 2. Statistical indicators of conflict causes among students in physical education lessons

Causes for conflicts	Students	n	M	SD	t	p
Disregard of the student's personality*	Girls	172	3.12	.76	-7.64	$p < .01$
	Boys	153	4.21	.58		
Blank contents of cooperation*	Girls	172	3.94	.67	8.11	$p < .01$
	Boys	153	3.35	.64		
Fear of the error, psychical tension	Girls	172	2.75	.54	-1.89	$p > .05$
	Boys	153	2.88	.68		
Tactlessness, roughness,	Girls	172	3.79	.81	5.20	$p < .01$

authoritarianism*	Boys	153	3.36	.72		
Non-observation of the unity of words and acts	Girls	172	3.47	.56	-4.88	p < .01
	Boys	153	3.81	.68		
Partial attitude towards the student	Girls	172	2.56	.62	1.71	p > .05
	Boys	153	2.43	.73		
Meticulous regulation of the activity	Girls	172	3.82	.36	1.79	p > .05
	Boys	153	3.69	.83		
Avoidance of responsibility	Girls	172	2.79	.75	1.51	p > .05
	Boys	153	2.67	.69		
Lack of attention, insensitivity*	Girls	172	3.57	.66	6.54	p < .01
	Boys	153	3.12	.58		
Dishonesty, lying*	Girls	172	3.54	.71	-8.01	p < .01
	Boys	153	4.07	.49		
Greediness, desire of possession	Girls	172	3.89	.84	1.13	p > .05
	Boys	153	3.76	.75		

Note. * p < .01. M = mean; SD = standard deviation

Meanwhile, the boys indicated the following main causes for conflicts: teachers' disregard for the students, non-observation of the unity of words and acts and teachers' dishonesty and lying. However, there were some rarer causes for conflicts indicated by the girls and the boys: teacher's partial attitude towards a student, meticulous regulation of the activity, avoidance of responsibility, greediness, desire of possession and fear of students' errors.

In order to compare the application of conflict manifestation strategies among the students from comprehensive schools in physical education lessons, the means and standard deviations were calculated and criterion χ^2 was used for the determination of reliability between the differences By using the methodology by K. Thomas, it was determined the choice of the strategy of cooperation was different statistically reliably ($\chi^2(2) = 22.4$; $p < .05$) between the 15-16-year-old girls and boys because cooperation in the conflict solution in physical education lessons was characteristic to 50.6 percent of the students-girls and 33.3 percent of the students-boys. The obtained results allow supposing the 15-16-year-old girls try to help to realize the needs of others in conflict situations more often, adapt to the acts of others and situations better, understand the significance of acts, reach for appropriate solidarity and agreement more than the boys of the same age.

Table 3. Distribution of students according to the strategies of conflict solution in physical education lessons (in numbers and percent)

Strategy of conflict solution	Students	Strategy of conflict solution						$\chi^2(2)$; p
		Non-characteristic		Averagely characteristic		Characteristic		
		n	%	n	%	n	%	
Cooperation*	Girls	32	18.6	53	30.8	87	50.6	22.4
	Boys	65	42.5	37	24.2	51	33.3	p < .05
Competition*	Girls	63	36.6	55	32.0	54	31.4	22.8
	Boys	24	15.7	47	30.7	82	53.4	p < .05
Compromise*	Girls	42	24.4	51	29.7	79	45.9	13.9
	Boys	63	41.2	47	30.7	43	28.1	p < .05
Avoidance*	Girls	59	34.3	60	34.9	52	30.2	11.3
	Boys	33	21.6	43	28.1	74	48.3	p < .05
Adaptation	Girls	47	27.3	61	35.5	64	37.2	1.72
	Boys	36	23.5	65	42.5	52	34.0	p > .05

Note. * p < .05 – comparison of the distribution of indicators among students-girls and boys

It was revealed the choice of the strategy of *compromise* in physical education lessons was different statistically reliably ($\chi^2(2) = 13.9$; $p < .05$) between the students-girls and boys as 45.9 percent of the boys and 28.1 percent of the boys had an inclination to compromises. The analysis of the research data showed the girls were more inclined to agreements between the parties with opposite opinions or interests and they were reached with mutual concessions mostly. The data obtained about the 15-16-year-old girls allow supposing it is worth reaching for a compromise if the goals of the both parties are important equally and it is necessary to reach a temporary agreement about a complicated issue. On analysing the choice of the strategy of *competition* for the 15-16-year-old students, the obtained results showed the choice of *competition* in physical education lessons was different statistically significantly $\chi^2(2) = 22.8$; $p > .05$ between the girls and the boys: the boys used this strategy more often than the girls (53.4 and 31.4 percent, respectively). It allows supposing reasonably the boys try to satisfy their interests more often by providing the other party with the solutions that are more favourable to them. However, this strategy brings long-lasting results quite seldom as the losers often start opposing to the caused pressure. It also emerged the choice of the strategy of *avoidance* was different statistically significantly ($\chi^2(2) = 11.3$; $p < .05$) and the choice of the strategy of *avoidance* and avoidance was characteristic to 48.3 percent of the boys and 30.2 percent of the girls. These results enable stating that most boys do not tend to take any active measures during conflicts, do not defend their rights, do not discuss their solution with anybody, even often withdraw from the conflict and lose a possibility to affect the course of the situation in this way. This strategy is useful if the conflict is not related with any direct interests of the participants. On assessing the choice of the strategy of *adaptation* among the 15-16-year-old students, it was determined the assessments of adaptation were not different statistically significantly in the both groups ($\chi^2(2) = 1.72$; $p < .05$). It could be explained by the facts that both the girls and the boys accept the opponent's position in conflict situations similarly, do not tend to defend their interests and try to keep a good relation with the opponent at any price. It is supposed this strategy is only suitable if the conflict is not acute and the outcome of the conflict is especially important for the opponent.

4. Discussion

In the research, we paid the main attention to conflicts among 15-16-year-old students, their causes and ways of solution in physical education lessons. There are a lot of scientific studies (Keyes, Coleman, 1983; Van Doorn et al., 2009; Dhillon et al., 2015) emphasizing that the age of adolescence is favourable to various conflicts that are often caused by the misunderstanding of maturation, scarce true-life experience, superficiality of thinking, inability to look at life and interrelations in a deeper way. According to Yao, Enright (2018), age can be related with abstracter reasoning about conflict solution, but it is not a strong ground as most adolescents of this period still behave so that they cause social alienation and aggression in the relations.

Below, we will discuss the results of the research of conflicts among the students (girls and boys). The research revealed that the students-boys are more inclined to conflicts in physical education lessons than the girls of the same age (45.1 percent of the boys and 20.4 percent of the girls, respectively). It was possible to expect this conclusion as the results of previous studies confirm boys express hostile reactions more strongly in complicated situations and their aggressive behaviour is expressed more often (Lim, Ang, 2009). It was thought for a long time that boys are more vulnerable during conflicts than girls. However, it is discussed much about it now. It is assumed in the recent research (Archambault et al., 2017; Rahmat, 2020) the inclination to conflicts among girls and boys is different with the expression of behaviour and not with the grade of severity. These differences can occur because the sex affects the reaction to conflicts. For example, the assumption that girls are inclined to the withdrawal and concern can be supported partially and it is confirmed with our results as passiveness or even tactful behaviour is characteristic to most 15-16-year-old girls in conflict situations. According to Bujosa et al. (2018) the sex of students and adults is not considered a bigger or smaller reason for conflicts, it is also emphasized in this study a big wish to win and cheating during games is the cause for conflicts in physical education lessons. Meanwhile, Danuta (2018) determined the participation of adults in the situations that are threatening for the implementation of their goals increases negative emotions and conflict situations very often. Our work also analysed the causes for conflicts among

students in physical education lessons. After comparing the studies performed by other authors (Palujanskienė, Uzdila, 2004; LaRusso, Selman, 2011; Griesel, Hovinen, 2022) with the research of this work, it can be stated students encounter conflict situations in relation with teachers and other students at their schools almost every day. The data of our research proved quite unambiguously that girls and boys have different causes for conflicts. The girls indicated the following main causes for conflicts: blank contents of the physical education teachers' communication, tactless, rough, authoritarian style of work and insufficient attention and sensitivity to the students. Meanwhile, the boys indicated the following main causes for conflicts: teachers' disregard for the students, non-observation of the unity of words and acts and the teachers' dishonesty and lying. In this aspect, it is difficult to compare the obtained results with similar studies performed by other researchers as most of them applied different methodologies and accentuated different causes for conflicts.

For example, Čiuladienė (2006) confirms with her research that conflict behaviour of adolescents is often caused by disappointment and state of tension as they are unable to satisfy certain needs, realize goals and cope with difficulties. In the author's opinion, conflicts can also be caused by different values and needs of conflicting people and different understanding of their rights and obligations. However, the study performed by Čiuladienė (2007) must confirm the results of our research in the most exact way as it tries to reveal the frustration of needs that becomes the cause for conflicts among adolescents and their classmates, teachers and parents mostly. In this research, it should also be considered that the teachers' behaviour that prevents adolescents from satisfying the need for safety and recognition causes indirect conflict behaviour of adolescents more often. Needs-related conflicts with teachers are mostly related with the frustration of the need for safety (insulting teacher's behaviour), it is also indicated it is tried to avoid the teacher that restricts and mistrusts adolescents during the conflict. Adolescents lack their teachers' empathy very often: one fourth of the adolescents said teachers are often insensitive to students, this conclusion is also confirmed by the results of the girls that participated in our research, but it should be accentuated the previous research did not analyse any causes for conflicts in physical education lessons. However, on analysing scientific literature, the data about constructive ways of conflict solution among young people can be found much more often (Palujanskienė, Uzdila, 2004; Goštautas, Rakauskienė, 2006; Butovskaya et al., 2007; Yao, Enright, 2018; Gerstein et., 2021). There are some studies (Palujanskienė, Uzdila, 2004) stating that constructive ways of conflict solution are dominant among two hundred researched students. In a conflict situation, students look for compromises, avoid direct conflicts and cooperate. These conclusions are also confirmed partially by the data of our research as we tried to assess the strategies of conflict solution in the aspect of sex in our study, meanwhile, the previous research analysed the psychological assumptions of the ways of conflict solution among 16-18-year-old students depending on the level of their aggression. The results obtained for the girls that participated in our research allow stating they apply the strategy of cooperation in conflict situations, i.e., reach for the common solution satisfying the both parties, defend their interests, consider the opponent's wishes and look for the solution satisfying the both parties; conflicting parties accept different attitudes, listen and try to understand another opinion. Second, they accentuate the strategy of compromise. It means girls try to discuss the problem with the conflicting party and discuss by looking for the best way of solution. Meanwhile, the results of our research about boys show they first try to satisfy their interests in conflict situations by intruding a self-favourable solution to the other party, the goal can even be reached by using force, threatening to use it and ignoring any arguments of the other party. Moreover, Dhillon, Babu (2015) that analysed conflicts among 6-10-year-old children (girls and boys) from different age groups suggest that conflicts occur among older children more often and older children tend to apply more various strategies of conflict solution; it was also determined boys have conflicts more often. We cannot support this opinion as out researched were older students. Meanwhile, the data published by Palujanskienė and Uzdila (2004) showed the students that solve conflicts constructively tend to accuse themselves in conflict situations, they are first to suggest yielding, to say sorry, they are able to gain control of themselves and not to say anything insulting, rough, mocking etc. These conclusions contradict the results obtained about the boys from our research. However, to sum up the results of this part, we can state the students researched by us tend to look and find the most suitable way of conflict solution. Unfortunately, there is a lack of unanimous conclusions of researchers or certain consistency. We think more additional research would be necessary to

substantiate this assumption because there are certain differences in the research (Wang et al., 2014) analysing the ways of conflict solution in the aspect of sex.

This research has a few restrictions and we cannot help mentioning them. One of the most important restrictions of this type is the compilation of the size of the sample as the size of the sample chosen by us was small. Second, the data is only substantiated with the assessment of the students, third, the researched were only selected from schools of the big cities and it affected the generalization of the data. Fourth, on applying the quantitative research methods, we did not have a possibility to check if the obtained conclusions were confirmed to the extent of the total population. Another restriction that should be noted on deepening the knowledge about students' conflicts in physical education lessons, for example, on continuing further research, could be eliminated by interviewing adolescents of different ages both from the cities and smaller residential towns. Additional studies applying the monitoring and expert assessment methods could also be performed in order to obtain a clearer image in the analysed topics. The present scientific works prove and substantiate the complicacy of the topics of students' conflicts. Moreover, our research enabled defining further trends to researchers of conflicts in order to supplement the available knowledge in this field. Additional studies are necessary in order to reveal and make exacter answers in what way conflicts depend on the sex of students as ambiguous conclusions are made about this issue. Long-lasting studies of conflicts could be necessary so that students and teachers understand their importance in the constructive solution of conflicts. We think researchers should consider in the future if similar results are proper for the contexts of physical education lessons of younger or older students. Another development issue that should be considered additionally is the research of conflict solution and management at schools. The last trend of the future research could be the search for new conflict management models and strategies of prevention as well as checking of their effectiveness.

5. Conclusion

It was revealed all the 15-16-year-old students that participated in the research have an inclination to conflict behaviour, but it is more characteristic to the boys statistically significantly. Taking this data into account, it can be supposed boys are more inclined to confrontation during a conflict, do not want to take responsibility for their problems and tend to accuse others more often. Meanwhile, girls tend to behave in a considered, proper, consistent way in conflict situations on reaching for the set purpose.

In the girls' opinion, the main causes for conflicts in physical education lessons are blank contents of the teachers' communication, tactless, rough, authoritarian style of work and insufficient attention to the students. The boys indicated the following causes for conflicts: teachers' disregard for the students, non-observation of the unity of words and acts and the teachers' dishonesty and lying. After analysing the results of the choice of strategies of students' behaviour during conflict situations in physical education lessons, we can state that girls tend to solve conflicts in a constructive way in these situations statistically significantly more often than boys (they apply the strategies of cooperation and compromise). Boys solve conflicts in a destructive way statistically significantly more often (they apply the strategies of competition and avoidance). The analysis of these 15-16-year old students allows recommending both physical education teachers and pedagogues of other subjects to pay more attention to the analysis of causes for conflicts among adolescents in order to choose the most suitable acts of conflict solution and regulation. In order to implement this, it would first be useful for students and teachers to understand a conflict situation better and define the causing issue more clearly.

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Using Game Mechanics in Professional Training of Future Teachers Working with Gifted Children

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Abstract

One of priority tasks of modern society is creation of conditions which help identification and development of gifted children. Training of teachers during which there is an expansion of students' professional competences in diagnosing, supporting abilities and talents of learners, including learners with special educational needs, takes place within the framework of the corresponding master's program. The purpose of the study is to assess the impact of using game mechanics when training master's degree students, future experts in work with gifted children on the quality of their professional training.

The methodology is based on the analysis and generalization of scientific literature on clarifying the essence and potential of the phenomenon of "gamification of education" in the context of UNESCO recommendations and development of the digital school, clarifying principles of game mechanics and their limitations for didactics in general and when teaching learners with special educational needs. For practical implementation of game mechanics the mechanics "Achievement", "Joint research", "Restraining factors", "One time fun – always fun", "User progress" were chosen.

Research results. Gamification of activities of master's degree students of the experimental group is presented by the authors both in the "computerless" format (business or board game, research project, etc.) and in the Kodu Game Lab environment.

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In conclusion the directions for improving training of master's degree students, future teachers working with gifted children are described.

Keywords: gamification, digital school, learners with special educational needs, game elements, Kodu Game Lab.

1. Introduction

The relevance of the study is determined by the following factors:

1. UNESCO recommendations, international rules in the field of education determine that innovative pedagogical technologies (e-learning, distance learning, m-learning, artificial intelligence, gamification, etc.) and digital services provide additional didactic potential to enrich learning-organizational forms (17 Goals to Transform Our World, 2022). These recommendations also include training formats in the context of the COVID-19 pandemic.

2. A special role in realizing the potential of new pedagogical and information technologies is assigned to the mentor/tutor of the digital school (Soboleva i dr., 2017). According to A.V. Kirilenko, a modern teacher needs to have the ability to quickly change approaches to education and development of students, including learners with special educational needs (Kirilenko, 2020). These conclusions largely coincide with the recommendations of UNESCO, the content of the Digital School passport, as part of the Modern Digital Educational Environment project. The provisions of the project define the priority areas that should be guided by innovative teachers when designing lessons, task systems and related educational resources (Pasport Federal'nogo Proekta «Tsifrovaya Shkola», 2018). In particular, the digital school mentor is encouraged to use information technology to identify and develop abilities and talents of students.

3. One of options for special training of teachers who work with gifted children, experts in the image of the future child in the Russian system of higher education is the master's program 44.04.01 Pedagogical Education. Pedagogy of giftedness (Federal'nyj gosudarstvennyj obrazovatel'nyj...). In accordance with the federal state educational standard of higher education in this area, the work programs involve studying the theory and technologies of working with gifted children, methods and techniques for developing their research activities, self-development techniques, gaining experience in managing pedagogical projects and digitalizing science education, developing skills and computer game development skills.

4. Some scientists, in particular, T.H.S. Eysink, A.M. van Dijk, T. de Jong, conduct studies that substantiate the need for gamification when teaching gifted children (Eysink et al., 2020). The authors describe the project of organizing the educational environment "BE COOL!", which combines various game mechanics and information technologies.

5. N.A. Zvonareva, G.S. Kupalov note that gamification of education necessitates the teacher to solve a whole range of problems: technical, methodological, and organizational (Zvonareva, Kupalov, 2021).

Thus, the use of game mechanics in teaching master's degree students, future experts in work with gifted children is not only a compliance with the priorities of the international educational community, but also implementation of the didactic potential of new pedagogical and digital technologies to improve quality of education, development of students, including learners with special educational needs.

1.2. Objectives of the research

The purpose of the work is determined from the need to assess the impact of using game mechanics when training master's degree students, future teachers working with gifted children on quality of their professional training.

Research objectives:

– to clarify the essence and potential of the phenomenon of “gamification of education” in the context of UNESCO recommendations and development of the digital school;

– to study the principles of game mechanics and their limitations for didactics in general and for learners with special educational needs;

– to describe the stages of systematic targeted work on using game mechanics in education;

– to experimentally confirm effectiveness of the proposed system of work and the didactic potential of game mechanics for improving quality of professional training of master's degree students, future teachers working with gifted children.

2. Relevance

2.1. Literature review

The literature analysis was carried out in the following directions:

1) clarifying the potential of gamification resources for education, professional activities of a digital school mentor in the context of international priorities;

2) studying the experience of using innovative pedagogical technologies for identifying and developing gifted children.

2.1.1. Analysis of Russian scientific and pedagogical literature

When studying the didactic potential of game mechanics and related software solutions, it was revealed that one of principles of modern education is stimulation of the cognitive activity of adolescents, the so-called "Generation Z", when using innovative pedagogical and computer technologies (Krainyukov, 2019). A feature of teenagers of the "Generation Z", according to the author, is the clip-like thinking. This is manifested through their passion for video games, short stories, animated videos. E. K. Gerasimova et al. describe methodological difficulties of organizing the learning process and preparing graduates for the new digital society: a decrease in the interest of schoolchildren to study theoretical material, scientific concepts, facts, laws, etc., irritation after long routine work when doing mathematical calculations, distraction of attention to external factors, communication in social networks, chats of mobile games (Gerasimova et al., 2021).

When studying the practice of applying innovative pedagogical technologies for identification and development of gifted children, we note the experience of G.L. Parfenova, O.G. Kholodkova, Yu.A. Melnikova. They determine that inclusion of games in work with talented schoolchildren is, firstly, one of the labor functions of a mentor in conditions of informatization of society, and, secondly, an important aspect of improving quality of education (Parfenova i dr., 2019).

Summarizing domestic pedagogical experience, M.A. Maznichenko et al. note that working with gifted children may require teachers to use both traditional (for example, demonstration, experience, excursion, etc.) and non-traditional (folklore, mythology, films, games) teaching methods (Maznichenko et al., 2021).

In particular, according to G.I. Fazylzyanova, T.Yu. Sokolova, V.V. Balalov, it is recommended that a digital school mentor use information technology to identify, develop abilities and talents of students (Fazylzianova i dr., 2021).

The description of the essence of gaming technologies for didactic purposes, identification of criteria and principles for designing a gaming lesson at university is presented in the work of N.V. Makarova (Makarova, 2021). She points out that "game" is a multifaceted concept, and "game for didactic purposes" implies an extremely accurate choice of content, software services, and special training of the presenter. N.V. Makarova analyzes earlier studies of gamification, supplementing and developing the conclusions of the authors in relation to university training (Soboleva et al., 2017).

N.V. Makarova formulates the ideas of the "7k" conception: the quality of knowledge, cognitive activity, control, correction, teamwork, competition, communication (Makarova, 2021). The scientist emphasizes that only indispensable implementation of these seven principles contributes to the maximum didactic effect of including game mechanics in higher education. She also highlighted the problems of gamification: ambiguity of decisions of the game teacher/presenter, transfer of negative emotions between the participants from the gaming space to everyday interaction (rivalry, threats, etc.), limited time resources for both the teacher and students.

Ya.N. Poddubnaya, K.S. Kotov, A.A. Slukina consider gamification not only from the position of historical development, but also to identify possibilities of including game mechanics in the arsenal of teachers of higher educational institutions (Poddubnaya i dr., 2021).

As part of the second direction, when analyzing the literature, special attention was paid to justification that work with gifted children may require teachers to adapt existing digital services, information materials, game mechanics to educational needs of students (Balakireva, Mogilevich, 2021).

V.S. Yurkevich notes that the problem of development of gifted children is the difficulty of turning their increased mental abilities into real creative abilities (Yurkevich, 2021). The author proposes the idea that a special "search need" should be considered as the basis for motivating such learners with special educational needs. This need is formed through overcoming situations of

misunderstanding by a gifted child when a mentor uses a special style of interaction, through the possibility to choose the level of difficulty of tasks, relative freedom in learning and the obligatory change by the teacher of the knowledge assessment scale (Gali et al., 2019).

E.V. Shmeleva substantiates the need to develop a holistic model of work with gifted children in the digital environment as an important condition for supporting the welfare of the population and ensuring national security. At the same time, there are also opportunities for achieving sustainable development goals (Shmeleva, 2018).

Due to the fact that implementation of the creative, developmental orientation of education according to the recommendations of UNESCO, the content of the passport of the "Digital School" makes high demands on the teacher professionalism, the inclusion of game mechanics in the educational, pedagogical, research, managerial, methodological activities of master degree students, future experts in working with gifted children can contribute to improving the quality of their training in general.

2.1.2. Analysis of foreign studies

The comprehensive and systematic study carried out by M. Del Carmen Pegalajar Palomino was highlighted when clarifying the potential of gamification resources for education, professional activities of a digital school mentor in the context of international priorities. It provides an overview of the most significant approaches to the gamification of higher education for scientific theory and practice (Del Carmen Pegalajar Palomino, 2021). The author analyzes the didactic potential of game strategy, dynamics, mechanics and elements of the game through students' ideas about them. R. W. Mee Mee et al. conduct a similar research on the exmple of school education in Malaysia (Mee Mee et al., 2021). The authors conclude that the concept of gamification is widespread due to development of information technology, software, video games and gaming applications. Gamification involves not only creation of games, but also transformation of the learning process into an exciting adventure for obtaining new theoretical information.

P. Lameras et al. present the results of the study and assessment of natural sciences teachers' opinions regarding the influence of the Simaula environment on the quality of education (Lameras et al., 2021). The authors considered the following possibilities of the game resource: identifying interests, needs and motives of schoolchildren; support of creativity and independent activity, basis of research projects, support for studying and accumulation of theoretical knowledge. Summarizing the findings, P. Lameras et al. conclude that the didactic effect in each direction depends on seven components: the format of training; position of the teacher; role of the student; material for the content of the game world; game mechanics; feedback mechanisms and game uncertainty. Thus, the choice of game mechanics is an integral element of effective game interaction in the learning space. The results Ootained by P. Lameras et al. largely coincide with the conclusions of J. Swacha et al. about effectiveness of gaming technologies in relation to new challenges in the field of education (Swacha et al., 2021).

J. Swacha et al. describe benefits of game-based learning for achieving sustainable development goals (Swacha et al, 2021). Using the example of the Eco City project, the researchers identify the didactic possibilities of gamification for formation of technical skills, information and analytical activities. S. J. Viudes-Carbonell et al. study complexity of designing and developing games that are focused not on entertainment, but on obtaining new theoretical knowledge or developing a skill (Viudes-Carbonell et al., 2021). The scientists notice that there are a significant number of educational games, however, their creators did not always manage to fully implement the principles of didactics, interactivity, and the feedback mechanism. In their opinion, it is necessary to improve the methodology for tracking the dynamics of the state of the game (according to the game mechanics), obtaining operational feedback.

S. Kadum, E. Kopas-Vukašinović, A. Miljković explore the problems of teachers' readiness to work with gifted children (professional, emotional, methodological components) (Kadum et al., 2021).

The work of N. Tanik Önal, U. Büyük discusses various aspects of the interaction of learners with special educational needs: with each other, with parents, with teachers, with peers. The authors give real examples of situations of success and stress, conflicts in the team and personal problems (Tanik Önal, Büyük, 2020). J. van Tassel-Baska, C.G. Quek and A.X. Feng describe the specifics of the work of teachers with parents of learners with special educational

needs. Their study confirms that the task of parents and mentors working with gifted students is to create a common space for cooperation (van Tassel-Baska et al., 2006).

Thus, the analysis of the scientific works listed above makes it possible to identify the problem associated with the need for additional study of using game mechanics when training specialists who work with gifted children.

3. Materials and methods

3.1. Theoretical and empirical methods

The following methods were used in the work: theoretical analysis and generalization of literature to describe the essence and potential of the phenomenon of "gamification of education" in the context of UNESCO recommendations and development of the digital school, to clarify the principles of game mechanics and their limitations for didactics in general and for learners with special educational needs.

The base of the experiment is Vyatka State University, Pedagogical Institute (Faculty of Pedagogy and Psychology). The study involved 44 students, future experts in upbringing and development of gifted children, when they did the course "Development and application of computer games in education." In addition, the acquired knowledge and skills on including game mechanics in the education of learners with special educational needs were used by master's degree students during the pedagogical practice. The bases of practice are: Center for additional education of gifted students, secondary school No. 47 with in-depth study of individual subjects (Kirov), Vyatka humanitarian gymnasium, school for gifted children "Intellect" (the Oryol region), School for gifted children "Leonardo" (Oryol), Oryol State Institute of Culture (Department of Documentary Communications and Social and Cultural Activities).

The study was conducted in 2020–2022. From October to December 2020 (during the COVID-19 pandemic) it was carried out using distance learning technologies. Fundamental factors for including game elements in non-game contexts when training master's degree students – future teachers who work with gifted children: game mechanics (rules) and players.

When designing game educational spaces, the following logic is implemented: Determining the state of the system, Evaluating the states before and after making decisions (based on information obtained during the game cycle), Changing the state of the game (action according to game mechanics), Feedback (player – system, player – player, player – presenter).

For practical implementation of game mechanics, the mechanics "Achievement", "Joint research", "Restraining factors", "One time fun – always fun", "User progress" were chosen.

To identify the control and experimental groups the authors carried out a measurement, the principles and content of which are disclosed in the research program.

The levels "high", "low", "medium" were introduced to determine the quality of training of future specialists. The methodology for determining the levels is described below (program and results of the study). The average age of the respondents was 24 (50 % women and 50 % men). The size and composition of the sample is justified by the specifics of the study. When characterizing the relationships of the features under consideration, nonparametric statistical criteria are used, in particular, the Pearson's chi-square coefficient – $\chi 2$.

3.2. The base of research

The main purpose of the experiment is to test the didactic potential of including game mechanics in the organization of educational, pedagogical, research, managerial, project, methodological activities of master's degree students, future teachers working with gifted children, and to assess changes in the quality of their professional training. 44 students of the training program 44.04.01 Pedagogical education. Pedagogy of giftedness (master's degree level) were involved.

Integration of gaming applications into training was carried out in the same classrooms, using the same equipment and software.

The materials for the test were developed by the authors in accordance with the current standard of higher education in the field of the study.

3.3. Stages of research

At the preparatory stage of the experiment the didactic potential of gamification was determined both for higher education and for the development of gifted children.

The conditions and limitations of including game mechanics in the training of master's degree students were analyzed (readiness of students to design game educational spaces, technical level for implementing the code in a visual constructor, desire for creativity and professional growth).

An important aspect of the study is the subsequent use of games in practice for teaching children, including learners with special educational needs. In this context the materials and results of international, all-Russian projects have been studied. For example, the content of the project "Gifted children – a prosperous Russia" for small settlements of the Khanty-Mansiisk autonomous district, works and nominations of the international competition for gifted children "Young Talents – 2021", etc.

The necessary theoretical material was selected (the history of the formation of gaming, types of game strategies, principles of the game, etc.).

The following software tools are considered: Scratch, Blockly, MS PowerPoint, LearningApps.org, Kodu Game Lab.

Then the authors compiled tasks for the measurement event, based on the results of which it would be possible to form the control and experimental groups. The principles of selecting and designing tasks take into account the content of pedagogical, psychological and philosophical disciplines, the theory and technologies of work with gifted children; trends in the digitalization of education; ideas about the didactic potential of gaming technologies; meta-skills (for example, creativity, awareness and the ability to find a way out of unforeseen situations); features of using digital services in professional activities.

In total, during the test the participants were asked to solve 4 tasks (the corresponding wording and evaluation criteria are presented in the part 4.3.1.). For the correct answers of the first and second tasks the student could receive maximum 3 points. The solution of the third and fourth tasks was evaluated using 5-point scale.

So, as a result of the initial diagnosis, each participant scored from 0 to 16 points. Based on the measurement results the quality of training of future experts who work with gifted children was determined.

It was decided to understand the quality of training as the correspondence of the level of training of the teacher to the requirements of the professional environment in which he/she will work.

Methods for determining the level: from 0 to 6 points (inclusive) – "low", from 7 to 12 points (inclusive) – "average" and in all other cases – "high".

Thus, it was possible to collect data on 44 master's degree students, from which experimental and control groups were formed (22 people in each). The experimental group consisted of 50 % women and 50 % men.

The second stage was devoted to correlating the topics of the course "Development and application of computer games in education" with the peculiarities of organizing training of teacher who work with gifted children.

The third stage of the study covers training of students to develop and use computer games in the didactic process.

4. Results

4.1. Key ideas and structure of the discipline "Development and application of computer games in education"

Game technologies for educational purposes are studied by students of the training program 44.04.01 Pedagogical education of various master's programs when they design and develop computer programs with interactive, visual components. Game elements in a non-game context are used by higher education teachers both as a means and as an object of learning.

We emphasize that it was decided to understand the quality of training as correspondence of the level of training of a teacher to the requirements of the professional environment in which he/she will work.

The following is the structure of the course "Development and application of computer games in education", the training program specialization "Pedagogy of giftedness". By the beginning of the

course, master's degree students (both experimental and control groups) have already studied the materials of the disciplines "Pedagogy and psychology of creativity", "Theory and technologies of working with gifted children", "Technologies for development of research activities of gifted children", etc.

I stage. Pedagogy of the game, the history of gamification in the world and Russia. The game state of the educational space, game elements, mechanics and other basic components of games.

II stage. Analysis of priorities and directions for the development of international education (recommendations from UNESCO and the Organization for Economic Cooperation and Development (OECD), the activities of Erasmus Mundus, centers for supporting creativity and talents) in terms of gamification of knowledge, including learners with special educational needs.

III stage. Inclusion of game mechanics in studying digital services for professional activities (Online Test Pad, mind maps, applications for quick survey and reflection, NearPad, Prezi, Scratch, LearningApps.org).

IV stage. Technical implementation of game rules and interactions for organizing work with gifted children in the Kodu Game Lab constructor.

V stage. Application of software solutions in the course of pedagogical practice.

VI stage. Discussion of the results of including game elements in work with gifted children. Participation in master classes, competitions, open lessons to present game applications.

It is worth noting that the structure of the course takes into account the fact that the academic semester is interrupted by practice in schools, educational centers, camps, etc.

In general, the game mechanics is understood as a set of rules and methods that support the interactive interaction of participants in the game educational environment and the game space itself (characters, design, plot).

At the heart of the "Achievement" mechanics there is a material/virtual expression of the result of the player's action. Achievements are considered by the game educator either on their own or as rewards. For example: a hint during a test, an assessment, additional time to prepare an answer, the possibility to “change” a ticket in an exam, etc.

The mechanics of "Joint research" involves searching a solution to a task, overcoming obstacles.

The "Restraining factors" mechanics is used to ensure that the player (student) corrects the system of own actions. For example, if a participant is significantly and without good reason late for a lesson, then a question is added in the final test of the course.

The “One time fun – always fun” mechanics is focused on achieving the opposite effect: repetition of simple actions that give the game participant positive emotions.

In the "User Progress" mechanics the achievements of the participant in the game educational space are tracked when solving a series of tasks.

Implementation of game mechanics took place both in a "computerless" way (business or board game, research project, etc.), and in the Kodu Game Lab environment. The latter was chosen based on the following criteria: paid/free content, intuitive interface, the need for knowledge of programming languages, support for the rating/points/awards system, the possibility to work offline without the Internet, compliance with the logic of the selected game mechanics.

In addition, the selected visual constructs support the development of 3D games and animated 3D scenes. This circumstance is of no small importance in training and developing gifted children, since they themselves and their parents are oriented towards the professions of the future. For example, a moderator, a game master, a science artist, a startup mentor, a personal tutor in aesthetic development, etc. These professions assume that a graduate of the digital school will be proficient in the basics of working with XBox game consoles and computer design elements.

4.2. Stages of systematic targeted work on the application of game mechanics in education

Let us consider in detail the stages of applying game mechanics in the study of digital services for professional activities and options for designing game worlds (including those for learners with special educational needs) in the Kodu Game Lab constructor.

At the preparatory stage of the study the course teacher chose the mechanics "Achievement", "Joint research", "Restraining factors", "One time fun – always fun", "User progress".

The mechanics "Achievement" can be effectively implemented when studying the system of paragraphs, sections, chapters. For example, if the school uses a textbook that has 24 paragraphs with questions and assignments, 2 review works, and at least 3 tests. In addition, electronic textbooks, tests, tasks with a detailed explanation may be involved. It is useful for the teacher to introduce a separate grading system, for example, as follows:

- for answering a theoretical question a student receives 2 points (the answer is full and correct, confident);
- for correct, independently solved problem, a student receives 3 points (methodologically correct solution, i.e. there is a short note, a detailed graphic explanation, the answer is in the appropriate units of measurement);
- an additional report on the topic – maximum 3 points (the report is structured, correctly designed, logical and reasonable conclusion);
- correct performance of test tasks – each participant receives 2 points.

Based on the results of using this mechanics in the course "Development and application of computer games in education", a score rating was formed for the master's degree students of the experimental group. Before the exam the game teacher chose three winners. They were offered the following prizes: teacher's help in preparing a research paper, access to additional information sources at the next test, etc. For the rest of the participants in the experimental group, the bonus was an increase in the time to prepare and defend the game project.

The "Joint research" mechanics in the course "Development and application of computer games in education" was used to master the functionality of the new software tool by the students of the experimental group. The game teacher prepared a route sheet for studying, for example, Kodu Game Lab. Following the instructions, the participants (or the group) could design their own learning path: the pace, the quality of problem solving, number of game levels. A variant of the sequence of steps in the instructions: launching the application; creation of "New World"; work on the basic playing field with the tools "Hand", "Brush"; scaling; removing and adding new fragments to the base field; studying icons for creating and changing the landscape of fields, adding a reservoir; saving the game world.

The following is a variant of applying the game mechanics "Joint research" in work with gifted children (from the report of the master's degree students of the experimental group on practice at the school for gifted children "Leonardo"). Research problem: determine the height of the tree if the length of the shadow and the height of the researcher are known. Motivation: Test Jules Verne's theory presented in the novel "The Mysterious Island", where the engineer measured the height of the Distant View site. Place of the game: school stadium or the nearest park (alley). The teacher divides all students into 3-4 groups in advance by drawing lots according to colored flash cards (resource https://color.adobe.com/en/explore) or based on the class list (https://ciox.ru/split-a-list-into-groups).

In class the teacher identifies the trees to be measured. There is a clear explanation of the rules, goals and objectives for the game. Necessary measuring instruments and tools are selected. The homework task is to arrange the research materials in spreadsheets. The use of mechanics provides additional opportunities to rally the team, to show cognitive/physical activity, to test research abilities and non-standard thinking skills, to gain new knowledge in a playful way. The winners can be awarded according to the option specified earlier for the "Achievement" mechanics.

To explain the game mechanics of "Restraining Factors" we will describe the content of the game "Contact". The game teacher thinks of a concept (noun, common noun, singular) and calls out loud its first letter. The task of participants is to guess the term/definition by remembering other words starting with this letter, asking additional questions. The task of the presenter is not to reveal the following letters in the word to the players as long as possible. For example, letter «C". One of players asks the question: "Is this a direct continuation of the plot, the second part?". The game educator needs to quickly figure out what the player means and say: “No, it is not a Sequel (if it was a Sequel, then you should admit it). Other players also ask questions. And, if they understand before the teacher what “Sequel” is meant, then they say: “Contact” or “There is contact”. Next, participants count in chorus to ten, and then call the word. If at least two opinions of students coincide, then the game teacher, according to the rules, reveals the next letter. The prerequisite for the game (deterrent) is “contact” between two students.

The mechanics “One time Fun – Always Fun” can be used to reinforce previously acquired knowledge. Students, moving around the classroom, at each step (turn, bow) name a term, concept, phenomenon, etc. from the studied material. For example, gamification, game technology, game plot, game genre, etc. The condition for implementation of the mechanics is that participants repeat the same simple (pleasant) action several times.

The mechanics "User Progress" allows in a playful way to check the quality of memorization of rules, algorithms by students. Possible course of the game:

1. The teacher, using a random number generator (https://randomus.ru/), determines the main character – the Player.

2. The player leaves the classroom for a while. At this time necessary items and tools are being prepared.

3. The teacher and other participants choose an algorithm, a rule that can be implemented using the available materials. For example, the algorithms "Towers of Hanoi", "Carrier", "Linear search for an element", "Sorting by the simple exchange method", etc. Practical situations in which this algorithm can be useful (in education, at home, while traveling) are thought out.

4. The player enters the classroom. The teacher explains what he/she should do (find the necessary tools; guess the algorithm). The rest of the students tell the Player the possible application of this method, algorithm in life. The player makes guesses.

5. The guessed algorithm/method is demonstrated by the Player using the selected materials. For recording and design, virtual boards can be used (https://limnu.com/, https://www.twiddla.com/).

The mechanics allows to test retained knowledge. During one lesson master's degree students (from the experience and practice at the Oryol State Institute of Culture) played two or three games with different methods, algorithms, and sets of rules. The participants of the experiment noted that this form of control effectively develops logic, memory, thinking, and intelligence; communication skills and digital skills are formed.

For the technical implementation of game mechanics the master's degree students were offered the visual constructor Kodu Game Lab. Let us give an example of one of the game projects that was designed and applied during pedagogical practice by future experts who work with gifted children (the experimental group).

The project is one of the schools for gifted children "Intellect": Create a game world "Minotaur's Labyrinth", in which the brave Theseus overcomes trials, meets Ariadne and receives a ball of threads from her, looks for a way out of the labyrinth, collects various flowers (narcissus, rose, hawthorn, laurel, dill, etc.) into a wreath for girl. The project implements all the previously discussed mechanics:

- "Achievement" – overcoming all the trials, passing the levels of the labyrinth (by receiving points) and receiving a reward;
- "Joint research" – solving problems of a problematic nature: to do a "puzzle", to decipher the rebus;
- "Restraining factors" – when moving, it is necessary to take into account that the Minotaur is hiding in the labyrinth. Violation of the boundaries of the labyrinth, collision with the wall, wrong decision - and the player will meet the monster;
- "One time fun – always fun" – the right decision, completing tasks are seen as an opportunity to get a flower for beautiful Ariadne;
- "User progress" – the content of each task, the plot of the game allows to check the previously acquired knowledge, formed skills.

4.3. Experimental assessment

4.3.1. The ascertaining stage of the experiment

Specially designed control and measuring materials were used to assess the input conditions. The tasks were formulated according to the following principles:

- quality of knowledge in pedagogy and psychology, theory and technology of work with gifted children;
- understanding of international and Russian trends in the digitalization of education;
- ideas about the didactic potential of gaming technologies, pedagogy of the game;
- information search, analysis and ability to argue one's position;

- mastering digital services in educational, cognitive, professional activities.

Task examples.

Task 1 (knowledge of gamification terms, relevant techniques and methods, game elements, rules and algorithms). For example, give options for rewards, punishments to stimulate the player. Or, from the proposed list of scientists mark those who used game techniques in teaching. The student could get maximum 3 points.

Task 2 (fundamentals of informatization of education, possibilities of software tools for upbringing and development of the individual, personalization of learning by means of information technology). For example, list functions and options for using digital technologies in pedagogical assessment at the stage of reflection. The maximum score is 3 points.

Task 3 (application of software for gamification in professional activities when working with gifted children). For example, develop a quiz (to test knowledge in a playful way) and describe the methodology for working with it. The student could receive maximum 5 points.

Task 4 (analysis, reasoning and independence of judgments). For example, imagine that you are a novice game master and organizer of work, including with learners who have special educational needs. It is necessary to choose a software tool that every student in the class could master and apply to visualize their project activities (MS PowerPoint, NearPad, Prezi). Justify your choice (orally, in writing, in electronic form). The score is maximum 5 points.

So, as a result of the initial diagnosis, each master's degree student scored from 0 to 16 points. Based on the measurement results, the quality of training of future experts who work with gifted children was determined.

Thus, it was possible to collect data on 44 master's degree students, from which the experimental and control groups were formed (22 people in each). The experimental group consisted of 50 % women and 50 % men.

4.3.2. Forming stage of the experiment

This stage of the experiment was devoted to determining the structure of the course "Development and application of computer games in education". The educational needs and technical possibilities of potential practice bases were analyzed. In particular, it was revealed that the Vyatka Humanitarian Gymnasium plans to actively use game elements in the study of foreign languages. School for gifted children "Leonardo" (Oryol) plans to use it for attracting master's degree students to conduct trainings on self-determination and webinars on intercultural communication. The regional school for gifted children "Intellect" (the Oryol region) is focused on holding game events for formation of emotional intelligence, development of creative abilities, stress management, attention and concentration management.

The methods for determining the level: 0 to 6 points (inclusive) – "low", from 7 to 12 points (inclusive) – "average" and in all other cases – "high".

Master's degree students of the control group did I and II stages of the course "Development and application of computer games in education" in the same way as the experimental one. However, the study of digital services for the pedagogical activity, the functionality of the Kodu Game Lab constructor, internship, participation in master classes, competitions did not imply the purposeful inclusion of game mechanics in professional training.

4.3. 3. Control stage of the experiment

To check the compliance of the level of training of the future expert who work with gifted children with the requirements of the professional environment in which he/she will work, the test was carried out. As a result of the diagnostics each master's degree student scored from 0 to 16 points.

The number of tasks, principles of their compilation and evaluation are described earlier. Information about the results of testing the quality of training of teachers who work with gifted children before and after the experiment is presented in Table 1.

The following hypotheses were accepted:

- H0: the level of training of teachers who work with gifted children in the experimental group is statistically equal to the level of teachers in the control group;
- H1: the level in the experimental group is higher than the level of the control group.

Table 1. The results of the level of preparation of master's degree students

Level	Groups			
	Experimental group (22 master's degree students)		Control group (22 master's degree students)	
	Before the experiment	After the experiment	Before the experiment	After the experiment
High	2	7	3	4
Average	5	12	5	7
Low	15	3	14	11

In the online resource (http://medstatistic.ru/calculators/calchit.html) the values of the criterion were calculated before ($\chi 2obs.1$) and after ($\chi 2obs.2$) the experiment. For $\alpha = 0.05$, according to the distribution tables, $\chi 2crit$ is equal to 5.99. Thus, we get: $\chi 2obs.1 < \chi 2crit$ ($0.23 < 5.99$), and $\chi 2obs.2 > \chi 2crit$ ($6.71 > 5.99$).

Therefore, the shift towards improving the quality of professional training of future experts who work with gifted children can be considered not accidental.

5. Limitations

The selection of master's degree students was not random: the experimental and control groups were formed in such a way that each group was guaranteed to have the same knowledge and skills that form the basis of the professional competences of the teacher who work with gifted children.

In the course of diagnostics the results of the input control test were taken into account. The selection of participants for the experiment and the sample size are justified by the specifics of the study, the correspondence of the practice base (its divisions) to the the specialization of the training program; availability of modern materials and technical base for providing effective gamification of education. In addition, the use of game mechanics, development of games for educational purposes is included in the training program for a limited number of specialties.

Throughout the experiment practical activities on using game mechanics in the professional training of future teachers who work with gifted children were carried out by the same teacher, on the same software equipment, in special classrooms.

The implementation took into account the basic principles and stages of developing an educational project, functionality of software services and platforms that have didactic potential for gamification of learning, including for learners with special educational needs.

6. Discussion

The study made it possible to clarify the didactic potential of gaming technologies for designing individual and collaborative activities of students (both master's degree students and gifted children):

- activation of cognitive interest;
- strengthening of interdisciplinary connections (history, literature, informatics, physics, etc.);
- development of demanded personality traits (diligence, desire for self-development and self-improvement, resourcefulness, organization, etc.);
- formation of communication skills (in interpersonal communication and group work).

Performing the qualitative assessment of the results of the control test, we note that 32 % of the master's degree students of the experimental group had a high level of preparation for the requirements of the future professional environment. Initially, this percentage was equal to 9 %. The share of students whose quality of future professional training was initially defined as "low" qualitatively decreased from 68 % to 14 %. In the control group the changes are less significant. For example, the proportion of students who have high level increased by 4 % (from 14 % to 18 %), low level decreased from 64 % to 50 %.

Of course, restrictions for applying game mechanics were formulated. For example, when teaching master's degree students: compliance with the training program, field of professional

activity and features of functioning of the practice base. When working with gifted children: discussion of used game forms with the administration of the school (center), parents, taking into account individual and psychological and physiological needs of students.

The research materials correspond to the priority areas of the activity of UNESCO and OECD, Erasmus Mundus, centers for supporting creativity and talents in terms of gamification of education, including for learners with special educational needs (17 Goals to Transform Our World, 2022).

The obtained results correspond to the conclusions of N. V. Makarova about the potential of didactic games for higher education (Makarova, 2021) and develop the ideas of P. Lameras et al. regarding the influence of game strategy, mechanics, dynamics on the quality of education (Lameras et al., 2021). The proposed version of gamification can be part of E. V. Shmeleva's holistic model of working with gifted children in the digital environment (Shmeleva, 2018).

7. Conclusion

Work with gifted children assumes that the digital school mentor will be able to show flexibility of thinking, creativity, professional skills, and the ability to apply innovative pedagogical technologies. The complexity of implementation of these areas of activity is determined by the presence of a wide range of problems in teaching learners with special educational needs: the complexity of diagnosing giftedness (talent), the choice of methods and means of development, the difficulties of socializing gifted children in a peer group, etc.

Innovative pedagogical technologies (gamification, m-learning, flipped classroom, etc.) enrich didactic tools of the teacher, provide additional opportunities for both organizing individual and joint work. Obtaining theoretical knowledge on gaming technologies, developing skills in working with digital services for gamification of work with gifted children, experience in participating in competitions and festivals for presenting/self-presenting gaming educational solutions is an important stage in the professional training of master's degree students of the training program 44.04.01 Pedagogical education. Pedagogy of giftedness (Federal'nyj gosudarstvennyj obrazovatel'nyj...).

The significance of the present study lies in the following:

– the possibility and expediency of using game mechanics in the preparation of master's degree students, future experts who work with gifted children, is substantiated;

– a variant of integration of game mechanics into educational, design, research and educational and entertainment activities of learners, including those with special educational needs, is presented.

When discussing the results of the experiment and clarifying the didactic potential of gamification, relevant digital services for professional training of master's degree students, it was found that the described system of actions has real possibilities for:

- improving the quality of knowledge in pedagogy and psychology, theory and technology of work with gifted children;
- enrichment of the methodological complex for identification of giftedness at different age stages;
- development of own educational solutions on problems of digitalization;
- development of information and communication literacy skills.

Possible directions for improving the presented option of including game mechanics in educational, design, research and practical activities of master's degree students, future experts who work with gifted children may be the following:

1. Consider game mechanics not only for reward (positive motivation), but also for punishment. For example: "Non-reward" (the player who breaks the most devices/instruments during the study does not receive points), or "Quarantine" (the player who most often violates rules of network interaction or interpersonal communication is temporarily isolated).

2. Apply game mechanics in related disciplines of the master's program. For example, "Organization of educational start-up projects".

3. More actively present results of game solutions at festivals of pedagogical skills or competitions for gifted children.

Of course, the use of game elements in non-game contexts will require additional labor, time, and financial resources from both the teacher of higher education institution and the master's

degree students, however, positive emotions after winning a game, competition, festival significantly contribute to intensification of professional development.

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Do Physical Education Teachers' Family Income Predict Their Social Communication and Perceived Working Environment?

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Abstract

Making the career choice to join the teaching profession is usually encouraged by intrinsic motives. Although external motives are less important, they are also worth considering. Among the latter, the role of teachers' income in their professional activities has been less studied. This article examines the family income of physical education teachers, along with their social communication and perceived working environment, and presents an analysis of the association between these factors. The study methodology included a cross-sectional questionnaire survey of physical education teachers. The research sample included 310 physical education teachers aged from 18 to 68 years (43.6 % female). It was found that fewer than half of the physical education teachers surveyed considered their family income sufficient. The study findings revealed that teachers' income was related to their social communication: those with less income tended to be openly negative about other people and mutual interaction. It was found that half of the physical education teachers worked under considerable pressure. Additionally, the study results revealed that evaluation of family income was statistically significantly associated with experienced tension at work and perceived working environment. Specifically, more teachers who assessed their income as insufficient indicated that they experienced a large amount of stress at work, and also demonstrated more negative attitudes towards their working environment.

Keywords: physical education teachers, teachers' income, social communication, teachers' attitude to their work.

1. Introduction

Although a teacher's role has changed over time, it remains a crucial element in the education of younger generations. Recent social and economic developments have imposed new demands on

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the education system, in general, and the teaching profession, in particular; nevertheless, the motives for choosing this career have not changed appreciably. Research has demonstrated that making the career choice to join the teaching profession is usually encouraged by such intrinsic motives as the desire to work with children, a wish to help and support students, a passion for teaching, the hope of contributing to society, or a sense of altruism (Gicheva, 2022; Fray, Gore, 2018; Sharif et al., 2016). Although external motives are less important, they are also worth considering. Previous studies have established that when teachers choose a place to work, they tend to prioritise job security, flexible working hours, the ability to balance salary, and working conditions (Fray, Gore, 2018; Dundar, 2014). Moreover, poor salaries and professional development prospects have been identified as major factors leading to withdrawal from the profession (Arviv Elyashiv, Navon, 2021; Dundar, 2014; Hassan, Mehdi, 2016; Panagopoulos et al., 2014). In light of these findings, the teachers' income factor in the context of their professional activity is somewhat complicated.

Notably, only limited scholarly attention has centred around the role that teachers' income plays in their professional activities. One study has reported a relationship between student achievement and teacher salary (Loeb, Page, 2000), but the authors cautioned that causality was very difficult to evaluate. A more recent study highlighted the complexity of the relationship between salary and teaching quality in the author's observation that salary was not always directly related to effective teaching and student outcomes (Hanushek, 2016). However, while school teachers' remuneration may be tied to the quality of the schools where they teach, this aspect primarily reflects the financial capability of an educational institution to recruit better teachers (Arviv Elyashiv, Navon, 2021; Hanushek, 2016) rather than the driving motivation behind a teacher's choice to join the staff of a particular school, a decision that goes beyond salary considerations, including intrinsic motives and administrative support (Viano et al., 2021). Other studies have focused attention on the involvement of teachers in their work (Bakker, Bal, 2010), how they perceive their working conditions, and teacher communication and cooperation (Toropova et al., 2021). Although various scholars have demonstrated that engaged teachers are more likely to contribute to the life of the school (Parker, Martin, 2009) and less likely to leave the profession (Mérida-López et al., 2020), issues surrounding the role of teachers' income remain relevant in the school context.

Current public expectations make teachers' competences related to cooperation and communication with children and their parents, as well as other teachers, a critical issue. Research has associated a teacher's expertise in the area of communication with the educator's experience of positive emotions, along with the emotions that the children in their classrooms experience and their perceptions of the teacher's support (Mazer et al., 2014). New teachers consider community support and cooperative relationships, leading to positive emotions, very important (Darby et al., 2011; Mérida-López et al., 2020). However, various education-focused reforms have had a negative impact on teachers' emotional state, affecting communication with school administrators and between teachers while eroding mutual trust to an extent that has degraded the quality of teachers' lives; moreover, such reforms have been associated with problematic administrative approaches and the magnification of pedagogical differences between administrators and teachers (Hargreaves, 2005). According to Datnow (2020), teachers have often felt relatively powerless in the face of the reform adoption process. The existing problem of poor teacher salaries also bears mention in this discussion. Some research evidence has revealed that the average teacher's salary in many countries is significantly lower than the earnings of other professionals (Dupriez et al., 2016). Although some countries (e.g. Lithuania) have witnessed an increase in teachers' salaries in recent years (Eurydice, 2021), the remuneration for educators remains, nonetheless, relatively low. The effects of low, even inadequate, salaries extend beyond educators and their households, however. Some recent studies have suggested that economic factors related to income may have a negative impact on a teacher's decision to seek a change of profession and influence the staff's approach to work (Dogar et al., 2015), student performance (Yontz, Wilson, 2021), and the teaching profession's prestige in society in general. In this context, therefore, this study raises the question of how teachers' incomes relate to their attitudes about their work and their social communication. In seeking answers to this question, we narrowed our focus to physical education teachers. This choice was influenced by several factors. The complexity of the physical education teacher's role is inherent to the situation of physical education as a school subject and its specific subject requirements (Trinkuniene, 2014). Additionally,

the versatility of physical education responsibilities, which combine two distinct functions into the dual role of a "teacher–coach", potentially creates exhausting conditions and the possibility of role conflicts (Kwon et al., 2010; Richards, Templin, 2012). Finally, a sometimes prevalent view sets the value of physical education lower than the worth of subject areas that require and further refine cognitive skills (Bailey, 2018). In light of these observations, the aim of this research was to assess whether physical education teachers' family income was associated with their social communication and perceived working environment.

2. Literature review

Continuing and unrelenting economic and political changes, as well as new organisational challenges, have led to the frequent characterisation of the modern working environment as a source of tension for the employee (Sparks et al., 2011; Zurlo et al., 2013). Generally, teachers, including those who teach physical education, represent professions whose activities are related to permanent mental and physical tension (Klassen et al., 2010; Varea, Öhman, 2022; Zurlo et al., 2013). In particular, physical education teachers are required to control their emotions, behave impeccably, follow school regulations and rules for procedures, observe hygiene norms, sustain general health conditions, and enforce work safety rules in the gym. Difficult working conditions (Blažević et al., 2020), communication problems (Kougioumtzis et al., 2011), and insufficient remuneration (Both et al., 2010; Tsigilis et al., 2010) have been shown to have a negative impact on physical education teachers' well-being and, consequently, on their approach to their work.

One of the working environment factors that may affect physical education teachers' approach to their work is job satisfaction, which is closely related to the teacher's motivation and, in turn, the productivity of the school where they work (Richards et al., 2019). Job satisfaction in the context of physical education can be understood as an evaluation of whether teachers in this subject area like or dislike their work. Notably, teachers' attitudes to their work and their job satisfaction are generally associated with a variety of factors. For example, various studies have revealed that teachers' self-efficacy (experienced through working with students), support from other teachers (von der Embse, 2016), and the collegial relationship between teachers (Kim, Yang, 2016) affected their positive attitude toward their work as well as their job satisfaction. Another critical factor worth mentioning is job security (Dogar et al., 2015). However, recent changes in the education system have led teachers to perceive a decrease in job security. In general, the current reform has often had negative consequences on schoolteachers' well-being (Hargreaves, 2005; Mouza, Souchamvali, 2016; Datnow, 2020), leading them to experience negative emotions and stress that have decreased their capacity for mutual communication and diminished their approach to work as well as job satisfaction (von der Embse et al., 2016).

As for the physical education teachers' attitudes about their work, one recent study revealed that neither men nor women demonstrated high levels of emotional identification with the organisation; specifically, few of them enjoyed working as a teacher of physical education, and even fewer were proud of the school where they worked (Trinkuniene, 2015). These data point to the insufficiently high social prestige of physical education teachers and may even suggest that they inhabit an inferior status among the teachers of other school subjects. Other scholars have observed that a profession's poor status is one of the factors associated with negative attitudes toward the teaching profession, as well as less job satisfaction (Hassan, Mehdi, 2016; Brezicha et al., 2020).

One analysis of research results on teachers' status in various specialities demonstrated that educators who taught school subjects that did not have examinations (Kardeliene et al., 2009) occupied a low status in the educational hierarchy. Scholars have commonly recognised that physical education in the education system is underestimated due to the generalised social perception that academic subjects involving cognitive abilities (e.g. math) are more prestigious than others focused on artistic, expressive, or physical athletic qualities (Bailey, 2018). Thus, students, other teachers, and even school principals justify the understanding of this subject area as a "second-class discipline" (Gariglio, 2021). Richards et al. (2018) pointed out that the marginal status of the physical education discipline and its teachers generates institutional conflicts, often involving limited support from principals and colleagues, which generates feelings of marginalisation.

An analysis of teachers' work environment characteristics highlighted educators' social communication as a critical element (Mazer et al., 2014). Some scholars have reported that the

social communication attitudes of physical education teachers are dominated by conservativism (Kardeliene, Kardelis, 2006; Masiliauskas, 2011). Arguably, physical education teachers at schools are more likely to focus on the teaching subject than the personality of the learner. Some authors observed that physical education teachers who exhibited a more positive attitude toward social communication demonstrated a more positive approach to communication with students during physical education classes. In addition, they were better able to provide students with an environment that encouraged the students' joy of knowing; such teachers also displayed other ethical competence skills. Contrariwise, the literature also offers evidence that physical education teachers, compared with teachers of other subjects, are more often characterised by open or covert hostility directed at the communication partner (Kardelienė, Kardelis, 2006). Although some other research suggested that physical education teachers evaluated their professional skills as adequate, and best of all, their communication skills with students and colleagues (Poteliuniene et al., 2012).

On another topic, somewhat conflicting data have emerged from the analysis of issues related to teachers' work specificity. Notably, income is connected to external factors that encourage individuals to choose the teaching profession and the work it entails (Dundar, 2014). Moreover, income may serve as an indication of the educational institution's financial capacity to recruit better professionals and provide better conditions for professional development (Hanushek, 2016). However, empirical studies have uncovered only a weak correlation between income and quality of work (Hanushek, 2016; Loeb, Page, 2000). According to data drawn from the Teaching and Learning International Survey (TALIS) (OECD, 2010), the majority of teachers in different countries indicated that they would not be awarded for trying harder or being more inventive and innovative, which suggests that high-quality work did not result in higher pay. Specifically, three-quarters of the teachers surveyed maintained that the best and most efficient teachers or those who applied innovations did not receive higher salaries. At the same time, it should be noted that the quality of teachers' work, as well as that of professionals in other areas, is related to professional development opportunities. However, the report shows that one of the main reasons preventing teachers from participating in professional development events is their high cost. It is worth mentioning that a recent Teaching and Learning International Survey (TALIS) (OECD, 2018) has also shown that teachers are not very satisfied with their salaries. Interestingly, more experienced teachers are, on average, less satisfied with their salaries than novice teachers.

In this context, we should note the distressing financial difficulties that assail physical education teachers. Research results have shown that male physical education teachers have concerns about their family maintenance (Smith, Leng, 2003). Because of their relatively low remuneration, physical education teachers tend to pursue an increased school workload, contributing to a practice of overwork in several schools. Moreover, their work does not end with the last school bell, as most of these teachers engage in after-school (informal) activities, such as training students and preparing them for sports competitions. Although this work is taken for granted as an additional professional commitment, unlike other after-school activities, the goal of winning sports competitions requires intensive work and daily planning throughout the year to achieve the desired results. Furthermore, school administrators, teachers, students and parents all look forward to successful performances, while teachers-coaches become officially responsible for their teams' accomplishments. These diverse responsibilities create exhausting working conditions for a teacher-coach (Ha et al., 2011; Kwon et al., 2010; Richard, Templin, 2012). The teacher-coach job involves two different professions, potentially leading to conflict between the different roles (Kwon et al., 2010; Richards et al., 2019). Never-ending work and professional troubles inevitably encroach upon teachers' private environment and leisure time. Some authors have established that teachers experience more difficulty than many other professionals in terms of combining work and family roles (Erdaman, Damirel, 2014), which may eventually lead to work-family conflict. Such conflict causes stress and depression (Ha et al., 2011; Zhang et al., 2012), increases morbidity (Zhang et al., 2012), and reduces job satisfaction (Carr et al., 2008) and family life satisfaction (Warner, Hausdorf, 2009).

Other studies have also underscored the problem of low wages (inadequate income) connected to the work of physical education teachers. For example, Tsigilis et al.'s (2011) findings suggested that Greek teachers felt great dissatisfaction with their salaries and the educational system. In a similar vein, in a study in Brazil, physical education teachers admitted to being dissatisfied with their salaries and working conditions (Both et al., 2010). Meanwhile, a study set in

Israel reported a positive correlation between salary increases and physical education teachers' professional satisfaction, although social (social interaction) and structural (school premises and equipment) factors more adequately supported high-quality work on the part of these teachers than any bureaucratic or psychological factors (Fejgin et al., 2005). Along the same lines, a recent study in Australia showed that salary was not the least important factor motivating physical education teachers to continue teaching (Whipp, Salin, 2018). In specific terms, a study conducted in Turkey discovered that physical education teachers perceived a "low salary" as a threat (Ünlü, Filiz, 2019).

In summary, research aiming at revealing the role of teachers' income in this profession appears to be lacking. Limited research suggests that income is more attributable to external reasons for choosing this profession (Dundar, 2014) and has been linked to withdrawal from the profession (Dundar, 2014; Hassan, Mehdi, 2016; Panagopoulos et al., 2014). In our opinion, the degree to which teachers' income is related to their attitudes toward their work and mutual communication remains a relevant topic of inquiry. The relevance of the questions is grounded by the evidence that the latter factors are associated with perceived school climate (Malinen, Savolainen, 2016), which is important for the quality of teaching. Meanwhile, the quality of teaching reflects the school's contribution to the development of the country in terms of educating the younger generation. With a specific focus on physical education teachers, the questions raised are relevant in the context of health education for the younger generation. In addressing the emphasis on the lack of funding for teachers, the study will seek to answer the question of whether physical education teachers' family income is associated with their social communication and perceived working environment. Little of the existing research related to our problem questions, and the results of the literature review were rather ambiguous; therefore, specific hypotheses did not emerge in our study.

2. Materials and methods

2.1. Participants and Procedure

Prior to beginning the study, approval was received from the Education Development Centre (from 01-09-2019 National Agency of Education). The study was conducted in Lithuania with a sample comprising physical education teachers from different cities and regions in Lithuania. The study intended to be representative of the country's physical education teacher population. According to the *Statistical Yearbook of Lithuanian Sport*, the country's schools employ 1,754 physical education teachers. Hence, based on random number tables (Cohen et al., 2018) and selecting the 95 % confidence level and 5 % confidential interval, the body of research participants should include no fewer than 317 teachers. The participants were recruited by applying multi-phase sampling (Cohen et al., 2018). First, physical education teachers in all five major cities (Vilnius, Kaunas, Klaipeda, Siauliai and Panevezys) and various regions of the country were chosen for inclusion in the study. Second, physical education teachers representing the country's major urban and rural schools were interviewed in conjunction with seminars organised by the Education Development Centre. Before the interviews were conducted, the teachers were offered explanations concerning the aim of the study. Additionally, they were informed that their responses would be anonymous and confidential. In all, a total of 330 teachers were interviewed. Because of some unlikely responses (n = 4), an excess of missing values throughout the questionnaire (n = 4), or missing responses regarding the family's economic status (n = 12), 20 questionnaires were excluded. Lastly, we analysed the final sample of 310 (135 female and 175 male) physical education teachers aged from 18 to 68 (M = 44.55, SD = 9.99) and with teaching experience from 1 to 47 years (M = 20.43, SD = 10.17). Nearly half (48.5 %) of the research participants had the qualifications of a senior teacher, while 38.2 % were methodologists or expert pedagogues. The distribution of the physical education teachers' experience and level of teaching qualification did not differ by gender ($p > 0.05$).

2.2. Measures

2.2.1. Social communication attitudes

The participating physical education teachers' attitudes towards social communication attitudes measured using Boiko's (2000) questionnaire. This questionnaire consists of 25 statements, assessed by the research participants by selecting one of the two answer options: "I agree" or "I disagree". The questionnaire facilitates establishing the research participants'

attitudes in terms of the measure's five subscales of social communication. The "Undisclosed cruelty in dealing with people and judging them" subscale demonstrates the subject's approach to participants in the specified communication situations (5 items, e.g. "*There is envy and lack of benevolence on each team")*. The "Open cruelty dealing with people" subscale shows how much a person is not inclined to hide their negative attitude to the other person and not inclined to demonstrate concern for those around them (5 items, e.g. "*It is better to think about a person badly and make a mistake, than on the contrary – to think well and make a mistake*"). The "Reasonable negative attitude to people judging them" subscale reveals how much a research participant tends to draw deliberately negative conclusions about some individuals or certain aspects of interpersonal communication (5 items, e.g. "*Usually people do not show initiative in the workplace"*). The "Gripe" subscale uncovers how much the research participant tends to excessively negatively view negative facts about communication and social life (5 items, e.g. "*In my environment, I meet far fewer clever than stupid people*"). Lastly, the fifth subscale, "Negative experience of interaction with the surrounding persons", brings to light the research participants' attitudes about how much they have failed in life because of the surrounding people or colleagues at work (5 items, e.g. "*People with whom I have to work together usually pretend to be decent, although in fact this is not characteristic of them*"). Each statement included in a subscale is given the appropriate number of points according to the particular answer option chosen – agree or disagree. The total assessment score for all scale statements is 100 points. The corresponding scores for each subscale are also calculated. A subject's score that is higher than the average score of the group indicates that their attitude toward social communication is negative. These calculations allowed us to determine the number of subjects demonstrating negative and positive attitudes toward each subscale.

2.2.2. Perceived working tension

To assess the participants' attitudes about tension experienced at work, we provided the subjects with a list of 12 factors that could possibly cause tension (Stock, Kramer, 2000). The process of assessing each factor (sample items are "Specific physical education requirements for teachers", "Competition") required participants to choose one of four options for a response from "Does not cause any tension" to "Causes permanent tension". According to the median of the scores for the answer options, we divided the research participants into two groups: periodically and episodically suffering from tension at work. Cronbach's alpha coefficient for this scale was 0.83.

2.2.3. Perceived working environment

The participating physical education teachers' approaches to the working environment were measured using a modified scale comprising 14 statements (Gerikiene, 2007). The subjects' responses to these statements (sample items are "Nobody notices me at school", "My job is meaningful") were assessed on a five-point scale by choosing response options ranging from "strongly agree" to "strongly disagree". According to the estimated median of scores, we divided the subjects into two groups: "Positive approach to the working environment related to the need to cooperate" and "Negative approach to the working environment associated with the desire to confront". Cronbach's alpha coefficient for this scale was 0.74.

2.2.4. Perceived family income

We evaluated the family financial condition of these physical education teachers by soliciting their answers to several questions. One question aimed at establishing family income by asking, "What is your family's monthly income after taxes?" The answer options for this question were presented with the stated amounts. The teachers were not asked to specify an exact amount of money because subjects are more likely to respond to questions about income when they are given a choice of alternatives. We analysed the data and divided the subjects into two groups: families whose income was less than or equal to the average monthly salary for all professions in the country and families whose income was higher than the average monthly salary in the country. Specifically, our allocation of research participants between these two groups in terms of income was based on information from the Lithuanian Department of Statistics concerning the average monthly gross salary in the national economy, which amounted to €751 in the fourth quarter of 2018. Accordingly, teachers who responded that their family's monthly income was not higher than this amount were allocated to the first group, while those who indicated an income higher than the national average were placed in the second group.

Additionally, the teachers answered the question, "Is this income sufficient?" Four alternative answers were provided: "Absolutely sufficient", "It is enough", "Not enough" and "Absolutely insufficient". As a result of our analysis of the data, we divided the subjects into two groups: family income was sufficient, and family income was not sufficient.

2.2.5. Other socio-demographics

The questionnaire also included questions about gender, age, teaching experience and pedagogical qualifications. According to our analysis of the data, we divided the respondents into two groups for each of these characteristics. For teaching experience, these groups were characterised as working 20 years and less (n = 161) and working more than 20 years (n = 149). In terms of pedagogical qualifications, the groups distinguished those with the teacher and senior teacher qualification (n = 189) from those who were qualified as methodologists and experts (n = 121).

2.3. Statistical Analyses

Our statistical analysis began by describing the composition of the sample in terms of their family income and their evaluation of their family income, social communication, perceived tension at work and perceived working environment. We used a chi-square test to assess the statistical significance between groups. Next, we applied Pearson's correlation coefficient to identify correlations among variables. Prevalence odds ratios (OR) and 95 % confidence intervals (CI) were also calculated with logistic regression modelling to estimate associations between the participating physical education teachers' family income and social communication, perceived stress at work and evaluation of their working environment. Logistic regression was used because predictor variables were not normally distributed; moreover, the predictors and dependent variables were categorical. All analyses were performed using IBM SPSS Statistics for Windows software (version 22.0).

3. Results

This study's physical education teacher survey revealed that fewer than half (46.1 %) of the participants reported a monthly family income that was not more than the national average monthly salary. Notably, more male teachers (58.5 %) indicated that their salary was slightly higher than the average family income; however, statistically significant differences in comparison to the female participants (47.9 %) were not observed. Similarly, no statistically significant differences in monthly family income emerged with respect to different levels of teaching experience. More teachers with higher qualifications (60.2 %) reported higher monthly family income in contrast to those with lower qualifications (49.7 %); nevertheless, the difference was not statistically significant (p = 0.08). The survey showed that fewer than half of the surveyed teachers (42.0 %) considered their monthly family income to be sufficient. Moreover, sufficient monthly family income was reported by more teachers with higher qualifications (46.6 %) compared to those with lower qualifications (38.6 %). A difference in teaching experience had no apparent impact on the participants' evaluations of their monthly family income. An assessment of the relationship between family income and its evaluation revealed a close to moderate statistically significant correlation (r = 0.29, p < 0.01).

Next, we analysed the dependent variables in light of the study results. Our examination of social communication showed that fewer than half of the physical education teachers demonstrated negative attitudes according to the subscales of undisclosed cruelty (46.7 %), open cruelty (46.9 %), reasonable negative attitude to other people (39.9 %) and gripe (39.9 %). Slightly more physical education teachers (61.7 %) indicated a negative approach on the "Negative communication experience" subscale. On all of the social communication subscales, although men were more likely than women to demonstrate negative attitudes, the differences between the male and female teachers were not statistically significant. Similarly, no statistically significant differences were found when comparing the results of social communication in terms of different levels of teaching experience. Furthermore, different qualification levels yielded no statistically significant differences in the teachers' social communication results. That said, more negative social communication was observed in teachers with lower pedagogical qualifications, especially in the subscale "Undisclosed cruelty in dealing with people and judging about them (p = 0.07).

The survey revealed that 51.5 % of the participating physical education teachers worked under considerable pressure. According to their responses related to the perceived working environment, fewer than half (48.5 %) of them were inclined to cooperate. Notably, gender,

teaching experience, or educational qualification had no statistically significant impact on the percentage of teachers who were inclined to cooperate.

We then tested the link between the participants' social communication attitudes, work-related tension and approach to the working environment. Our analysis of the results revealed that work-related tension was slightly but statistically significantly associated with a reasonable negative attitude (r = 0.16, $p < 0.01$) and negative communication experiences (r = 0.13, $p < 0.05$). The teachers' approach to the working environment had a weak but statistically significant correlation with undisclosed cruelty (r = 0.19, $p < 0.01$), open cruelty (r = 0.14, $p < 0.05$), reasonable negative attitude (r = 0.18, $p < 0.01$) and gripe (r = 0.17, $p < 0.01$). We also identified a weak correlation between experienced tension and approach to the working environment (r = 0.23, $p < 0.01$).

Univariate analysis indicated that teachers whose monthly family income was less statistically significantly more demonstrated negative attitude of open cruelty (χ^2 (1, N = 310) = 46.54, p = 0.01) and reasonable negative approach (χ^2 (1, N = 310) = 3.83, p = 0.05) in the subscales of social communication (Table 1). However, other social communication subscales were not predictable by teachers' family income. Furthermore, the teachers' evaluation of their family income was not linked to social communication.

Table 1. Links between physical education teachers' family income and social communication

Social communication subscales	Income		Evaluation of income	
	Less or average	More than average	Insufficient	Sufficient
Undisclosed cruelty	48.8 %	43.6 %	46.4 %	47.1 %
	OR = 0.79; CI 95 % [0.48-1.28]		OR = 1.08; CI 95 % [0.64-1.72]	
Open cruelty	55.0 %	39.7 %	48.5 %	45.5 %
	OR = 0.56; CI 95 % [0.34-0.91]		OR = 0.95; CI 95 % [0.88-1.55]	
Reasonable negative approach	53.4 %	41.3 %	47.9 %	48.0 %
	OR = 0.64; CI 95 % [0.40-0.99]		OR = 1.16; CI 95 % [0.71-1.90]	
Gripe	44.1 %	34.7 %	39.2 %	40.5 %
	OR = 0.67; CI 95 % [0.40-1.11]		OR = 1.11; CI 95 % [0.67-1.85]	
Negative cooperation experience	60.2 %	60.9 %	63.1 %	58.6 %
	OR = 1.13; CI 95% [0.68-1.89]		OR = 0.83; CI 95 % [0.49-1.39]	

The study revealed that the average monthly household income that the participating physical education teachers reported was not statistically significantly associated with experienced tension at work or perceived working environment (Table 2). However, more of the teachers whose income was lower tended to say that they experienced great pressure at work. Interestingly, the opposite tendency was observed in the higher-income teachers, in particular, in demonstrating a more negative approach to the work environment.

Logistic regression analyses revealed that evaluation of family income was statistically significantly associated with experienced tension at work and perceived working environment (Table 2). According to the survey, more teachers who assessed their income as insufficient indicated that they experienced a large amount of stress at work (χ^2 (1, N = 310) = 14.1, p = 0.001). Moreover, more of these teachers, in comparison to those who assessed their income as sufficient, demonstrated negative attitudes towards their working environment (χ^2 (1, N = 310) = 3.82, p = 0.05).

Table 2. Links between physical education teachers' family income and perceived tension and working environment

Perceived tension and working environment	Income		Evaluation of income	
	Less or average	More than average	Insufficient	Sufficient
Experiencing much tension at work	56.5 %	49.1 %	62.0 %	39.01 %
	OR = 0.88; CI 95 % [0.53-1.42]		OR = 0.61; CI 95 % [0.44-0.88]	
Typical negative approach to work	47.6 %	53.7 %	56.5 %	43.4 %
	OR = 1.23; CI 95 % [0.76-2.06]		OR = 0.46; CI 95 % [0.36-0.99]	

4. Discussion

This study aimed to determine whether physical education teachers' family income was associated with their social communication and perceived working environment. Based on this aim, in our investigation, we began by collecting information on the family financial conditions that our participants, comprising a sample of physical education teachers in Lithuania, were experiencing. The results revealed that fewer than half of the surveyed physical education teachers reported monthly family income that was less or equal to the national average monthly salary; moreover, fewer than half of the teachers considered their monthly income sufficient. Some recent qualitative studies aiming to explore the job satisfaction of physical education teachers also found that 50 % were not satisfied with their salary (Eirín-Nemiñ et al., 2022). Prior research in other countries has also highlighted physical education teachers' low salaries (inadequate income) and the problems that arise from this financial situation (Panagopoulos et al., 2014; Tsigilis et al., 2011; Ünlü, Filiz, 2019; Whipp, Salin, 2018). While it is likely that obtaining or possessing a higher level of professional qualification should support a reasonable expectation of higher remuneration for work, in the case of the physical education teachers who participated in this study, the survey results indicated no significant differences in the assessment of reported salaries based on their qualifications.

The results related to teachers' social communication and their approach to work are also worth noting. The survey showed that physical education teachers mostly reported a negative experience of communication with others. Notably, more than one-third of the teachers had negative attitudes toward social communication in general. This finding is in line with the observations of Kardeliene and Kardelis (2006), who found that the linguistic behaviour of some physical education teachers was dominated by a hierarchical approach to communication. Specifically, the authors mentioned the teachers' occasional use of unsuitable expressions during physical education lessons, especially when the learner failed in some exercise. Prior research has revealed that such an approach is more common for physical education teachers who are closer to the negative attitude to social communication (Masiliauskas, 2011). When discussing teachers' communication results it is important to note that both the teachers' communication with students and with other teachers is important for the learning process and for the teachers' development in general (Gonçalves et al., 2022; Simonton et al., 2021). While communicating with others, teachers may demonstrate various emotions, but it is important for the teacher to understand how to express these emotions when communicating with students and how they can be perceived by students (Simonton et al., 2021). Teacher's ability to express and manage their emotions and feelings and to use them constructively is an important aspect of teacher competency (Lohmann et al., 2021). Therefore, respect, trust-based communication with others, and even having opportunities to hear constructive criticism from colleagues are important for the professional development of physical education teachers (Goncalves et al., 2022).

In this research we also found that one out of two physical education teachers reported experiencing stress at work. These results support the findings of other researchers who classified the teaching profession as a high-risk occupation (Klassen et al., 2010; Varea, Öhman, 2022; Zurlo et al., 2013).

The main research question in this study called for assessing associations between physical education teachers' family income and their social communication and perception of their working

environment. While several links emerged between teachers' family income and their social communication, other relationships were not found to be statistically significant. According to our data, teachers who receive lower incomes are more susceptible to open cruelty, indicating their propensity to express negative attitudes to others more openly, as well as show less concern for the interests of others. In addition, teachers with lower incomes more often draw reasonable conclusions about other people and mutual interaction. Because attitudes about social communication tend to be reflected in various aspects of an individual's interpersonal communication, lower-income teachers are more likely to draw adverse inferences about others and their interaction with others. Importantly, no link was established in the study findings between teachers' evaluation of their income and their attitudes regarding social communication. Nevertheless, almost half of the participating teachers reported receiving an income that was lower than the national average salary for all occupations, and even fewer participants believed that their income was sufficient. This finding might be explained by other researchers' reports that salary is not the most important factor in choosing the teaching profession because altruistic factors are more important (Fray, Gore, 2018; Sharif et al., 2014; Sharif et al., 2016). That said, actual income, not a teacher's evaluation of that income, has been shown to adversely affect communication between teachers. In this context, it is worth mentioning other researchers' claims that the lack of a material reward, which might describe the situation of earning a low salary, can be a factor that causes stress (Kongcharoen et al., 2019; Merkys et al., 2011). Moreover, recent research has pointed to the lack of income, stress, and a high workload, along with problems concerning schoolchildren's behaviour, as factors that encourage teachers to change jobs (Arviv Elyaskiv, Navon, 2021). In addition to these factors, the low status of physical education teachers can increase their intention to change professions (Eirín-Nemiña et al., 2022; Mäkelä et al., 2014).

The current study analysed links between physical education teachers' income and experienced tension at work as well as their perceived working environment. When these teachers negatively evaluated their income, they were more likely to experience stress at work and had a more negative attitude toward their working environment. These data partly correspond to other scientists' claims that a lack of earnings is associated with poor job satisfaction (Hassan, Mehdi, 2016; Malinen, Savolainen, 2016; Eirín-Nemiña et al., 2022). However, no association was established between the average monthly household income reported by physical education teachers and their experienced work-related stress as well as their perceived working environment. Thus, while teachers' income is important in terms of their mutual communication and approach to their work, other aspects are noteworthy as well. Among these are the material working conditions (Eirín-Nemiña et al., 2022; Trinkuniene et al., 2016), support from school management for employees (Eirín-Nemiña et al., 2022; Tsigilis et al., 2011), employee involvement in decision-making (Kim, Yang, 2016), and teacher self-efficacy and perceived autonomy (Avanzi et al., 2013; Skaalvik, Skaalvik, 2014). At the same time, teachers' mutual cooperation is essential for job satisfaction (Eirín-Nemiña et al., 2022; Klasser, 2010). Hence, teachers' income is a complex factor in that it has an impact on the total positive climate of the school as well as teachers' job satisfaction (Malinen, Savolainen, 2016).

In summary, physical education teachers' family income and their evaluation of that income are essential elements when seeking to understand their social communication and perceived working environment. However, our study revealed some differences in the participants' evaluation of income and income perception. Income is more closely associated with social communication, while the individual's income perception connects with tension experienced at work and their approach to work. The survey results reflect the context of our study, which was the teaching profession. These professionals must meet profession-specific requirements related to the fact that they work with children. Therefore, the specificity of working with children is important in the assessment of school staff interaction, well-being at work and, consequently, their approach to work. It is no coincidence that teachers' well-being at work is linked to their personal capabilities in terms of performing classroom-related duties (Woolfolk-Hoy, Davis, 2006), teacher self-efficacy in the classroom (von der Embse et al., 2016), and their students' motivation, as well (Hassan, Mehdi, 2016). In the evaluation of the specificity of the school as an organisation and, in particular, the teaching profession, it should be noted that teachers as employees face many challenges, ranging from the impact of the ongoing reforms to the lack of support from parents, while continually being forced to endure financial security issues. In this context, attention should be

paid to the limitations of our study and the opportunities for future research that these limitations suggest. Among the study limitations was the methodology. In particular, our evaluation of the income of the participating physical education teachers did not separate the spouse's income and did not consider the spouse's occupation. Although salary is not the only factor related to incentive, especially in terms of teachers' professional activities, we did not evaluate any existing school system targeting staff motivation. Therefore, further research should supplement the consideration of teachers' income by including other teacher promotion measures (e.g. the possibility of participating in training courses, internships) related to teachers' job satisfaction and the quality of work. Although this study aimed to uncover the relationships between physical education teachers' income and their perceived social communication as well as work-related stress and approach to their work, further research should include teachers of other subjects and school administrators.

5. Conclusion

In conclusion, this study has extended the evidence base in terms of understanding the significance of physical education teachers' income as it relates to their social communication and perceived working environment. The current study revealed that fewer than half of the participating physical education teachers evaluated their family income as sufficient. The study findings suggest that teachers' income, albeit not their income evaluation, is related to their social communication, as those with less income tended to be openly negative about other people and in their mutual interaction. It was also revealed that teachers' more negative perception of their income (negatively evaluating their income/evaluating it as insufficient) was related to their experience of tension at work and led to a more negative approach to work.

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Nomadic Schools in the System of the State National Policy in the Russian North: Advantages and Limitations

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Abstract

One of the main tasks of the state national policy in the Russian Federation is to ensure ethno-cultural and linguistic diversity through the improvement of the education system. At the same time, the strategic priorities for the development of the northern territories of the country are focused on increasing the availability of quality general education. Nomadic schools for indigenous small-numbered peoples of the North, leading a nomadic or semi-nomadic lifestyle, perform educational, socio-pedagogical, and sociocultural functions. The article presents the results of a qualitative content analysis of scientific literature (n=54) concerning functioning and description of the nomadic schools experience in the northern regions of Russia. Nomadic schools are characterized as ungraded schools with socio-cultural and national-regional components in education, and the flexibility of the educational process. Among the advantages of this form of education are the availability of education, and a differentiated approach to students. The cost of creation and functioning of nomadic schools, the lack of a regulatory framework for regulating their activities at the federal level, undeveloped organizational and scientific and methodological issues of nomadic education, as well as the shortage of teaching staff for this form of educational institution can be considered as disadvantages. Conclusions about the need to develop a unified approach to the testing and implementation of different types of nomadic schools are formulated.

Keywords: North, state national policy, nomadic school, nomadic and semi-nomadic way of life, indigenous small-numbered peoples of the North.

1. Introduction

According to UNESCO, around 258 million children, adolescents and youth in the world are out of school (New Methodology, 2019). The lack of educational institutions in sparsely populated

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areas due to the lack of funding and the shortage of teaching staff are one of the reasons for the inaccessibility of education (Bagley, Hillyard, 2019; Moseley, Pahl, 2007). However, on the one hand, education has an impact on the integration of indigenous peoples into the economy, participation in political life (Gilbert, 2014), on the other hand, it continuously forms cultural identity (McGregor, 2013). In this regard, global and national political discourses consider education as flexible and diverse in order to broadly involve the nomadic population (Dyer, 2016).

One of the key directions in the state national policy of the Russian Federation is to ensure ethnocultural and linguistic diversity through the improvement of the education system (Ukaz..., 2012). The indicated direction of state policy is consistent with the Strategy for Developing the Russian Arctic Zone and Ensuring National Security until 2035 (Ukaz..., 2020). Increasing the availability of high-quality general education, providing conditions for additional education for children, including settlements located in remote areas and rural settlements, as well as the development of distance learning technologies in conditions of low population density in the Arctic zone of the Russian Federation (hereinafter referred to as the Russian Arctic), which is about 0.641 people/km (Fauzer et al., 2017), are among the measures of social development of the region.

Taking into account the peculiarities of the natural and geographical living environment, the nature of human economic activity in the northern latitudes, the cultural traditions of the local population and the state task of providing quality education, the search for the most optimal forms of education and training of the younger generation is being updated.

The existing network of residential educational establishment in the Russian North for children from families leading a semi-nomadic or nomadic lifestyle is becoming a factor in population migration. Students living away from their families receive education, for summer and winter holidays they come to their families in the tundra; and on leaving school they often do not return to their small homeland. For example, in the Yamal-Nenets Autonomous Okrug of Russia, about 500 children out of 700 who graduated from boarding schools do not return to the tundra, and choose cities and other settlements as their place of residence (Matsiong, 2022).

After the collapse of the USSR, the desire to overcome the outflow of the population from the northern territories, to level the risk of losing the native language, as well as breaking intergenerational ties, on the one hand, and the increased need to preserve the original culture, the traditional way of life, and to maintain forms of economic activity among the indigenous peoples of the North, on the other hand, actualized the revival of a nomadic school, which had its own history.

Despite the obvious optimal model for organizing the education of children of nomadic and semi-nomadic peoples, and the existing practice of its implementation in modern Russia, there are calls in scientific discourse to rethink current trends and prospects for education, taking into account best practices (Sitnikova, Nikolaeva, 2021). Thus, the relevance of the study is determined by the increasing importance of the issue of preserving the population and increasing human capital assets, which are the main resources for the development of the northern territories. The path of development of the Arctic and the North should be determined by the indigenous population, contributing to the maintenance of socio-cultural characteristics, lifestyle and traditional forms of economic activity. In this regard, the search for ways and mechanisms to ensure the preservation of the indigenous population comes to the fore. One of these mechanisms can be a nomadic school as a set of models for organizing educational activities for the indigenous children of the North, whose families lead a nomadic or semi-nomadic life and implement traditional forms of economic activity, in order not to separate children from their families and their familiar habitat, to give them access to the national culture and to preserve the native language.

2. Materials and methods

This study is aimed at identifying the characteristic features of a nomadic school, determining the advantages and disadvantages of this form of education for nomadic or semi-nomadic children in the northern regions of Russia. The research problem is in the contradiction between the insufficiency of a comprehensive understanding of the variable practices of nomadic schools in the northern regions of Russia and the growing need for their generalization and the analysis for further scientific understanding and improvement of nomadic schools. Based on this, the problematic question of the study is as follows: “What are the advantages and limitations of the nomadic school in the system of state national policy in the north of Russia?”. The authors for the

first time attempt to systematize the practice of organizing various models of a nomadic school in the north of Russia on the basis of highlighting its features, advantages and possibilities, limitations and disadvantages. This is the novelty of the study.

The study was implemented within the qualitative paradigm according to the following step-by-step scheme:

- primary immersion in the designated problem;
- development of methodologies;
- selection and substantiation of empirical research methods, determination of the mechanism and methods of material processing;
- accumulation and systematization of empirical material, determination of its sufficiency;
- filling in the content analysis matrix;
- thick description and interpretation of the obtained data.

The main research method is a qualitative content analysis of scientific literature describing the functioning practices and analysis of the activities of various models of nomadic schools. The choice of this method is due to the phenomenology, complexity, ambiguity and multidimensional nature of the phenomenon under study, which requires an objective interpretation and systematization of data from the standpoint of qualitative methodology. The total array of analyzed scientific publications amounted to 54 sources and was formed in 2 stages. At the first stage, a dictionary of 20 key words on the designated topics (including "education", "ethnopedagogy", "North", "Arctic", "indigenous peoples", "indigenous peoples of the North", "nomadic school", " nomadic education", etc.) for content analysis was compiled and a group of 66 publications for 2010-2022 was collected. The considered time period of publications is due to the very purpose of this article to analyze the modern practice of developing a nomadic school in the north of Russia as a form of educational organization. At the second stage, we screened out publications that were not presented in peer-reviewed publications, i.e. did not get approval and evaluation of the quality of published materials. The authors were guided by the following criteria for selecting publications for high-quality content analysis:

- authority of researchers in the field of nomadic education in the North; the research of nomadic schools is their research interests;
- scientific and practical significance of the presented material and its sufficiency for conducting a qualitative analysis;
- citedness of publications (publications from journals with a non-zero impact factor).

Thus, about 54 publications presented in journals indexed in the Web of Science, Scopus, Russian Science Citation Index (RSCI) databases, and included in the list of peer-reviewed scientific periodicals in which the key research insights of PhD dissertations and theses for a doctor's degree of the State Commission for Academic Degrees and Titles of the Ministry of Science and Higher Education of the Russian Federation should be published, were considered. The search for publications was carried out using the electronic library of scientific publications Library.ru.

The procedure for conducting a qualitative content analysis of the data array logically followed a two-phase, 8-stage study model proposed by M.R. Roller (Roller, 2019). A content analysis matrix, where each text was considered in 4 generalized categories, made up the research tools. After highlighting the text of interest, a description, systematization, comparison and analysis of the obtained data were compiled. The main categories of analysis were "models of a nomadic school", "the nature of models of a nomadic school", "advantages" and "disadvantages, limitations" of a nomadic school as a type of educational institution in the northern territories of Russia. It should be noted that these categories included smaller units of analysis. Thus, forms of organization, types, and options for the implementation of nomadic education were taken into account in the category of "a nomadic school model". The category "a nature of the nomadic school model" included units regarding seasonality, form of work, time aspect, and the role of subjects of the educational process in a nomadic school. The category "advantages" included positive aspects, benefits, opportunities, and perspectives for development of the nomadic school. The category "disadvantages, limitations" contained disadvantages, negative costs, and problems of organizing a nomadic school.

3. Results

A nomadic school is a generalized and rather ambiguous concept that includes several options for organizing education for nomad children. There are 10 models of nomadic educational

institutions: nomadic school, nomadic kindergarten-school, community school, tutor school, taiga school, stationary nomadic school, network school, summer school, Sunday school, family school (Neustroev, Neustroeva, 2013, Belianskaia, 2016). Each of the listed educational institutions differs in such parameters as:

- form of activity (moving with a nomadic family from camp to camp or a school at a fixed location in a small village or based on a production team);
- the role of the key subjects of the educational process in the nomadic school (the "parents-students" dyad, the "teachers-students" dyad or the "family-teacher-students" triad);
- time aspect (full-time, part-time education, residential sessions);
- seasonality (a stationary school or, for example, a summer ethnic camp).

The experience of nomadic schools in the Arctic zone of the Russian Federation (in the Nenets Autonomous Okrug, the Krasnoyarsk Territory, the Republic of Sakha (Yakutia), the Chukotka Autonomous Okrug, the Yamalo-Nenets Autonomous Okrug) indicates that they are limited by the level of primary education (Table 1). Basically, nomadic schools are represented by kindergartens (preschool group), schools for children of primary school age (as classes), and nomadic camps (ethnocamps). Thus, school students study at a boarding school from the 5th grade.

Table 1. Models of nomadic schools in the subjects of the Arctic zone of the Russian Federation, 1991-2022 (source: compiled by the authors based on public data)

Type/model of school	Name of nomadic school	Region/municipality
Nomadic (primary education)/ nomadic kindergarten-school	Nerget Even nomadic school	Republic of Sakha (Yakutia)/Kobyaiskiy ulus (District)
Nomadic (primary education)	Nomadic school in the Tyanya village, Charoda community	Republic of Sakha (Yakutia)/Olekminskiy District
Nomadic (primary education)/teachers visit the camps of reindeer herding brigades	Seasonal nomadic elementary school	Yamalo-Nenets Autonomous Okrug/Shuryshkarskiy District
Nomadic (pre-school education)/nomadic kindergarten	Short stay groups, Rosinka Kindergarten, Kharampur village	Yamalo-Nenets Autonomous Okrug/Purovskiy District
	Short stay groups, Solnyshko Kindergarten, Khanymei village	Yamalo-Nenets Autonomous Okrug/Purovskiy District
Nomadic (pre-school education)	Nomadic groups, Solnyshko Kindergarten, Yar-Sale village	Yamal-Nenets Autonomous Okrug/Yamal District
Nomadic (pre-school education)/teachers visit settlements 4-6 times a month	Nomadic school functioning on the principle of a "visiting teacher" activity	Yamalo-Nenets Autonomous Okrug/Shuryshkarskiy District
Nomadic (pre-school education)/nomadic school - kindergarten – pre-school education	Summer Nenets school, Yamb To community	Nenets Autonomous Okrug/Zapolyarniy District
	Malyshok nomadic short stay group of different ages	Yamalo-Nenets Autonomous Okrug/Nadymskiy District
	Umka seasonal summer nomadic short stay group, Olenyonok kindergarten, Seyakha village	Yamalo-Nenets Autonomous District/Yamal District
Nomadic (pre-school education)/Summer play-based school (vacation) – pre-school education	Yalemd nomadic school -Steps to the alphabet	Yamalo-Nenets Autonomous Okrug/Tazovskiy District

Stationary (primary education)/ungraded nomadic school	Amma Evenk community school	Republic of Sakha (Yakutia)/Aldanskiy District
	Ugut Evenk community school	Republic of Sakha (Yakutia)/Aldanskiy District
	Ulakhan-Kyuelsk nomadic ungraded elementary general education school	Republic of Sakha (Yakutia)/Anabarskiy national (Dolgan-Evenk) ulus (District)
Stationary/nomadic ungraded school (classes in the Evenki language, Evenki ethnography, hunting, reindeer herding, geography)	Avdanna summer ethno-ecological nomadic ungraded school	Yamalo-Nenets Autonomous Okrug/Olekminskiy District
Stationary school, Hinka fishing point (pre-school education)/pre-school training	Summer Nenets nomadic school – kindergarten, Noskovskaya tundra	Krasnoyarsk Territory/Taimyrskiy Dolgano-Nenets District
Nomadic school (primary education)/nomadic kindergarten school	Nerget Even nomadic school	Republic of Sakha (Yakutia)/Kobyaiskiy ulus (District)
Stationary kindergarten school (pre-school and primary education)/nomadic kindergarten school at the ancestral commune	Chukotka kindergarten school, Nutendli community	Republic of Sakha (Yakutia)/Nizhnekolymskiy District
Mixed type school	Keneleken nomadic school (2 stages of education)/I, II school terms – training takes place in a basic school, III, IV school terms – training in a nomadic mode. According to the Regulations, stage 1 – primary education (grades 1-4), stage 2 – grades 5-6 (with the possibility of educating up to grade 9)	Republic of Sakha (Yakutia)/Olenekskiy Evenk municipal district
	Nomadic school at Ulakhan - Chistai secondary school named after N.S. Tarabukin (primary education)/3 school terms in the nomad mode, 1 school term – in the basic school	Republic of Sakha (Yakutia)/Momskiy District
	Ulakhan-Kyuel School on the basis of the Mola community (elementary education)/stationary nomadic school	Republic of Sakha (Yakutia)/Verkhoyanskiy District
	Nomadic educational raw-hide tent (pre-school education): semi-nomadic kindergarten and taiga-nomadic mini-kindergarten	Krasnoyarsk Territory/ Evenki District
	Pyaku-To nomadic school: profile practice of 7-9 grades students of the boarding school during the holidays in the	Yamalo-Nenets Autonomous Okrug/City of Muravlenko

	camps. Consulting short stay group of tundra children	
Stationary (pre-school education)/nomadic kindergarten	Evenk ungraded nomadic school – kindergarten at the Uradan community	Republic of Sakha (Yakutia)/Srednekolymskiy District
	Nenets nomadic school, Polikarpovsk village	Krasnoyarsk Territory/Taimyrskiy Dolgano-Nenetskiy District
	Preschool nomadic summer short stay group on the basis of the Skazka kindergarten, Samburg village	Yamalo-Nenets Autonomous Okrug/Purovskiy District
	Nomadic short stay group, Factoriya Yuribey village	Yamalo-Nenets Autonomous Okrug/Tazovskiy District
	Nomadic short-term stay groups in the inter-settlement territory, Antipayuta municipality (Zvezdochka kindergarten)	Yamalo-Nenets Autonomous Okrug/Tazovskiy District
	Short stay groups for nomadic and semi-nomadic families on the basis of the Snezhinka kindergarten (Nakhodka Boarding School of Primary General Education)	Yamalo-Nenets Autonomous Okrug/Tazovskiy District
Stationary school (primary education)/summer classes	Nomadic school at the Kaettyn transshipment base	Chukotka Autonomous Okrug/Bilibinskiy District
Stationary school (primary education)/September classes	Medvezhya Gora Seasonal school on the basis of the Kharampur boarding school, Kharampur village	Yamalo-Nenets Autonomous Okrug/Purovskiy District
Stationary school (pre-school and primary education)/Tundrovichok counseling center for pre-school children, Accessible Education Center for children of school age	Payuta Multifactorial educational center	Yamalo-Nenets Autonomous Okrug/Priuralskiy District
Stationary school (primary education)/Stationary school – ethnic camp. Nomadic school (primary education)/Yamdana-Sei nomadic school: teachers visit the camps	Anna Nerkaga School, Laborovaya village	Yamalo-Nenets Autonomous Okrug/Priuralskiy District
Nomadic school (pre-school education)/summer play (leisure) playgrounds for tundra children. Stationary school (pre-school education)/mobile seasonal	Azbuka tundrovichka nomadic pre-school	Yamalo-Nenets Autonomous Okrug/Nadymskiy District

playground for short-term stay of children of senior pre-school age in the period of their living in the village		

The characteristic generalized features of the nomadic school include the following:

1. Ungraded schools with small class sizes, which do not exceed 12-15 people. Most often, from 3 to 6 children from one or two nomadic families study at the school.

2. The presence of a pronounced socio-cultural component. School, family, community, environment represent a single socio-cultural space for the formation of the personality of a growing child. As a rule, the educational process in a nomadic school is carried out on a bilingual basis - in Russian and in the children's native language (Evenki, Even, Nenets, Yukaghir, Dolgan, Chukot, etc.). This allows not only to solidify the knowledge of the native language, but also to eliminate its functional limitations if it were studied as an independent academic subject. Introducing children to a nomadic lifestyle and traditional economic activities contributes to the formation of national identity and a sense of belonging to the main family business, instilling ethnocultural traditions, and ensuring continuity between generations (Belianskaia, 2016).

3. Implementation of the national-regional component in education, both in terms of content and organization of the educational process (Neustroev, Neustroeva, 2013). The nomadic school makes it possible to compare optimally ethnic and national, international and national, regional and federal issues (Danilov et al., 2016). In the applied aspect, such a regionalization of education has a positive effect on the formation of the knowledge, skills and abilities necessary for a person in a nomadic environment.

4. Flexibility of the educational process. Due to the conditions of nomadism, and constant moving, it is difficult to introduce a traditional class-lesson system into a nomadic school. The specificity of training lies in the variability of the training schedule and the mode of training activities. At the same time, some restrictions in the distribution of study time do not interfere with the implementation of the principles of cultural and natural conformity, and practice-oriented education.

Nevertheless, such undeniable advantages of the nomadic school have some amendments, and in some cases – restrictions.

Firstly, the nomadic school ensures the availability of education for the children whose parents lead a nomadic or semi-nomadic lifestyle in the northern territories. The nomadic school makes it possible to strike a balance between receiving educational services in accordance with age and keeping the family upbringing. This transmits and instills ethno-cultural values, and reduces the risk of psychological trauma when getting subsequent education in a boarding school. However, in nomadic conditions it is not always possible to use innovative educational technologies, to ensure full and continuous access to the Internet information and communication network. In other words, the indicated accessibility of quality educational services remains very conditional.

Secondly, the interaction of a teacher with a family, the establishment of partnerships with parents and their full involvement in the educational process makes it possible to integrate adequately education and family upbringing. The teacher provides assistance in economic activities, often also lives in the dwelling of a nomadic family. At the same time, such interaction poses a risk of losing subordination in the "teacher-family" system, which can affect the reduction of the teacher's demands on the student in mastering the educational program.

Thirdly, due to the small number of students in a nomadic school, a teacher can implement a differentiated approach to students, take into account their interests and needs in the educational process, timely identify gaps in learning and carry out individual work to eliminate them. However, in nomadic conditions, the inclusion of children in the system of additional education, which focuses on areas related to traditional types of economic activity, is significantly limited. For example, it becomes impossible to visit sports clubs or dance studios due to their absence. The aforementioned calls into question the individualization of education: a child from a nomadic family does not receive all the opportunities and resources for building and implementing an individual educational trajectory, and becomes somewhat limited in choosing a further life experience.

Of course, despite these shortcomings, the advantages of the nomadic school determine its high pedagogical and ethnocultural potential. At the same time, the functioning of nomadic schools

encounters a number of criticisms both from the scientific and pedagogical community, and from the indigenous population, who, on the one hand, do not want “the school to come to the chum”, and, on the other hand, doubt the quality of education of the nomadic school. Let's imagine the main range of problems around nomadic schools identified as a result of content analysis.

Firstly, a nomadic school is a rather costly form of the educational system, requiring constant financial and resource investments at the stage of creation and maintenance. Until now, the nomadic school has been of a design and experimental nature; its functioning directly depends on the administrative will of local authorities and the manifestation of initiative and support from representatives of the indigenous peoples of the North. Due to the specifics of the nomadic school, control of its activities in general and the work of a teacher in particular cannot be carried out properly.

Secondly, the functioning of nomadic schools is not actually regulated at the federal level. The provisions of the current regulations do not cover all controversial issues related to the organization of a nomadic school, the protection of the rights of students, parents, teachers, since in many respects a nomadic school can contradict federal requirements for educational activities (in terms of material and technical, sanitary and hygienic support, educational and methodological equipment, etc.). The Republic of Sakha (Yakutia) remains the only region with a fully developed regulatory framework for the functioning of nomadic schools, where the law on nomadic schools was first adopted (Zakon.., 2008).

Thirdly, the nomadic school remains undeveloped in organizational, scientific and methodological terms. There is no comprehensive statistics of nomadic schools, evaluation of their effectiveness and efficiency. The conceptual apparatus of the nomadic school is not unified; the variability of nomadic schools, the convergence of different educational approaches, forms of education and upbringing makes the criteria for their selection unclear, which may subsequently result in difficulties of a legal, scientific, educational, methodological, and sociocultural nature. For example, it is paradoxical that a nomadic school can mean a stationary school located in a camp, as well as a nomadic kindergarten that functions in the summer as preparation classes. In our opinion, a clear division of the types of nomadic schools is required for a better understanding of the specifics of their activities.

Fourth, there is the problem of training teachers for nomadic schools. Ideally, the teacher of a nomadic school should be a representative of the same socio-cultural environment, and speak his native language and Russian. In practice, this turns out to be very problematic, since non-local teachers are not always able to get involved in the life of a nomadic community quickly and adapt to the conditions of nomadism, and build interaction with parents; and the nomadic population is not always ready to connect their professional activities with the work in a nomadic school.

4. Discussion

At the beginning of the 19th century there were mobile schools for the Lamut and Chukchi children. Starting from 1925-1926, after the establishment of the Soviet regime and “the organization of the North committees in the center and localities, the emergence of cultural centers, which included the school, a network of schools and boarding schools was growing in the most remote corners of the Far North” (Krongauz, 1967). In the 1920-1930s, in the northern regions, mobile schools, camp schools, "red raw-hide tents", "red yarangas" functioned as a kind of branches of stationary schools and were not only of educational, but also of cultural nature.

Depending on the season, the nomadic school migrated along with the local population. In autumn and winter, the school went into the tundra, in spring and summer - to the sea or river. The nomadic school housed in raw-hide tents or tents that could be easily carried. Therefore, this type of school successfully existed in the conditions of the lifestyle of the local population. Summer nomadic schools worked mainly in the spring and summer and partly in the autumn, other nomadic schools continued to work all year round, moving along with the indigenous population. Initially, in the 1920s, in the North, all types of educational institutions complemented and alternated with each other. After 1929, in connection with a change in the internal political course of the USSR, criticism of the nomadic school intensified, which was associated with the following problems of the educational model:

1) The work of a nomadic school often depended on the political and religious sentiments of the local population (in some cases, the school could even be unaccepted by the indigenous population);

2) The nomadic school of the 1920–1930s did not have the necessary educational equipment. It was characterized by a low sanitary and hygienic level;

3) In the early 1930s, the nomadic school was characterized as a temporary phenomenon, and a forced government measure. As part of the internal political course of I.V. Stalin, his ideological coercion and the growing trend towards unification in education, this type of school ceased to fit into the general socio-political framework.

The main goal of these formats was to eliminate illiteracy among the nomadic population – both children and adults. Gradually, the practice of creating nomadic schools in these formats came to naught largely due to the lack of teaching staff ready to work in nomadic conditions. The liquidation of nomadic schools began in 1938, although in the 1940s, in the Yakut Autonomous Soviet Socialist Republic (YASSR), the Ryzhovskaya Even nomadic school worked on the basis of the Olenevod collective farm; in the 1950s, a nomadic school functioned in the Siver camp. From the 1950s children of nomads were sent to study in boarding schools, which until the 1990s were considered the only possible place for education of the nomadic population. However, the practice of teaching nomad children in boarding schools was seriously criticized because of students' psychological trauma due to separation from the family, language environment, habitual living conditions; poor progress due to children's poor command of the Russian language; and the formation of students' deviant behavior and attitudes towards dependency. As a result, the younger generation could experience disruption of the intergenerational transmission of their languages (Zamyatin, 2012).

With the collapse of the Soviet Union, alternative educational institutions for children from nomadic families were created: small schools in the villages, and family-type boarding schools. Interest in nomadic schools manifested itself in the 1990s and intensified in connection with the adoption in 1994 of the federal target program "Children of the North" within the framework of the presidential program "Children of Russia" (Ukaz..., 1994). Approbation of different types of nomadic education started, mostly, in the project mode.

In contrast to the early Soviet period, in the 1990s the opportunity to receive different levels of education without leaving the family, as well as to restore, preserve and reproduce the traditional economy, culture and language (Terekhina, 2017), and to realize the right to universal education, taking into account the nomadic lifestyle (Terekhina, 2014), were considered as the goals of creating nomadic schools.

All publications considered in the framework of a qualitative content analysis are focused on any one aspect of the functioning of the nomadic school; and the study of its organization in the North does not actually go beyond the educational and ethnographic context. At the same time, their implementation is directly related to the concepts of the state national policy regarding the preservation of the traditional way of life and forms of management of the indigenous peoples of the North. This leads to the issue of developing the human capital of the Russian Arctic. Most of the scientific literature describes the implementation experience and individual models of the nomadic school (Terekhina, 2014, 2017; Belianskaia, 2016).

In the literature, the specificity of the educational environment of a nomadic school is considered from a pedagogical standpoint: taking into account the spatial-objective, social-communicative, and organizational-content components (Neustroev, Neustroeva, 2013). So, the spatial-subject component of the educational environment means proximity to the rhythm of life of the northern peoples, familiarization with traditional crafts, and inclusion in traditional life as a symbolic space. The social and communicative component of the educational environment is connected with the principle of eventfulness, family and domestic relationships, the absence of formality in the organization of the educational process, and harmonious participation in various cultural events. In turn, the organizational and content component implies dependence on natural and climatic conditions, an ethno-cultural component, an individual approach, and adaptation to the biorhythms of a nomadic lifestyle. Nomadic schools are also considered as the most important condition for preserving the traditional culture of indigenous peoples, while the focus is on the material and technical support and staffing of nomadic schools (Neustroev, et al., 2017).

However, some students' parents consider nomadic schools as another invention that is dictated on orders from above (Zamyatin, 2017), and can be considered in the context of contradictions between the worldviews of political authorities and local residents (Little Bear, 2000).

Education as a key institution for the socialization of the younger generation should be considered as an instrument of cooperation between all participants in the educational process. The system of nomadic education is aimed at consolidating the interests of the family, community and state (Zhirkova, 2018).

Nikiforova E. with co-authors describe nomadic schools in the Republic of Sakha (Yakutia), emphasizing the tasks of preserving languages, original culture and traditions of small-numbered peoples of the nation. The problems of nomadic schools are considered by the authors from the point of view of modernization of the education system. The development of a network of nomadic schools is associated with issues of improving the quality of life and well-being of the population of the Arctic territories (Nikiforova et al., 2019).

5. Conclusion

Thus, nomadic schools for children of the indigenous small-numbered peoples of the North, leading a nomadic or semi-nomadic lifestyle, perform specific educational, socio-pedagogical, and socio-cultural functions, which determine their special ethno-cultural and pedagogical potential. The results of the content analysis made it possible to identify the characteristic features of nomadic schools: small number of students, the presence of a socio-cultural component, the implementation of the national and regional component, and the flexibility of the educational process. The availability of education for children from nomadic families, the interaction of a nomadic teacher and a family, a differentiated approach to students are attributed to the advantages of this form of education. Among the problems of nomadic schools are the cost of their creation and activity, the lack of federal legislation to regulate their activities, the lack of elaboration of issues of nomadic education in organizational and scientific and methodological terms, as well as the problem of training teachers for this form of educational institution. Due to the experimental nature of nomadic schools and the non-systematic nature of their activities, it is necessary to develop a unified approach to testing and implementing different types of nomadic schools. The creation and functioning of nomadic schools should be carried out in close cooperation with the authorities, the scientific and pedagogical community, and civil society institutions representing the interests of the nomadic population.

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Development of Students' Digital Competence When Using the "Oracle" Electronic Portal

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Abstract

In today's constant change in the market of educational services and opportunities to engage in various formats of education (vocational, general education, special, higher, and others), consumers are faced with the question of choosing the quality education. High-quality education is one of the key conditions of student motivation and the attractiveness of higher education. The present study explores indicators of the quality of education in the context of the development of digital competence in future specialists in economics as part of a combination of interactive digital technologies and electronic platforms for the pedagogical interaction of participants in the educational process. The purpose of the study is to design a pedagogical technology relying on the management of learning and creative activities of economics students with the use of the electronic resource "Oracle" as a means to improve the quality of professional training of specialists in modern conditions. The feasibility of using "Oracle" in the formation of the digital competence of future economists is determined through an expert survey. The conducted pedagogical experiment reveals that the effectiveness of the educational process organization, an indicator of which is the quality of professional training of economic students, is 17.5 % higher with the model of educational management using the chosen info-digital electronic resource (business intelligence platform) compared to the traditional learning system due to improved training of future specialists in all components of digital competence.

Keywords: distance learning, information and communication technologies, info-digital electronic resource, traditional learning system, electronic management.

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1. Introduction

In the age of informatization and high technology, the competitiveness of individual countries in the global market greatly depends on the level of people's education, the development of their creative abilities, and their readiness to obtain new knowledge. Thus, the role of a country in the world is defined by the level of education and culture in it (Artemova et al., 2022; Bikbulatova et al., 2016; Mkrttchian et al., 2020). Therefore, the quality of education (QE), which today is interpreted as compliance with certain standards, is becoming relevant in many spheres of social life, including higher education (Kurkina et al., 2021).

In our opinion, the professional training of modern economic specialists should proceed from updating the pedagogical system with innovative technical means and electronic software products (ESP) in view of the digitalization of the educational space (Shishov et al., 2021; Vasilyeva et al., 2021). The basis for these changes is the electronic management of education with consideration of the concept of digital pedagogy and the introduction of digital learning technologies (Krivova et al., 2021; Nanjundaswamy et al., 2021).

The outlined problem is becoming increasingly relevant in the context of distance learning employed in the COVID-19 pandemic, which has proven the urgent need for pedagogical influence executed by means of interactive digital technologies and electronic platforms for the pedagogical interaction of subjects in the educational process (Williamson et al., 2020). These changes shape the relevance of the topic of our study, since, in our view, the greatest transformations that affect the quality of contemporary higher education take place in the information-digital environment.

2. Literature Review

Researchers characterize the QE from different points of view:

- as a political category, the QE comprises in itself the main directions of state educational policy and the main strategic lines of development of the national education system in the context of global trends (Schindler et al., 2015);
- as a social category, the QE reflects the ideals of educatedness inherent in society and indicates the general objectives of education legally defined and normatively enshrined in state standards (Parri, 2006);
- as a category of management, the QE defines the strategies of influence on certain indicators of the operation of the educational system and selects possible ways to change its development (Cullen et al., 2003).

M.P. Karpenko (2012) understands QE as balanced correspondence (of the result, process, educational system) to the established needs, goals, requirements, and norms (standards). According to G.P. Shlykov (2006), the components of the QE in higher education are the organization of training, scientific and pedagogical staff, material and technical base, the educational environment, including electronic, students' learning achievements, the management system, and the results of scientific research.

K.-L. Krause (2012) asserts that the commonality between the QE at different levels of management is the creation of optimal conditions (staff, scientific and methodological, material, financial, legal, sanitary and hygienic, etc.) for the proper operation and continuous development of the educational system and the institution, which significantly affect the QE. P.T. Knight, M. Yorke (2003) emphasizes that the improvement of the QE is a necessary condition for improving the life of society and constitutes the basis for economic modernization, the development of a culture of innovative thinking, and the assertion of the fundamental values of human existence.

A review of definitions of "digital competence" (DC) (Gisbert et al., 2016; Petrova, Scherbik, 2018; Starčič, Lebeničnik, 2020) suggests that this concept is considered as a technological level of tasks that specialists have to be able to perform in view of the wide use of electronic resources, digital software, SMART educational and information and communication technologies. This concept is examined from the position of the motivational, cognitive, activity, and development components.

Considering the above aspects, we can conclude that the effective formation of the DC of an economic specialist requires the person to have a specialized system of knowledge, abilities, and skills in using information and communication technology (ICT) and experience in using electronic platforms and digital means of communication based on a system of algorithms for managing the solution of economic problems in the given area of professional work (Canada Pujols, 2012).

The outlined provisions prove that the DC needs to correspond to the specific directions of professional activities and be structurally and functionally organized in the form of a model of DC.

Analytical studies (Cirdan, 2019; Glazunova et al., 2021) define the DC of a future economic specialist as their ability to successfully implement economic measures in a professional environment based on systematic knowledge, skills, and abilities in implementing electronic resources in production, technological process management, providing network operational planning of economic activities, and organizing and controlling the operation of the digital economic data network system, as well as a set of personal qualities that encompass the individual characteristics providing for effective assimilation and updating of experience in the use of digital content.

Analysis of publications allows us to highlight some general approaches to the provision of pedagogical conditions for the development of the DC of future professionals in the economic sphere:

- formation of the motivational-value mechanism of students' mastery of the components of DC, the development of their economic culture (López-Meneses et al., 2020);
- development of models for the management of the content of education based on a comprehensive pedagogical process of DC formation (López-Meneses et al., 2020);
- introduction of computer-oriented systems for organizing economic training (Bashkireva et al., 2020);
- application of modern pedagogical technologies in the formation of DC (Tuomi et al., 2018);
- introduction of student scientific research projects in the sphere of economic education (Ilomäki et al., 2016);
- activation of practice-oriented economic training of future specialists in economics in production settings (Razinkina et al., 2021).

The organization of the educational process based on models of educational management is presented in studies (Morozova, Stepanov, 2016; Kozhevnikova, 2019). Substantiation for using business intelligence platforms as a way to improve the quality of professional training of future economic specialists is given in (Sergeev i dr., 2012; Gorbacheva et al., 2020; Kotlyarova, Shumskaya, 2020).

However, outside the attention of researchers remain some important theoretical and methodological aspects of the formation of DC in the mentioned category of specialists by means of electronic means of pedagogical technology on the basis of models of educational management in higher education institutions using specific business intelligence platforms.

Thus, the goal of the present paper is to give substantiation for the process of forming the DC of future economists and to develop the corresponding pedagogical technology based on the management of students' learning and creative activities with the use of the electronic resource "Oracle" as part of distance learning.

Research objectives:

1. to determine the most promising info-digital resource (IDR) for the formation of the DC of future specialists in economics;
2. to conduct an experimental study to perform a comparative analysis of the formation of DC components among specialists in the sphere of economics under the model of an IDR and in the traditional learning system;
3. to obtain results on the level of effectiveness of distance learning in accordance with the IDR model.

Research hypothesis: the effectiveness of the organization of the educational process by the model of educational management with the use of an info-digital electronic resource (business intelligence platform) is much higher than in the traditional distance learning system.

3. Methods

The objectives of fostering the DC of future specialists and improving the QE in the modern pedagogical space overall can only be achieved with comprehensive introduction of ICT and the corresponding ESP.

The approximate set of qualitative and quantitative research methods deployed to achieve the purpose of the study is as follows. The main qualitative data collection method is the document analysis method, which enables the use of the quantitative methods (expert survey, pedagogical experiment) to compare different electronic portals and select the one most promising for implementation in the learning process of future economists.

The first stage of the study involved analysis of literature covering approaches to the category of "QE", the development of DC, and identification of the component structure of DC in future specialists in economics. Proceeding from the literature analysis, we selected the existing electronic portals (four business intelligence platforms) that served the general didactic functions of organizing a digital learning environment and provided for the development of future specialists' DC.

At the second stage of the study, an expert survey was conducted, asking the respondents to voluntarily give an operational and subjective assessment on a five-point scale proposed for the comparison of electronic portals.

The criteria set for the selection of experts included experience in using information technology in higher education, as well as the duration of this experience for at least 5 years.

The survey sample consisted of 35 experts: 12 male employees of IT companies (aged 29-35 years old) and 23 employees of Russian universities (13 men aged 31-42 years old and 10 women aged 30-37 years old). In this way, we attempted to ensure the greatest variability of the sample in terms of the experts' occupation, sex, age, and work experience (Table 1).

Table 1. Profile of the sample of experts

Expert	Age	Organization
EM-1	34	Saint Petersburg Mining University
EM-2	40	Saint Petersburg Mining University
EM-3	31	Saint Petersburg Mining University
EM-4	35	State University of Humanities and Technology
EM-5	42	State University of Humanities and Technology
EM-6	38	State University of Humanities and Technology
EM-7	40	Moscow Aviation Institute
EM-8	41	Moscow Aviation Institute
EM-9	37	Moscow Aviation Institute
EM-10	42	Moscow Aviation Institute
EM-11	39	Moscow Polytechnic University
EM-12	37	Moscow Polytechnic University
EM-13	36	Moscow Polytechnic University
EM-14	30	IT company
EM-15	29	IT company
EM-16	31	IT company
EM-17	35	IT company
EM-18	32	IT company
EM-19	33	IT company
EM-20	34	IT company
EM-21	36	IT company
EM-22	29	IT company
EM-23	30	IT company
EM-24	36	IT company
EM-25	30	IT company
EF-1	37	Saint Petersburg Mining University
EF-2	30	Saint Petersburg Mining University
EF-3	31	State University of Humanities and Technology
EF-4	35	State University of Humanities and Technology
EF-5	32	State University of Humanities and Technology
EF-6	33	Moscow Aviation Institute
EF-7	37	Moscow Aviation Institute
EF-8	36	Moscow Polytechnic University
EF-9	38	Moscow Polytechnic University
EF-10	30	Moscow Polytechnic University

At the third stage of the study, a pedagogical experiment was conducted in order to analyze the development of DC components in economics professionals under the model of the IDR and the traditional training system (TLS). The results of the pedagogical experiment are used to derive conclusions on the effectiveness of organizing the educational process based on the model of educational management using the info-digital electronic resource.

The pedagogical experiment was conducted on a total of 120 students from the Saint Petersburg Mining University, State University of Humanities and Technology, Moscow Aviation Institute, and Moscow Polytechnic University studying "Management" and "Economics" specialties based on the example of disciplines designed to form the DC of future specialists at the bachelor's and master's levels of education. Characteristics of the sample of students recruited for the pedagogical experiment are provided in Table 2.

Table 2. Sample characteristics

Specialty	Sex		Year of study		
	Male	Female	III	IV	V
Management	26	35	26	21	14
Economics	32	27	25	22	12

The pedagogical experiment was organized according to the classical technological structure with the allocation of control and experimental groups based on already existing academic student groups and includes the ascertaining, formative, and control stages. The experimental groups were taught according to the pedagogical model with the use of the IDR, and the control groups studied according to the TLS.

In our study, the quality of professional training is understood as compliance of learning outcomes with the established learning objectives (formation of DC).

The criteria for the quality of professional training of students in the economic profile were the motivational-value, cognitive, activity, and personality development components of DC of future professionals.

During the mathematical processing of the results of the study, the components of DC of future specialists were evaluated on a 100-point scale.

The reliability of differences between the results of students in the experimental and control groups was assessed by Student's t-test for independent samples.

The basis for using Student's t-test was: the correspondence of the frequency distribution of data in the experimental and control groups to the normal distribution law (estimated using the Shapiro-Wilk W-test); the absence of a statistically significant difference between the variances of the experimental and control groups (the homogeneity of the variances was assessed using the Fisher F-test); the presence of the number of observations in the experimental and control groups more than 20.

4. Results

In view of the fact that the market offers more than two dozen educational platforms, based on the analysis of analytical research (Hillman et al., 2020; James, 2014; Sabanovic, Søilen, 2012), we selected four business intelligence platforms that could be used to train future economists to compare their characteristics: Tableau, Oracle, MicroStrategy, and IBM Cognos.

The results of the comparative expert analysis of the selected IDRs are presented in Table 3.

Table 3. Comparative analysis of the platforms

Comparison criterion	Tableau	Oracle	MicroStrategy	IBM Cognos
Expert performance assessment on a five-point scale				
Technical support	5	5	4	3
Scalability	4	5	4	4
Support for Big Data	5	4	4	4
Client access	5	5	5	5

Interface	4	4	2	4
Integrability	5	4	4	4
Visualization	4	5	3	4
Modeling and analytics	4	5	4	3
Administration	5	5	3	4
Build environment	4	5	4	3
Subjective expert assessment on a five-point scale				
Cost-effectiveness of introduction	4	5	4	3
Prospects of implementation	5	5	4	3
Complexity of the system	4	4	4	4

Note: compiled on the basis of the expert survey

As a result of the comparative analysis of the business intelligence platforms included in the initial list, the "Oracle" platform was chosen for the pedagogical experiment.

Table 4 presents the results of the comparative analysis of the development of DC in economics specialists through the model of the "Oracle" IDR and the TLS.

Table 4. Analysis of the development of DC components among economics professionals using the Oracle IDR and the TLS

Academic discipline	Assessment of the components of DC of future specialists on a 100-point scale							
	Motivational-value component (MVC), in points		Cognitive component (CC), in points		Activity component (AC), in points		Personality development component (PDC), in points	
	IDR	TLS	IDR	TLS	IDR	TLS	IDR	TLS
Information systems and technologies	95	78	92	81	91	80	96	80
Economic cybernetics	93	81	90	78	88	73	95	82
Economic and mathematical modeling	94	80	89	76	88	77	92	75
Information systems in economics	92	79	88	73	87	75	93	78
Mean score	93.5	79.5	89.75	77	88.5	76.25	94	78.75
Effectiveness of the pedagogical model of PTC, %	17.6		16.6		16.1		19.4	
Overall effectiveness, %	17.5							

The results of the pedagogical experiment show that the proposed IDR model is significantly more effective than TLS. Specifically, improvement in the level of specialist training is detected across all components of future specialists' DC: a 17.6 % increase in the motivational-value component; a 16.6 % increase in the cognitive component; a 16.1 % increase in the activity component; a 19.4 % increase in the personality development component.

Statistical analysis of the reliability of differences by Student's t-test for students trained according to the model of the "Oracle" IDR and the traditional learning system confirm the higher results of students trained by the "Oracle" model ($tEmp = 3.9$; $p \leq 0.01$).

5. Discussion

As evidenced by scientific research (Knight, Yorke, 2003; Glazunova et al., 2021), current curricula of professional disciplines in IT double the volume of information support for business processes in all companies every two years. M. Gisbert and colleagues give a number of projections for the development of digital content of the educational management system until 2025, justifying that by 2025, more than fifty billion devices will be connected to the Internet, and 90 % of teachers will use digital learning tools (Gisbert et al., 2016).

In the meantime, our findings demonstrate that the introduction of key technological aspects of using the electronic resources of the "Oracle" corporation portal in teaching economics students results in the activation of students' learning activities, enhancement of their creative abilities, and the acquisition of the skills of independent search and use of modern digital resources for solving economic problems on the example of modeling of production situations.

To make the opportunities for the use of the proposed solutions more understandable, we need to clarify the technological sequence of the use of the "Oracle" educational product in our experimental study. It is reasonable for students to first explore the applications of technology that help bring about technological change (transformational technology). This requires an introduction to entry-level materials, which include illustrative and practical materials based on the case method.

In order to cultivate students' research skills, it is recommended to use problem situations that require analytical evaluation (Tuomi et al., 2018). Later on, students can attempt to work independently with some products of the corporation, such as "Oracle" Always Free cloud services. Students who are looking to advance their knowledge and skills in this digital content sphere can be offered other "Oracle" learning tools.

Proceeding from the results of the study, we assert that in order to improve the quality of economic education in the conditions of digitalization, it is advisable to develop an interactive pedagogical system that would embody the concept of managing students' learning and creative activities during distance learning in the system "digital educational complex – student – teacher" (Krause, 2012).

According to our findings, the main directions for solving this problem lie in the digitalization of the pedagogical system of the university through the implementation of the following measures:

1) designing and organizing a digital educational environment based on a single Internet resource for online communication interactive mode (Petrova, Scherbik, 2018);

2) creating an online educational platform for educational management (Petrova, Scherbik, 2018) based on the "Oracle" IDR;

3) creating electronic distance learning complexes (DLC) in "Oracle" IDR based on the development of electronic textbooks, teaching aids, recommendations for students' independent work in the digital system;

4) creating a digital diagnostic complex (Cirdan, 2019) on the basis of "Oracle" IDR and designing an electronic base of remote control (electronic logs of class attendance, records of independent and individual work, knowledge testing (current, interim, final);

5) developing the legal framework for distance learning in the context of digitalization of pedagogical processes (Cirdan, 2019).

Realization of the proposed measures requires high decentralization of pedagogical influence and a structure of the didactic process that would allow students to add to the information subsystem some elements of self-planning, self-organization, and self-control in accordance with the objectives of digital training (Chumaceiro Hernandez et al., 2022). In this, the functions of the teacher need to change considerably. The teacher has to become a facilitator who ensures effective educational online communication in the "Oracle" IDR.

6. Conclusion

Analysis of the experimental results confirms the hypothesis that the effectiveness of the organization of the educational process based on the model of educational management using an info-digital electronic resource (business intelligence platform) is much higher than with the traditional distance learning system. The proposed educational management model provides for online management of the educational process, which determines the high level of development of DC in future specialists in economics. The overall effectiveness of the educational process of DC

development in economic specialists under the model of the IDR "Oracle" is 17.5 % higher compared to the traditional learning system.

The article has methodological limitations in view of the fact that there was no probabilistic selection of subjects for the control and experimental groups.

The obtained results suggest the following direction for further scientific and pedagogical research in this area: the development of electronic information systems of educational and methodological support for the formation of DC in future economic specialists; integration of educational electronic resources by "Oracle" and pedagogical SMART-technology in the educational process of development of the components DC in specialists in the economic profile.

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Relationship between the Principal Support, Self-Efficacy, Collective Efficacy and Teacher Commitment in Primary School

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Abstract

Teacher commitment to school is an important factor of school efficacy and it has immediate influence on pupil success. It also conveys teachers' psychological attachment to the teaching profession. There are numerous positive results of teacher commitment to school. Committed teachers are more devoted to their work, are willing to contribute to the achievement of school goals and are less likely to leave their profession. Quality teacher retention has become a growing challenge in education systems across the world. Thus, it is important to determine the factors which affect teacher commitment. The aim of this study was to examine to which extent certain demographic and contextual teachers' characteristics, together with the perceived principal support, self-efficacy and collective efficacy contribute to the affective, normative and continuance teacher commitment to school. The results of the performed regression analyses indicate that principal support is the most significant predictor of affective and normative teacher commitment. Although principal support has had a significant contribution in explaining continuance commitment, this contribution is quite small. Teacher self-efficacy has not been proved to be a statistically significant predictor of teacher commitment, while collective teacher commitment has a statistically significant, but low contribution in explaining affective, continuance and normative teacher commitment.

Keywords: collective teacher efficacy, principal support, primary school, teacher commitment, teacher self-efficacy.

1. Introduction

1.1. Principal Support

According to The Primary and Secondary School Education Act of the Republic of Croatia, the school principal is a manager and expert leader who, among other responsibilities, monitors and analyzes the work performed by teachers, enables their professional development, provides

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their security, and makes sure their rights and interests are secured (Official Gazette, no. 87/08, Article 125). A school principal is a key to efficient schools. Therefore, researchers have been trying to determine the specific characteristics of such principals (DiPaola, 2012). Principals, as school leaders, have the central role in creating a positive teaching and learning environment (Liebowitz, Porter, 2019). They strengthen institutional culture by providing guidelines and support and provide the necessary teaching and institutional resources (Hughes et al., 2015). Intense interaction between principals and teachers creates opportunities for two-way communication in various areas of teachers' work, gives a sense of security and supports teachers' professional development and growth. Principal support is positively related to teacher satisfaction (Brown, Wynn, 2009; Grissom, 2011), teacher well-being (Liebowitz, Porter, 2019), teacher confidence in and teacher commitment to school/organization (Demirtaş et al., 2017), and teachers' work engagement (Rothmann, Fouché, 2018). On the other hand, it is negatively related to teachers' abandonment of the teaching profession (Brown, Wynn, 2009; Grissom, 2011). While measuring principal support for teachers, four dimensions were extracted: emotional support – accepting and encouraging teachers and their ideas; instrumental support – providing the necessary resources for teachers to perform their work; informational support – providing information necessary for work, and appraisal support – giving constructive feedback on teacher efficacy (Littrell et al., 1994). Evidently, principal support is a multidimensional construct, related to the professional work performed by teachers and functioning of school as an institution.

1. 2. Teacher Self-Efficacy

Self-efficacy is a person's confidence in their own organizational abilities and abilities to perform activities necessary for completing a certain task or achieving a certain goal (Bandura, 1977). People who perceive their self-efficacy as very high are committed to achieving their goals, they do not give up easily, no matter how demanding the tasks are, because they perceive them as challenges, not threats. They are focused on the tasks, and even if they fail, they regain the feeling of self-efficacy in a short time period (Bandura, 1993). Teacher self-efficacy has been in the focus of scientific research in the last fifty years. Teacher self-efficacy implies confidence in one's own abilities to achieve the learning outcomes and engage students in the teaching activities regardless of their abilities and motivation (Bandura, 1977; Tschannen-Moran, Woolfolk-Hoy, 2001). Creating a positive learning environment depends to a great extent on teacher self-efficacy (Bandura, 1993). Based on their analysis of numerous studies on measuring teacher efficacy, Tschannen-Moran and Woolfolk-Hoy (2001) developed an instrument which included three factors: efficacy for instructional strategies, efficacy for classroom management, and efficacy for student engagement. The results of a vast body of research indicate that teacher self-efficacy is related to students' positive attitudes to school (Miskel et al., 1983) and that teachers who are highly confident in their self-efficacy are more responsive to implementing didactic innovations in the teaching process (Guskey, 1988) and feel more responsibility when working with students with developmental difficulties (Allinder, 1994). It is important to point out the benefits for teachers – teacher self-efficacy is positively related to psychological well-being, satisfaction, and commitment to work, and it is negatively related to burn-out factors (Zee, Koomen, 2016).

1.3. Collective Efficacy

However, some teachers' confidence in their own self-efficacy is sometimes not high enough to enable them to feel satisfaction and success because achievements also depend on the ability to negotiate and cooperate with other people and their ability to work in synergy (Caprara et al., 2003). A feeling of group (or organization) collective efficacy strengthens the group ties and is based on the group's confidence in their ability to resolve problems it is facing (Bandura, 1986). A person's confidence in self-efficacy determines their actions at an individual level, while confidence in collective efficacy influences collective actions. Perceived collective efficacy implies a teacher's judgement that school "as a whole can organize and execute the courses of action required to have a positive effect on students" (Goddard et al., 2004: 4). In schools in which collective efficacy is at a high level, teachers help and support each other, communicate in a better way, and harmonize their work. Donohoo (2018) points out that the results of numerous studies have revealed the link between collective efficacy of teachers and a range of productive behavior patterns, because they are more focused on implementing the strategies which lead to school improvement, have high expectations and are interested in academic activities, have a higher level of job satisfaction, are more committed to the teaching profession and professional development,

and have more positive attitudes to teaching. Teachers who work in such schools have a direct impact on academic success of students, and they can also have influence on reducing negative consequences of social and demographic variables of students (Ramos et al., 2014). Furthermore, there is a positive link between collective efficacy and teacher commitment (Ross, Gray, 2006; Ware, Kitsantas, 2007; Al-Mahdy et al., 2018).

1.4. Commitment

Teacher commitment is an important factor of school efficacy. Quality teacher retention has become an increasing problem in education systems across the world. Teacher commitment is multidimensional and it implies psychological attachment of an individual to the teaching profession, professional associations and school, colleagues, parents and students (Nir, 2002; Park, 2005; Lee et al., 2011). Teacher commitment has numerous positive results. Committed teachers are more devoted to work, ready to work towards the achievement of school goals and are less prone to professional abandonment. Apart from that, they find it easier to face the challenges while teaching, they are more optimistic in finding solutions to pedagogical problems and they feel more responsible for their own success and failures in work (Fathi, Rostami, 2018). Meyer and Allen (1991) developed a three-component model of organizational commitment which includes affective commitment, normative commitment and continuing commitment. In the school context, affective commitment implies emotional attachment to and identification with school, as well as the wish to work in school, while normative commitment encompasses a sense of obligation to school. Continuance commitment implies fear of job loss and unwillingness to abandon school, because in that way teachers would face a certain form of loss or cost and jeopardize their own existence.

Schools are organizations in which constant interactions among teachers and between teachers and principals are at work. Their relationships influence their behavior, the flow of the teaching process and functioning of the school as a professional organization.

The aim of this study was to examine to which extent principal support, teacher self-efficacy and collective efficacy can account for teacher commitment to school. Taking into consideration the three-component model of commitment, it is assumed that the examined variables will significantly shed light on affective commitment of teachers to school, but not on normative and continuance commitment.

2. Materials and methods

Participants and Procedure

The research participants were 767 primary school teachers from all counties of the Republic of Croatia. According to the ISCED classification, one part of the sample teaches ISCED level 1: Primary education, and another part ISCED level 2: Lower secondary education. The analysis of univariate outliers resulted in the removal of two respondents, while the analysis of Mahalanobis distance led to the removal of 4 more respondents. Therefore, the basic sample consisting of 767 respondents was reduced to 761 respondents. A detailed overview of demographic and contextual characteristics of teachers is presented in Table 1.

Table 1. An overview of demographic and contextual characteristics of teacher participants (N = 761)

Demographics	Frequency	Percentage (%)	Workplace characteristics	Frequency	Percentage (%)
Gender			**Workplace**		
Male	51	6.7	Primary education	268	35.2
Female	710	93.3	Lower secondary education	493	64.8
Age			**Total number of students in school**		
30 and below	77	10.1			
31-40	270	35.5	1-150	109	14.3
41-50	236	31.0	151-300	165	21.7
51-60	160	21.0	301-500	205	26.9

61 and above	18	2.4	501-750	186	24.4
Work experience			751 and above	96	12.6
10 and below	250	32.9	**Average number of students per class**		
11-20	274	36.0			
21-30	167	21.9	10 and below	85	11.2
30 and above	70	9.2	11-20	387	50.9
Professional qualification			21-30	262	34.4
College degree	78	10.3	30 and above	27	3.5
University degree	664	87.3			
MA, PhD	19	2.5			

Data collection was conducted online, in closed teacher groups on a social network. Prior to completing the questionnaire, the participants were informed about the aim of the research and their anonymous and voluntary participation. All participants gave their consent to participate in the research. The completion of the questionnaire lasted approximately 15 minutes.

Measures

The Sociodemographic Questionnaire

Data were collected on sociodemographic characteristics of the respondents: gender, age, work experience, professional qualifications and county.

The Principal Support Scale (PSS)

The Principal Support Scale was used to measure principal support (DiPaola, 2012). The scale originally comprised 16 items used to measure two dimensions (expressive support and instrumental support).

Exploratory factor analysis was performed, applying the principal components analysis method with orthogonal (varimax) rotation (KMO = .961; Bartllet's test of sphericity χ^2_{df120} = 14767.70; p = .000). A single factor structure was obtained, explaining 72.15 % of the principal support variance. Cronbach's alpha coefficient of scale reliability was α = .974.

Teachers' Sense of Teacher Efficacy Scale (TSES)

A shortened version of the Teacher Sense of Teacher Efficacy Scale (Tschannen-Moran, Woolfolk Hoy, 2001) was used to measure teacher self-efficacy. The original scale contains 12 items measuring three dimensions of efficacy (efficacy in student engagement, efficacy in instructional strategies, and efficacy in classroom management). Exploratory factor analysis was performed using the principal components analysis method with orthogonal (varimax) rotation (*KMO* = .897; Bartllet's test of sphericity χ^2_{df66} = 3980.370; p = .000). A two-factor structure was obtained, explaining 57.38 % of the self-efficacy variance. The first factor, which includes the items efficacy in student engagement and efficacy in instructional strategies, has Cronbach's alpha coefficient of scale reliability α = .848, while the value for the second factor, efficacy in classroom management, was α = .872.

Collective Teacher Efficacy Scale (CTES)

A shortened version of the Collective Teacher Efficacy Scale survey (Goddard et al., 2000; Goddard, 2002) was used to measure collective teacher efficacy. The original scale contains 12 items measuring two dimensions of collective efficacy: task analysis and teaching competence. Exploratory factor analysis was performed using the principal components analysis method with orthogonal (varimax) rotation (*KMO* = .831; Bartllet's test of sphericity χ^2_{df36} = 2343.383; p = .000). A two-factor structure was obtained, explaining 58.91 % of the collective efficacy variance. Factor loadings of individual indicators are statistically significant and have a satisfactory value (.64 and more), apart from loadings of three items which are significantly below .40 and which were therefore removed. The first factor – teaching competence, has 6 items which are in line with the original structure of the questionnaire, and the calculated reliability is α = .848. The second factor, task competence, has three items, and the calculated reliability coefficient is α = .695.

Teacher Commitment

The Three-Component Model (TCM) of commitment survey (Meyer, Allen, 2004) was used to measure teacher commitment to school. The survey consists of 24 items measuring three

dimensions: affective, continuance, and normative commitment. Factor analysis was performed using the principal components analysis method with orthogonal (varimax) rotation (KMO = .884; Bartllet's test of sphericity χ^2_{df136} = 6515.461; p = .000). The performed factor analysis resulted in extraction of three factors which match the original structure and explain 59.45 % of the commitment variance. After removing the items with low loadings or loadings on two factors, 17 items were kept. The obtained reliability coefficients were: α = .908 for affective commitment, α = .754 for continuance commitment, and α = .725 for normative commitment.

3. Results

Table 2 presents an overview of descriptive parameters for all examined variables. The total result on each scale is the arithmetic mean of the estimates on the corresponding items.

Table 2. An overview of descriptive statistics for the entire sample (N = 761)

	Number of items	M	SD	Min	Max	Kolmogorov-Smirnov index	d	Skew	Kurt
Principal support	16	3.50	1.13	1.00	5.00	.093*		-0.383	-0.932
Self-efficacy (SE)	12	4.20	0.41	2.92	5.00	.084*		-0.040	-0.044
SE engagement & instructions	8	4.16	0.67	1.50	5.00	.111*.		-0.005	-0.227
SE classroom management	4	4.26	0.52	2.50	5.00	186*		-0.239	-0.200
Collective Efficacy (CE)	9	3.32	0.59	1.44	5.00	.051*		-0.123	0.032
teaching competence	6	3.55	0.67	1.50	5.00	.064*		-0.053	-0.267
task analysis	3	2.86	0.74	1.00	5.00	.143*		-0.207	0.307
Commitment	17	3.35	0.61	1.29	4.94	.060*		-0.293	-0.074
affective commitment	8	3.70	0.94	1.00	5.00	.086*		-0.544	-0.423
continuance commitment	5	3.34	0.88	1.00	5.00	.080*		-0.165	-0.550
normative commitment	4	2.63	0.82	1.00	5.00	.077*		0.131	-0.161

As can be seen in Table 2, distributions of results of all used scales significantly deviate from the normal distribution, according to the Kolmogorov-Smirnov test. However, all scales have satisfactory indices of skewness and kurtosis (Kline, 2011), therefore parametric statistics was applied in further data analyses.

In order to examine to which extent demographic and contextual characteristics, principal support, self-efficacy and collective efficacy contribute to commitment, three regression analyses were performed. Prior to conducting these analyses, relationships between the variables were checked and it was determined that all correlations were small and moderate, but also significant (with 1 % risk). Therefore, it was concluded that the variables were suitable for regression analysis. Additional testing of the criteria which need to be met was conducted, in order to perform regression analysis. The results indicate that although not all variables had normal distribution, the distributions were not bimodal nor U distributions, and they were mosty symmetrically shaped. Additionally, the unexplained parts of criteria variance (residuals) were distributed normally. The value of the Durbin-Watson test was close to 2 (2.123); that is, it does not indicate multicolinearity, which is confirmed by VIF factors lower than 4 (values in the range between 1.000 and 1.516). Table 3 presents the results of regression analysis with information about regression coefficient R=.640, that is, about 41.0 % of the explained affective commitment variance based on the employed predictors.

Table 3. Results of hierarchical regression analysis for affective commitment criteria

	ΔR^2	β	*t*	*p*
Step 1		-		
gender		-		
age		-		
work experience		-		
workplace		-		
teacher educational qualification		-		
total number of students in school		-		
average number of students per class		-		
Step 2	.618**			
Principal support		.618	21.671	.000
R = .618; R^2 = .382; Adjusted R^2 = .381; $\Delta F\ (_{1/759})$ = 469.628; p < .01				
Step 3	.006*			
Classroom management		.077	2.277	.023
Engagement & Instruction		-.003	-.083	.934
R = .623; R^2 = .388; Adjusted R^2 = .385; $\Delta F\ (_{2/757})$ = 3.501; p < .05				
Step 4	.022**			
Teaching competence		.139	4.220	.000
Task analysis		.061	1.921	.055
R = .640; R^2 = .410; Adjusted R^2 = .406; $\Delta F\ (_{1/755})$ = 13.849; p < .01				

Note. R – multiple correlation coefficient; R^2 – multiple determination coefficient; ΔR^2 – change in multiple determination coefficient; * p < 0.05; ** p < 0.01.

The first step included sociodemographic factors, but they did not seem to have predictive value and were therefore removed from the analysis. The second step included the principal support dimension and 38.2 % of the affective commitment variance explanation was obtained. The obtained regression coefficient is statistically significant. The positive link between principal support and affective teacher commitment points to a conclusion that the increased result for principal support leads to an increased result for affective commitment. In the third step, self-efficacy dimensions were added and the percentage of the explained variance increased by 0.6 %. The increase proved to be statistically significant, but only for the classroom management dimension. Again, based on the links between the variables, the information on positive relationship was obtained; that is, the increase on the classroom management variable leads to the increase in the affective commitment result. Additional analyses indicate that in this step, the percentage of the explained variance by principal support variable remains the same – 38.2 %. Classroom management explains 0.6 % of the affective commitment variance. In the final step, two collective efficacy dimensions were added and the percentage of the explained variance increased statistically significantly by 2.2 %. The results further indicate that teaching competence is a statistically significant predictor, while task analysis has a limited significance. Collective efficacy is also positively related to affective commitment, that is, the increased results in collective efficacy lead to the increased result in affective commitment. Additional analyses showed that the percentage of the explained variance from the previous steps is reduced: principal support explains 33.4 % of variance, class management explains 0.7 % of variance, teacher engagement and instruction strategies explain -0.6 % of variance, teaching competence explains 5.5 % of variance and task analysis explains 1.9 % of variance.

The following regression analysis examined the influence of the variables on continuance commitment. Prior to the analysis itself, the preconditions were tested and they showed moderate correlations, lack of bimodal distributions and U distributions, while residuals were normally distributed. The value of the Durbin-Watson test was close to 2 (2.032); that is, it did not indicate the presence of multicolinearity, which is confirmed by VIF factors lower than 4 (ranging from 1.000 and

1.579). Table 4 presents regression analysis results which show the regression coefficient R = .268, that is, 7.2 % of the explained continuance commitment variance based on the employed predictors.

Table 4. The results of hierarchical regression analysis for continuance commitment criterion

	ΔR^2	β	*t*	*p*
Step 1				
gender		-		
age		-		
work experience		-		
workplace		-.138	-3.849	.000
teacher educational qualification		-		
total number of students in school		-.100	2.802	.005
average number of students per class		-		
R = .171; R^2 = .029; Adjusted R^2 = .027; $\Delta F\ (_{1/759})$ = 11.408; p < .01				
Step 2	.015**			
Principal support		-.124	-3.472	.001
R = .211; R^2 = .044; Adjusted R^2 = .041; $\Delta F\ (_{1/757})$ = 12.054; p < .01				
Step 3	.006			
Classroom management		-.090	-2.127	.034
Engagement & Instruction		.044	1.001	.317
R = .224; R^2 = .050; Adjusted R^2 = .044; $\Delta F\ (_{2/755})$ = 2.281; p < .05				
Step 4	.022**			
Teaching competence		-.037	-.895	.371
Task analysis		-.151	-3.712	.000
R = .268; R^2 = .072; Adjusted R^2 = .063; $\Delta F\ (_{1/753})$ = 8.759; p < .01				

Note. R – multiple correlation coefficient; R^2 –multiple determination coefficient; ΔR^2 – change in multiple determination coefficient; * p < 0.05; ** p < 0.01.

In the first step, only demographic variables were introduced, but only the teachers' workplace and the total number of students in school had a predictive value. Therefore, the remaining variables were removed from regression analysis. The total explained variance amounted to 2.9 % and it is statistically significant. A statistically significant regression coefficient was obtained for workplace, which explains 1.9 % of the variance, while the total number of students in school explains 1 % of the continuance commitment variance. Both variables are negatively related to continuance commitment, which means that primary school teachers seem to have a higher level of continuance commitment in comparison with lower secondary education teachers, and an increase in the total number of students in school leads to a decrease in the result for continuance commitment. In the second step, principal support results were introduced in the analysis and the percentage of the explained variance increased from 1.5 % to 4.4 %. By adding principal support in the second step, the explained variance by workplace remained 1.9 %, the total number of students in school increased to 1.1 % and principal support explained the added 1.4 % of the continuance commitment variance. Principal support is negatively related to continuance commitment, that is, an increase in the principal support variable decreases continuance commitment. In the third step, dimensions of self-efficacy were added, so the percentage of the explained variance increased by 0.6 %. However, this increase did not have any statistical significance. An overview of all dimensions revealed that the classroom management dimension is statistically significant. Additional analyses indicate that this step led to a decrease in the percentage of the explained variance by the workplace variable to 1.8 %, and to a slight increase in the variance explained by a total number of students in school to 1.2 % and principal support to 1.5 %. The percentage of variance explained by class management was 0.5 %, and by teacher engagement and teaching strategies 0.04 %. In the final, fourth step, two dimensions of collective efficacy were added, and the percentage of the explained continuance commitment variance increased statistically significantly, by 2.2 %. The results further indicate that task analysis is the

only statistically significant predictor. Additional analyses revealed that this step restored the percentage of explained variance by workplace to 1.9 %, reduced variance explained by total number of students in school to 0.9 % and by principal support to 0.7 %. The percentage of variance explained by class management is still 0.5 %, while the percentage explained by teacher engagement and teaching strategies is 0.1 %. Task analysis explains 0.5 % of the continuance commitment variance, while teaching competence explains 2.8 %. Both variables of collective efficacy are negatively related to continuance commitment.

The following regression analysis examined the influence of the variables in explaining normative commitment of teachers. The testing of the relationship among variables revealed moderate, but significant correlations with 1 % risk. The value of the Durbin-Watson test was close to 2 (2.084), not indicating multicolinearity, which was confirmed by VIF factors with value below 4 (ranging from 1.000 and 1.520).

Table 5 presents the results of regression analysis which provides information on regression coefficient R = .501, that is, on 25.1 % of the explained normative commitment variance based on the included predictors.

Table 5. Results of hierarchical regression analysis for the normative commitment criterion

	ΔR^2	β	*t*	*p*
Step 1				
gender		-		
age		-		
work experience		-		
workplace		-		
teacher educational qualification		-.148	-4.158	.000
total number of students in school		-.114	-3.193	.001
average number of students per class		-		
R = .187; R^2 = .035; Adjusted R^2 = .032; $\Delta F\,(_{1/758})$ = 8.813; p < .01				
Step 2	.194**			
Principal support		.443	13.794	.000
R = .478; R^2 = .229; Adjusted R^2 = .226; $\Delta F\,(_{1/757})$ = 190.054; p < .01				
Step 3	.005			
Classroom management		-.014	-.362	.717
Engagement & Instruction		.076	1.961	.050
R = .483; R^2 = .233; Adjusted R^2 = .226; $\Delta F\,(_{2/757})$ = 2.281; p < .05				
Step 4	.018**			
Teaching competence		.062	1.684	.093
Task analysis		.121	3.330	.001
R = .501; R^2 = .251; Adjusted R^2 = .244; $\Delta F\,(_{1/753})$ = 8.991; p < .01				

Note. R – multiple correlation coefficient; R^2 – multiple determination coefficient; ΔR^2 – change in multiple determination coefficient; * p < 0.05; ** p < 0.01.

The employed demographic indicators in the first step of the analysis showed that only teacher educational qualifications and the total number of students in school have a predictive value. Therefore, other variables were removed from regression analysis. The total percentage of explained variance is 3.5 %, and it has statistical significance. A statistically significant regression coefficient was obtained for teacher educational qualification, explaining 1.4 % of varience, and for total number of students in school, explaining 1.3 % of the normative commitment variance. Teacher educational qualification and total number of students in school are negatively related to normative commitment. In the second step, principal support was introduced, and the percentage of explained variance increased by 19.4 %, to 22.9 %. Principal support is significantly related to normative commitment. In the third step, self-efficacy dimensions were added and the percentage of explained variance increased by 0.5 %. However, the increase did not have statistical significance. An overview of the dimensions revealed that teacher engagement and teaching

strategies were statistically significant dimensions. Additional analyses show that this step reduced the percentage of explained variance by teacher qualification variable to 1.1 % and slightly increased the variance explained by total number of students in school to 0.9 %, while principal support was 19.7 %. The percentage of variance explained by class management was 0.1 %, while the percentage explained by teacher engagement and teaching strategies was 1.2 %. In the final, fourth step, two dimensions of collective efficacy were added, leading to a statistically significant increase in the percentage of the explained normative commitment variance by 1.8 %. The results further indicate that only task analysis was a statistically significant predictor. Additional analyses show that in this final step, the percentage of explained variance by the teacher educational qualification variable was 1.0 %, variance explained by total number of students in school was 1.2 %, while variance explained by principal support was 16.5 %. The percentage of variance explained by class management was -0.1 % and by teacher engagement and teaching strategies 0.7 %. Teaching competence explained 1.8 % of variance, while task analysis explained 3.4 % of variance.

4. Discussion

The aim of this study was to examine to which extent principal support, teacher self-efficacy and collective teacher efficacy can affect explanation of affective, continuance and normative commitment of teachers to school.

According to our research results, sociodemographic indicators did not have a predictive value in explaining teacher commitment in most of the conducted analyses. Similar results were obtained by Meyer et al. (2002), since the results of meta-analysis they had conducted pointed to generally small correlations between demographic variables and all three commitment components. In our research, a negative statistically significant relation was determined between workplace and total number of students in school and continuance commitment, and total number of students in school and teacher educational qualification and normative commitment. Primary education teachers, in comparison with lower secondary education teachers, exhibit more continuance commitment, which could be due to the fact that primary education teachers find it more difficult to find employment, so they might feel more fear of jeopardizing their existence. This can also be related to the total number of students in school, since the level of job security in smaller schools is lower. Teachers who work in schools with a larger number of students and who have higher teacher educational qualification exhibit a lower level of normative commitment; that is, they have a weaker feeling of commitment to school since their job is secure, and the higher level of educational qualification gives them a better position on the labor market.

As has become clear in this study, the results of the conducted regression analyses indicate that principal support is the predictor which has the greatest influence in predicting affective and normative teacher commitment. As a rule, affective commitment has been proved to be the strongest predictor of positive outcomes in organizational context (Marković et al., 2020). Although principal support has been proved to have statistical significance in explaining continuance commitment, its contribution was quite small. Principal support is positively related to affective and normative commitment, and negatively related to continuance commitment. Therefore, teachers who perceive a higher level of principal support are more emotionally attached to the school in which they work and have a stronger sense of obligation to school. At the same time, they feel less fear of losing their job. The literature supports these findings, since principal support determines whether teachers perceive school as a desirable workplace (Eğinli, 2021). Our findings suggest that principals should invest additional effort in creating an environment in which teachers will not feel fear of losing their job and will not continue working in school primarily to secure their existence.

Teacher self-efficacy has not been proved to have consistent relation to commitment. The classroom management dimension was shown to be a statistically significant predictor of affective and continuance teacher commitment, while dimensions teacher engagement and teaching strategies were statistically significant for normative commitment. Statistically significant positive relation between classroom management and affective commitment was determined, while a statistically significant negative relation was determined with continuance commitment. It is possible that teachers who are confident in their classroom management skills are able to establish a better relationship with students and teachers, so they might feel more comfortable in school, while at the same time they feel less pressure about the possibility of losing their job.

The dimension engagement and instruction is statistically significantly related to normative commitment, from which it can be concluded that teachers who are more engaged in work in school and who use efficient teaching strategies exhibit a greater level of commitment to school and are ready to stay in that school, although they may not benefit from that.

The findings of previous research indicate that collective teacher efficacy is a significant predictor of teacher commitment (Ross, Gray, 2006; Ware, Kitsantas, 2007; Lee et al., 2011). The results of our regression analysis show that, when collective teacher efficacy dimensions are analyzed, teaching competence is a statistically significant predictor of affective commitment, while task analysis is a statistically significant predictor of continuance and normative commitment. Furthermore, the results show that, among the mentioned dimensions, there is a negative relation only when it comes to task analysis and continuance commitment. Collective teacher efficacy implies exchange of knowledge, ideas, experiences, and pedagogical solutions with the aim of helping students grow and develop. Joint effort unites teachers in reaching the values important for everyone, increases an individual's readiness to adjust to the work environment and behave responsibly in the organization, develops a sense of attachment to school and encourages teachers to continue working in it, at same time reducing the level of anxiety related to a job loss. According to everything that has been mentioned, teachers who are committed to the organization in which they work are more likely to continue working in it for a longer period of time, are more likely to work towards the achievement of the goals of their organization and will invest more time and energy in their career (Yousef, 2000).

5. Conclusion

The results of this study are important for several reasons. First of all, the research included participants from all parts of Croatia, both primary and lower secondary education teachers, from schools with different number of students. At the same time, the sample is also a limitation of the study. Although data collected from over 750 teachers from all parts of Croatia were analyzed in the study, the sample was not representative, and the obtained results can be taken only as indications.

Secondly, teachers' perceptions of commitment can be related to some sociodemographic indicators, principal support, certain dimensions of teacher self-efficacy and collective efficacy. The findings indicate that principal support is the most significant predictor of commitment. That means that the amount of the perceived principal support influences the extent to which teachers share the same values, want to work in a certain school, and exhibit attachment and commitment to school.

Thirdly, this study extended the literature on relationships between principal support, self-efficacy, collective teacher efficacy and teacher commitment in primary school. We argue that our findings imply the need for constant investment not only in the development of school principals' competencies, but also in teacher competencies, in order to create a positive and encouraging work environment for all school employees.

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Self-Regulation and Formative Assessment Format Interrelation in Mining Engineering ESP Course

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Abstract

The paper considers the issues of the interrelation between obtaining the self-regulation skill and the format of the formative assessment which represents an effective tool of educational process involving comprehensive processing of the material and further feedback. The participants of the research were first and second-year engineering students of the mineral resources specializations in St. Petersburg Mining University. Paper-based and online assessment methods were used in control and experimental groups accordingly during the autumn term 2021 which entails five to seven formative tests, depending on the number of modules in the ESP course. The gathered data were manually put into the SPSS software and analyzed statistically with the output of ANOVA test, Cronbach's Alpha reliability test and Pearson correlation test with identification of p-value.

The purpose of the study was to determine whether there exists a correlation between the formative assessment format and the acquisition of some non-technical skills in the ESP course such as self-regulation. The results of the formative assessment as well as the results of the self-regulation questionnaire proved to be statistically effective and revealed uneven distribution. The interpretation of the results showed that although the experimental group performed better during the online formative assessment, their self-regulation skill was not formed as profoundly as that of the control group students whose formative assessment was in pen-and-paper format.

Keywords: self-regulation, engineering education, paper-based format, online format, formative assessment, ESP.

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1. Introduction

Since "mineral resource complex is one of the factors of sustainable development of the country" (Khrustaleva et al., 2021: 417), engineering education in the mineral sector should be paid special attention as a pending aspect of technological progress. A sustainable approach to the successful engineering education process entails alignment between all the components of the curriculum (Gutierrez-Bucheli et al., 2022). In order to ensure sustainable development of the global energy sector, "it is necessary to have an in-depth knowledge of the search for and implementation of the advanced technologies" (Litvinenko et al., 2020: 435), which is impossible without continuous enhancement of mining engineering education. As Avsec S. and Savec V. put it, future engineering specialists should also be ready for innovative behaviour which is "important for keeping up-to-date with the rapidly changing social and natural environments" (Avsec, Savec, 2019: 30).

"Implementation of interdisciplinary connections, when training bachelors and masters" in engineering majors is of high importance since both general and special disciplines evolve students' ability "to think systematically and independently" and master in solving professional tasks (Goldobina et al., 2020: 803). In Saint-Petersburg Mining University "there are continuous efforts to advance students' competence through well-designed and motivating assignments" (Skornyakova, Vinogradova, 2021: 241). In their strive to enhance the quality of engineering education, teachers of Mining University substantially introduce experimental technologies and novel methods, for example the "use of modern augmented reality (AR) technologies" (Voronina et al., 2019: 2). However, apart from training their professional skills, the engineers in technoscience, geoscience in particular, need to develop efficient thinking ability and self-control, "soft skills, including communication and cooperation skills, problem-solving, conflict resolution", etc. (Mikeshin, 2020: 22). Furthermore, to gain proficiency, "a specialist must also possess certain personal characteristics that would allow him or her to remain competitive", as well as develop general competences (Kharlamova, 2019: 1709).

Along with such contemporary approaches in mining specialists training as "wide application of modern educational technologies", "academic mobility", 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 entails ability to communicate in the foreign language. While teaching the ESP course to future engineers it is necessary to apply advanced learning technologies which not only help "to develop and improve all the aspects of foreign language competence for professional interaction" but also enhance the professional competence (Murzo, Chuvileva, 2021: 146).

Having a good command of a foreign language is crucial for future engineers (Inozemtseva, 2017), particularly engineers of the raw materials industry, if they want to be competitive in the global labour market. Pushmina S. and Karter E. assert 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).

According to the Federal State Education Standard of the Russian Federation future engineering specialists are to acquire a number of general competences which can be mastered in the course of second language learning. Along with general competence development, during the ESP course the educators also form "intercultural and professional competence" (Gagarina, 2020: 9). As we teach future engineering specialists we need to "analyze professional goals in the curricula, to develop students' competencies in order to adapt or relate expertise needed for future job with the graduates' competence assessment" (Sishchuk et al., 2020: 804). The quality of students' professional education significantly depends on ability to think critically and apply various "competences, including the competence of self-education and self-development" (Shestakova et al., 2022).

In the view of the aforesaid, it is obvious that the issues of mastering a foreign language and general competences fostering have become pending in the educational process around the world and in Saint-Petersburg Mining University as well. Therefore, it is of vital importance that soon-to-be engineers are fully engaged in different types of assessment, pleased with the results of online and paper-based tests, adequately provided with feedback identifying their strengths and weaknesses. Assessment of the foreign language mastering performance is highly connected with "the general scope of technical education … in an engineering professional context" (Rus, 2019: 369).

The formative assessment method is considered as a means of collaboration between the student and the educator (Hansen, 2020) which helps not only to assess the current results of the students' academic performance but also to detect the shortcomings of the course and to help adapt it to the students' needs. Formative assessment produces substantial effect on "motivational beliefs and behaviors involved in the self-regulation" (Granberg et al., 2021: 8). In the current conditions of quickly developing ICT educational technologies, computer-based formative assessment is considered to be a "powerful instructional tool" (Sullivan et al., 2021: 11).

It is widely acknowledged that assessment plays a pivotal role in a continuous education process which is used as a constructive feedback to highlight students' academic performance and teaching efficacy (Rus, 2019). Different forms of assessment in classroom help reach the desired standard of learning (Baird et al., 2017).

There is a theory according to which assessment is divided into two types: formative and summative assessment. The first one being an educational strategy aimed at detection of the flaws and academic gaps in the process of the programme acquisition. It guides the educational process and defines "the direction in which teaching and learning should go" (Cheng, Fox, 2017: 5). Formative assessment is a tool for the educator to help navigate the students' knowledge gaining in progress and promote student learning (Gotwals, Cisterna, 2022). The summative assessment purpose is to evaluate whether the knowledge has been acquired by the student and to what extent. Thus, formative assessment can be described as assessment for learning, while summative one is assessment of learning (Cheng, Fox, 2017).

Formative assessment provides useful feedback for university teachers who need a comprehensive knowledge about assessment practices to carefully follow students' progress (Andersson et al., 2019; Veugen et al., 2021).

There has been "an abrupt shift to virtual classrooms caused by coronavirus spread" (Osipovskaya et al., 2021: 764), hence there has also been an evident and accelerated transition from pen-and-paper to computer assessment, especially when it refers to summative assessment (Perry et al., 2022). However, transition from paper-based to online formative assessment is also gaining popularity (Kuriakose, Luwes, 2016). One can find a majority of online assessment techniques, e.g. using clickers (Kuriakose, Luwes, 2016), software programs (Pezzino, 2018), different designs of computer-based tests (Nguyen et al., 2017). Researchers and educators indicate that the formative assessment using ICT improves students' performance (Wilson et al., 2011; Elzainy et al., 2020). However, it is necessary to take into consideration the factors affecting online tests accomplishment, such as different external factors, environmental setting and even students' mood (Kaur et al., 2021). Formative feedback conducted through "online assessments help students to better judge their academic performance and level of knowledge" (Kühbeck et al., 2019: 8).

Formative assessment has been admitted to be an effective strategy in enhancing English learner's capability for self-regulation (Xiao, Yang, 2019).

So it is necessary to focus on the self-regulation competence in terms of foreign language learning in the higher education system. There is a number of interpretations of this term. Thus, in psychology self-regulation is considered as "the internal and/or transactional processes, enabling a person to conduct goal-directed activities over time and across changing circumstances" (Ozhiganova, 2018: 256). This term can be further narrowed down to relation between self-regulation as a psychological issue and its crucial outcomes such as educational accomplishments and academic performance (McClelland et al., 2018). Currently self-regulation is often considered as "one of the factors associated with the educational process" (Bylieva et al., 2021: 2). Self-regulation as an aspect of educational strategy entails different sophisticated metacognitive, motivational and behavioral learning policies (Wang, Zhan, 2020). La Ode Nggawu defines a self-regulated learner as a student who is capable of gaining knowledge, is motivated and has volition for effective and independent learning (Nggawu et al., 2018).

Students' academic skills and competences are gained through cognitive and behavioral abilities (McClelland et al., 2018). Students of the up-to-date educational engineering programmes are to obtain among other skills the so-called self-control competence. We opt to broaden the term to the self-regulation capacity since the two are related and interconnected. The Zimmerman's self-regulated learning model which suggests "four developmental levels: observation, emulation, self-control and self-regulation" (Zimmerman, 2000: 19) was implemented by Granberg, Palm and

Palmberg in their research which showed that formative assessment substantially affects self-regulated learning (Granberg et al., 2021).

Within the SRlang scale ("Self-Regulatory Control Scale for Language Learning"), Wen-Ta Tseng outlines five major factors that allow measuring self-regulation: commitment factor, metacognitive factor, satiation factor, emotion factor, environment factor (Tseng et al., 2017: 534-535). A number of researchers feature six aspects of self-regulation of the English learners in the Internet medium: goal setting, time management, task strategies, environment structuring, help seeking, self-evaluation (Zheng et al., 2018; Yilmaz, 2022).

In the view of the abovementioned, the authors have detected the major aspects of self-regulation that are crucial for the engineering students in the mineral sector that can be mastered through formative assessment during foreign language learning (but not restricted to it). These are the following five aspects: time-management (ability to allocate enough time for preparation and fulfillment of every task, ability not to get distracted by any outer factors, etc.), double-checking during the test (consciousness and understanding the importance of self-checking), control of one's emotional state (ability to control nervousness and tension that arises prior and during the test), ability to verify and correct one's mistakes (feedback carried out after the test is completed, ability to find one's "gaps" in knowledge and eliminate them), help seeking (ability to withstand the temptation to cheat, seek help with peers, use the Internet and other sources and so on).

Since it is proved that there is "relationship between learners' self-regulations and their learning strategies in a foreign language learning setting" (Erdogan, 2018: 1483), the authors of the current paper attempted to scrutinize whether the method of formative assessment during ESP course can influence the self-regulation skill of the engineering students and, more specifically, whether the format (paper-based traditional assessment vs. online assessment) is relevant.

The focus of the present study is the interrelation of students' self-regulation capacity and the formative assessment while accomplishing paper-based and online tests.

The authors have opted for a blended assessment approach where the use of online testing system has been integrated with more traditional forms of assessment. The aim of the research is to trace the patterns in ESP students' self-regulation competence acquisition with respect to their academic performance in the conditions of different format – online vs. paper-based testing. In the view of this, the research questions can be formulated as follows:

- Will the results of the formative assessment be different in conventional pen-and-paper format and in online format?
- Will the self-regulation capacity be developed evenly in cases when the formative assessment is conducted in pen-and-paper format and in online format?
- Is there any pattern and hence correlation between the format of formative assessment and the development of the self-regulation in students?

The study has been conducted to verify the following hypotheses.

(1) Null hypothesis – There is no significant difference between engineering students' results when undergoing paper-based and online formative tests.

Alternative hypothesis – There is a significant difference between engineering students' results when undergoing paper-based and online formative tests.

(2) Null hypothesis – There is no significant difference between engineering students' self-regulation skill development when undergoing paper-based and online formative tests.

Alternative hypothesis – There is a significant difference between engineering students' self-regulation skill development when undergoing paper-based and online formative tests.

2. Materials and methods

Students of Saint-Petersburg Mining University, Russia, learn the discipline "Foreign language (English)" during two academic years when they are first- and second-year students. During the first term of 2021/2022 academic year the authors of this research introduced with their students an experimental system of formative assessment in online format. The educational programme of the foreign language discipline in Saint-Petersburg Mining University consists of several blocks (units) covering vocabulary and grammar topics necessary to shape the sustainable communicative competence which entails listening, reading, speaking and writing skills in the foreign language. As well as the communicative competence, the students are supposed to acquire

self-regulation capacity that entails the skills of time-management, double-checking, control of one's emotional state, ability to verify and correct one's mistakes and seeking help.

At the end of every module of the educational programme (from 5 to 7 modules, depending on the specialization and faculty) the students undergo a formative assessment in the form of a test with obligatory feedback and detailed elaboration of the blind sides detected during the test. Thus, the acquisition of the material tends to be more profound and the educator gains information about what topics seem to be more difficult and need to be dealt with again.

However, the format of formative assessment might also influence the educational process and results, so it was decided to verify if there is significant correlation between the format of the assessment and its result.

The educational process in Saint-Petersburg Mining University was full-time, i.e. took place on the university premises in the classrooms. Total number of students that participated in the research amounts to 295 people (see Table 1). Among them 142 were the experimental, or focus, group who were offered to take the regular formative assessment test in the online format. Conversely, the control group amounted to 153 people whose formative assessment entailed no difference from the usual practice of our university, i.e. the students underwent traditional pen-and-paper test as formative assessment.

Table 1. Participants distribution.

	N	Percentage
Experimental group	142	48,1
Control group	153	51,9
Total	295	100,0

Among these students there are 1-st and 2-nd year students of 7 faculties whose specializations are engineers in various spheres connected with the mineral sector: oil and gas faculty, mechanical and machinebuilding faculty, geological faculty, mining faculty, construction faculty, raw material processing faculty, power engineering faculty.

The essence of the experiment was the format of the assessment (paper-based vs. online). Even though content of the tests differed according to the educational programme of every specific faculty, it could not affect the results of the experiment. Thus, the students' gender and the year of study (1-st or 2-nd) were irrelevant in the current study.

It is necessary to note that between the first and the latest assessments there was a number of other tests as well – in the experiment group there were 5 to 7 more tests in online format conducted individually by students at home and in control group there were 5 to 7 tests carried out in paper-based in-class format. This allows us to assume that experimental group underwent the experimental formative assessment in a sufficient scope in order to come up with representative performance distinct from the one by the control group.

After the experimental period, the students were offered a questionnaire to detect the degree of self-regulation capacity acquisition in two groups. Since the aim of the questionnaire was to detect how profoundly the students gained the skill of self-regulation, the authors formed the questions basing on the major aspects of self-regulation determined above: time-management, double-checking during the test, control of the emotional state, ability to verify and correct one's mistakes, help seeking. The corresponding questions together with the results of both groups are represented in figures 2-6. The responses were measured on a 5-point Likert-scale ('1' meaning 'definitely agree', '2' – 'rather agree', '3' – 'undecided', '4' – 'rather disagree', '5' – 'definitely disagree').

As a tool of online formative assessment carried out for the experiment, we used two online platforms: customized web-portal of Saint-Petersburg Mining University for organizational purposes – lk.spmi.ru (with restricted access gained only by the students and employees of the university) and free multifunctional online service for learning and testing onlinetestpad.com (with no restrictions). Online assessment system implies substantial work of teacher at the stage of test compilation, but does not involve the participation of teacher during the test itself or at the stage of checking the results, since it is done automatically.

It should also be stated that the learning process itself was carried out in the offline format, i.e. traditional full-time in-class education of the engineering specializations of the mineral sector. The formative assessment of the educational process was conducted online for the experiment group and in class with the help of paper-based tests for the control group.

One of the most important issues is to elicit what exactly is measured by the test. We based our tests (both for the experimental and for the control groups) on the subject educational programme of each specialization devised by our university. According to the programme, the students master their foreign language communication skills through acquiring the knowledge of grammar and vocabulary. Grammatical topics do not differ much, but still depend on the students' initial language level and, correspondingly, the class rank. Vocabulary aspect of the 1st year students of all the faculties covers general topics necessary for communication, while 2nd year students' vocabulary aspect covers professional topics and includes specialized terminology. It is written test (and not oral examination or open-answer questions) that was chosen as the assessment method since it is one of the most popular, not time-consuming and at the same time representative methods of assessment that is apprehensible for interpreting the results.

The tests devised for the online assessment were adapted due to the fact that online testing system has restricted scope of tasks in comparison with paper-based verified by the teacher. This is why the in-class tests were also adapted for the purpose of objectiveness: the creative, open-answer questions were excluded in order to make the assessment unambiguous and unbiased. All the formative tests in both groups included 40 questions with 20 items dedicated to grammar and 20 items dedicated to vocabulary – the maximum score in every test was 40 points. The grading system in Saint-Petersburg Mining University stipulates four-point scale: "Excellent", "Good", "Satisfactory" and "Failed" (in the Russian grading system this scale equals to grades "5", "4", "3", "2" correspondingly). The "Failed" grade implies unsatisfactory result that needs to be improved, otherwise the student is expelled. In our tests, the score distribution was calculated as follows: 85 % and higher – "Excellent", 60 % to 84 % – "Good", 40 % to 59 % – "Satisfactory", 39 % and less – the test is considered as failed.

3. Results

Statistical analysis

At the beginning of the experiment (first formative assessment test at the beginning of the term) and at the end of experiment (the last formative test at the end of the term), the results were gathered and compared in the spreadsheet form with the help of special software – Statistical Package for the Social Sciences (SPSS). Furthermore, the students were also interviewed in order to collect their opinion and attitude towards the aspects of self-regulation capacity that were supposed to be gained. The answers of the questionnaire in the experimental and control groups were also compared with the help of SPSS software and verified for statistical significance and relevance.

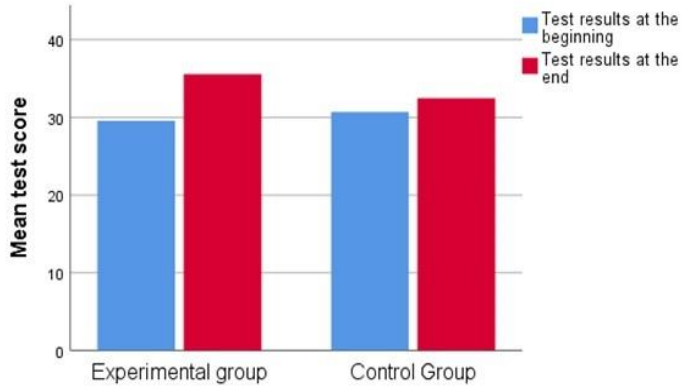

Fig. 1. Mean test grades at the initial step and at the final stage of the study

The gathered results were processed manually and typed into the SPSS software for Windows (64-bit version) within two months. After that the computational opportunities of the software were used, namely the correlation test (with Pearson correlation and research significance output),

the reliability test (with Cronbach's Alpha output), ANOVA test (with F-ratio output; the assumptions of homogeneity and normality were complied with).

The results of the formative online test conducted in the experimental group and of the formative paper-based test taken by the control group are depicted in Table 2 (distribution of grades between the groups at the initial and final stages of the study) and Figure 1 (mean academic performance in two groups at the initial step and at the final stage represented in score scale).

Table 2. Academic performance at the initial step and at the final stage of the study

Group		First_test_grade	Latest_test_grade
Experimental group	Mean	4.01	4.68
	N	142	142
	Standard deviation	.636	.496
Control Group	Mean	4.19	4.26
	N	153	153
	Standard deviation	.604	.696
Total	Mean	4.10	4.46
	N	295	295
	Standard deviation	.625	.643

It can be concluded that the experimental group performed much better during the formative assessment at the end of experiment while test results of the control group at the end of the experiment do not differ greatly from the ones they had at the beginning. The initial conditions for the both groups were practically the same – the mean of the groups' results was about 30 points. It should be noted that the test score of the control group cannot be defined as negative or unsatisfactory. The educational process in the group conveyed the same methods and educational technologies. Nevertheless, the formative tests of the experimental group can be defined as excellent. It was observed that the more tests had been taken by the experimental group online, the better score they had achieved in general.

Table 3. Pearson correlation in terms of formative assessment performance in the experimental and control groups

		Group	First_test_points	Latest_test_points
Group	Pearson correlation	1	.115*	-.303**
	Sign. (2-tailed)		.049	.000
	N	295	295	295
First_test_points	Pearson correlation	.115*	1	.654**
	Sign. (2-tailed)	.049		.000
	N	295	295	295
Latest_test_points	Pearson correlation	-.303**	.654**	1
	Sign. (2-tailed)	.000	.000	
	N	295	295	295

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis of the formative assessment results implemented via SPSS programme indicates that the correlation between the two groups during the first assessment is weak (0.115*), while the correlation between the groups during the latest assessment is more relevant, i.e. -0.003**. Interpreting these results, we can assert that at the beginning of the experiment the results of the groups were relatively equal. However, at the final stage of the

experiment period, experimental group scored better during the online formative assessment than the control group whose results have not changed much from those they showed during the first formative test. Therefore, the null hypothesis of the first issue brought up to consideration can be rejected since it was proved that the experimental group showed better performance during the formative assessment than the control group.

Further, it is necessary to consider the second issue raised in this research regarding the self-regulation competence that the students are to acquire. In Figures 2-6, one can see the distribution of the answers to the questions that were asked both in the experimental and control group. The questions were formulated in a way that positive answers would designate the respondent's determination to sustainable self-regulation while the negative answers bear evidence of the respondent's lack of self-regulation or its inconsistent development.

Scrutinizing the charts on the left, it can be noted that the majority of the students from the experimental group, namely two thirds, tend to answer "Rather disagree" and "Definitely disagree" when they were answering the questions relating the aspects that altogether are parts of the self-regulation competence. Only about a third of the respondents in the experimental group answered "Rather agree" and "Definitely agree", which offers an opportunity to assert that their self-regulation competence has significantly formed.

On the contrary, the pie charts on the right depict that more than half (up to three fifths) of the control group students are apt to the answers "Rather agree" and "Definitely agree", which verifies that their self-regulation competence has developed in a sustainable way.

Fig. 2. Time-management factor

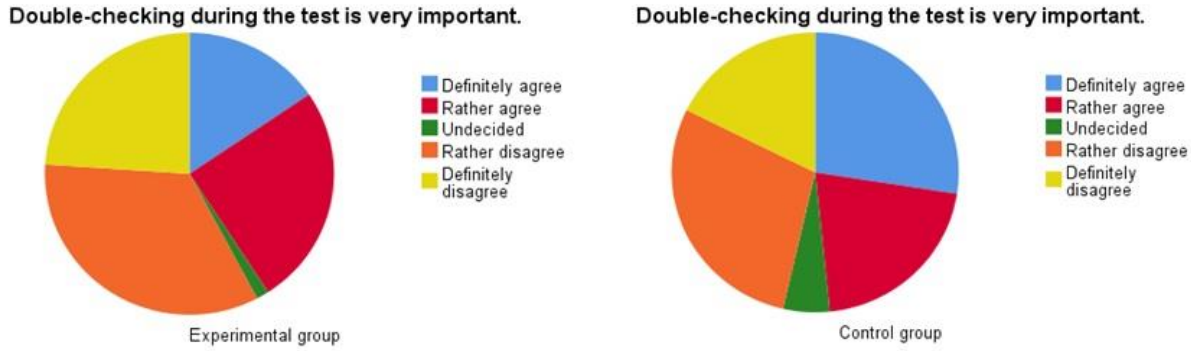

Fig. 3. Double-checking factor

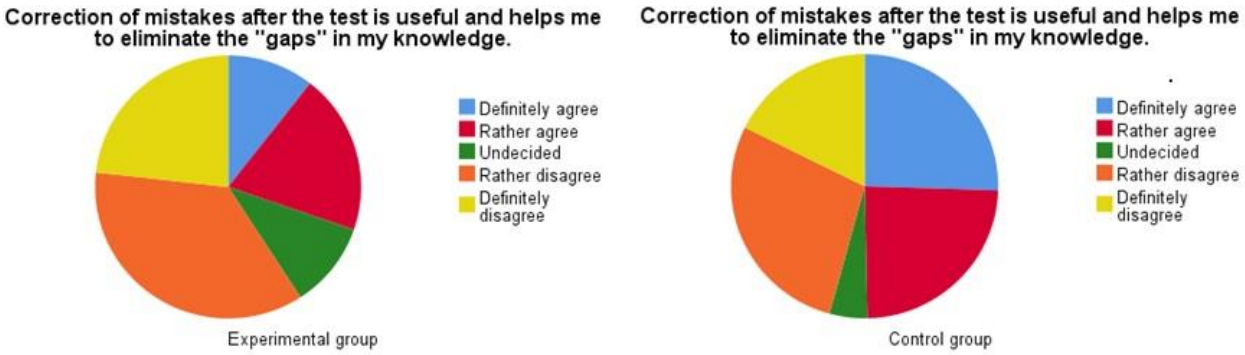

Fig. 4. The factor of ability to verify and correct one's mistakes

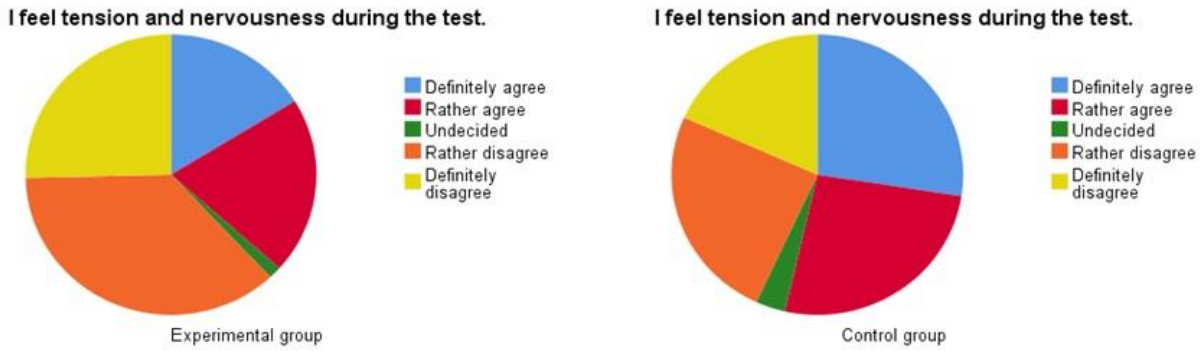

Fig. 5. Emotional state factor

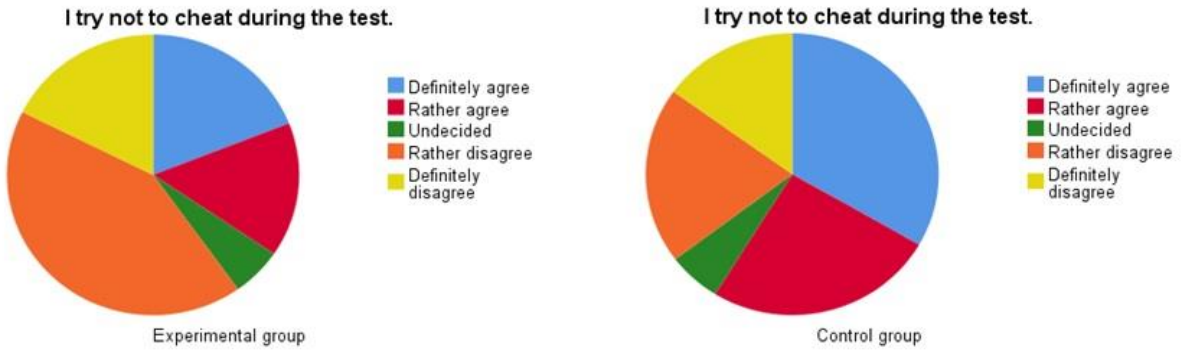

Fig. 6. Help seeking factor

As it has already been stated, statistical analysis for the current research was carried out via SPSS software. Table 4 shows the results of the ANOVA test.

The ANOVA test proved the efficiency of the research conducted: The level of self-regulation differs significantly between the control and experimental groups due to the fact that F-ratio (1.293) equals from 4.254 to 15.031 and the p-value varies from 0.000 to 0.040. These results give us opportunity to reject the null hypothesis number two and assert that there is uneven formation of self-regulation competence between the experimental group and the control group during the formative assessment. Hence, let us consider the results of statistical analysis in terms of correlation data.

Table 4. Results of the ANOVA test regarding the self-regulation competence representation

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
My skill of controlling the time allocated for the test has improved as compared to the first test	Between groups	9.817	1	9.817	4.254	.040
	Within groups	676.061	293	2.307		
	Total	685.878	294			
Double-checking during the test is very important.	Between groups	10.146	1	10.146	4.582	.033
	Within groups	648.756	293	2.214		
	Total	658.902	294			
Correction of mistakes after the test is useful and helps me to eliminate the "gaps" in my knowledge.	Between groups	20.933	1	20.933	10.425	.001
	Within groups	588.368	293	2.008		
	Total	609.302	294			
I feel tension and nervousness during the test.	Between groups	21.567	1	21.567	9.689	.002
	Within groups	652.209	293	2.226		
	Total	673.776	294			
I try not to cheat during the test.	Between groups	31.861	1	31.861	15.031	.000
	Within groups	621.088	293	2.120		
	Total	652.949	294			

The statistical analysis acknowledges that there is a certain correlation (from -.120* to -.221**) between the groups and the answers to the questions (See Table 4). Thus, in group 2 (control) the answers tend to decrease, i.e. they are mostly 1 or 2; while in group 1 (experimental) the answers tend to increase, i.e. they are mostly 4 or 5. It means that group 2 answered positively to the questions related to their self-regulation. Group 1 mostly answered negatively to the questions revealing their self-regulation skill. These facts imply that group 2 has acquired a more sustainable self-regulation competence in comparison with group 1.

Table 5. Pearson correlation in terms of self-regulation performance in the experimental and control groups

		Group	My skill of controlling the time allocated for the test has improved as compared to the first test	Double-checking during the test is very important.	Correction of mistakes after the test is useful and helps me to eliminate the "gaps" in my knowledge.	I feel tension and nervousness during the test.	I try not to cheat during the test.
Group	Pearson correlation	1	-.120*	-.124*	-.185**	-.179**	-.221**
	Sign. (2-tailed)		.040	.033	.001	.002	.000
	N	295	295	295	295	295	295

*. Correlation is significant at the 0.05 level (2-tailed).
**. Correlation is significant at the 0.01 level (2-tailed).

The observed result can be reported as statistically significant since the p-values of the variables are 0.040, 0.033, 0.001, 0.002 and 0.000 (see Table 5).

So the null hypothesis of the second issue can be rejected. The self-regulation competence differs depending on the group. According to the results of the conducted research and statistical analysis, the experimental group showed poorer self-regulation than the control group.

Table 6. Reliability statistics of the self-regulation questionnaire results.

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.714	.715	5

It is necessary to point out that according to the Cronbach's Alpha method, the research results of the self-regulation representation of the students in two groups are statistically reliable (see Table 6). Since the Cronbach's Alpha is above 0.7, the statistics results are considered to be reliable and consistent.

4. Discussion

Further are the possible reasons of the results described above in order to continue the experiment in the right direction. So let us deal with every parameter separately.

The first question related time management skill. The survey displays that most students who underwent the formative assessment through online testing feel that their time management skill has not improved. Online test contains a timer in the corner of the webpage, which, as turns out, does not contribute to individual control of the time. Furthermore, the online format of education entails such a disadvantage as higher temptation to get distracted from the educational process for the Internet provides with easy access to a variety of entertainment activities such as social networks, games, videos, etc. (Bylieva et al., 2021).

The second question was regarding the double-checking one's answers during the test. The students whose formative assessment was in the online format were not prone to verify their answers for the second time. Probably the reason is that every question is on a separate webpage, after clicking "Next" button there is no volition to come back to fulfilled tasks (Frolova et al., 2021).

The third question revealed the attitude to the correction of mistakes that had been made during the formative assessment. The feedback aspect proves to be a little more effective when the student and the teacher interact during the correction of mistakes process in the classroom rather than within the conditions of delayed-response communication in the Internet format (Janke et al., 2021).

The fourth – emotional state of the students proved to be mostly imperturbable during the online test. On the one hand, this might lead to cold-minded perception of the assessment process and contributed to better concentration and knowledge extraction. On the other hand, negative emotions and anxiety are inseparable part of educational process (Schildkamp et al., 2020) and it is necessary to learn to take control of oneself in nervous situation. In this light comfortable and tensionless atmosphere during the test does not contribute to the sustainable development of self-regulation competence.

The fifth question revealed the help seeking factor. The ability to refer to the Internet source of peer source is undoubtedly higher in case of online format and tendency of getting better grades in case of online assessment has been pointed out by other researchers (Jin et al., 2021; Golden, Kohlbeck, 2020).

Taking into account the abovementioned, immersion in the online format needs a gradual approach and a "blended learning model as a rational choice" (Bulkani et al., 2022: 118).

5. Limitations

It was noted that the students of such specializations as geography, physics and chemistry show greater performance in critical thinking than students of humanitarian specialization (Frolova et al., 2021), which confers the possibility to limit our research to the engineering specialization of mineral sector. The research was conducted in an engineering university of mineral sector and is restricted to the students of a number of specializations. The research method of opinion poll might be partly subjective, so some allowance might be engaged during perceiving the results of this research.

6. Conclusion

1. The results of the formative assessment proved to be different in conventional pen-and-paper format and in online format. The research results validated better academic performance during formative assessment with the students who underwent it in the online format. Better performance of the experimental group (in relation to the test score) was not unexpected and it might be caused by the more comfortable conditions with less stressful factors than in the classroom. Moreover, the students practically admitted temptation to cheat if they work on the test in computer-assisted format with immediate access to the Internet.

2. It was established that self-regulation capacity had developed unevenly in cases of the formative assessment conducted in pen-and-paper format and in online format. The experimental group of students who conducted online formative assessment assignments did not obtain a sustainable self-regulation skill which is supposed to be formed among other methods through their preparation, implementation and feedback on the formative assessment.

Self-regulation, being one of the core skills for the engineering students, proved to be better obtained by the students whose formative assessment during ESP course was conducted in the paper-based format.

3. As to the reasons of the detected correlation, it is probable to conclude that offline education needs offline formative assessment. Blended education which entails more equal distribution between formats might be effective in terms of self-regulation. However, traditional offline course breeds better mastering of self-regulation skill when the formative assessment is conducted in paper-based in-class format.

Self-regulation performance also might be influenced by the fact that the experiment was carried out among the students of engineering specialties in the mineral sector. Lately the need for foreign communication has been decreasing among Russian engineering students so as the motivation of these students to study the foreign language in the light of current conditions. Since self-regulation is inseparably connected with motivation, it would be reasonable to continue the research in terms of motivational aspect of the posed issue.

Summing up, it should be pointed out that traditional educational format that has been implemented in Saint-Petersburg Mining University proved to be more effective in terms of acquiring self-regulation capacity and in terms of depicting the trustworthy formative assessment results among future engineers of mineral sector. Transition to e-learning should be soft, gradual and balanced not to undermine the existing practice of traditional educational methods that have been elaborated during several decades and even centuries.

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Private Educational Organizations in Russia: Problems and Prospects

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Abstract

The article suggests the author's position, revealing the prospects for the development of private educational organizations in the Russian educational space. Special attention is paid to the attitude of the state to the private educational sector. The analysis of the reasons hindering the development of private general education in the territory of the Russian state is made. The positive and negative aspects of private general education in comparison with public education are revealed. The problems of private schools in the regions of the country have been identified. The methods used in the work made it possible to realize the stated goal, in particular: empirical; general scientific and concrete scientific methods; historical-legal and comparative-legal method. As a result of the study, the reasons hindering the development of private general education in Russia are identified. These include: unequal conditions for the activities of public and private educational organizations, including in terms of material and technical support and digitalization of the educational process; lack of business interest in investing in private education; problems with renting premises and high rents for private general education organizations; shortage of qualified teachers; low incomes of the population and high cost of education in private general education schools. The conclusions made in the course of the study allow us to formulate proposals aimed at changing the current situation in the field of Russian private general education.

Keywords: Russian private general education, private school, licensing, private education resources.

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1. Introduction

The Russian private educational sector was formed in the period of the nineties of the twentieth century. Private educational organizations implement: preschool; primary general; basic general and secondary general education. In addition, there are several levels of vocational education: secondary vocational; higher education – bachelor's degree, specialty, master's degree and training of highly qualified personnel (Federal'nyj zakon..., 2012).

Federal Law 273-FZ does not prohibit the activities of private educational organizations. However, it does not regulate in detail the specifics of the legal status of the latter, authorizing in article 7 the possibility of including in part of the basic educational program formed by the participants of the educational process themselves, academic disciplines (subjects) that ensure the implementation of the "religious component". In addition, the legislator regulated in art. 11 of the said law has the right to establish by private educational organizations, the founders of which are religious, as well as spiritual educational organizations, additional conditions for admission to appropriate training.

The Russian legislator, taking care of the development of private secondary schools, authorizes the provision of the latter, benefits enjoyed by small and medium-sized businesses.

However, in law enforcement practice, there are still a lot of issues that require legislative regulation. They relate to the interaction of private educational institutions with state-funded educational institutions, justifying the increase in the cost of services provided, participation in auctions, labor relations with employees, etc. All these aspects need legislative regulation and confirm the relevance of the stated topic.

In this regard, the purpose of this work is a comprehensive study of the problems of the functioning of private educational organizations in the Russian Federation and the development of promising proposals for their solution.

In this paper, attention is focused on general education, which in the current realities is of particular research interest.

Despite the fact that a rich experience of private educational activity has been accumulated in Russian history, which was forgotten during the Soviet period, modern domestic private education, in comparison with world practice, has not become popular and occupies an insignificant share in the educational segment of the country. In this regard, the tasks of identifying the position of the state in relation to the private general education sector, determining the causes and conditions constraining its development are actualized.

At the turn of the XIX–XX centuries in tsarist Russia, the educational sector was represented by both private schools, which did not fundamentally differ from the best state-owned gymnasiums, and private higher education institutions. According to A.E. Ivanov, at the beginning of the XX century there was an unprecedented interest in the development of private education. In the period from 1908 to 1913, 26 "free higher schools" appeared in Russia. Before the February revolution, there were more than 80 public and private educational institutions in the country (Ivanov, 1991: 100). The private education sector quite reasonably competed with the public sector. At the same time, women were engaged in teaching in private schools at the end of the XIX century. It can be stated that the historical merit of a private school is the involvement of women in the field of education.

2. Materials and methods

The work uses domestic normative legal acts regulating the activities of general education organizations, reflecting the strategy of the state in relation to private general education. Excerpts from some international legal acts are provided as illustrative material that ensures the objectivity of comparative analysis. To compare different points of view, the study cites the judgments of Russian authors and statistical data from reputable domestic and foreign research groups. The use of these materials allowed us to maintain objectivity in assessing the facts presented in scientific publications.

In the course of the study, empirical research methods were used that allowed comparing public and private general education, through comparative analysis, the peculiarities of financing public and private schools were identified, the costs of education in Russia and in foreign countries were determined.

In the course of the study, empirical research methods were used, including measurement, as a technique by which quantitative comparison of indicators was carried out, as well as a comparison

method that allowed comparing public and private general education. In addition, through a comparative analysis, the peculiarities of financing public and private schools were identified, the costs of education in Russia and in foreign countries were determined. On the basis of general scientific methods, in particular, analysis and synthesis, the specifics of the organization of private general education in the capital and regions of Russia are revealed, as well as leaders and outsiders in the quality of education are identified. The use of historical and legal methods made it possible to obtain information about the legislation regulating the activities of private educational organizations in certain historical periods. The comparative legal method made it possible to distinguish the common and different in public and private education in the Russian educational environment.

3. Results

According to the rating of Russian regions on the quality of education in secondary schools compiled by experts of Rosobrnadzor and the Federal Institute for Education Quality Assessment (FIOKO), the leading positions belong to St. Petersburg (92.1 out of 100 possible points), Moscow (92.0), Leningrad (77.1), Kaliningrad (76.5) and Yaroslavl (76.2) regions (Minprosveshcheniya Rossii..., 2021).

The lowest rates are in Ingushetia (7.8), Dagestan (10.6), Chechnya (13.7), Karachay-Cherkessia (13.7) and Kabardino-Balkaria (15.5) (Minprosveshcheniya Rossii..., 2021). See Table 1.

Table 1. Rating of Russian regions on the quality of education in secondary schools in 2021

Rating of Russian regions by education level 2021	
Saint-Petersburg	92,1
Moscow	92,0
Leningrad Region	77,1
Kaliningrad Region	76,5
Yaroslavl region	76,2
Kabardino-Balkaria	15,5
Karachay-Cherkessia	13,7
Chechnya	13,7
Dagestan	10,6
Ingushetia	7,8

In our opinion, there is a weak prospect in the lagging regions in the field of improving the quality of education. We believe that a way out of this situation can be found in state stimulation of the development of the private educational sector, which is practically absent in outsider regions. The competition between public and private secondary schools will solve the problem of the quality of training of schoolchildren.

In addition, stimulating the creation of private schools contributes to the creation of jobs for a large number of teachers and staff and, thereby, will favorably affect the solution of the state social task of increasing the employment of the able-bodied population. The attitude of the regional authorities to private education is ambiguous. For example, in Voronezh, officials accept any form of education, including private, as an alternative form. Of the eleven private licensed schools, only four work on accredited educational programs, despite the fact that such a general education organization is entitled to state support when receiving program accreditation. Accordingly, only

four schools receive subsidies from the state, go to the state final certification and participate in All-Russian verification work. In this regard, as officials note, it is impossible to determine in which school, private or public, the educational process is better provided until equal conditions for participation in evaluation procedures are formed (Minprosveshcheniya Rossii..., 2021).

The issue of accreditation of educational programs in private schools is one of the difficult issues. Accreditation enables the school to provide educational services according to the basic educational program, including conducting attestations and issuing state-issued certificates. According to the law "On Education in the Russian Federation", passing the state final certification is possible only in accredited schools (Federal'nyj zakon..., 2012).

With the help of accreditation, a secondary school confirms educational activities in accordance with the federal state educational standard.

According to some representatives of the educational community, educational programs of schools that have received accreditation may cost more than programs of schools without accreditation (Pochemu shkola..., 2022).

In this regard, the question arises, why are private secondary schools not eager to undergo the accreditation procedure?

We believe that the answer is obvious. The subject of the accreditation examination is to determine the conformity of the content and quality of training of students in an organization engaged in educational activities, according to the educational programs declared for state accreditation, federal state educational standards (Federal'nyj zakon..., 2012).

Most private educational organizations do not want to submit themselves to accreditation tests, as they do not see any significant advantages in this procedure. In accordance with the accepted rules, a comprehensive private school generates its income at the expense of: a) entrance fees ranging from 3 to 7 percent; b) monthly tuition fees of about 70 percent; c) grants and other injections of sponsors and others within 20 percent. In accordance with the current Russian legislation, she will not be able to receive any other funds. Therefore, most managers and founders are content with licensing educational activities.

The specifics of the organizational and legal form of educational organizations in Russia are related to their non-profit status, which imposes some restrictions. In particular, the income from educational activities cannot be used except for the development of the school, it cannot be invested in another business. The founder of the school can make a profit only in the form of wages for work at the school. This fact forces many founders to refrain from accreditation of educational organizations. The second factor constraining the desire to carry out accreditation in private schools is associated with the complex process of preparing documents for accreditation, distracting almost the maximum number of participants from directly educational activities.

A private comprehensive school and its place in the Russian educational space. A private school is usually understood as a non-governmental educational institution owned by private individuals, charitable, religious, educational organizations, foundations (Zaitsev, 2018: 5).

In accordance with the current Russian legislation, a private educational organization is an organization established in accordance with the legislation of the Russian Federation by an individual or individuals and (or) a legal entity, legal entities or their associations, with the exception of foreign religious organizations (Federal'nyj zakon..., 2012).

The specificity of the Russian educational segment consists in the preferential right of the state to establish educational organizations both in the system of general, secondary vocational and higher education. This situation has developed due to political and economic reasons. Many educational organizations are under the jurisdiction of ministries and departments of various government systems (Ministry of Internal Affairs, Ministry of Defense, Ministry of Justice, Ministry of Foreign Affairs, Ministry of Culture, Ministry of Health and Social Development, Federal Security Service of the Russian Federation, etc.) (Cherdakov, 2021)). Each ministry, with the exception of the Ministry of Education and Science and the Ministry of Education, seeks to limit the presence of private educational organizations in its sector. Russian education in its modern form can be defined as public education. The share of students in Russian state educational institutions is the highest in the world. Compared with the countries of the Organization for Economic Cooperation and Development (OECD), it is 91.4 % (Education GPS..., 2021).

Financing of Russian general private education. In accordance with the Law on Education in the Russian Federation, subsidies for reimbursement of expenses of private organizations engaged

in educational activities for the implementation of basic general education programs, the financial support of which is carried out at the expense of budgetary allocations of the budgets of the subjects of the Russian Federation, are calculated taking into account the standards determined by the state authorities of the subjects of the Russian Federation in accordance with paragraph 3 of part 1 of Article 8 of this Federal Law. Subsidies for reimbursement of expenses of private organizations engaged in educational activities for professional educational programs, the financial support of which is carried out at the expense of budget allocations of the federal budget, budgets of subjects of the Russian Federation, local budgets, are calculated taking into account the regulatory costs for the provision of relevant state or municipal services in the field of education (Federal'nyj zakon..., 2012). The amount depends on the capabilities of the region (Skol'ko zarabatyvayut shkoly, 2019). At the same time, the state provides financial support only to accredited private educational organizations.

In world practice, not all states participate in financial support of private education, so in OECD countries budget expenditures are allowed only for public schools. In 2018, the Parliament of the European Union adopted a resolution prohibiting the financing of for-profit private schools. One of the arguments in support of the resolution was the thesis that "taxpayers" money should not be used to finance networks of private schools or commercial organizations in the field of education. Given the detrimental impact of such schools on transparency, democracy and quality, such funding is a violation of States' human rights obligations and global commitments to free quality education (European Parliament, 2021).

The resolution was based on paragraph 4.1 of article 26 of the Universal Declaration of Human Rights, which does not allow the use of financial resources in support of private, commercial educational institutions (European Parliament, 2021).

Difference from America, where a mixed model of financial support for schools is developed, consisting of public funding, private investments in the school fund and endowments, in Russia public schools are fully provided with public funding (Mordasov, Zhabbarov, 2020). A mixed funding model is only possible in private schools.

In some countries, private education is actively funded by the State, for example, in the Republic of Filipina in 1998, Law No. 6728 was adopted, known as the "Law on State Assistance to Students and Teachers in Private Education". He determined that "the state recognizes the complementary role of public and private educational institutions in the education system and the invaluable contribution that private schools have made and will continue to make to education. For these purposes, the State should provide mechanisms to improve the quality of private education by maximizing the use of existing private education resources, recognizing the responsibility of the Government to ensure basic primary and secondary education, vocational and technical education and higher education as a priority compared to its other functions" (Philippine laws, 2022).

In most countries that are part of the OECD, the funds allocated per student amount to about $ 9.5 thousand per year. The highest level of financing in Luxembourg is about 20.6 thousand dollars. In the USA – about 12.5 thousand dollars (Mogut li..., 2021).

According to the statistical collection "Education in Numbers" in the Russian Federation, 109 thousand rubles per year are accounted for per student in the general education system, 135 thousand rubles per year in the secondary vocational education system, 393 thousand rubles per year in the higher education system (Obrazovanie v tsifrah, 2021). Seven times less than the OECD average (Mogut li v, 2021) (see Table 2).

Table 2. Tuition fees in different countries

Funds allocated for the education of one student per year	
Luxembourg	20.6 thousand dollars
USA	12.5 thousand dollars
Russian Federation	109 thousand rubles

State expenditures in Russia in 2020 for general education amounted to 1817.5 billion rubles, for secondary vocational education 284.0 billion rubles, higher education – 644.3 billion rubles.

The quality of education in private Russian schools. It should be noted that the assessment of the quality of Russian general education, according to the United Nations Education Index 2020, is not high enough, our education ranks 39th in the ranking (Mogut li..., 2021).

Despite the fact that private general education organizations are mostly not funded from the state budget, the quality of education in private schools, according to some experts, is not worse than in public schools, and according to some indicators they can compete with prestigious metropolitan schools. The Forbes publication in 2020 compiled a rating of the best private schools in Moscow, it included 30 educational institutions. Several parameters were identified as criteria for evaluating the effectiveness of secondary schools: the results of exams and Olympiads; conditions of study and stay; additional classes. In most private schools, these indicators are very high. However, the publication noted the criterion by which private schools are still inferior to public schools – this is the level of infrastructure development and the amount of space per student (Ivanova, 2018).

According to the results of the 2021 rating conducted by the REX rating agency (REX – Analytics), six private secondary schools entered the top 100 in terms of graduate competitiveness in Russia (Top-100 shkol..., 2020).

Data published by the National Research University of the Higher School of Economics indicate that in the private general education sector, the indicators of school enrollment in modern forms and technologies of education are not in favor of the latter. E-learning is better in the public sector than in the private sector. At the same time, most private schools have developed an individual approach to students, which allows them to form their individual educational trajectory (Chastnye shkoly..., 2019).

Problems that do not contribute to the development of private educational organizations. As a result, of a survey of directors of private secondary schools from 19 subjects of the Russian Federation, the main problems that do not contribute to the development of the private educational sector were identified. As the most significant respondents identified: a) lack of state support, including in terms of material and technical support for private schools; b) low level of state funding; c) problems with renting premises and high rents; c) bureaucratic difficulties in licensing and accreditation; d) low level of professional training; e) shortage of qualified teachers; e) numerous and incorrect, in the opinion of respondents, inspections of supervisory authorities (Chastnye shkoly Rossii..., 2019).

Private general education organizations, however, as well as public secondary schools, are hostages of the existing education system, which is excessively bureaucratic and requires school administrators and teachers to spend a significant amount of time implementing excessive requirements set out in educational standards and other documents regulating educational activities.

It should be noted that the requirements of higher educational institutions for the quality of training of school graduates – potential applicants, are increasing every year, which indicates an increase in employers requests. There is a vicious circle. If the school graduates poorly trained applicants, then in turn the higher educational organization is not able to correct the "marriage" and offers the employer insufficiently qualified specialists.

The basis for choosing an educational organization (public or private) should already be based on the quality of education. This may cause a social demand for an increase in private schools in Russia, provided that the management staff, headed by the founders of private secondary schools, feel the existing and emerging needs in society and will be able to design the educational process and conditions of stay in school with their consideration (Natapov, 2019).

The role of state educational policy in the development of private general education.

The private educational sector will not be able to exist without a clearly formulated state educational policy in which the attitude of the state towards private schools will contribute to their development.

According to the annual report submitted to the Federal Assembly by the Government of the Russian Federation on the implementation of state policy in the field of education, in 2020 launched "Project 500+", aimed at solving the problem of improving the quality of education by

supporting schools with low educational results working in difficult socio-economic conditions with coverage of at least 6000 schools (Doklad Pravitel'stva..., 2021).

Private schools were not mentioned in the report. It was noted that within the framework of the federal project "Modern School", infrastructural measures were implemented to create new places in general education organizations and the material and technical base of schools was updated. In educational organizations located in rural areas and small towns, in 80 constituent entities of the Russian Federation, 2951 centers of digital and humanitarian education of the "Point of Growth" have been created (Doklad Pravitel'stva..., 2021).

From the context of the report, it is clear that the Government has not taken any steps in relation to the private educational sector.

In the national project "Education", designed for implementation until 2024, private education is also not paid attention.

The report of the Minister of Education, made in April 2021, outlines the priority areas of the Ministry's work, which intends to pay special attention to improving educational results, creating a modern educational environment and learning conditions for students and teachers, developing the education system and educational infrastructure as a whole (Minprosveshcheniya Rossii..., 2021). At the same time, the Minister did not consider the private segment of general education.

4. Discussion

The problems of private Russian schools in Russian scientific literature have been discussed since the beginning of the nineties of the last century, and this topic loses its urgency from time to time due to the lack of interest in Russian society. Private schools were viewed by the scientific community from different angles, ranging from the education of emigrants in Russia (Bennett Jivaan, 2021) to a comparative analysis of curricula in Russian and British private educational organizations (Differences between..., 2021).

At the beginning of the third millennium, dissertation research appeared, affecting various aspects of private education. So, in 2007, S.V. Codrle presented the manuscript of her PhD thesis "The development of private schools in Russia and Great Britain as a factor of state education reform" (Codrle, 2007). The author tried to answer a number of questions concerning the development of private school education in Russia and the UK. In part, she succeeded, at the same time, some judgments are of a debatable nature.

In 2012, E.A. Ustinova prepared a doctoral dissertation on private school education in Russia in the context of a new educational paradigm. The work reflects the search for new ways and forms of education development. The author says that one of the promising forms to overcome the educational crisis is private education, which has deep historical roots in Russia and has rich pedagogical traditions (Ustinova, 2012).

Many authors of scientific articles saw the main research task in comparing public and private education. For example, A.V. Mogilev expressed his opinion about the crisis of Russian general education and the possibility of overcoming it by strengthening private educational organizations. The author proposed to replace the traditional school system with innovative methodological approaches of close contact with parents, as well as to increase independence from educational authorities (Mogilev, 2013). L.G. Vinokurova, in our opinion, made a successful attempt, revealing the features of the regulatory regulation of the creation and operation of private educational institutions in Russia. She analyzed Russian legislation and grouped it by branches of law, highlighting articles related to educational activities (Vinokurova, 2021).

The activities of the private educational sector have been the subject of discussions at scientific round tables and conferences more than once (Mezhdunarodnaya...). Many opinions have been expressed regarding the prospects of Russian private general education; (Astapenkova, 2020) basically, most of them were reduced to stating unfavorable forecasts. We do not share the negative scenarios of the development of private general education and offer our vision of its prospects.

According to a study published by the HSE Institute of Education, Russia has entered the top 3 countries in terms of the pace of changes in school. However, not all of them testified to an increase in the quality of education. The report analyzed the transformations that have taken place in schools in 53 countries (including 47 OECD countries) over the past ten years. Russia has once again demonstrated growth in many indicators, taking 3rd place in the overall index in the ranking.

Only Slovenia and Canada are ahead of us, and, for example, Great Britain, Singapore, the USA, South Korea are far behind (Rossijskaya shkola..., 2022).

According to the Ministry of Education of the Russian Federation, a total of 879 private schools were registered in 2020 – this is less than a percent of the total number of secondary educational organizations in the country. While in foreign countries, this figure reaches 77 % (Mogut li..., 2022). Criticism of traditional Russian school education has long been the norm. It would seem that all the prerequisites for the growth of the private education market exist, but this niche remains unfilled.

Private educational organizations in modern Russia after the Soviet period of oblivion are becoming more widespread, as in many developed foreign countries. However, Russian private educational institutions need serious state support and a special educational state policy in which the attitude of the state towards private schools will contribute to their development, as it happens in Western foreign countries (USA, France, Luxembourg, etc.).

5. Conclusion

Thus, it can be argued that the sector of private general education in the Russian Federation in modern realities is at the stage of formation and its development prospects are not very clear. There are few investors willing to invest in the general education segment. The state provides financial support only to accredited private schools, all other participants in the general education services market have to be content with parental and sponsorship financial support. A high degree of financial dependence on parents and investors makes a private school limited in freedom of action. Difficulties in the selection of qualified teachers, especially in the regions, as well as a high level of start-up costs for the establishment of a school and the organization of its educational activities adversely affect the private school. In this regard, there is a tendency to have private schools only in large cities, where the sprouts of a culture of private education originated. Most private schools lose competition with state educational organizations in terms of the material and technical base, digitalization of the educational process and the implementation of the tasks of multidisciplinary education. Difficulties with renting premises, high rents do not allow the founders of private educational schools to build a long-term perspective, which partly affects their unwillingness to accredit educational programs. At the same time, business representatives – beneficiaries or beneficiaries do not see the prospects of investing in private education, as they do not consider it a stable and profitable business. Only some of the wealthy people decided to invest in educational projects. For example, Herman Gref opened a school called “Khoroshkola”. Suleiman Kerimov invested money in the construction of the Zarechenskaya school, and Vadim Moshkovich created a school for capable and motivated children “Letovo”. The latter school is accredited in the IB system, and graduates of the program (IB DP) can enroll in foreign universities. The director of the technopark “Chemical Plant” in Togliatti Irina Handel opened the “Center School”. However, this is the exception rather than the rule.

The opinion has matured in the professional community about the expediency of resolving the problems that have developed in a modern comprehensive school as soon as possible, regardless of belonging to the public or private sector.

One of the first in this series is the problem of equalizing the interests of students, namely the imposition of the same type of educational programs that include the study of the humanities, exact and natural sciences, without taking into account the interests and abilities of students. Only in some high schools there is an opportunity to choose a profile.

The second problem concerns the system of assessment of knowledge, skills and abilities. The race for indicators leads to the fact that the administration of a general education organization tries in every possible way to gain a significant number of preferences due to an increased average score and USE results. This leads to the appearance of inflated estimates, which sometimes do not correlate with real knowledge.

The third problem stems from the legalized formalism that permeates all spheres of school life, which makes the educational process a routine. This can include: low efficiency of classes due to unproductive spending of school time; large homework assignments that kill the interest of schoolchildren in learning; different levels of training of students gathered in one class, which makes classes uninteresting for many students; low level of professional training of teachers and outdated teaching methods; “training” for the Unified State Exam instead of forming a worldview

and a broad outlook; formalized extracurricular load based on voluntary and compulsory attendance of class hours and other events, including quizzes, concerts and others.

When discussing the pros and cons of the activities of general education private schools, individualization of education is usually highlighted as positive aspects, which helps to create a comfortable environment for students, we teach children the same subjects, the same textbooks, almost the same programs. But individualization of the learning process is easier to provide in a private school, where there is an opportunity to approach each student based on his own needs (Al-Mutairi et al., 2022; Frolova et al., 2021).

The listed problems cannot be solved overnight. To do this, it is necessary to adjust the educational policy, which is currently being implemented without taking into account private general education. In this regard, it is possible to propose a certain algorithm of actions aimed at leveling the disparity between public and private general education. Based on the current situation, two groups of tasks are determined. The first covers the material and technical sphere, the second – directly educational. In material and technical support, the issues of preferential rental of premises of employees for the implementation of general education tasks in private schools require urgent solutions. Without the administrative factor, this problem cannot be solved, especially in the regions. An equally important issue concerns the renewal of the fleet of computer equipment, software and communication lines with the Internet. Only the state is able to provide equal conditions for computerization and digitalization of public and private educational organizations. This task can be solved at the level of the Ministry of Education of the Russian Federation by allocating the appropriate blocks in the programs for the development of general education.

In terms of the educational strategy, the state can provide the private sector of general education with freedom in the development and implementation of general education programs with subsequent accreditation, thereby ensuring the profiling of the school, taking into account regional specifics and economic objectives.

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The History of Education

The Institution of the Rectorship in the Higher Education System of the Russian Empire in the 19th and Early 20th centuries: The Case of Imperial Kharkov University

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Abstract

This paper explored the institution of the rectorship through the case of Imperial Kharkov University, a classical (research-oriented) university that operated from 1805 to 1917 in Ukraine, then part of the Russian Empire.

The institution of the rectorship lent itself as a useful indicator of trends and transformations in university education in Ukraine and the Russian Empire as a whole. The findings revealed that there was a transformation in the functionality of the university rector from a mere appointee to a leader in the scholarly community enjoying a high level of public recognition.

A distinctive characteristic of the institution of the rectorship in the Russian Empire was its dual status – (1) representing university's academic community and (2) representing the state's bureaucratic machine.

The rectorship at Imperial Kharkov University was explored through the lens of the following key aspects: legal, organizational, ethnic, and social.

Keywords: rector, trustee, model of the university, classical university, Imperial Kharkov University, education policy, higher education.

1. Introduction

Kharkov University is one of the oldest universities in Eastern Europe. It was founded in November 1804 on the initiative and through the offices of nobleman V.N. Karazin, an Enlightenment scholar, whose name it bears to this day. All of the substantial funding required

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for the establishment of this university was raised by the nobility (Bagalej, 1893–1898: 59-60). Funding was gathered not only in Kharkov Governorate but in Yekaterinoslav and Kherson Governorates as well. On his end, V.N. Karazin enlisted the support of Emperor Alexander I and gathered all the documentation needed to found the new institution of higher learning.

The university was officially opened in January 1805. The history of Imperial Kharkov University is an integral part of the intellectual, cultural, and spiritual history of the Ukraine of that period. The names of a number of scholars and enlighteners of global repute are associated with it (e.g., P.P. Gulak-Artemovsky, N.I. Kostomarov, D.I. Bagaley, and A.A. Potebnya). At different times, some of the world's most renowned academic and cultural figures became its honorary members and doctors (e.g., J.W. von Goethe, A. von Humboldt, I.Ya. Franko, L.N. Tolstoy, and P.P. Semenov-Tyan-Shansky).

A major center for the creation of Ukrainian national science, culture, and literature, Imperial Kharkov University played a seminal role in the emergence of the nation's first newspapers and magazines (e.g., *Kharkovsky Yezhenedelnik*, *Ukrainsky Vestnik*, *Ukrainsky Zhurnal*, and *Uchenyye Zapiski*) and academic societies (e.g., Philotechnical, Mathematical, Historical-and-Philological, Physical, Chemical, and Legal).

2. Materials and methods

In putting this work together, use was made of a variety of sources dealing with the history of the development of university education in Sloboda Ukraine, capitalled in Kharkov. Specifically, these are the materials dealing with the development of the university space in the region (Sbornik postanovlenij, 1864) and the government documents establishing the norms and rules for the operation of Russian imperial universities and the rights and obligations of their rectors (Akt postanovleniya, 1802; Polnoe sobranie, 1830; O pravah rektora, 1868a; O pravah rektora, 1868b; Dneprov, 2017; Utverditel'naya gramota, 1805).

An analysis of the University Statutes of 1804, 1835, 1863, and 1884 (Tablica ustavov, 1901) helped gain an insight into the role and functions of the university rector in the system of corporate culture within the nation's higher education sector and in the bureaucratic system of the Russian state.

A major source of information about the university's rectorate was the lists of officers from the Memorandum Books for Kharkov Governorate (Pamyatnaya knizhka, 1862-1917), which provided a general insight into the organization and management of university education in the area.

Systematized data on the rectorate of Imperial Kharkov University were also drawn from the bibliographical publications (Bogdashina i dr., 2012; Istoriya, 2004; Prokopova, 2004; Russkij biograficheskij, 1896–1913).

The study's methodological basis was grounded in the principles of objectivity, historicism, and analytical integrity. Use was made of both general and special historical research methods, including the historical-analytical method, classification and categorization, historical-logical analysis, the chronological method, the structural-systems method, and comparison.

3. Discussion

Exploring various aspects of the institution of the rectorship at Imperial Kharkov University is of considerable scholarly interest for conceptualizing the factors and mechanisms underpinning the development of the system of university education in Ukraine. Most of the articles, monographs and collections of documents that have been released up to now in conjunction with the celebration of the university's anniversaries (Bakirov, Duhopel'nikov, 2004; HGU, 1955; HGU, 1980) are only partially facilitative of a conceptualization of the rector's role and place in the system of management and education.

Therefore, it makes sense to classify the research on this topic into several thematic blocks. The first block is concerned with the research by Imperial Kharkov University rectors as members of the scholarly community. All of them held professorial positions before being appointed to (and some after stepping down from) the office of rector, engaging in pedagogical and scholarly activity. The published works that resulted from this activity provide insight into the rectors' contribution to the development of university science (Mogilevskij, 1817; Komlishinskij, 1817; Ellinskij, 1831).

The second block is concerned with the research analyzing the scholarly legacy of the university's rectors as members of the scholarly community (e.g., the philological legacy of P.P. Gulak-Artemovsky, the historical works of D.I. Bagaley, and the philosophical reflections of

A.I. Dudrovič). This research is crucial for conceptualizing their scholarly legacy and the scholarly potential of Imperial Kharkov University. However, it is little informative when it comes to describing their work in the actual office of rector, with most of the information it provides being scrappy and patchy (Levit, 1957; Kolomiec' 2000; Slabkij, 1957).

There appears to be more value in what comprises the third thematic block – the obituaries. This material contains valuable facts about the lives of the university's rectors and professors and can give us an idea of their contribution to the development of the university as a whole and its various units in particular. We can also subsume under this group some other documents and sources on the history of Imperial Kharkov University, like reminiscences by contemporaries (Antonovskiĭ, 1811; Astahova, 2004; Chirikov, 1876; Modzalevskij, 1909; Rechi, 1804-1911; Rommel', 1868; Wurzbach, 1856).

Worthy of a separate mention is the reference and encyclopedic literature containing information about the university's rectors as members of the scholarly class and a scholarly corporation and as members of the higher ranks in the Russian Empire (Potyomkin, 2019; Bagalej, Miller, 1903; Roslavskij-Petrovskij, 1841; Roslavskij-Petrovskij, 1850; Russkij biograficheskij, 1896–1913).

Certain aspects of the operation of the institution of the rectorship in the Russian Empire can be traced in the research investigating the country's system of higher education (Andreev, Posohov, 2012; Rossijskie universitety, 1998; Tomsinov, 2012), the development of its bureaucratic system (Posohov, 2017), and the development of its system of university education in a European context (Andreev, 2004; Andreev, 2009; Dement'ev, 2016; Tomsinov, 2009). Issues that are important for understanding the figure of the rector include legal support for their activity (Dneprov, 2017; Chernyh, 2011) and their relationships with other members of officialdom (Zhukovskaya, 2009).

The characteristics of the development of university education in Ukraine were explored in a number of research works focused on the organization of the educational process within Ukraine's university sector as a whole (Lebid, Shevchenko, 2021b). There are two studies looking at this process at Imperial Kharkov University, in particular (Lebid, Shevchenko, 2021a; Lebid, 2022).

The work by A. Lebid and N. Lobko analyzed several aspects of the institution of the rectorship (legal, organizational, ethnic, and social) through the case of the rectorship at the Imperial University of Saint Vladimir in Kiev (Lebid, Lobko, 2022). The findings from this research can be used in conducting comparative analyses of the subject in the future.

An insight into the general trends in the development of the system of education in Ukraine in the period under review was provided in the fundamental work by S. Siropolko (Siropolko, 2001).

4. Results

As mentioned earlier, the mastermind behind the establishment of Imperial Kharkov University was local nobleman V.N. Karazin, who at the time held the post of Secretary of the Central School Board in the Ministry of Public Education. The rationale behind opening the university was to help drive economic and cultural growth in the region. The university was seen as an institution of higher learning that could enroll graduates of educational institutions in Kharkov (e.g., Kharkov Collegium). A significant role in this matter was played by the proactive stance of members of the progressive nobility, such as V.N. Karazin, G.Ye. Donets-Zakharzhevsky, and G.R. Shidlovsky, and the edifying work of Ukrainian philosopher G.S. Skovoroda.

The city's government had provided a plot of land for the future university. The school had its charter developed (Ustav, 1805) and the foundation charter issued for it (Utverditel'naya gramota, 1805). Count S.O. Potocki was appointed the university's trustee and I.S. Rizhsky – its first rector. In the initial years of the university's existence, the bulk of its professorial and teaching staff was made up of foreigners. This was due to difficulty recruiting well-qualified staff domestically, with the school's administration left facing the issue of staffing its newly established academic units. In fact, at the time the university opened, half of the charter-prescribed vacancies for professors had not been filled. Therefore, at first there was often a need to hire foreigners. In the first decade, the university employed 29 professors of foreign descent, with 18 of these being Germans, 4 – French, and 7 – Slavs (Bagalej, Miller, 1903: 103).

Initially, Imperial Kharkov University had the following four divisions: Physics and Mathematics, Medicine, Philosophy, and Philology. By the start of the 20th century, it had the following four faculties:

Physics and Mathematics, History and Philology, Medicine, and Law. Subsequently, the following three institutes were opened at it: Pedagogical, Veterinarian, and Medical.

The newly established higher educational institution had an enrollment of 57 students, with 33 of these having state-funded tuition and 24 paying for education. Among its first graduates, produced in 1808, only 28 received a diploma. The low number of students attending the university in the initial years of its existence may have been associated with the fact that the lectures were conducted in Latin, a language not taught in high school and not spoken by most university entrants in the region at the time. Nevertheless, the number of students enrolling at Imperial Kharkov University increased year on year: 57 entrants in 1805, 65 in 1807, 72 in 1809, and 118 in 1811 (Bagalej, Miller, 1903: 104).

In the entire imperial period of its existence (1805–1917), Kharkov University had a total of 25 rectors (Table 1).

Table 1. Rectors of Imperial Kharkov University (1805–1917)

№	Rector	Specialization	Term
1	I.S. Rizhsky	Philology	1805–1806; 1808–1811
2	A.I. Stojković	Physics	1807–1809; 1811–1813
3	T.F. Osipovsky	Mathematics	1813–1820
4	V.Ya. Dzhunkovsky	Philology	1821–1826
5	A.G. Mogilevsky	Theology	1826
6	I.Ya. Kroneberg	Philology	1826–1829; 1833–1836
7	A.I. Dudrovič	Philosophy	1829–1830
8	N.I. Yellinsky	Medicine	1830–1833
9	V.S. Komlishinsky	Physics	1836–1837
10	A.F. Pavlovsky	Mathematics	1837–1838
11	A.V. Kunitsyn	Law	1839–1841; 1849–1850; 1852–1853
12	P.P. Gulak-Artemovsky	Philology	1841–1849
13	A.I. Palyumbetsky	Law	1850–1852; 1872–1873
14	K.K. Voigt	Philology	1852–1858
15	A.P. Roslavsky-Petrovsky	History	1858–1862
16	V.I. Kochetov	Agronomy	1862–1872
17	A.S. Pitra	Botany	1873–1881
18	G.M. Tsekhanovetsky	Economics	1881–1884

19	I.P. Shchelkov	Medicine	1884–1890
20	M.M. Alekseyenko	Law	1890–1899
21	G.I. Lagermarck	Chemistry	1899–1901
22	N.O. Kuplevasky	Law	1901–1905
23	L.V. Reinhard	Botany	1905–1906
24	D.I. Bagaley	History	1906–1911
25	I.V. Netušil	Philology; History	1912–1918

The institution of the rectorship at Imperial Kharkov University can be explored through the lens of the following aspects of its operation: legal, organizational, ethnic, and social.

The powers of the Rector of Imperial Kharkov University were regulated by *The Imperial University of Dorpat Establishment Act* (Akt postanovleniya, 1802), *Preliminary Procedures for Public Education* (Polnoe sobranie, 1830: 437), the University Statutes of 1835, 1863, and 1884 (Tablica ustavov, 1901), the Charter of Imperial Kharkov University (Ustav, 1805) and a few other documents (O pravah rektora, 1868a; O pravah rektora, 1868b).

As shown in our earlier research, the rector was under the significant influence of the trustee of the educational district. The rector served as a sort of intermediary between the Ministry of Public Education and the university (Lebid, Lobko, 2022: 976-977). It was quite common for educational district trustees to lobby for the appointment of university rectors. For instance, this was the case with the candidacies of I.S. Rizhsky and T.F. Osipovsky at Imperial Kharkov University.

In this context, it is worth noting that the trustee also "oversaw" issues related to appointing professorial and teaching staff at the university. For instance, it was on the recommendation of the trustee that the Board of Imperial Kharkov University "elected" V.Ya. Dzhunkovsky as an ordinary professor of Greek language arts. V.Ya. Dzhunkovsky would eventually go on to become the university's rector. Another future Imperial Kharkov University rector, P.P. Gulak-Artemovsky, was appointed to the post of teacher of Polish "owing to the auspices of" the trustee, Count S.O. Potocki. Such practices were common throughout the university sector in the Russian Empire.

At the same time, the trustee also had the ability to bring about the dismissal of a person from the post of rector or professor. For instance, T.F. Osipovsky was relieved of the posts of ordinary professor and rector at Imperial Kharkov University "at the behest of" trustee Z.Ya. Katneyev (Prokopova, 2004: 11). Thus, it can be argued that, in essence, the role of educational district trustees boiled down to using informal practices to control the activity of university professors – so much so that they could interfere directly with the work of a university's senior and middle management. However, as early as the University Statute of 1835, the functions of the trustee were formalized, incorporating him into the structure of the university as the top level of its administration.

The evolution of the system of university education in the Russian Empire can be characterized from the standpoint of the university's transformation from an academic corporation to a centralized bureaucratic establishment. In this hierarchical system, the university rector was one of the links, being integrated into the bureaucratic model of management. Yet the post of rector being an elective position contravened the nation's entrenched model of authority, with some educational district trustees even pushing for the government to discontinue the practice of electing rectors, as it "diminishes respect for one's superiors" (Petrov, 2003: 135). In this context, a telling fact is that Kharkov University got its first elected rector (L.V. Reinhard) only in 1905.

The principle of electing rectors was breached widely at the time. There were cases where the powers of "suitable" rectors remained in place even after the end of their term in office. At the instance of the educational district trustee, such rectors would be appointed for a new term. It was common to elect rectors based not on one's qualifications and credentials but one's descent, family connections, closeness to the government, and social connections in town (Andreev, Posohov, 2012: 296). Quite often, the final say in electing a rector was with the Ministry of Public Education.

As regards the organizational aspects of rectors' activity, of particular interest are the following areas: the sphere of one's scholarly interests, one's work experience gained prior to being appointed Rector, and the age composition of the rectorate at Imperial Kharkov University.

As mentioned in our earlier research, while a candidate's specialty area did not matter primarily when electing or appointing rectors, most in the Russian Empire had a degree of Doctor of Law (Lebid, Lobko, 2022: 977). On one hand, this was associated with the fact that during that period faculties of law (alongside those of medicine) led the way in the size of both the teaching workforce and the student body (Lebid, 2022: 271; Table 2). On the other hand, it was the result of the bureaucratization of university life (Posohov, 2017: 124).

Table 2. Total Size of the Student Body at Kharkov Imperial University in the Period 1850–1881 (Lebid, 2022: 271)

Faculty	1850–1851		1859–1860		1869–1870		1880–1881	
	people	%	people	%	people	%	people	%
History and Philology	32	9	19	4	34	6	76	10
Physics and Mathematics	75	19	99	20	90	17	138	18
Law	122	31	148	31	285	54	114	15
Medicine	160	41	215	45	123	24	435	57

Out of Imperial Kharkov University's 25 rectors, 6 specialized in philology, 6 in the natural sciences, 4 in law, 3 in history, 2 in mathematics, 2 in medicine, 1 in economics, 1 in theology, and 1 in philosophy. Thus, Imperial Kharkov University did not follow the national trend of university rectors tending to specialize in law, unlike the Imperial University of Saint Vladimir in Kiev (Lebid, Lobko, 2022: 978).

There was another noteworthy trend. Most university rectors had had extensive experience working in an executive position before being appointed to the post. The primary factor in selecting a candidate was the bureaucratic component, as opposed to one's scholarly background.

It is worth considering the following statistics for Imperial Kharkov University: 23 out of its 25 rectors had held an executive position prior to taking up office (mainly, the posts of faculty dean and university board secretary). Six of the rectors had worked as a prorector (V.Ya. Dzhunkovsky, A.V. Kunitsyn, K.K. Voigt, G.M. Tsekhanovetsky, I.P. Shchelkov, and I.V. Netušil). Of particular note is the case of I.V. Netušil, who had worked as a member of the Board under the Trustee of the Kharkov Educational District.

The post gave Imperial Kharkov University rectors the opportunity for further career growth. For instance, after leaving office, M.M. Alekseyenko became the Trustee of Kazan Educational District and a member of the Third and Fourth State Dumas. N.O. Kuplevasky became a member of the Academic Committee of the Ministry of Public Education. D.I. Bagaley combined the office of rector with the post of councilor in the Kharkov City Council; he later was a member of the State Council from the Universities and the Academy of Sciences; he served as Mayor of Kharkov from 1914 to 1917. I.V. Netušil became a corresponding member of the Russian Imperial Academy of Sciences (Basargina, 2008: 557). As we can see, the career of most of the ex-rectors of Imperial Kharkov University continued in social, academic, political, and public policy environments – often in high-level positions.

Of particular interest is the age of the university's rectors at the time of assuming office. The youngest Imperial Kharkov University rectors were A.V. Kunitsyn, who at the time of assuming office was 32, A.I. Dudrovič, and N.I. Yellinsky, both taking up the post at the age of 34. The institution's oldest rectors were I.V. Netušil, L.V. Reinhard, and G.I. Lagermarck (62, 58, and 56, respectively). The average age of the university's rectors was 41.

Imperial Kharkov University was the alma mater of many of its rectors – 10 out of the 25. Its directors included graduates of other imperial universities – the Imperial University of Saint

Vladimir (2), Imperial Saint Petersburg University (1), and Imperial Kazan University (1). Some of the rectors had attended lectures at the Universities of Edinburgh, Göttingen, Jena, and Berlin. Some were graduates of Vladimir and Kazan Ecclesiastical Seminaries.

In terms of ethnic background, most of the rectors of Imperial Kharkov University were Ukrainians (52%), with the rest including ethnic Russians and individuals hailing from Hungary, Serbia, Czechia, and Finland.

It should be noted that many universities in the Russian Empire were under considerable German influence at the time, with instruction in them conducted mainly based on educational models used by German universities. Some of the professors invited to Imperial Kharkov University from foreign universities went on to become its rectors. Of particular interest is the case of A.I. Stojković, born in Ruma, then part of the Austrian Empire. He was invited by the Trustee of Kharkov Educational District, Count S.O. Potocki, to Kharkov University to fill the post of physics professor. Stojković took an active part in organizing the work of the university – he stood at the origins of the Physics Laboratory there. He was the Dean of the Physics and Mathematics Division before becoming Rector (Inostrannye professora, 2011: 145-148).

Another Imperial Kharkov University rector of foreign descent, A.I. Dudrovič, was a native of Hungary. A disciple of well-known philosopher J. Schad, he was characterized by some contemporaries as a person who "himself so lived as he taught others" (Inostrannye professora, 2011, 2011: 89-90), a phrase associated with the legacy of Ukrainian philosopher G.S. Skovoroda.

In terms of social background, the overwhelming majority of Imperial Kharkov University rectors, 40 %, were descended from clergy, with the rest representing, in equal measure, the nobility, merchants, urban commoners, and the military estate (15% each).

According to researcher S.I. Posokhov, the average length of service as a rector in the Russian Empire at the time was six years (Posohov, 2017: 127). The figure for Imperial Kharkov University was 4.5 years. The way in this respect was led by V.I. Kochetov, who held the office for 10 years (1862–1872), M.M. Alekseyenko – 9 years (1890–1899), P.P. Gulak-Artemovsky – 8 years (1841–1849), and A.S. Pitra – 8 years (1873–1881).

It is worthy of note that the role of V.Ya. Dzhunkovsky in the office was taken over by A.G. Mogilevsky following the former's death in 1826. Incidentally, A.G. Mogilevsky's (5 months) was the shortest term served as Rector of Imperial Kharkov University.

This is a good example of the fact that not all rectors were able to serve out their term. The most common reasons included health issues, death, and legal troubles.

In this context, of particular interest is the case of A.I. Stojković, who was accused of "illegal commercial activity" and was eventually fired from the university (Wurzbach, 1856: 142). More specifically, there were complaints of A.I. Stojković engaging in behavior that made him "unworthy of the title of rector" – he was accused of repeatedly using most of the funding that he requested for ordering labware and books for the Physics Laboratory to "purchase red Hungarian wine and sell it to others". He was also accused of selling master's and doctoral diplomas. Attempts were made to sweep the matter under the rug. Stojković enlisted the support of the Trustee of Kharkov Educational District and the Minister of Public Education, with the latter directing that the investigation be discontinued due to "failure to substantiate the accusations properly".

In terms of social status, of particular note are the highest distinctions awarded to the university's rectors. All of the rectors of Imperial Kharkov University were holders of at least one of the following Imperial orders: the Order of Saint Vladimir, the Order of Saint Anna, and the Order of Saint Stanislaus. For instance, I.S. Rizhsky was a recipient of the Order of Saint Anna (2nd class), A.S. Pitra – the Order of Saint Anna (2nd class) and the Order of Saint Vladimir (3rd class), and A.I. Palyumbetsky – the Order of Saint Anna (2nd class), the Order of Saint Vladimir (2nd class), and the Order of Saint Stanislaus (1st class and 2nd class).

The following rectors held the title of distinguished professor at Imperial Kharkov University: T.F. Osipovsky, V.Ya. Dzhunkovsky, A.V. Kunitsyn, and M.M. Alekseyenko. The following were its honorary members: A.V. Kunitsyn, A.I. Palyumbetsky, K.K. Voigt, and A.P. Roslavsky-Petrovsky.

5. Conclusion

The institution of the rectorship was approached in this work as a useful indicator of trends and transformations in university education in Ukraine and the Russian Empire as a whole, both in the academic and administrative arenas. The rector served as an important link in the hierarchical

bureaucratic system. The emergence of Imperial Kharkov University was another testimony to the government remaining true to its policy of building a system of Russian universities, which was manifested in the establishment of the universities in Kiev, Kazan, Odessa, Saint Petersburg, and other cities.

The Imperial Kharkov University had all the qualities of a classical (research-oriented) university, and the rector acted as a "patriarch" of the university's values and traditions.

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The Development of Women's Higher Education in Prerevolutionary Russia

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Abstract

This work examines the development of women's higher education in the Russian Empire in the second half of the 19th and early 20th centuries. Consideration is given to the characteristics of the higher women's courses in the country's university cities.

Reference was made to a set of regulations relating to women's higher education in Russia issued in the early 20th century. The use of the fundamental principles of historicism, systematicity, and objectivity helped gain a proper insight into the development of women's higher education in the Russian Empire in the second half of the 19th and early 20th centuries.

The study's findings revealed that the development of women's higher education in the Russian Empire had several distinctive characteristics. A major role in this process was played by private women's educational institutions, more specifically the higher women's courses. Originating back in 1859, these courses were continually perfected and harmonized with the system of higher education under the purview of the Ministry of Public Education. At the cusp of the 19th and 20th centuries, this even helped establish in Russia the two women's state institutes. Overall, by the start of the 20th century Russia had in place nearly 25 different higher women's courses, with instruction in this sector offered across a variety of subject areas, including pedagogy, medicine, architecture, technical drawing, art and design, and technical and practical sciences. The new vistas of opportunity opening up for women with a higher education helped many of them become active participants in social life in prerevolutionary Russia.

Keywords: women's higher education, Russian Empire, higher women's courses, late 19th and early 20th centuries, women's pedagogical institute.

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1. Introduction

Women's higher education in Russia owes its development mainly to nongovernmental and private initiatives. Women were first admitted to university in Russia in 1859, when Saint Petersburg University began to admit women as non-degree students. In 1860–1861, similar processes took place in the universities in Kharkov, Kiev, and Odessa. However, as early as 1863, following the adoption of the University Statute of 1863, women were no longer allowed to attend a Russian university. However, demand for women's higher education in the country was so high that the first higher women's courses were soon launched. These courses would go on to play a significant role throughout the prerevolutionary period in making higher education accessible to women in Russia.

2. Materials and methods

Reference was made to a set of regulations relating to women's higher education in Russia issued in the early 20th century, including *Imperially Approved Report on Allowing Female Graduates of the Saint Petersburg Higher Women's Courses to Teach All Subjects in the Upper Grades of Women's Gymnasiums and Progymnasiums of September 25, 1901* (Vysochaishe utverzhdennyi doklad..., 1901), *Regulation of the Board of Trustees on Allowing Female Home Tutors Who Are Graduates of the Saint Petersburg Higher Women's Courses to Teach in the Upper Grades of Institutes of May 31, 1903* (Polozhenie Opekunskogo soveta..., 1903), *Proposal of the Minister Regarding the Rights of Female Non-Degree Students in Universities of August 1, 1907* (Otnositel'no prav..., 1907), and *On Evaluating Females' Knowledge Learned in the Program of an Institution of Higher Learning and on the Procedure for Granting Them the Academic Credentials for Teaching at a Secondary Educational Institution. Rules Approved by the Emperor on December 19, 1911* (Ob ispytaniyakh lits zhenskogo pola..., 1911).

The use of the fundamental principles of historicism, systematicity, and objectivity helped gain a proper insight into the development of women's higher education in the Russian Empire in the second half of the 19th and early 20th centuries.

3. Discussion

In recent decades, the history of women's higher education in Russia has been explored in both national and regional contexts.

The works considering women's higher education in Russia in a national context, most notably, include the work by A.Ye. Ivanov, focused on higher education in imperial Russia (Ivanov, 1991), the work by L.B, Chirkov, focused on the historiography of higher women's education in Russia in the late 19th and early 20th centuries (Chirkova, 1999), the work by R.A. Fando, focused on the "women's question" in the context of education in prerevolutionary Russia (Fando, 2016), and the works by V.A. Vremenko (Veremenko, 2004) and O.A. Patrikeyeva (Patrikeeva, 2011), focused on women's education in Russian universities.

N.F. Katsalova researched women's higher education in industrial engineering in Russia in the late 19th and early 20th century (Katsalova, 2013). L.M. Zotova researched women's education in early-20th-century Russia in the context of the demand for female specialists in the country's labor market (Zotova, 2012). In addition, of comparative interest is the work by T.V. Koroleva, which examines women's higher education and the women's movement in France in the 19th and early 20th centuries (Koroleva, 2005).

The works considering women's higher education in Russia in a regional context, most notably, include the work by Ye.F. Kuzminova and S.A. Nekrylov, focused on women's higher education in early-20th-century Siberia (Kuz'minova, Nekrylov, 2006), the work by L.T. Fayzrakhmanova, focused on women's higher education in Kazan at the cusp of the 19th and 20th centuries (Faizrakhmanova, 2015), the work by Ya.B. Rudneva, focused on women's higher education in Russia in the second half of the 19th and early 20th centuries through the lens of the system of education in the Kazan Educational District (Rudneva, 2012), the work by O.V. Melnik, focused on women's higher medical education through the lens of the Odessa Courses (Mel'nik, 1912), and the work by T.N. Kulikova, focused on women's higher education in the late 19th and early 20th century through the lens of the Guerrier Courses (Kulikova, 2019).

4. Results

The second half of the 19th century witnessed the launch of pedagogical classes at Russian secondary women's educational institutions with the aim of providing women with further education. The first such class was set up in 1859 at the Mariinsky School in Saint Petersburg. In 1863, the class was transformed into the Pedagogical Women's Courses, which would have a two-year program of study. As early as 1870, the school was split into two divisions – the Division of Philology and the Division of Mathematics. In 1879, the length of the school's program of study was extended to 3 years. Its curriculum was continually enhanced, and in 1903 the school was reorganized into an institution of higher learning – the Women's Pedagogical Institute (Vademekum, 1915: 7).

However, members of the fair sex in Russia were not happy with being limited to attending pedagogical courses and undertook a series of initiatives to boost the accessibility of higher education to women. In 1868, a collective petition signed by 400 women was sent to the Rector of Saint Petersburg University requesting that lectures and courses in various disciplines be organized for women. Concurrently, there emerged a similar advocacy group in Moscow. The matter was forwarded for consideration to the Minister of Public Education. As a result, females were permitted to attend public lectures that previously were accessible only to males. On January 20, 1870, Saint Petersburg became home to the Vladimir Courses. This school offered instruction in language arts and mathematics, with each course being of 2-year duration. A little earlier, on April 1, 1869, Saint Petersburg became home to a preparatory school for women intended to help fill gaps in a person's knowledge from secondary school and make it easier for them to comprehend the content of a professor's lectures. Beginning in 1870, similar schools began to open in other regions of the Russian Empire as well (e.g., Kazan, Kharkov, and Warsaw). Instruction in such schools was limited to lectures, and the composition of students attending these lectures was inhomogeneous in terms of education level. To this end, the Moscow Higher Courses for Women was launched in 1872. This school had a charter; it would also be known as the Guerrier Courses (Kulikova, 2019: 22). It was a private educational institution focused on providing female graduates of secondary educational institutions with the opportunity to continue their education. Instruction in this school was conducted by Moscow University professors. Gradually, the Guerrier Courses would take on the structure of a faculty of history and philology. Initially, the school's program of study had a duration of 2 years. In 1879, it was extended to 3 years.

The Kazan Higher Women's Courses was established in 1876. In 1879, the school was split into two divisions – the Division of Philology and History and the Division of Physics and Mathematics. In 1878, a similar school with similar divisions was opened in Kiev.

The Vladimir Courses in Saint Petersburg, closed in 1875, reopened in 1878 with a university curriculum and a new name – the Bestuzhev Courses. The first director of the Bestuzhev Courses was Academician K.N. Bestuzhev-Ryumin, who lectured in Russian history there. The school had three divisions – the Division of Philology and History, the Division of Physics and Mathematics, and the Division of Mathematics (which, beginning in second grade, had a program different from that of the Division of Physics and Mathematics) (Mel'nik, 1912: 73-74). The school's program of study had a duration of 3 years. In 1881, it was extended to 4 years.

The 1870s witnessed the emergence of women's higher medical education in Russia. Specifically, in 1872 the Saint Petersburg Women's Higher Medical Courses was established. At first, it operated as a school for training academic midwives. The school's curriculum was gradually expanded to match a university-level one, and the duration of its program of study was extended from 4 to 5 years. Those who completed their program of study would receive the title of physician. In 1876, the Women's Medical Courses was moved to the Nikolayevsky Military Hospital. It was in existence there up to 1887, when there was a change in the senior management of the Military Department. It, however, is worth noting that the Saint Petersburg Women's Higher Medical Courses was the first women's medical institution of higher learning in the world, i.e. back then there was no experience of this kind even in Europe.

All of the above-mentioned higher women's courses were established in Russia through nongovernmental or private initiatives. The schools were mainly financed by donations and tuition fees. Back then, the existence of private educational institutions largely depended on the demand for education. When the demand declined, such schools would close – to reopen at a time when a sufficient number of those willing to pursue higher education had been reached. Hence, the higher

women's courses sector was characterized by impermanence, with such schools often closing down, just like any private educational institution. In the late 1880s, the Ministry of Public Education closed, one by one, the women's courses in Saint Petersburg, Moscow, Kiev, and other cities. In 1889, a few years after the closure of the Bestuzhev Courses, the new higher women's courses was launched in Saint Petersburg. The new school had an upgraded charter, and there were changes in organization, with management of the school passing from the public to the school's director, who was given the authority to appoint instructors. The director was appointed by the Minister of Public Education. The public, in turn, was empowered to establish a board of guardians in an effort to obtain more funding for the school. The school also received a government subsidy to the tune of 3,000 rubles to fund the salary of the director. Curricula were the purview of the Ministry. Initially, the school had two divisions – the Division of History and Philology and the Division of Physics and Mathematics. In 1906, the Division of Law was also established.

On September 14, 1897, i.e. 10 years after the closure of the women's medical courses in Saint Petersburg, the city became home to the Women's Medical Institute. The regulation dealing with the establishment of this school came out back in 1886. There were solid reasons behind the opening of this institute – over the decade, not only had there been accumulated a sufficient number of potential students willing to attend it but sufficient funding had been raised too. Initially, it was believed that the institute would run solely on donations (by 1897, the school received nearly 700,000 rubles worth of donations) and tuition fees. The city provided a parcel of land for the school and let it use the Petropavlovskaya Hospital for its clinical classes. On May 10, 1904, a new regulation was adopted dealing with the institute. By this time, there had been substantial improvements in terms of the school's educational and material resources, making it possible to bring education in the institute up to the level of that in a faculty of medicine. The institute was empowered to perform tests and grant the diploma of Doctor of Medicine. The instituted admitted females aged 19 to 28 with a secondary education who had passed an additional exam testing their knowledge of the curriculum of a male gymnasium. The school's budget was 229,000 rubles, of which 139,000 was from the Treasury. In 1911, state funding increased by another 75,000 rubles. Thus, as at 1911 the government took care of almost all the needs of the Women's Medical Institute in Saint Petersburg (Vademekum, 1915: 11).

On April 7, 1900, the Emperor approved the establishment of the Moscow Higher Women's Courses, whose operation was to be based on the same organizational design as the Saint Petersburg Courses. The school was opened on September 15, 1900. Initially, it had two divisions – the Division of History and Philology and the Division of Physics and Mathematics. In 1906, the school's third division – the Division of Medicine was set up (Kulikova, 2019: 24). The school was granted an annual government subsidy of 8,600 rubles to fund the work of its administration. However, most of the funding came from tuition fees, with each student paying 100 rubles per year and 50 rubles per term (Kulikova, 2019: 26).

In 1903, the Imperial Women's Pedagogical Institute was opened based on the Pedagogical Courses at the Saint Petersburg women's gymnasiums of the Office of the Institutions of Empress Maria. Pursuant to a regulation adopted on May 6, 1912, the institute was considered an institution of higher learning specializing in training female teachers for secondary educational institutions, as well as form teachers and home tutors. The school was managed by an honorary trustee appointed from among members of the imperial family. The institute incorporated a women's gymnasium, a primary school, a kindergarten, and a daycare center, which were used for students' practical classes. The school had two divisions – the Division of Philology and History and the Division of Physics and Mathematics. The school's program of study had a duration of 4 to 4.5 years and offered the following disciplines: divinity, philosophy, pedagogy, history, physics, mathematics, natural history, and foreign languages. The institute admitted female graduates of secondary educational institutions aged at least 16 years, with the selection process involving a review of one's prior academic performance and achievements. Graduates of this institute would be authorized to teach subjects that were their specialty in all women's secondary educational institutions, while those who had majored in foreign languages would be in a position to teach in all men's and women's educational institutions.

The Odessa Higher Women's Pedagogical Courses was established in 1903. It was transformed in 1906 into the Odessa Higher Women's Courses. The school was similar to the Saint Petersburg and Moscow Courses in the structure and organization of the educational process.

In light of petitions from regions across the country for the opening of higher women's courses in them, on December 3, 1905, the Minister of Public Education was authorized to establish private women's courses in them. That same year, women were granted admission to most Russian universities and other institutions of higher learning. Furthermore, there appeared mixed-type general education institutions, i.e. schools serving both males and females. The period following 1905 witnessed a marked upturn in the development of women's higher education in Russia, an area in which this nation was outperforming even Western Europe. All Russian university cities were becoming home to various organizations offering general and vocational education to women, with some of those facilities funded by the government. There was brisk development in the women's technical education sector, with instruction in it now offered across a variety of subject areas, including architecture, technical drawing, art and design, construction, and technical and practical sciences. In the period from 1905 to 1913, the Ministry of Public Education issued over 30 permits for the opening of various higher women's courses. As a result, 5 times more higher women's courses were opened in Russia in that relatively short period than in the preceding 40 years.

The nation's institutions of higher learning for women were established in the following chronological order: 1878 – Petrograd Higher Women's Courses; 1900 – Moscow Higher Women's Courses; 1903 – Higher Women's Natural Science Courses in Saint Petersburg; 1905 – Higher Evening Women's Courses in Kiev. In 1908, similar schools were established in Tiflis, Yur'yev, Warsaw, Kharkov, Tomsk, and Kazan (Vademekum, 1915: 14).

Virtually all of these schools had a 4-year program of study. Medical students would have to study for 5 to 6 years. The schools were mainly funded through tuition fees. For instance, this particular source of funding brought the Saint Petersburg Women's Courses over 400,000 rubles in 1909–1910, and it gave the Moscow Courses 519,000 rubles in 1911. These two schools led the way in the size of the student body – in 1911–1912, the Saint Petersburg Courses and the Moscow Courses had enrollments of 5,875 and 5,706, respectively. In 1911–1912, the women's courses sector in the Russian Empire had a combined student body of nearly 22,000 (25,000 inclusive of the student bodies at Saint Petersburg's Pedagogical and Medical Institutes).

Those years witnessed an expansion of the sphere of employment for graduates of higher women's courses. Ultimately, on December 19, 1911, the government passed the law *On Evaluating Females' Knowledge Learned in the Program of an Institution of Higher Learning and on the Procedure for Granting Them the Academic Credentials for Teaching at a Secondary Educational Institution* (Ob ispytaniyakh lits zhenskogo pola..., 1911: 1-9; Faizrakhmanova, 2015: 572). The law introduced the title of secondary school teacher. Female holders of this title admitted to service at state-run schools would enjoy the same privileges in terms of salary and pension as males (Ob ispytaniyakh lits zhenskogo pola..., 1911: 6).

As mentioned earlier, in 1905 women in Russia were granted permission to attend universities and some other institutions of higher learning as non-degree students. This was fundamental to resolving the issue of women's higher education, in a sense calling into question the need to establish higher women's courses. Yet, even though women had been granted admission to universities, the number of places reserved for them there was insufficient. According to researcher O.A. Patrikeyeva, competition to get into a university was normally "3 to 4 times" more intense for women (Patrikeeva, 2011: 181). In May 1908, following the First Russian Revolution, first the Ministry of Public Education and then the Ministry of Commerce and Industry issued ordinances discontinuing the admission of women to educational institutions under their purview.

An important event in the history of women's higher education in Russia was the government issuing an ordinance on February 9, 1913, allowing female natives of Siberia to enter the Faculty of Medicine at Tomsk University beginning in the 1913–1914 school year. This was the only university in Russia that admitted women back then.

The First All-Russian Congress on Women's Education and the First All-Russian Congress on Family Education, both held in late 1912 in Saint Petersburg, raised the issue of equal rights for women and men across all levels of education. Eventually, the discussion of the issue of provision of higher education to women in Russia would temporarily be postponed as a result of World War I.

5. Conclusion

The development of women's higher education in the Russian Empire had several distinctive characteristics. A major role in this process was played by private women's educational institutions, more specifically the higher women's courses. Originating back in 1859, these courses were continually perfected and harmonized with the system of higher education under the purview of the Ministry of Public Education. At the cusp of the 19th and 20th centuries, this even helped establish in Russia the two women's state institutes. Overall, by the start of the 20th century Russia had in place nearly 25 different higher women's courses, with instruction in this sector offered across a variety of subject areas, including pedagogy, medicine, architecture, technical drawing, art and design, and technical and practical sciences. The new vistas of opportunity opening up for women with a higher education helped many of them become active participants in social life in prerevolutionary Russia.

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Discussion of Geography Instruction in 1863 in the Kharkov Educational District, the Russian Empire

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Abstract

In the early 1860s, the Kharkov Educational District was a venue for heated discussions of practices for teaching various subjects. This paper analyzes a discussion around geography instruction that took place there in 1863 concurrently with a discussion around teaching language arts. The discussion was triggered by suggestions from a Kharkov University professor named S.V. Pachman that there was a need to have a link between the university and the gymnasiums. Following the publication of S.V. Pachman's statements in Tsirkulyar po Khar'kovskomu uchebnomu okrugu, a First Kharkov Gymnasium teacher named Spassky shared with the district's administration certain pedagogical ideas regarding geography instruction, which, he hoped, would find support among the university's faculty. All of a sudden, he had an opponent – another First Kharkov Gymnasium teacher, named Gadzyatsky, who suggested improving geography instruction via the use of completely different methods, ones of an ideological, rather than pedagogical, nature. A Kharkov University professor named A.P. Zernin acted as arbiter in the dispute. The discussion may be of particular interest to those interested in the history of Russian pedagogy and may provide a valuable insight into the daily pedagogical process in provincial gymnasiums in the Russian Empire at the time.

An analysis of the discussion revealed that in the early 1860s the system of teaching geography and language arts in Russian gymnasiums was undergoing brisk development. A shift was taking place away from rote learning with a focus on topographic nomenclature towards meaningful learning based on balancing the core learning material with supplementary literature, like journey descriptions and geographical essays (e.g., 'A Study of Trade at Ukrainian Fairs' by

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I.S. Aksakov). The emphasis was on engaging the attention of students and getting them to understand the extra material. Although the development of pedagogical practices for teaching geography in the Kharkov Educational District was not heavily impeded by the absence of a good textbook, there still were a few serious issues to consider, most importantly the irrational distribution of the course time for geography across grades (most of this time was accounted for by junior school, i.e. a time of limited cognitive abilities for most children) and the absence of geography as a subject in the university (as a result, geography was often taught in gymnasiums by instructors of dubious competence).

Keywords: history of pedagogy, teaching methodologies, historical pedagogical views, Kharkov Educational District, I.S. Aksakov, A.P. Zernin.

1. Introduction

As revealed in the article 'A Discussion of the Practices for Teaching Language Arts Employed in the Kharkov Educational District in 1863: The Case of Novocherkassk Host Gymnasium', the search for optimum practices for teaching language arts was discussed in the Kharkov Educational District in the early 1860s in fairly tough conditions (lack of funding, absence of appropriate textbooks, poorly qualified teaching staff, and poor student outcomes) (Peretyatko, Svechnikov, 2022: 983, 991-992). It was established that, in the face of all these difficulties, the district's administration managed to launch a constructive discussion among ordinary teachers on how to deal with the key issues facing provincial gymnasiums (Peretyatko, Svechnikov, 2022: 982). Discussions of this kind are of great value in that they offer an inside look at education in a different era, with the focus being not on theoretical constructions and model classes but on mass pedagogical practice, with this practice assessed not in terms of conformity with certain rules and guidelines imposed from above but in terms of the effectiveness of those rules and guidelines for organizing the learning process in schools. In that same year, 1863, a similar discussion developed in the Kharkov Educational District around geography instruction as well. Through the prism of this discussion, the present article will reconstruct both the pedagogical views of ordinary geography teachers in the 1860s Russian Empire and the daily pedagogical process in provincial gymnasiums, including the organization of geography classes.

2. Materials and methods

Reference was made to the following materials emanating from the 1863 discussion on geography instruction conducted in the Kharkov Educational District: 'A Note on Geography Instruction in Gymnasiums' by Spassky (Tsirkulyar..., 1863b: 113-123), the opinion of A.P. Zernin on it, and the note by Gadzyatsky (Tsirkulyar, 1863b: 123-127). Use was made of the historical-descriptive method to reconstruct a general picture of the discussion based on these materials. The historical-comparative method was employed to match the opinions voiced on the matter against the outcomes of an inspection of gymnasiums within the Kharkov Educational District conducted in 1862 and against the materials from the 1863 discussion on language arts instruction conducted in the Kharkov Educational District.

3. Discussion

Although the discussions that in the early 1860s developed in the Kharkov Educational District around the teaching of the two subjects did so independently from each other, the two processes were similar – both were triggered by notes from ordinary gymnasium teachers addressed to the district's administration. The author of the note 'On Russian Language Arts Instruction in Gymnasiums', a Novocherkassk Host Gymnasium teacher named A.M. Savelyev, did not specify the reasons behind writing it. All we know is that he just shared his thoughts on teaching the subject with the aims of getting advice and recommendation from his more experienced colleagues and raising the issue of the absence of a satisfactory textbook (Tsirkulyar..., 1863a: 66, 69-70). Evidently, he trusted the district's officials and so felt free to speak out on fundamental failures, flaws, and gaps in his teaching (Tsirkulyar..., 1863a: 66, 67). A colleague of his, a First Kharkov Gymnasium teacher named Spassky (most likely, Vasily Lukich Spassky, a well-known pedagogue and opinion writer based in Kharkov between the 1860s and 1880s (Russkii biograficheskii slovar', 1909: 177)), wrote 'A Note on Geography Instruction in Gymnasiums'. Spassky was clearer about his motives for writing his note, bluntly confessing that

geography teachers did "not have the means needed to carry out instruction properly" and so he wished to help straighten the issue out by acting based on the information provided in Issue 19 of Tsirkulyar po Khar'kovskomu uchebnomu okrugu for 1862 (Tsirkulyar..., 1863b: 113).

Speaking of that issue, there is one interesting fact that is worth mentioning – Spassky was referring not to some administrative directive and not even to a pedagogical article but to a report by professor S.V. Pachman on the administration of examinations in Voronezh and Tambov Gymnasiums (Tsirkulyar..., 1862: 183-198). Never a professional pedagogue, S.V. Pachman actually was an outstanding lawyer with numerous fundamental studies on jurisprudence to his name (Pakhman, 1911: 408-409). Yet he approached the duty of administering gymnasium exams for the university more than seriously, with his reports containing, in addition to descriptions of the actual exams, a whole raft of ideas for how to improve the educational system. One such idea was that representatives from the university attending gymnasium exams should act not as scrutineers, for "any control more or less has the nature of restraining and paralyzing custody", but as "intermediaries concerned with maintaining a steady solidary link between the university and the gymnasium" (Tsirkulyar..., 1862: 195). In S.V. Pachman's view, under this approach, suggestions by the university instructors in attendance made during a gymnasium exam would draw a more animated, informal response from the teachers and serve, "if not as a trigger for immediate improvements, at least as one for discussing them" (Tsirkulyar..., 1862: 195). Note that this approach was close to the ideas propounded by Kharkov University professor N.A. Lavrovsky, a major pedagogue whose ideas with regard to reform of the educational system began to be actively applied at that time in the Kharkov Educational District. In 1861, Tsirkulyar po Khar'kovskomu uchebnomu okrugu carried a large article by him focused on adequate control in education, which concluded with the following words: "As the era of dominance of fear in schools is nearing an irrevocable end and the existing intimidation-based system is being supplanted by brief penalties, it is now time for the school inspector to stop being a lightning that punishes inequitably and start being a friendly guest who brings some refreshment to the routine-weary educational forces and inspires and leads them, a kindly guide between the remote school and the folks up top" (Tsirkulyar..., 1861: 19).

Thus, whereas one can only surmise that what inspired A.M. Savelyev to write his note, 'On Russian Language Arts Instruction in Gymnasiums', was the administration of the Kharkov Educational District paying attention to the concerns of ordinary pedagogues, with a focus on encouraging, rather than intimidating, them, it was definitely the case with Spassky. Not only was he an attentive reader of Tsirkulyar po Khar'kovskomu uchebnomu okrugu, including materials in it relating to inspections of other gymnasiums, but he regularly utilized some of those insights in his own work too. And it is actually based on the idea about the need for a "solidary link between the university and the gymnasium", something that S.V. Pachman had proposed, that Spassky decided to speak out about the challenges faced by geography teachers in gymnasiums before the Board of Trustees of the Kharkov Educational District, which included university professors as well (Tsirkulyar..., 1863b: 113). Luckily, his hopes came true – not only did the Board not chastise the teacher, who was just being blunt about geography instruction being poor in all gymnasiums, including the one he taught at, but it went ahead and published Spassky's note in Tsirkulyar po Khar'kovskomu uchebnomu okrugu in hopes of drawing to his opinion the attention of other practicing pedagogues (Tsirkulyar..., 1863b: 113).

What Spassky saw as the main problem with geography instruction in gymnasiums was the wrong distribution of subject matter across grades within them (Table 1).

Table 1. Approximate Distribution of the Geography Subject Matter Taught in Russian Gymnasiums Across Grades in the Early 1860s

Grade	Number of hours per week	Subject matter
1	3	General survey
2	3	Africa, Asia, Australia, Oceania, America
3	3	Western Europe
4	2	General survey of national geography

5	1	In-depth instruction in national geography
6	–	–
7	1	Revision

Note: based on data from Tsirkulyar po Khar'kovskomu uchebnomu okrugu (Tsirkulyar po Khar'kovskomu uchebnomu okrugu. 1863. № 13. P. 113).

One important terminological clarification needs to be made here. Spassky employed the term 'national geography'. At that time, this term denoted in Russian gymnasiums the geography of the Russian Empire inclusive of certain independent regions. As will be shown below, a central place in Spassky's criticism of the then-existing practices for teaching "national geography" was actually occupied by his condemnation of the failure to make use of the book on Ukrainian fairs, which he considered a good source. Therefore, the term employed in the present work in place of Spassky's 'national geography' and 'Russian geography' is 'geography of the Russian Empire' (except in tables and quotes).

In Spassky's view, methodologically, instruction in geography must include the use of "a descriptive and pictorial element" – in order to impart to the learning content "a charm of captivating freshness" (Tsirkulyar..., 1863b: 113). However, he also argued that there was no textbook in Russian available at the time that combined the right amounts of scientific and pictorial content – or, as he put it, served as both a "manual" and a "study guide" (Tsirkulyar..., 1863b: 114). Yet this was not the most serious problem to him, as pictorial descriptions of various places were available from supplementary literature (Tsirkulyar..., 1863b: 114). The real issue was the difficulty of covering the geography of the larger part of the globe in one single grade – Grade 2 (Tsirkulyar..., 1863b: 114).

According to Spassky, "things are even worse in Grade 3, where you get to travel through Western Europe with children who hardly know what a civilization is" (Tsirkulyar..., 1863b: 114). The key issue to him was not with having enough learning material but with establishing a link with other themes – above all, topics that had yet to be covered. For instance, in describing Paris, it would help to touch upon the French national character, as well as the city's significance for both French and world culture (Tsirkulyar..., 1863b: 114). The situation was the worst with covering Germany, which still was a fragmented state at the time. According to Spassky, there was no way that a geography teacher could cover the characteristics of each German principality without getting into certain related historical events – something hardly possible to accomplish within the allowed timeframe. Hence, things would simply be reduced to rote learning ("Whether you like it or not, you are left with just one option – direct your students to memorize stuff in the book" (e.g., "Reichenhall is famous for its saltworks"; "Passau, formerly a fortress, is known as the venue for the Treaty of Passau (1552) and for its bridge with granite piers over the Danube")), the only upside being that "it could, in a sense, benefit the history teacher – should the Peace of Passau come up, the student will have been aware where Passau is" (Tsirkulyar..., 1863b: 114-115).

Spassky's primary concern was the teaching of the geography of the Russian Empire at the time. He noted at the very beginning of the corresponding part of his text that in the 1850s there came out many books concerned with the geographical characteristics of various regions across the country (Tsirkulyar..., 1863b: 115), enabling gymnasium teachers to make use of published works about formerly-little-researched regions. The work that appealed to Spassky particularly was 'A Study of Trade at Ukrainian Fairs' by I.S. Aksakov, which he described as distinguished by "masterly, brisk, life-breathing characterizations" (Tsirkulyar..., 1863b: 115). Spassky, who wrote about this piece of writing extensively and at length, matched its virtues against the way geography was taught in most Russian gymnasiums at the time. For instance, he observed that right after the release of I.S. Aksakov's book in 1858 (Aksakov, 1858) there came out as many as nine textbooks in geography, all primarily concerned with cities, giving a misleading impression of "a high degree of urban centralization in Russia" (Tsirkulyar..., 1863b: 116). Spassky complained of the textbooks' insufficient focus on folk life. He particularly condemned the absence in any of them of mention of the business of buying farm products wholesale from peasants and selling them after ('prasolstvo' in Russian), which he considered a vivid manifestation of the country's distinctive geographical characteristics and a consequence of "the population being scattered over large areas" (Tsirkulyar..., 1863b: 116).

What Spassky saw as no less important a virtue of 'A Study of Trade at Ukrainian Fairs' was that it provided characterizations of various population groups in the Russian Empire ("It contains superb characterizations of all kinds of vendors, across ethnicities and social estates, from Jews to sloboda dwellers, peddlers, self-employed transporters, and so on" (Tsirkulyar..., 1863b: 116)). Unfortunately, the text was written in a somewhat emotional, and even haphazard, manner, and Spassky offers no conclusion as to how it could be employed in teaching geography. Nevertheless, Spassky concluded his speculations by stressing that this and other books on the geography and ethnography of regions of the Russian Empire released in the 1850s must be used by gymnasium teachers (Tsirkulyar..., 1863b: 117). He singled out the following materials as deserving special attention: materials from the Russian Geographical Society, the anonymous 'Essays on the Pechory Region' (Ocherki Pecherskogo kraya, 1858) and 'Essays on the Transural Steppe and the Inner, or Bukey, Horde' (Ocherki Zaural'skoi stepi..., 1859), both released by the publishing house run by K.T. Soldatenkov and N.M. Shchepkin, and 'Physical and Ethnographical Characteristics of European Russia' by V.I. Lyadov (Lyadov, 1861) (Tsirkulyar..., 1863b: 115-117).

Thus, Spassky believed that, although in the early 1860s there had yet to be produced a good textbook in geography with an appropriate combination of scholarly and pictorial content, there were a whole range of relatively fresh books available in Russia that gymnasium teachers could put to efficient use in teaching the geography of the Russian Empire. However, this, again, was hampered by insufficient learning time, especially in Grade 5, where students were to receive in-depth instruction in the geography of the Russian Empire ("We cannot avail of all this wealth, when there is only one lecture in the course in Grade 5, can we?! ... Whether they like it or not, the teacher is just left with the option of marking out a certain passage in the textbook and concluding the lecture with the proverbial "memorize it from here up to here" (Tsirkulyar..., 1863b: 117).

In Spassky's view, the situation with geography was the worst in Grades 6 and 7. Grade 7 did not teach geography, so "all that was learnt with so much difficulty in previous grades would be just gone in one year" (Tsirkulyar..., 1863b: 117). Therefore, he argued, in Grade 7 the course material would have to be not revised but "learnt over again", but with much less success now (Tsirkulyar..., 1863b: 117). According to Spassky, while these issues with geography instruction had always been there, formerly they were not as palpitating, inasmuch as it was not clear what and how to teach, with geography mostly being treated not as a science but merely as "a dictionary mindlessly fusing into one lump anything that comes into the head of its author" (Tsirkulyar..., 1863b: 117). This kind of lack of systematicity in teaching a subject was nothing out of the ordinary for the educational system in the mid-19th-century Russian Empire. Based on an account by A.M. Savelyev, this precisely was the case with language arts instruction in Russian gymnasiums in the 1860s, where the subject was taught not only differently by different instructors but in a completely unsystematic manner too. Things even got as far as one language arts teacher "resolutely refusing to use any kind of system in his teaching" and instead working in class with any text that came to hand – and doing so on the grounds of "the vastness and diversity of the world of language arts" (Tsirkulyar..., 1863a: 66). Thus, in the 1860s, geography instruction was superior in quality in ordinary Russian gymnasiums to language arts instruction, with it simply remaining unclear in the case of the latter what specifically to teach in the gymnasium course. In the case of geography, while things were relatively clear in terms of methodology and objectives, the irrational distribution of course time across grades was still hindering teaching geography using "a descriptive and pictorial element", a technique aimed at enhancing students' learning experiences in the subject in helping them develop an idea of what different nations were like.

Before we examine Spassky's suggestions on how to improve geography instruction, it will be logical to touch upon student performance on exams in different gymnasiums at the time. In the case of the language arts course, due to the absence of a single system for teaching it in Russian gymnasiums in the 1860s, exam outcomes would gauge back then the effectiveness of the pedagogical systems of certain instructors only. For instance, in Novocherkassk Host Gymnasium, junior grade teachers of language arts tried to teach the fundamentals of philology by way of A.Kh. Vostokov (GARO. F. 358. Op. 1. D. 288. L. 21). Understandably, the use of a teaching system of this kind made little sense, inasmuch as there was a mismatch between the learning material and the potential of young gymnasium students, with exam outcomes typically indicating that "even those in third grade exhibit a rather jumbled command of the sentence and its parts, are scarcely familiar with the parts of speech, and tend to be poor at parsing sentences, with many resorting to

guesswork" (Tsirkulyar…, 1863d: 204). On the other hand, much better results were achieved by students taught by senior grade instructor A.M. Savelyev, who prioritized the practical study of works of literature. It was particularly stressed by the inspector that his students had read many top works of Russian and foreign literature "in part, if not in full" (Tsirkulyar…, 1863c: 12). In the case of geography, 'A Note on Geography Instruction in Gymnasiums' reveals that some form of common understanding had been reached in the Kharkov Educational District as to how to improve instruction in this course (i.e., improve it by means of a stronger "descriptive and pictorial element"). We can judge the degree to which such a notion of provincial pedagogues about pedagogical ideals was actually the case only from the actual outcomes of their activity reported officially. This begs the question, "Did other teachers (other than Spassky) actually employ supplementary literature in teaching their subject and did it produce positive results?"

Let us take a look at the outcomes of some gymnasium inspections conducted in 1862. Unfortunately, the exam reports for the Kharkov gymnasiums offer no information on specific subjects, and are the least informative in general (probably, because the district's authorities were aware of the level of teaching there) (Tsirkulyar…, 1862: 168-173). In Kursk Gymnasium, students reportedly demonstrated a satisfactory level of knowledge on their final exam. It was particularly stressed in the report of an inspector from Kharkov University that the teacher had used in class, alongside the textbook, descriptions of famed journeys with the aim of helping "students learn about the way of life, mores, and character of different peoples" (Tsirkulyar…, 1862: 176-177). In addition, the instructor even made time to teach drawing maps, at which he was so successful that right during the exam one of his students asked for permission to draw a map of the United States on the blackboard – and it was done "with remarkable precision" (Tsirkulyar…, 1862: 177). Things were a lot worse in Oryol Gymnasium – out of the 17 examinees, 7 received unsatisfactory grades, with most of the maps composed by these students being "hardly distinguished by accuracy" (Tsirkulyar…, 1862: 179-180). S.V. Pachman was highly critical of the geography exams in Voronezh and Tambov Gymnasiums, noting that the knowledge of most students there was reduced to "condensed" information related to topographic nomenclature, i.e. an ability to name various mountains, seas, rivers, etc. (Tsirkulyar…, 1862: 190). In his view, students new nothing about ethnography or statistics, were unfamiliar with descriptions of famed journeys, and had no idea about "the influence of geographical conditions on the development of society and the inner life of peoples" (Tsirkulyar…, 1862: 190). Lastly, in Novocherkassk Host Gymnasium, students had a "good command" of the material, and the teacher "did not limit himself to just conveying the contents of the textbook but mixed in entertaining stories from first-hand accounts and descriptions of journeys offering insight into the culture of various countries and the distinctive ways of life of their inhabitants" (Tsirkulyar…, 1862: 201).

Thus, out of the five gymnasiums detailed inspection-related information on which was provided in Issue 19 of Tsirkulyar po Khar'kovskomu uchebnomu okrugu for 1862, very poor levels of knowledge were exhibited by examinees in two, where instruction was conducted strictly by the textbook, without the use of journey descriptions or ethnographical essays. By contrast, there were two gymnasiums where examinees exhibited clearly satisfactory levels of knowledge – it is in these schools that textbook content was combined with journey descriptions. Finally, the last case was a borderline one – while the overall level of knowledge of examinees was not low, most of them were unable to pass the exam (i.e., the class was divided into two roughly equal camps – those with a good and those with a poor command of the subject). This leads us to conclude that Spassky was right, although he may have overstated things a bit. The thing is that by the 1860s, a new, more effective, system of teaching geography in gymnasiums (at least those within the Kharkov Educational District) had already been developed in broad outline. Under this approach, a good teacher would make active use of supplementary literature, students would study not only topographic nomenclature but statistics and ethnography as well, and inspectors would then check their knowledge in these areas.

Spassky's claim about the wrong distribution of the course time for geography across grades in early-1860s Russian gymnasiums appears to be well-founded. While the then-latest standards required geography to be taught in an integrated fashion, i.e. by combining textbook content with supplementary literature, there were no changes in the distribution of course time across grades. And, while the obvious solution would have been to increase the number of hours allotted to teaching geography in gymnasiums, doing so would have required reducing the number of hours

allotted to teaching other subjects, which was problematic. So Spassky ingeniously suggested a different solution – keep the total number of hours the same but distribute them evenly across grades and change the order in which the course's subject matter is taught (Table 2).

Table 2. Distribution of the Geography Subject Matter to Be Taught in Russian Gymnasiums Across Grades – As Proposed by Instructor Spassky

Grade	Number of hours per week	Subject matter
1	2	General survey
2	2	Africa, Asia, Australia, Oceania, America
3	2	Africa, Asia, Australia, Oceania, America
4	2	General survey of national geography
5	2	In-depth instruction in national geography
6	2	Western Europe
7	1	Revision

Note: based on data from Tsirkulyar po Khar'kovskomu uchebnomu okrugu (Tsirkulyar po Khar'kovskomu uchebnomu okrugu. 1863. № 13. P. 119).

Spassky explained in detail the logic behind the changes proposed by him. We will examine his speculations without mentioning the specific textbooks he recommended. Most of the time, the pedagogue specified the textbook and supplementary literature to be used in instruction under the proposed distribution of hours. In Grade 1, where general concepts in geography were covered, one hour was lost each week. The solution to this problem proposed by Spassky was to alter the methodology of instruction – shift away from engaging students in mechanical memorization of various facts and terms jumbled together towards having them study the material as part of several units, each of which would describe, in general outline, a specific part of the world (Tsirkulyar..., 1863b: 120-121). The larger part of the world was covered in Grades 2 and 3, which, as can be seen from a comparison of Tables 1 and 2, made an extra hour available for instruction weekly (2 hours per week over the course of 2 years versus 3 hours per week over the course of 1 year). Furthermore, Spassky suggested moving from the simple to the complex – from studying less developed to doing more developed regions, in the following order: Australia, Oceania, and Africa (Grade 2) and Asia and America (Grade 3) (Tsirkulyar..., 1863b: 121). Spassky placed a particular emphasis on the following idea, one crucial to the new distribution of the subject matter across grades: "Learning geography in this way will not be fraught with mental strain – little by little, students will move from the easiest to the hardest, with a focus on learning about the relationship between man and nature. By employing journey descriptions, for which there will be enough time available under our approach, we can have a better focus on ethnography, an area that has barely lent itself to instruction up to now. And, by enabling students to get to know different peoples and learn what life was like at different stages of their history, we can help them develop a good grounding in history" (Tsirkulyar..., 1863b: 121). The idea that geography must be studied by moving from the simple to the complex was actually a central one to Spassky – he founded on it the entire logic behind reform of geography instruction in gymnasiums.

Thus, subsequently, in Grades 4 and 5, there would be instruction in the geography of the Russian Empire, to which an extra hour would be allotted each week (2 hours per week over the course of 2 years against 2 hours per week in the first year and 1 hour per week in the second year). This extra hour was to help expose students more extensively to supplementary literature (e.g., 'A Study of Trade at Ukrainian Fairs' by I.S. Aksakov) (Tsirkulyar..., 1863b: 121). On the other hand, instruction in the geography of Western Europe was to serve as a conclusion to the course in Grade 6 – as the world's most complex and developed part. Spassky commented on this in an emotional and literary manner. He readily acknowledged the superiority of Western Europe over the Russian Empire ("It starts in the lower grades with where use was barely made of the axe, scythe, or sickle, progresses little by little to where the rays of civilization began to dawn, flows through, and concludes in the higher grades with the political geography of Europe – a radiant point on the surface of the globe" (Tsirkulyar..., 1863b: 123). The downside to Spassky's proposal

was that the coverage of Western Europe would be allocated an hour less (2 hours per week over the course of 1 year versus 3 hours per week over the course of 1 year). While Spassky did not comment on this directly, he may well have believed that this shortcoming was to be strongly offset by the fact (he mentioned this in a note) that, under his system, it would not be the coverage of European geography preceding the coverage of European history, but the other way round, which would reduce significantly the volume of information required to be given to students as part of the program (Tsirkulyar…, 1863b: 122). Lastly, in Grade 7 there remained in place 1 hour for revision. Spassky was convinced that now, with the coverage of geography becoming uninterrupted, it would be a lot more fruitful (Tsirkulyar…, 1863b: 122).

It is also to be noted that Spassky was a staunch advocate of the right of instructors to decide what materials to use in their teaching, regardless of the conventional importance of having continuity in course material. Although he acknowledged that it was cheaper to have a single textbook, he still argued that no expense must be grudged to purchase several suitable books in the absence of a quality textbook (Tsirkulyar…, 1863b: 122). Moreover, he considered the creation of a quality textbook in the 1860s an utter impossibility, citing as a reason precisely the rapid development of geography and methods for teaching it ("There are so few practices that are firmly in place and commonly accepted" (Tsirkulyar…, 1863b: 122)). Nevertheless, Spassky did not see the absence of a good textbook as a serious problem and was convinced of the ability of teachers to achieve good results through a particular combination of relevant books, which did not necessarily have to include geography-specific academic study guides (Tsirkulyar…, 1863b: 122).

In concluding the examination of 'A Note on Geography Instruction in Gymnasiums', it is worth observing that its author, Spassky, appears to be a lot bolder than the author of the note 'On Russian Language Arts Instruction in Gymnasiums', A.M. Savelyev. The purpose behind the latter's sharing of his teaching methods was to trigger a discussion in hopes that there would finally be developed, based on best practices from teachers in the Kharkov Educational District, a uniform teaching program and an appropriate textbook (Tsirkulyar…,1861: 66, 69-70). Thus, A.M. Savelyev made no pretense of designing a new, more effective, methodology for teaching language arts. Spassky took it a step further – he approached the district's administration with a specific teaching program of his own design. He did not propose implementing this program across the board but just asked for permission to alter the distribution of the course time for geography across grades (Tsirkulyar…, 1863b: 123).

Quite predictably, this proposal for reform was not met without objection, including within the gymnasium itself. Spassky was challenged by Gadzyatsky, another geography teacher, whose background nothing is known of whatsoever. The participation in the pedagogical discussion of this perfectly ordinary teacher, who, unlike A.M. Savelyev and V.L. Spassky, did not do much writing, was a testimony to the ability of the teaching community within the Kharkov Educational District to engage in discussion of topical issues related to education. Not only did Gadzyatsky initiate a debate with his colleague, but he actually produced a note of his own on geography instruction. Yet his note, while even more ambitious than Spassky's, was founded not on pedagogical but purely ideological considerations – specifically, ideas tracing back to the Official Nationality theory, which by the start of the 1860s had, obviously, become obsolete. Evidently, Gadzyatsky belonged to the older generation of teachers. At any rate, Tsirkulyar po Khar'kovskomu uchebnomu okrugu mentions him as a person "with extensive experience in pedagogy" (Tsirkulyar…, 1863b: 126).

Gadzyatsky proposed a complete overhaul of the gymnasium curriculum. More specifically, he suggested keeping only "those subjects that bring light into a child's soul and that cultivate a proper attitude toward God and toward themselves, with a focus on nurturing their spiritual growth" (Tsirkulyar…, 1863b: 126). These subjects would be taught in three stages. These stages would correspond to the junior, secondary, and higher grades. In the junior grades (Grades 1 through 3), only "descriptive" disciplines would be taught; no textbook would be used, with reliance being on a reader and on teacher questions – this was to help cultivate in students the "ability to reason independently" (Tsirkulyar…, 1863b: 126). In the secondary grades (Grades 4 and 5), there would be instruction in disciplines related to "the laws of inner life" and a textbook would be used (Tsirkulyar…, 1863b: 126). What many find the hardest to understand is what exactly Gadzyatsky wished to be in the curriculum for the higher grades (Grades 6 through 7). Since his note is only available to us in retold form, it is hard to tell if it is his failure to formulate it clearly or, rather, others' failure to understand what he wanted to get across. Evidently, he wished that

higher-grade students be taught an integrated course, one combining several sciences. For instance, in the case of science class, after receiving in Grades 4 and 5 instruction in the sciences concerned with "the laws of the inner life of nature (chemistry, physics, anatomy, physiology)", students would explore "the gradual engagement of those laws in practice (the history of creation)" in Grades 6 and 7 (Tsirkulyar..., 1863b: 126-127). Textbooks were to be replaced in these grades by lecture notes (Tsirkulyar..., 1863b: 126). Arguably, Gadzyatsky, above all, was desirous that study at a gymnasium should be used to help children form a religious picture of the world, and this would be done in a gradual manner, starting with exposing them to simple descriptions of carefully selected facts, then instructing them in certain immutable laws in both the exact sciences and the humanities, and concluding with synthesizing all this knowledge into a single religious-mystical system.

Gadzyatsky proposed an overhaul of geography instruction via a similar scheme. The changes proposed by him, clearly, surpassed in scale those proposed by Spassky. The only grade where the subject matter would not change would be Grade 1. However, Gadzyatsky approached the general survey part in a lot more speculative manner. For instance, he suggested that junior-grade students should explore the relationship between the mathematical climate and the real one (Tsirkulyar..., 1863b: 126). Second-grade students would receive general instruction in nature, and third-graders – in peoples, with special focus on the ethnographical component (Tsirkulyar..., 1863b: 126-127). For fourth- and fifth-graders, Gadzyatsky designed some new courses, which had little to do with traditional geography and were more related to modern psychology and sociology. For instance, he suggested providing students with general instruction in "the laws that govern a person's thoughts, feelings, and desires" or having them explore "where industry, science, and art come from" (Tsirkulyar..., 1863b: 127). In Grades 6 and 7, the course would be concluded with history (Tsirkulyar..., 1863b: 127). However strange most of his ideas may seem, arguably, Gadzyatsky simply wished to bring together in a single discipline several subjects concerned with the study of society and the place of man in it. On the lowest level in this discipline in his pedagogical system – the descriptive one – was geography, as a science that describes different peoples and their conditions of life. On the middle level – the one concerned with "the laws of inner life" of people and society – were descriptive psychology and sociology. Lastly, on the higher level – the one concerned with "the gradual engagement of those laws in practice" – was history, concerned with showing one how the various theoretical psychological and sociological constructions are applied in practice. While this system was not devoid of ingenuity, it could hardly have been implemented in practice. In essence, decreeing that geography be taught exclusively in the junior grades would have meant admitting that most examinees would not know any geography at the end of their school program, given the limited cognitive abilities of most junior-graders and the absence of opportunity to revise the subject in the secondary and higher grades.

The discussion between the two geographers was continued in person at meetings of the Academic Board of First Kharkov Gymnasium. Unfortunately, we do not have all of the details of those meetings. Evidently, Gadzyatsky confronted Spassky with specific criticisms of his proposals, most of which the latter, however, parried with brilliance. For instance, Gadzyatsky took issue with the complexity of certain geographical concepts – probably, in the context that reducing the time allotted to teaching geography in Grade 1 (an idea proposed by Spassky) would make it harder for children to master the course's conceptual content (e.g., some students having difficulty with the term 'ecliptic') (Tsirkulyar..., 1863b: 126). Spassky did not contest this – he actually fully agreed with his opponent and even gave an example from his own personal experience. He revealed how he once managed to explain the concept of the ecliptic to only some of his first-grade students at an uyezd school (Tsirkulyar..., 1863b: 126). However, unlike his opponent, Spassky attributed this not to the complexity of the actual concept but to the fact that it was still too early for a child in first grade to grasp it. Indeed, he did not have to make as great an effort when explaining it to his third-grade students (Tsirkulyar..., 1863b: 126).

The Academic Board of First Kharkov Gymnasium sided with Spassky in the discussion. Both teachers had had their notes submitted to the Kharkov Educational District. Yet "the Board of First Gymnasium expressed the wish that all educational institutions, while being expected to keep to the official program, should only be allowed to move lectures in a particular discipline between grades – this could involve adding or removing hours between courses, all to help ensure high quality learning throughout the curriculum" (Tsirkulyar..., 1863b: 124). In other words, the

Academic Board seemed to be supportive of Spassky's proposal in any event, regardless of the course of the discussion on changing the system of teaching geography in the Kharkov Educational District, and willing to permit him to implement his innovative pedagogical ideas in practice. Furthermore, the Board raised the issue of empowering educational institutions to choose for themselves how to distribute the course time for different subjects across grades, which suggests that the two disputants were not the only instructors keenly interested in the issue.

Since geography, unfortunately, was not taught as a standalone discipline in 1860s Russian universities, there were neither faculties nor professors of geography at the time. Therefore, the notes of both geographers were forwarded to a Russian history professor named A.P. Zernin to review. A.P. Zernin was a fairly serious scholar with a number of works on the history of Byzantium and the 17th-century Russian state to his name. Perhaps, he would have become more famous, had he been able to conduct his scholarly activity longer (incidentally, he went insane in late 1863, at the age of just 42) (Russkii biograficheskii slovar', 1916: 359-363). The fact that he, just like S.V. Pachman, approached in a determined manner working with school teachers specializing in what was not his specialist subject is yet another testimony to the creative atmosphere of partnership that existed in the 1860s Kharkov Educational District among all parties involved – the gymnasiums, the university, and the district's administration.

Upon comparison of the two notes, A.P. Zernin gave preference to Spassky's proposal. He rejected Gadzyatsky's proposed plan for reform of geography instruction in gymnasiums without even offering a detailed critique thereof – he just called it "fantastical and impracticable" (Tsirkulyar..., 1863b: 127). He found that the plan lacked "clarity in certain areas", which would complicate the practical implementation thereof (Tsirkulyar..., 1863b: 127). This criticism is important in that it reveals that in the early 1860s the administration of the Kharkov Educational District was capable of critical evaluation of proposals put forward by teachers. Its approbation of the proposals put forward by A.M. Savelyev and Spassky was hardly formal by nature. A.P. Zernin spared no compliments in his admiration of Spassky's note. He found Spassky's criticism of the then-existing system of instruction "highly worthwhile" (Tsirkulyar..., 1863b: 124). The historian also praised Spassky's choice of supplementary content, noting that "Mr Spassky deserves every acknowledgement at least for the reason that he tries to draw attention to the importance of teaching geography in gymnasiums using good pieces of writing, such as the one on Ukrainian fairs by Aksakov" (Tsirkulyar..., 1863b: 124). In terms of Spassky's proposals for changes to the distribution of course time and subject matter across grades, A.P. Zernin took a particular liking to the idea of progressing from simple to complex topics (Tsirkulyar..., 1863b: 125).

Finally, A.P. Zernin concluded that, since Spassky's ideas were well-founded and logical, he should be given permission to implement the proposed changes to geography instruction in the grades he taught (Tsirkulyar..., 1863b: 126). However, at the same time A.P. Zernin observed that "in terms of convenience, it must be confessed that Spassky's scheme presents a few inconveniences" (Tsirkulyar..., 1863b: 126). His biggest concern was that the new system could be too demanding of teachers (Tsirkulyar..., 1863b: 126). Although A.P. Zernin did not explain what he meant, one may venture to guess that he was apprehensive that not every teacher would be able to pick the right supplementary literature for their classes. In conjunction with this, he brought up a major issue related to geography instruction, something that Spassky had not mentioned – that geography was not taught in Russian universities and, because of that, gymnasiums lacked instructors with a specialist qualification in the subject ("With universities offering no geography, we now have so many cases where the post of geography teacher is given to someone freshly out of school whose knowledge and skills have not been verified") (Tsirkulyar..., 1863b: 126).

Thus, on one hand, A.P. Zernin backed a teacher with a sensible proposal for reforming geography instruction, and, on the other, curbed the enthusiasms of that teacher and his colleagues a little – by reminding them that, in working out reforms in education, one should not overlook pedagogues' level of training and competence too. Where this level was low, excessive freedom to choose teaching methods and objectives would normally lead to negative consequences, a case in point being the unmethodical teaching of language arts in gymnasiums within the Kharkov Educational District in the early 1860s (e.g., the case of a teacher working in class with any text that came to hand). Thus, the discussion around geography instruction conducted in the Kharkov Educational District resulted not in the introduction of a new system of teaching geography, per se, but in the district's administration, essentially, giving pedagogues the green light to develop a

teaching program of their own, with the authors of programs deemed potentially effective receiving permission to teach using the system of their own, even if it would require making changes to the distribution of course time across grades.

4. Conclusion

Our analysis of the materials published in Tsirkulyar po Khar'kovskomu uchebnomu okrugu in 1863 in relation to the geography instruction discussion examined in this paper helped gain an insight both into geography instruction in provincial gymnasiums in the Russian Empire and into ordinary instructors' pedagogical views of teaching the subject there. The study yielded the following conclusions:

1) During that period, geography was turning from "a dictionary mindlessly fusing into one lump anything that comes into the head of its author" into a school subject that met the requisites of pedagogy. A shift was taking place away from rote learning with a predominant focus on topographic nomenclature towards meaningful learning based on balancing the core learning material with supplementary literature, like journey descriptions and popular essays, the idea being to enable students to get to know other countries and cultures. Of particular importance in this respect was the release in the 1850s of books on various regions across the Russian Empire.

2) At the same time, the process did not unfold without resistance from conservative pedagogues. In the course of the discussion, it was suggested to augment the religious element in education by removing from the gymnasium curriculum the courses not related to God and reducing geography to a sort of introduction to history rendered through the lens of religious-mystical traditions.

3) Another major issue was the irrational distribution of the course time for geography across grades, which was out of line with the latest pedagogical trends at the time. Most of this time was accounted for by junior school, i.e. a time of limited cognitive abilities for most children, when they had yet to be exposed to the study of adjacent subjects, such, above all, as history. There simply was not enough time physically for supplementary literature, like journey descriptions and popular essays.

4) Finally, there was the issue of incompetent teachers. Since geography was not offered as a standalone subject at universities in the Russian Empire, instruction in geography was often provided in gymnasiums by total strangers.

However, despite all these challenges, geography was not the most problematic subject in the gymnasium curriculum. While the administration of the Kharkov Educational District and most teaching staff there had a more or less clear idea of how to conduct instruction in geography in a new way, by reference to changes in one's notions of the subject, things were not as good for some other subjects. For instance, things were rather chaotic in Russian gymnasiums with instruction in language arts, with there totally lacking a common understanding of how to teach the subject.

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The Pedagogical Periodical Press in the Kazan Educational District, the Russian Empire (1865–1917)

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Abstract

This study explored the pedagogical periodical press in the prerevolutionary Kazan Educational District, the Russian Empire.

The study relied on a set of relevant reference, encyclopedic, and academic sources. In terms of methodology, use was made of content analysis and the historical-chronological method.

The study's findings revealed that the pedagogical periodical press in the Kazan Educational District emerged in 1865. Before the downfall of the Russian Empire in 1917, the region published 10 academic journals. Most of these periodicals were published in Kazan – 6 items (inclusive of a periodical originally created in Simbirsk, which eventually was moved to Kazan). Two of the 10 journals were produced in Samara, 1 in Astrakhan, and 1 in Saratov. The majority of the journals were connected to the Ministry of Public Education. As a result, these periodicals remained in existence up to 1916–1917. There were exceptional cases, which included *Zhizn i Shkola*, a politicized pedagogical periodical that eventually was closed down by the government, and *Sbornik Semeyno-Pedagogicheskogo Kruzhka v Gorode Kazani*, a journal created on the initiative of a small group of people.

Keywords: periodical press, Kazan Educational District, pedagogical journals, Russian Empire, period 1865–1917.

1. Introduction

The Kazan Educational District was established on January 24, 1802, by a decree from Emperor Alexander I. By the end of the 19th century, the district included Vyatka, Kazan, Samara, Saratov, Simbirsk, and Astrakhan Governorates. The most influential educational institution in the district was Kazan Imperial University (founded on November 5, 1804). This enabled Kazan to play

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a key role in organizing science throughout the district. The organization of the pedagogical periodical press was no exception.

2. Materials and methods

The study relied on a set of relevant reference, encyclopedic, and academic sources. In terms of methodology, use was made of content analysis and the historical-chronological method.

3. Discussion

The existing historiography on the subject is focused on (1) regional pedagogy and (2) the periodical press in the Russian Empire. The first group of works includes E.A. Abdrashitova's 'The Role and Significance of the Pedagogical Legacy of A.I. Anastasiyev' (Abdrashitova, 2008). Another work in this group, 'A.I. Anastasiyev: A Prominent Figure in Russian Regional Education' by V.B. Pomelov, likewise, explores the pedagogical legacy of this prominent pedagogue, considered a promoter of science by the author (Pomelov, 2019). An attempt to investigate the development of pedagogical science, including in the prerevolutionary period, was undertaken by I.E. Yarmakeyev in 'The Development of Pedagogical Science: Traditions and Prospects' (Yarmakeev, 2006), which examines theories by various prerevolutionary pedagogues related to public education.

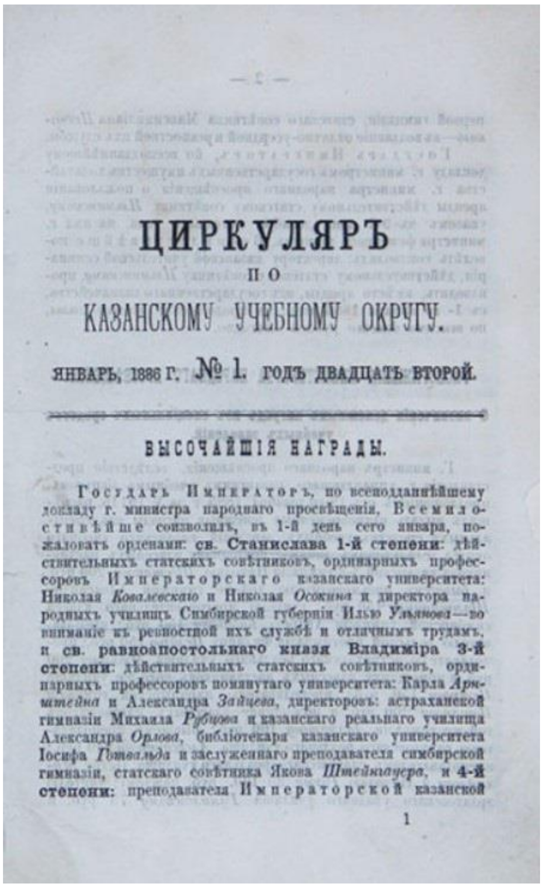
The second group, most notably, includes 'The Russian Periodical Press (1702–1894)' (Russkaya periodicheskaya..., 1959), a reference work released under the editorship of A.G. Dement'yev and his colleagues, which provides a wealth of information about periodicals published in the Russian Empire. A similar principle underpins N.A. Ablov's 'The Pedagogical Periodical Press (1803–1916): A Bibliographic Survey' (Ablov, 1937). Of particular note are 'The Tatar Pedagogical Periodical Press During World War I' by Z.Z. Gilazev and R.A. Aynutdinov (Gilazev, Ainutdinov, 2017) and 'The Journal *Vestnik Obrazovaniya i Vospitaniya* on Issues of Teaching Language Arts (Kazan, 1914–1916)' by Yu.V. Lazarev (Lazarev, 2010). The pedagogical periodical press in the Caucasus was explored by A.M. Mamadaliev and his colleagues (Mamadaliev et al., 2022).

4. Results

The Kazan Educational District comprised six governorates, with academic pedagogical life therein chiefly developing in the gubernia capitals Kazan, Astrakhan, Samara, Saratov, and Simbirsk (i.e., all of the capitals except for Vyatka). Overall, in 1865–1917 the district published 10 pedagogical journals (6 in Kazan (inclusive of a journal that initially was published in Simbirsk before it was moved to Kazan), 2 in Samara, 1 in Astrakhan, and 1 in Saratov).

Quite naturally, the district's first academic pedagogical journal, *Tsirkulyar po Kazanskomu Uchebnomu Okrugu* (Russian: 'Bulletin of the Kazan Educational District') (Figure 1), emerged in Kazan. It happened in 1865, i.e. when both Kazan University and the educational district were older than 60 years. The periodical was published from 1865 to 1916. From 1865 to 1869, the journal had a publication frequency of two times per month. Beginning in 1869, it became a monthly (it would stay that way for the rest of its existence). Arguably, the fact that it was the official organ of the Kazan Educational District is what ensured permanence in the publication of this journal. In terms of subject matter, in addition to carrying official information, the journal also had an unofficial pedagogical section. This section contained articles on teaching methodologies in the secondary school context, teaching-aid catalogues, and lists of books recommended for reading (Russkaya periodicheskaya..., 1959: 469). The periodical's first editor was A.N. Troitsky, the district's Chief Clerk.

The district's second pedagogical journal, *Gorodskoy i Selsky Uchitel* (Russian: 'Urban and Rural Teacher') (Figure 2), emerged in Simbirsk, the capital of Simbirsk Governorate. It was published from 1894 to 1899. It had a publication frequency of six to eight issues per year. Of note is the fact that in 1894–1896 the journal was published in Simbirsk, and in 1897–1899 in Kazan (Yarmakeev, 2006: 153).



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ЦИРКУЛЯРЪ

ПО

КАЗАНСКОМУ УЧЕБНОМУ ОКРУГУ.

ЯНВАРЬ, 1886 Г. № 1. ГОДЪ ДВАДЦАТЬ ВТОРОЙ.

ВЫСОЧАЙШІЯ НАГРАДЫ.

Государь Императоръ, по всеподданнѣйшему докладу г. министра народнаго просвѣщенія, Всемилостивѣйше соизволилъ, въ 1-й день сего января, пожаловать орденами: **св. Станислава 1-й степени:** дѣйствительныхъ статскихъ совѣтниковъ, ординарныхъ профессоровъ Императорскаго казанскаго университета: Николая *Ковалевскаго* и Николая *Осокина* и директора народныхъ училищъ Симбирской губерніи Илью *Ульянова*—во вниманіе къ ревностной ихъ службѣ и отличнымъ трудамъ, и **св. равноапостольнаго князя Владиміра 3-й степени:** дѣйствительныхъ статскихъ совѣтниковъ, ординарныхъ профессоровъ помянутаго университета: Карла *Арнштейна* и Александра *Зайцева*, директоровъ: астраханской гимназіи Михаила *Рубцова* и казанскаго реальнаго училища Александра *Орлова*, библіотекаря казанскаго университета Іосифа *Готвальда* и заслуженнаго преподавателя симбирской гимназіи, статскаго совѣтника Якова *Штейнгауера*, и **4-й степени:** преподавателя Императорской казанской

1

Fig. 1. Title page of the journal *Tsirkulyar po Kazanskomu Uchebnomu Okrugu*

ГОРОДСКОЙ И СЕЛЬСКІЙ

УЧИТЕЛЬ.

ГОДЪ ВТОРОЙ.

1895.

Fig. 2. Cover of the journal *Gorodskoy i Selsky Uchitel*

The journal was launched by pedagogue A.I. Anastasiyev (Pomelov, 2019: 156). It carried government ordinances, articles on education in urban and rural schools, as well as pedagogical news items, criticisms, and bibliographies. The journal had a special focus on local pedagogical life. Following the appointment of A.I. Anastasiyev in 1897 to the position of Director of Kazan Teacher's Institute, the publication of the journal was moved from Simbirsk to Kazan (Abdrashitova, 2008: 108).

The third journal, *Trudy i Protokoly Pedagogicheskogo Obshchestva* (Russian: 'Works and Proceedings of the Pedagogical Society'), was launched in Kazan by the Pedagogical Society, an organization within Kazan Imperial University. It was published once and twice per year. It had 1 issue published in 1900, 1 issue in 1902, 2 issues in 1903, 1 issue in 1904, 2 issues in 1905, and 2 issues in 1906. Its last issue was published in 1916. In addition to the society's proceedings, the journal also carried pedagogical reports and articles on the history of public education. Its contributors included some of the time's prominent pedagogues, namely V.N. Aristov, Ye.F. Budde, A.V. Vasil'yev, F.G. Mishchenko, and P.M. Kulsky (Ablov, 1937: 59-60).

The district's fourth journal, *Sbornik Semeyno-Pedagogicheskogo Kruzhka v Gorode Kazani* (Russian: 'Digest of the Pedagogical Family Club in the City of Kazan'), was produced between 1901 and 1902. It had a publication frequency of four times per year. Its editor was F.G. Mishchenko, Chairman of the Board of the Pedagogical Family Club, and its publisher was the club's Board. The journal published a number of pedagogical articles, some of which were concerned with kindergartens and some examined the work of various prominent pedagogues (e.g., K.D. Ushinsky).

The district's fifth journal was *Nachalnoye Obucheniye* (Russian: 'Primary Education'). This pedagogical journal was produced under the supervision of the Kazan Educational District as a supplement to *Tsirkulyar po Kazanskomu Uchebnomu Okrugu*. It was published in Kazan from 1901 to 1917. A narrowly specialized journal, it carried articles on primary education and on out-of-school education and local pedagogical news items. Its contributors included A.I. Anastasiyev, A.A. Krasnovsky, and N.A. Bobrovnikov. The journal's editor was A.I. Anastasiyev, who previously had published the journal *Gorodskoy i Selsky Uchitel*.

A.I. Anastasiyev, who played a significant role in the development of pedagogy in the Kazan Educational District, deserves a few words. He was born on November 30, 1852, in the village of Khodary in Simbirsk Governorate. He went to Alatyr Ecclesiastical School, and later to Simbirsk Ecclesiastical Seminary. Subsequently, he attended the Faculty of History and Philology at Kazan University. His service as a teacher began at Poretskaya Teacher's Seminary. He later taught Russian at Kazan Teacher's Institute. Beginning in 1885, he worked in administrative roles – first as Inspector of Public Schools in Simbirsk Governorate. He was appointed Director of Kazan Teacher's Institute in 1896. In 1903, he became Director of Primary Schools in Vyatka Governorate (Pomelov, 2019: 153).

The district's sixth journal, *Zhizn i Shkola* (Russian: 'Life and School'), emerged during the First Russian Revolution. It was published in Saratov between 1906 and 1907. It was a weekly, and its editor was A.R. Morrison. The journal was founded by a group of pedagogues, who were social democrats promoting antigovernment ideas (e.g., "The autonomous school with free science will give society the people it needs to fight the old system" (Ablov, 1937: 67)). Quite naturally, the journal was eventually closed down on January 5, 1908.

The district's seventh journal, *Izvestiya Samarskogo Obshchestva Narodnykh Universitetov* (Russian: 'Bulletin of the Samara Society of Folk High Schools'), was published in Samara from 1910 to 1916. In 1910, the journal had 20 issues published. Subsequently, it was published on and off. Its Issues 1 through 9 were released in 1910 under the editorship of N.A. Shishkov. Starting with its 10th issue, the journal's editor was P.A. Preobrazhensky. The periodical was mainly concerned with the activity of folk high schools. Its contributors included prominent scholars such as A.A. Borovoy, Ye.A. Jelačić, N.I. Kareev, and M.M. Rubinstein.

The district's eighth journal, *Semeynoye Vospitaniye* (Russian: 'Family Education'), emerged in Astrakhan. This periodical, focused on rational education, was published from 1911 to 1914. Its editor was A.A. Dernova-Yermolenko. The journal had a publication frequency of 10 issues per year. However, it had just two issues published in 1914. The journal's editorial board subsumed under the term 'family education' both preschool education and school education. The periodical carried pedagogical articles, reports describing the activity of various pedagogical societies, and

pedagogical news items. It also had a section on books and journals. The journal devoted special attention to issues related to protecting children and caring for orphans.

The district's ninth journal, *Byulleten Spravochnogo Byuro Otdela Narodnogo Obrazovaniya Samarskoy Gubernskoy Zemskoy Upravy* (Russian: 'Bulletin of the Information Office of the Public Education Department of the Samara Gubernia Zemstvo Council'), emerged in Samara. It was published between 1914 and 1915. Overall, the journal had seven issues published. Compiled by P. Kazantsev at the instance of the council, the journal carried extensive material on the development and organization of out-of-school education in the governorate (e.g., weekend schools, public readings, and public reading rooms) and reviews of the state of the public education system. Information on public education was normally accompanied by introductory pedagogical articles (Ablov, 1937: 100).

Lastly, the district's 10th journal, *Vestnik Obrazovaniya i Vospitaniya* (Russian: 'Bulletin of Education and Upbringing') emerged in 1914 in Kazan. The editor of this academic pedagogical journal, published under the supervision of administration of the Kazan Educational District, was V.S. Bogoyavlensky, then District Inspector of the Kazan Educational District. The journal was a monthly. Produced until 1916, it had 36 issues published (Lazarev, 2010). It carried articles of a general academic nature, works on pedagogy, reviews of journals, school life news items, and news stories about foreign school life. Most of the journal's content was written by Kazan University and Kazan Ecclesiastical Academy instructors. Each issue of the journal had a table of contents. The periodical had a special focus on issues related to family, moral, physical, religious, and school education.

5. Conclusion

The pedagogical periodical press in the Kazan Educational District emerged in 1865. Before the downfall of the Russian Empire in 1917, the region published 10 academic journals. Most of these periodicals were published in Kazan – 6 items (inclusive of a periodical originally created in Simbirsk, which eventually was moved to Kazan). Two of the 10 journals were produced in Samara, 1 in Astrakhan, and 1 in Saratov. The majority of the journals were connected to the Ministry of Public Education. As a result, these periodicals remained in existence up to 1916–1917. There were exceptional cases, which included *Zhizn i Shkola*, a politicized pedagogical periodical that eventually was closed down by the government, and *Sbornik Semeyno-Pedagogicheskogo Kruzhka v Gorode Kazani*, a journal created on the initiative of a small group of people.

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The Policy on Women's Education Pursued by the Zemstvo Liberal Party in Chernigov Governorate in the Period between the 1870s and 1880s. Part 2

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Abstract

This is the second part of a study investigating the policy pursued by the Zemstvo Liberal Party in Chernigov Governorate in the area of women's education in the second half of the 19th century. This process was explored through the prism of the Russian Empire's whole new historical realities – a time when a philosophy of counter-reforms and an atmosphere of reaction became the dominant tone of the Romanovs' domestic policy. The work relied on relevant research and documentary sources, some of which were introduced into scholarly discourse here for the first time ever. The conclusion was drawn that, despite the various unfavorable domestic political circumstances present during the time of the reign of Emperor Alexander III, members of the liberal opposition did manage to continue taking care of the development of women's education in Chernigov Governorate and initiate relevant measures.

At that time, the zemstvo liberals had to take account of the radical changes in the government's domestic policy, specifically those associated with the start of the period of counter-reforms under Emperor Alexander III, and adjust their policy in the area of women's education accordingly. On balance, the policy pursued by the Zemstvo Liberal Party in northern Ukraine in the area of women's education between the 1870s and 1880s can be regarded as progressive. It was an achievement founded on devoted efforts on the part of the opposition aristocratic fronde in the region. The democratic principles put into effect in the area of women's education were an integral, organic part of a large-scale humanitarian program implemented by the zemstvo liberal movement in the north of Leftbank Ukraine during that period.

Keywords: education, education policy, education reform, Zemstvo Liberal Party, women's education, zemstvo institutions, women's educational institutions.

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1. Introduction

Following the murder of Emperor Alexander II, committed on March 1, 1881, by terrorist revolutionaries, the Russian Empire entered the so-called "counter-reform period", which would last throughout the reign of Emperor Alexander III. Most of the transformations that took place dealt with the domestic policy of the Russian government. The principal strategic focus was on ideological restoration and wiping out the achievements of the Era of Great Reforms, i.e. going back to a political regime similar to the one the Russian Empire had in the first half of the 19th century.

A distinctive characteristic of the country's social and economic life at the time was the Russian monarchy's fixation on all-out support for and bolstering the position of the Empire's absolute minority – the great latifundist aristocracy. At the same, the government's policy towards the largest segment of the population, the peasantry, was characterized by discrimination and abridgement of individual rights and freedoms. Ethno-confessional life in the country underwent some negative changes, too. For instance, the Russian Orthodox Church, in essence, became a state institution, serving as an ideological backstop for the Romanov dynasty to lean on. The national policy of Russian absolutism was dominated by the ideals of Russian nationalism and chauvinism, which was highly facilitative of pogroms and ethnic unrest. Changes took place in the system of local self-government, too. Justice courts in the province were eliminated, and the institution of juries was reduced to mere formality, with the government instead putting in place zemstvo chiefs who would represent the supreme authority in the communities. The zemstvo and urban counter-reforms implemented helped secure complete government control and oversight over the local self-governing authorities, assure the dominance of members of the great nobility within the city dumas and zemstvo assemblies, and subjugate the local executive authorities completely to the gubernia administrations.

The education sector, likewise, underwent radical changes. There, in essence, was a return to a caste system – most members of the non-noble social estates were deprived of access to higher education. The counter-reform period, which began in the spring of 1881, had an effect on the development of women's education as well. With the domestic policy of the Czarist regime increasingly characterized by reactionary tendencies, the country's social life was again dominated by conservative political forces. This affected the majority of progressive accomplishments achieved under Emperor Alexander II, including in the area of women's education.

2. Materials and methods

The principal sources used in the second part of the study are published materials from the proceedings of zemstvo institutions in Chernigov Governorate conducted during the counter-reform period. Some of these sources were introduced into scholarly discourse here for the first time ever.

In putting this work together, use was made of both general and special-historical research methods. Universal methods such as classification, periodization, and summarization were employed to establish the chronological scope of the activity of the Zemstvo Liberal Party in Chernigov Governorate in the area of women's education, classify the ideological priorities of the zemstvo liberal opposition in Chernigov Governorate and its counterpart, the conservative political elite, and summarize the factual material from the sources. This helped draw meaningful conclusions.

The use of special-historical methods helped gain insight into the key events associated with the activity of the Zemstvo Liberal Party in the area of women's education. Specifically, the use of the historical-typological method helped assess the achievements of liberal zemstvo members in Chernigov Governorate and determine the typological characteristics of the ideological principles both of members of the liberal opposition and of those of the conservative political elite in the region with regard to women's education by grouping and ordering them. The historical-comparative method was used to juxtapose the accomplishments resulting from devoted efforts of Chernigov Governorate's zemstvo liberals in the area of women's education with the realities of the pre-reform period in the Russian Empire.

3. Discussion

The topic of women's education in the Russian Empire in the second half of the 19th century and early 20th centuries has been researched by numerous scholars, with many different aspects of the subject investigated. In much of this research, the development of women's education is the central theme (Kornilova et al., 2016; Kornilova, Magsumov, 2017; Kudinov, 2016; Kudinov, 2018;

Panova, Ponomareva, 2022). Certain aspects of the development of women's education have been explored in the context of the study of the history of higher and secondary education in the Russian Empire in the 19th and early 20th centuries (Lebid, Shevchenko, 2021; Lebid, 2022a; Lebid, 2022b).

At the same time, the place of women's education in the policy of zemstvo institutions in the Russian Empire has been investigated relatively little (Selyutina et al., 2022). Yet the history of the zemstvo movement itself, including in the Ukrainian governorates, has been researched fairly extensively (Zhilenkova, 2000; Mojsijenko, 1999; Red'kina, 2002; Jucevych, 2021; Rahno, 2017; Rahno, 2018; Kotelnitsky, 2018; Kotelnitsky, 2019; Kotelnitsky, 2021).

In the first part of the present study, insight was provided into the policy pursued by the Zemstvo Liberal Party in Chernigov Governorate in respect of women's education in the 1870s (Kotelnitsky, Degtyarev, 2022). The second part will examine this policy through the lens of whole different historical realities – the period of counter-reforms under Emperor Alexander III.

4. Results

The counter-reforms implemented under Alexander III also had an effect on the nature of the activity of zemstvo institutions in the Russian Empire, including the self-governing authorities of Chernigov Governorate. The region's zemstvo authorities continued to take active part in organizing women's education and enhancing the material-technical base of women's educational institutions in the governorate.

A session of the Chernigov Gubernia Zemstvo Assembly held in 1881 featured a report by the Gubernia Zemstvo Council regarding the expansion of the infrastructure of Chernigov Women's Gymnasium. At the sitting held on October 8, a liberal deputy named N. Konstantinovich stressed the need to organize education for the peasantry. He noted that Chernigov Women's Gymnasium was maintained mainly through funding from private individuals, although earlier the gymnasium had received financial assistance from the government – the city government of Chernigov, the Chernigov Gubernia Zemstvo, and the Ministry of Public Education.

The member of the zemstvo opposition stressed that the size of the gymnasium's student body increased with each passing year. As at September 1881, the gymnasium had an enrollment of more than 400 students, with 123 of these being natives of Chernigov and 120 – natives of Chernigov Uyezd. All uyezds in Chernigov Governorate were represented in this gymnasium by a student native to them. Therefore, N. Konstantinovich positioned Chernigov Women's Gymnasium as a regionally significant educational institution.

N. Konstantinovich also drew the attention of the councilors to the fact that failure to set up the additional, fourth, class in the gymnasium would have resulted in at least 75 girls being denied admission to school. This would have been detrimental to society, for this student body produced future pedagogues for primary public schools in the region. It was argued that the zemstvo institutions spent less on the training of public teachers than on other areas of public education.

According to N. Konstantinovich, meeting the needs of all those willing to go to school and satisfying the needs of the zemstvo authorities would definitely require increasing the size of the student body and opening up at least three additional classes. It would not be possible to do this without expanding the school's infrastructure – specifically, building new campuses for it. This would require allocating 5,000 rubles from the budget of the Gubernia Zemstvo. The Chernigov City Duma and Council, too, were expected to take part in the funding of the project (ZCHZ, 1881: 16-17).

However, members of the zemstvo conservative aristocracy argued against an increase in expenditure on the women's gymnasium, citing a lack of funds in the zemstvo budget as a reason. On top of that, the conservatives' argumentation contained notes of anti-Semitism. It was argued that, since at least 40 % of the gymnasium's student body was represented by girls from families within Chernigov's Jewish community, it had to be up to Jewish entrepreneurs to build new campuses for the gymnasium.

The liberal deputies confronted the arguments of members of the conservative wing, but to no avail – the Chernigov Gubernia Zemstvo Assembly refused to approve the allocation of 5,000 rubles for Chernigov Women's Gymnasium toward the building of new campuses (ZCHZ, 1881: 18-21).

The agenda of an ordinary session of the Chernigov Gubernia Zemstvo Assembly held in 1882 included discussion of the situation around the women's department of the feldsher's school at Chernigov Gubernia Almshouse. A special report on the matter had been prepared by members of the Gubernia Zemstvo Council. The sitting held on December 12 included an address by P. Chervinsky,

a member of the Zemstvo Liberal Party in Chernigov Governorate. He informed the deputies of the fact that the department had an enrollment of just seven students. The Council concluded that the department would have to be closed down – because its activity was unproductive and of little use in the context of medical education in the region. At the same time, the Council did not mind first letting the remaining students complete their program of study to the end.

P. Chervinsky noted the low popularity of the educational institution. What is more, the school issued only a certificate of completion of the course of study. The document was not as prestigious as what most other educational institutions provided to their graduates. This made it fairly difficult for graduates of the feldsher's school to get a job post-graduation. However, closing the feldsher's school down immediately could have led to having its students continue their study by enrolling at a similar educational institution in Moscow or Odessa, and there was a risk of no vacant places being available for them there.

There was the option of having members of the school's teaching staff give private lessons to the remaining students so that they could prepare faster for the exams required to get a medical qualification. With that said, a big decision had to be made on the following – stopping the admission of new students to the women's department of the feldsher's school and closing this cost-ineffective and uncompetitive facility down (SOCHZ, 1882. №2: 240-245).

The upshot was the Chernigov Gubernia Zemstvo Assembly ordaining the following:

1) that the admission of new entrants to the women's department of the feldsher's school at Chernigov Gubernia Almshouse be discontinued as of the 1883 school year;

2) that the procedure for closing the feldsher's school down be carried out subsequent to the department's remaining students receiving a certificate of completion of the course of study;

3) that the sum of 880 rubles be allocated from the gubernia zemstvo budget toward the needs of the department in the period 1883–1884;

4) that the necessary funding be allocated from the budget of the Gubernia Zemstvo toward discontinuing the operation of and carrying out the procedures for closing down the feldsher's school (ZCHZ, 1882. №1: 15-16).

Geographically, the region's zemstvo liberals extended their solicitude for the education of women beyond Chernigov Governorate. More specifically, an ordinary session of the Borzna Uyezd Zemstvo Assembly held in 1883 involved discussion of the possible participation of the region's zemstvo institutions in the funding of the Higher Women's Courses in Saint Petersburg.

At the sitting of the Uyezd Zemstvo Assembly held on October 26, 1883, members of the liberal camp of the deputies suggested that there was a possibility to allocate from the budget of the Borzna Uyezd Zemstvo a small amount of money toward the construction of a building for the higher women's courses in the capital. It was suggested to allocate for this purpose at least 100 rubles from the zemstvo budget. The proposal was approved, and the money was provided (ZBZ, 1883. №3: 19-20).

Later on, a session of the Chernigov Gubernia Zemstvo Assembly held in December 1883 involved discussion of funding the women's medical courses in Saint Petersburg. Note that some funding had already been provided for the school earlier (2,000 rubles in 1882). Now the Gubernia Zemstvo Council petitioned for the allocation of 2,000 rubles toward the upkeep of this educational institution annually.

Several members of the liberal party spoke out on the matter. N. Konstantinovich argued against the annual contribution of 2,000 rubles, citing as a reason the fact that the officials in charge of the women's medical courses had failed to account for the money received in 1882 (SOCHZ, 1883. №6: 176-177).

A liberal deputy named A. Lindfors focused on the headway achieved in the development of women's education. It was noted that numerous women's gymnasiums and boarding schools were established in the Russian Empire during the Era of Great Reforms, with Saint Petersburg and Kiev becoming home to higher women's courses. The deputy also stressed that the majority of people in the country supported the idea of women having higher education, including in the medical field. Yet, at the same time, A. Lindfors noted that, starting in the spring of 1881, the situation had worsened substantially. Most women's educational institutions in the country no longer enjoyed the good graces and patronage of private benefactors. Therefore, there was a lack of funding to dedicate to ensuring the proper operation of women's educational institutions, with many losing their campuses. The deputy argued against refusing help to women's education, both in and

outside of Chernigov Governorate, and insisted on having in the budget of the Gubernia Zemstvo the sum needed to support the needs of the women's medical courses in Saint Petersburg (SOCHZ, 1883. №6: 183-187).

A member of the liberal wing named V. Varzar seconded the proposal put forth by A. Lindfors. The argument was that, given the fact that the Gubernia Zemstvo had already taken part in funding the women's courses in the capital in 1882, it would not be right to refuse to provide this kind of support again in the future. Besides, the sum of 2,000 rubles was not a very large one for the Chernigov Gubernia Zemstvo. In fact, refusing to provide this kind of help could have led to the zemstvo institutions falling out of favor with the public.

After heated debates, the Chernigov Gubernia Zemstvo Assembly rejected, by a majority vote of 35 to 20, the allocation of 2,000 rubles from the zemstvo budget toward the needs of the women's medical courses in Saint Petersburg (SOCHZ, 1883. №6: 189-190,194).

The same sitting also involved discussion of the issue of getting a building for the women's higher courses in Saint Petersburg. The Chernigov Gubernia Zemstvo Council informed the Assembly of the need to allocate for that purpose 400 rubles for a period of 3 years. The liberals P. Chervinsky, N. Konstantinovich, and A. Lindfors suggested raising the funding through charity donations, without encumbering the budget of the local government. The deputies corps of the Gubernia Zemstvo Assembly approved this proposal by majority vote (ZCHZ, 1883. №6: 35).

At the next sitting of the Gubernia Zemstvo Assembly, held on December 13, 1883, the liberals made use of their deputy right to initiate a repeat vote on the decision regarding the provision of financial aid for the medical women's courses in Saint Petersburg. By that time, the educational institution had already lost its buildings, finding itself in an emergency situation. However, the deputies corps of the Chernigov Gubernia Zemstvo Assembly reaffirmed, by majority vote, its opposition to allocating 2,000 rubles toward the needs of the medical courses. With that said, the Chernigov Gubernia Zemstvo Council was directed to collect all the information about the situation of the women's medical courses in the capital. With detailed information about the school's financial needs in hand, the Gubernia Zemstvo Assembly could revisit the issue some time later (SOCHZ, 1883. №7: 217-221).

Even in the climate of the counter-reforms, the zemstvo liberals of Chernigov Governorate continued to look for ways to preserve the accomplishments achieved in the area of women's education. Specifically, an ordinary session of the Chernigov Gubernia Zemstvo Assembly held in December 1884 involved consideration of the request by the Board of Trustees of Chernigov Women's Gymnasium to allocate from the zemstvo budget a grant in the amount of 1,000 rubles toward the needs of this educational institution. Members of the conservative party opposed doing so, citing the proverbial lack of funding in the zemstvo budget as a reason. The liberal deputies attempted to argue that Chernigov Governorate's only women's educational institution of this level deserved all support from the local zemstvo institutions, for the entire system of women's education would be at risk of regression in the event of the gymnasium's downfall. They insisted on the provision of funds from the budget of the Gubernia Zemstvo to help keep the women's gymnasium running. While the liberals managed to stand their ground, it was not without considerable effort. Finally, the Chernigov Gubernia Zemstvo Assembly directed the Gubernia Zemstvo Council to allocate from the budget of the Gubernia Zemstvo the sum of 1,000 rubles toward the needs of Chernigov Women's Gymnasium (ZCHZ, 1884. №4: 27-28).

With the process of implementing the counter-reforms of Alexander III gaining momentum, the liberals of Chernigovshchina found it increasingly difficult to continue their progressive policy of supporting women's education. An ordinary session of the Chernigov Gubernia Zemstvo Assembly held in 1887 involved consideration of yet another request from Chernigov Women's Gymnasium for financial aid. As expected, deputies from the conservative party opposed the provision of such a grant. On top of that, they publicly reproached the Gubernia Council for spending large amounts of money on the school when other secondary educational institutions in the region were left without any help. With that said, it was argued that the uyezd zemstvos of Chernigov Governorate were not funding the needs of the gymnasium. Members of the liberal party attempted to rebut the assertions of the reactionaries by reminding them that in 1887 the Chernigov Uyezd Zemstvo allocated some funding from its own budget to support the needs of the women's gymnasium. However, in the end, the deputies corps of the Chernigov Gubernia Zemstvo

voted to turn down the request from Chernigov Women's Gymnasium for financial aid (ZCHZ, 1887. №9: 228-229, 232).

5. Conclusion

While the pre-reform Russian Empire did have private women's educational institutions, it is the Era of Great Reforms (1856–1874) that facilitated the emergence of an entire network of state and municipal women's educational institutions, most importantly gymnasiums and boarding schools. The retrieved historical sources, most of which are being introduced into scholarly discourse here for the first time ever, attest that a key role in these processes was played by the zemstvo institutions. An especially active part in this was taken by deputies of the zemstvo authorities who represented the liberal political wing. There were two major stages in the activity of the Zemstvo Liberal Party in Chernigov Governorate in the area of the development of women's education – (1) the 1870s and (2) the period of the reign of Emperor Alexander III. The first stage involved active efforts on the part of liberal zemstvo members in Chernigov Governorate in the area of building a network of women's educational institutions in the region. Specifically, a major achievement of the liberal party was the creation and development of Borzna Zemstvo Women's Progymnasium. The consolidated efforts of the zemstvo liberals helped secure steady funding for the school. Members of the liberal wing advocated for using an election-based system to form the school's teaching team and granting the status of zemstvo public officers with corresponding rights to its entire teaching staff.

The liberal deputies systematically initiated procedures for the provision of financial aid from the budgets of the zemstvo self-governing authorities to support the needs of women's educational institutions not only in Chernigov Governorate but in Kiev and Saint Petersburg as well.

In the second stage, the zemstvo liberals of Chernigov Governorate had to take account of the radical changes in the government's domestic policy and adjust their policy in the area of women's education accordingly. It is to be noted that members of the opposition publicly criticized many of the political decisions made by the government of the Russian Empire. Despite the domination of conservative ideology and reactionary practices in the country, liberal zemstvo members did find ways to preserve the accomplishments achieved during the Era of Great Reforms. A case in point is the provision of funding to support the needs of Chernigov Women's Gymnasium.

On balance, the policy pursued by the Zemstvo Liberal Party in northern Ukraine in the area of women's education between the 1870s and 1880s can be regarded as progressive. The democratic principles put into effect in the area of women's education were an integral, organic part of a large-scale humanitarian program implemented by the zemstvo liberal movement in the north of Leftbank Ukraine during that period.

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The System of Public Education in Astrakhan Governorate in the Second Half of the 19th and Early 20th Centuries. Part 2

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Abstract

This set of articles relies on reference and memorandum books from the period 1873–1917 to explore the development of the system of public education in Astrakhan Governorate. This is the second piece in the set. The 20-year timeframe it covers (1874–1894) incorporates the post-reform and counter-reform periods.

The principal source used in this work is the Memorandum Books for Astrakhan Governorate.

Methodologically, use was made of sets of historical (historical-systematic, historical-comparative, historical-typological, historical-genetic, and historical-statistical) and general (synthetic analysis, content analysis, and systems analysis) research methods.

Between 1874 and 1894, the number of public educational institutions in Astrakhan Governorate increased 8 times, which may be regarded as significant progress in the development of the system of education in the region. The number of students rose 6 times, which is a remarkable achievement too.

The 20-year period witnessed brisk progress in the development of female education in the region, with the number of female students increasing 5.7 times. This must have been facilitated by the region's distinctive economic characteristics – it had well-developed fishing and livestock farming industries, with many women engaged in processing work.

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Socially, the region's secondary education sector was dominated by children of nobles and functionaries, which must have been associated with an added focus on the prestige of education and on building a successful career.

In terms of religious composition, the bulk of the region's student body was made up of Orthodox Christians. This group outnumbered the rest of the religious groups more than 30 times.

Keywords: public education, system of public education, public schools, Astrakhan Governorate, education in Astrakhan Governorate.

1. Introduction

This part of the study explores the development of the system of public education in Astrakhan Governorate in the latter part of the post-reform period (1874–1881) and in the counter-reform period (1881–1894). Thus, its chronological scope is 1874–1894. Its geographic scope is Astrakhan Governorate. An analysis was conducted comparing the region's education system with that of certain areas within the Caucasus Educational District (e.g., Tiflis Governorate, Kars Oblast, and the territory of the Kuban Cossack Host), certain areas in central Russia (Vologda and Voronezh Governorates), and certain areas in Little Russia (modern Ukraine), namely Volyn Governorate.

2. Materials and methods

The principal source used in this study is a selection of memorandum books spanning the period from 1874 to 1894. These books contain information about officials in charge of various institutions within each ministry (including one's full name, rank, title, and post) and list various institutions in the region, of which of primary interest to us are educational organizations under the purview of the Ministry of Public Education.

Valuable data on the region's social makeup are available from the First General Census of the Russian Empire of 1897 (Perepis'.., 1897). An insight into the characteristics of legislation in the area of education at the time can be gained from 'The Complete Collection of Laws of the Russian Empire' (PSZRI, 1914).

In terms of methodology, use was made of both historical (traditional and nontraditional) and general research methods.

The following traditional historical research methods were used:

– historical-systematic method;

– historical-comparative method (in terms of (a) the chronological aspect, employed to compare the states of the system of education in Astrakhan Governorate in different stages during the period under review; in terms of (b) the historical-geographic aspect, employed to compare the development of the system of education in Astrakhan Governorate with that in several other regions across the Russian Empire);

– historical-typological method;

– historical-genetic method.

The only nontraditional historical research method used in this work was the historical-statistical method.

The general research methods employed in this work were synthetic analysis, content analysis, and systems analysis.

3. Discussion

Below is a review of the historiography on the subject.

Amongst the prerevolutionary literature, a highly valuable work representing an in-depth analysis of the system of public education in Astrakhan Governorate is N.F. Kazansky's 'Public Education in Astrakhan Governorate', a series of articles published in 1898 in the journal *Russkaya Mysl* (Kazanskii, 1898a; Kazanskii, 1898b; Kazanskii, 1898c; Kazanskii, 1898d).

Of interest are also the monographs 'The Astrakhan Chronicle: Historical Developments, Events, Ordinances of Public Authorities, and Facts about Social Life in the City of Astrakhan for the Period from 1554 to 1896 Inclusive', by A.N. Shtylko, which also touches upon issues in the education system of Astrakhan Governorate (Shtyl'ko, 1897), and 'A Historical Account of Astrakhan's First Male Gymnasium in the Period from 1806 to 1914', by T.N. Ostroumov (Ostroumov, 1914), devoted to the history of the region's oldest educational institution.

An analysis of preschool education in the region is provided in the article 'On Preschool Education in the Astrakhan Region' by V. Kalegulov (Kalegulov, 1918).

Among the relevant works produced during the Soviet period, of particular note are the monographs 'Literacy and Education in Prerevolutionary Russia', by I.M. Bogdanov (Bogdanov, 1964), and 'Essays on the History of 19th-Century Progressive Russian Pedagogy', by V.Z. Smirnov (Smirnov, 1963).

The Astrakhan region's education system of the prerevolutionary period was, most notably, examined in the Soviet-era articles 'The Ways to Maintain Student Discipline in Gymnasiums and Progymnasiums', by V.Z. Smirnov (Smirnov, 1956), and 'Literacy and Public Education in Russia between the 19th and Early 20th Centuries', by A.G. Rashin (Rashin, 1951).

The region's educational potential was discussed in 'Essays on the History of Education and Pedagogical Thought across the Nations of the USSR (Spanning the Second Half of the 19th Century)' (Ocherki..., 1976) and 'Essays on the History of Education and Pedagogical Thought across the Nations of the USSR (Spanning the Period from the Late 19th to Early 20th Centuries)' (Ocherki..., 1991).

Among the modern works covering the history of education in Astrakhan Governorate, of particular note are the monographs 'Government Regulation of Islam in the Russian Empire between the Last Third of the 18th and Early 20th Centuries', by D.Yu. Arapov (Arapov, 2004), 'Islam in the Astrakhan Region', by V.M. Viktorin (Viktorin, 2008), and 'The Kazan Educational District between the Late 19th and Early 20th Centuries', by I.E. Krapotkina (Krapotkina, 2011), the textbook 'The Development of the Education Sector in Astrakhan Governorate in the Period between the 18th and Early 20th Centuries: A Series of Lectures', by A.M. Treshchev, G.V. Alferova, and E.A. Tarabanovskaya (Treshchev i dr., 2001), and the dissertation 'Public Education in the Astrakhan Region in the Period between the 19th and Early 20th Centuries', by A.B. Olneva (Ol'neva, 1988).

Among the modern articles addressing ethnic and confessional education in Astrakhan Governorate, of particular note are the articles by I.K. Zagidullin (Zagidullin, 1992), R.M. Islemisova (Islemisova, 2013; Islemisova, 2014; Islemisova, 2015), R.G. Rezakov and F.M. Rekesheva (Rezakov, Rekesheva, 2014), and E.A. Tarabanovskaya (Tarabanovskaya, 2016).

As part of the present study, a comparative analysis was also conducted of the development of the system of public education in Astrakhan Governorate during the period under review vis-à-vis a number of other regions of the Russian Empire, including Vologda Governorate (Cherkasov et al., 2019), Volyn Governorate (Cherkasov et al., 2022), and certain areas within the Caucasus Educational District (e.g., Magsumov et al., 2020, Magsumov et al., 2021, Mamadaliev et al., 2022b, and Molchanova et al., 2019). The purpose behind comparing the region's education system with that of other regions of the Russian Empire was to form an objective understanding of the state and pace of the development of the system of public education in Astrakhan Governorate.

4. Results

Based on a set of statutory instruments adopted in the 19th century (e.g., *Charter for Educational Institutions Subordinate to Universities of November 5, 1804*[1], *Charter for Gymnasiums and Uyezd and Parish Schools of December 8, 1828*, and *Regulation on Urban Schools of 1872*) (PSZRI), educational institutions in the Russian Empire could be classified into the following four major types:

1) higher educational institutions: universities, institutes (except for teacher's institutes), and academies;

2) secondary educational institutions: gymnasiums and progymnasiums, teacher's institutes, ecclesiastical and teacher's seminaries, real schools, and technical schools;

3) lower educational institutions: urban schools, tradesman's (industrial) specialized schools, tradesman's schools, higher primary schools, Mariinsky schools, and uyezd schools;

4) primary educational institutions: primary schools and parochial (parish) schools.

The present work will not consider the system of higher education in the region.

[1] All dates hereinafter are provided in the old style.

As at 1873, Astrakhan Governorate had 38 educational institutions with a combined enrollment of 2,395 (Magsumov et al., 2022a: 1010).

The region had the following educational institutions as at 1874 (Pamyatnaya knizhka, 1874: 64-138):

– in the city of Astrakhan: Astrakhan Gubernia Male Gymnasium; Astrakhan Female Gymnasium of Empress Mary; Astrakhan Ecclesiastical Seminary; Astrakhan Diocesan Female School; Astrakhan Uyezd School; Armenian Agababov Uyezd School; Astrakhan First Parish School; Astrakhan Second Parish School; Astrakhan Third Parish School; Astrakhan Fourth Parish School; Astrakhan Fifth (Petrine) Parish School; Astrakhan Armenian Parish School; Astrakhan First Female Parish School; Astrakhan Second Female Parish School;

– in the city of Cherny Yar: Cherny Yar Uyezd School;

– in the city of Krasny Yar: Krasny Yar Male Parish School; Krasny Yar Female Parish School; Yenotayev Male Parish School; Yenotayev Female Parish School; Cherny Yar Male Parish School; Cherny Yar Female Parish School;

– in the city of Tsarev: Tsarev Parish School.

According to the source, there also were several Cossack stanitsa schools and a Host boarding school. It, however, does not specify the number of those schools. It also mentions the activity of the Inspectorate of Public Schools in the city of Astrakhan.

The 1875 Memorandum Book lists the same number of educational institutions as there were in the previous year.

As at 1876, the region had the following educational institutions (Pamyatnaya knizhka, 1876: 82-103):

– in the city of Astrakhan: Astrakhan Ecclesiastical School; Astrakhan Sixth Parish School; Armenian Parish School; Astrakhan Third Female Parish School.

The 1877 Memorandum Book lists the same number of educational institutions as there were in the previous year.

In 1878, the governorate became home to the following educational institutions (Pamyatnaya knizhka, 1878: 52-131):

– in the city of Astrakhan: Astrakhan Real School;

– in Astrakhan Uyezd: one-grade male school in the village of Nachalovo (Cherepakha);

– in Yenotayevsky Uyezd: two-grade male school in the village of Sasykoli;

– in Chernoyarsky Uyezd: one-grade male school in the village of Aksay;

– in Tsarevsky Uyezd: two-grade male school in the village of Prishiby; two-grade male school in the village of Sloboda.

In 1879, the governorate became home to the following educational institutions (Pamyatnaya knizhka, 1879: 98-133):

– in the city of Astrakhan: Astrakhan Seventh Parish School; Astrakhan Fourth Female Parish School;

– in the city of Cherny Yar: urban two-grade school;

– in Tsarevsky Uyezd: two-grade male school in the sloboda of Vladimirovka.

In 1880, the governorate became home to the following educational institutions (Pamyatnaya knizhka, 1880: 86, 131):

– in the city of Astrakhan: Astrakhan Tradesman's School of Emperor Alexander III; Nautical School;

– in Tsarevsky Uyezd: two-grade male school in the village of Bykovo.

In 1881, the region became home to an urban four-grade school in the city of Astrakhan (Pamyatnaya knizhka, 1881: 89), and in 1882 a one-grade school was opened in the village of Selitryanoye (Pamyatnaya knizhka, 1882: 118).

In 1883, the governorate became home to the following educational institutions (Pamyatnaya knizhka, 1883: 95-118):

– in the city of Astrakhan: non-Slavic school for Tatars; female urban four-grade school;

– in Astrakhan Uyezd: one-grade school in the village of Karantinnoye; one-grade school in the village of Kazymyakskoye; one-grade school in the village of Yandykovskoye;

– in Krasnoyarsky Uyezd: one-grade school in the village of Petropavlovskoye; one-grade school in the village of Raznochinskoye; one-grade school in the village of Teplinskoye; one-grade school in the village of Nikolskoye (Dzhambay);

– in Yenotayevsky Uyezd: one-grade school in the village of Tambovo; one-grade school in the village of Bolkhun; one-grade school in the village of Prishiby (not to be confused with the village of Prishiby in Tsarevsky Uyezd); one-grade school in the village of Nikolskoye (not to be confused with the village of Nikolskoye in Krasnoyarsky Uyezd, also known as Dzhambay);

– in Chernoyarsky Uyezd: one-grade school in the village of Solenoye Zaymishche; one-grade school in the village of Vyazovka; one-grade school in the village of Popovitskoye; one-grade school in the village of Solodniki; one-grade school in the village of Staritskoye; one-grade school in the village of Kamenny Yar; one-grade school in the village of Torgovoye; one-grade school in the village of Zavetnoye; one-grade school in the village of Remontnoye;

– in Tsarevsky Uyezd: two-grade female school in the village of Vladimirovka; one-grade female school in the village of Verkhnebalykleyskoye; one-grade male school in the village of Nikolayevskoye; one-grade female school in the village of Nikolayevskoye; one-grade male school in the village of Verkhne-Akhtubinskoye; one-grade female school in the village of Verkhne-Akhtubinskoye; one-grade school in the village of Rakhinka; one-grade school in the village of Berezhnovo; one-grade school in the village of Molchanovka; one-grade school in the village of Slobodka; one-grade school in the village of Novonikolskoye; one-grade male school in the village of Sredne-Akhtubinskoye; one-grade female school in the village of Sredne-Akhtubinskoye; one-grade male school in the sloboda of Kapustinoyarskaya; one-grade female school in the sloboda of Kapustinoyarskaya; one-grade school in the village of Kislovo; one-grade school in the village of Kalmytskobalakskoye; one-grade school in the village of Kolobovka; one-grade school in the village of Solodovka; one-grade school in the village of Zaplavnoye; one-grade school in the village of Pologoye Zaymishche; one-grade school in the village of Verkhnepogromnoye; one-grade school in the village of Srednepogromnoye.

In 1884, the region became home to the following educational institutions (Pamyatnaya knizhka, 1884: 129, 137):

– in the city of Astrakhan: Astrakhan Female Tradesman's School; Astrakhan Male Tradesman's School; primary public school in the Akhtuba station of the Baskunchak Railroad.

In 1885, the region became home to the following educational institutions (Pamyatnaya knizhka, 1885: 73, 131, 163):

– in the city of Astrakhan: Astrakhan Male Tradesman's School of the Ecclesiastical Charity for Poor Armenians;

– in the Kalmyk Horde: male Kalmyk school; male Tatar school in the village of Trekhprotokskoye (run by Mullah Khodzhayev); male Tatar school in the village of Trekhprotokskoye (Mullah Bilyalev); male Tatar school in the village of Kalinchinskoye; male Tatar school in the village of Zatsarevskoye; male Tatar school in the village of Bashmakovskoye;

– in Krasnoyarsky Uyezd: male Tatar school in the village of Khozhetayevskoye (run by Imam Yaksybayev); male Tatar school in the village of Khozhetayevskoye (Imam Alaverdyyev); male Tatar school in the village of Khozhetayevskoye (Imam Realiyev); male Tatar school in the village of Khozhetayevskoye (Imam Isayev); male Tatar school in the village of Khozhetayevskoye (Imam Mambedaliyev); male Tatar school in the village of Khozhetayevskoye (Imam Allaverdyyev); male Tatar school in the village of Khozhetayevskoye (Imam Kedrali Sarsembeyev); male Tatar school in the village of Khozhetayevskoye (Imam Abdula Sarsembeyev); male Tatar school in the village of Khozhetayevskoye (Imam Umerov); male Tatar school in the village of Khozhetayevskoye (Imam Sultanaliyev); male Tatar school in the village of Seitovskoye (Imam Shamardanov); male Tatar school in the village of Seitovskoye (Imam Amiraliyev); male Tatar school in the village of Seitovskoye (Imam Bayramaliyev); male Tatar school in the village of Seitovskoye (Imam Il'yasov).

According to the source, "education in all 15 schools of Krasnoyarsky Uyezd was free" (Pamyatnaya knizhka, 1885: 163).

In 1886, Astrakhan became home to an Armenian male ecclesiastical school and an Armenian female ecclesiastical school (Pamyatnaya knizhka, 1886: 80). In 1887, the city became home to a deaf-and-dumb school and urban first, second, and third one-grade schools (Pamyatnaya knizhka, 1887: 92). That same year, the city of Krasny Yar became home to an urban

three-grade male school (Pamyatnaya knizhka, 1887: 116), opened in the premises of a former parish school.

Starting in 1888, the source carried systematized data, including on education.

According to the 1888 Memorandum Book, at that time the region had 101 educational institutions under the purview of the Ministry of Public Education with a combined enrollment of 6,739 (5,016 boys and 1,723 girls) (Pamyatnaya knizhka, 1888: 186).

The region had 144 educational institutions under the purview of other authorities. These included ecclesiastical and ethnic educational institutions, an obstetric school, schools of literacy, and unisex children's shelters. The 144 schools had a combined enrollment of 5,123 (3,899 boys and 1,224 girls) (Pamyatnaya knizhka, 1888: 186).

While the 1889 Memorandum Book lists the same number of educational institutions under the purview of the Ministry of Public Education in Astrakhan Governorate at the time as there were in the previous year, it now lists a larger number of ethnic and private educational institutions in the region – 147. The region's educational institutions answerable to the Inspectorate of Public Schools had a combined enrollment of 6,591 (4,876 boys and 1,715 girls). Overall, the size of the student body in the governorate at the time was 12,708 (9,437 boys and 3,361 girls) (Pamyatnaya knizhka, 1889: 210-211).

In 1891, the number of educational institutions increased by 13 (Pamyatnaya knizhka, 1889: 71). It did not change in 1892 (Pamyatnaya knizhka 1892: 288). In 1893, it increased by 21 (to 308) (Pamyatnaya knizhka 1893: 27). In 1893, the region's combined student body was 14,725 (10,766 boys and 3,959 girls). The region's secondary education sector had a combined student body of 977 (618 boys and 359 girls) (Pamyatnaya knizhka, 1893: 27).

Astrakhan Governorate had quite an impressive boy to girl student ratio vis-à-vis other regions in the period under review (e.g., Natolochnaya et al., 2020 and Magsumov et al., 2021) – 2.7 to 1. This indicates that the period 1874–1894 witnessed brisk progress in the development of female education in Astrakhan Governorate. The ratio was even more impressive within the region's secondary education sector – 1.7 to 1. Vis-à-vis the regions Astrakhan Governorate was compared with, the figure was higher only in Kutais (Mamadaliev et al., 2021) and Vilna Governorates (Natolochnaya et al., 2019).

The 1894 Memorandum Book provides no statistical data on the numbers of educational institutions and students in them in the region at the time.

The numbers of educational institutions and students in them in Astrakhan Governorate in the period 1874–1894 are displayed in Table 1.

As at 1888, Astrakhan Governorate had the following distribution of students by faith within its secondary education sector (Pamyatnaya knizhka, 1890: 71-72):

– Orthodox Christians: male gymnasium – 247; real school – 138; female gymnasium – 245;

– Armenian Gregorian Christians: male gymnasium – 45; real school – 28; female gymnasium – 61;

– Protestants (Lutherans): male gymnasium – 17; real school – 9; female gymnasium – 17;

– Catholics: male gymnasium – 11; real school – 6; female gymnasium – 11.

The number of students representing other religious groups was negligible. As we can see, the bulk of the student body within the region's secondary education sector was made up of Orthodox Christians, which was associated with the fact that the bulk of its population was made up of ethnic Russians.

In terms of social composition, in 1888 Astrakhan Governorate had the following distribution of students within its secondary education sector (Pamyatnaya knizhka, 1890: 72):

– children of nobles, officers, and functionaries: male gymnasium – 157; real school – 61; female gymnasium – 151;

– children of petit bourgeois: male gymnasium – 68; real school – 93; female gymnasium – 87;

– children of peasants, Cossacks, and members of the lower ranks: male gymnasium – 31; real school – 17; and female gymnasium – 17;

– children of distinguished citizens and merchants: male gymnasium – 55; real school – 12; and female gymnasium – 70.

The number of students representing other social groups was negligible.

The percentage of students in terms of social background varied in the region from year to year. Specifically, in 1887 the number of children of distinguished citizens and merchants attending the male gymnasium was 12, and in 1888 it was now 55. It was the opposite in the real school – 49 students in 1887 and 12 in 1888 (Pamyatnaya knizhka, 1890: 72). The causes of this volatility have yet to be identified.

What is obvious is that the prevalence of children of members of the higher social classes in the gymnasium was primarily associated with an added focus on the prestige of education and on building a successful career.

Things were even more radical within the region's public education sector when it comes to distribution by faith. Specifically, as at 1888 the number of Orthodox Christians attending urban and rural schools in the region was 5,448, ahead of Tibetan Buddhists (mainly Kalmyks) – 172, Molokans and Sabbatarians – 147, and Armenian Gregorian Christians – 113 (Pamyatnaya knizhka, 1890: 72).

Table 1. Numbers of Educational Institutions (with a breakdown by type) and Students in Them in Astrakhan Governorate in the Period 1874–1894 (Pamyatnaya knizhka, 1874: 64-138; Pamyatnaya knizhka, 1875: 67-135; Pamyatnaya knizhka, 1876: 64-134; Pamyatnaya knizhka, 1877: 69-138; Pamyatnaya knizhka, 1877: 69-138; Pamyatnaya knizhka, 1878: 50-130; Pamyatnaya knizhka, 1879: 51-133; Pamyatnaya knizhka, 1880: 36-131; Pamyatnaya knizhka, 1881: 46-136; Pamyatnaya knizhka, 1882: 45-143; Pamyatnaya knizhka, 1883: 94-143; Pamyatnaya knizhka, 1884: 122-137; Pamyatnaya knizhka, 1885: 72-163; Pamyatnaya knizhka, 1886: 81-130; Pamyatnaya knizhka, 1887: 81-130; Pamyatnaya knizhka, 1887: 84-147, 186; Pamyatnaya knizhka, 1888: 65-114, 210-211; Pamyatnaya knizhka, 1889: 210-211; Pamyatnaya knizhka, 1890: 210-211; Pamyatnaya knizhka, 1890: 76-77; Pamyatnaya knizhka, 1892: 288; Pamyatnaya knizhka, 1893: 27; Pamyatnaya knizhka, 1894: 71-118).

Year	Educational institutions				Number of students
	Secondary	Lower	Primary	Total	
1874[1]	4	3	15	22 (38[2])	2,395[3]
1875[4]	4	3	15	22	N/A
1876[5]	4	4	18	26	N/A
1877[6]	4	4	18	26	N/A
1878[7]	5	4	23	32	N/A
1879[8]	5	5	24	34	N/A
1880[9]	5	6	25	36	N/A
1881[10]	5	7	25	37	N/A
1882[11]	5	7	26	38	N/A
1883[12]	5	9	69	83	N/A
1884[13]	5	11	70	86	N/A
1885[14]	5	12	91	108	N/A

[1] Data likely incomplete
[2] Data for 1873 from N.F. Kazansky (Kazanskii, 1898c: 4).
[3] Data for 1873 from N.F. Kazansky (Kazanskii, 1898c: 4).
[4] Data likely incomplete
[5] Data likely incomplete
[6] Data likely incomplete
[7] Data likely incomplete
[8] Data likely incomplete
[9] Data likely incomplete
[10] Data likely incomplete
[11] Data likely incomplete
[12] Data likely incomplete
[13] Data likely incomplete
[14] Data likely incomplete

1886[1]	5	14	91	110	N/A
1887[2]	5	15	94	114	N/A
1888	5	15	101 (228[3])	121 (248[4])	12,809
1889	5	15	101 (231[5])	121 (251[6])	12,798
1890	5	15	106 (240[7])	126 (265[8])	12,856
1891	5	18	116	139	12,685
1892	5	18	116	139	13,619
1893	5	18	137 (290[9])	160 (308[10])	14,725
1894[11]	5	18	137 (290[12])	160 (308[13])	N/A

As evidenced in Table 1, the system of education in Astrakhan Governorate developed in the period 1874–1894 in a leap-ahead fashion. There was fairly consistent growth up to 1882, but in 1883 the number of schools increased sharply – more than 2 times (from 38 to 83), with the bulk of the growth accounted for by primary schools in the region. This may be attributed to incomplete data in the sources. At the same time, the number of secondary educational institutions in the region did not change for many years, which may be associated with the government's counter-reform policy. Three of the region's five secondary educational institutions – the male gymnasium, the female gymnasium, and the real school – were under the purview of the Ministry of Public Education.

The sources offer more or less complete statistics on education in the region in the period from 1888 to 1893, with precise figures provided with regard to the number of educational institutions, the size of the student body, and the distribution of students by faith and social estate. This, too, may be associated with the counter-reform policy of the government of the Russian Empire.

The region witnessed a substantial increase in the number of educational institutions in the period 1892–1893. The provision of statistical data in the sources for those years was done in a highly skilled manner – so the growth must have been indeed explosive, which may have been associated with the brisk development of industry and commerce in the region at the time.

There was a gradual increase in the number of students, accompanied by an increase in the number of educational institutions. As at 1894, the region had an average of 49 people per school, which is a fairly decent result. By comparison, in the same period the figure for the Caucasus Educational District ranged from 65 (as was the case in the lightly populated regions, like Dagestan and Terek Oblasts; e.g., Rajović et al., 2022, Cherkasov et al., 2020c, and Natolochnaya et al., 2020) to more than 90 (e.g., Tiflis, Kutais, and Black Sea Governorates; e.g., Mamadaliev et al., 2020, Molchanova et al., 2019, and Cherkasov et al., 2020b).

If we compare the state of education in Astrakhan Governorate with that across central Russia (e.g., Cherkasov et al., 2019, Cherkasov et al., 2020a, and Magsumov, Zulfugarzade, 2020), we can see that, compared with the third quarter of the 19th century, the situation improved significantly by the century's end. This must have been directly associated with the brisk development of industry (fisheries and shipbuilding) and commerce in the region, which, obviously, required a literate workforce (a comparison could be drawn to the Black Sea regions within the Caucasus Educational District).

[1] Data likely incomplete
[2] Data likely incomplete
[3] Together with private educational institutions
[4] Together with private educational institutions
[5] Together with private educational institutions
[6] Together with private educational institutions
[7] Together with private educational institutions
[8] Together with private educational institutions
[9] Together with private educational institutions
[10] Together with private educational institutions
[11] Data likely incomplete
[12] Together with private educational institutions
[13] Together with private educational institutions

5. Conclusion

The study produced the following conclusions:

1. Over the 20-year period under review (1874–1894), the number of educational institutions in Astrakhan Governorate increased 8 times (from 38 to 308), which may be regarded as significant progress in the development of education in the region.

2. The period witnessed an increase of nearly 6 times, from 2,395 to 14,275, in the number of students in the region – the best result among the regions of the Russian Empire with which Astrakhan Governorate was compared.

3. The period witnessed brisk development of female education in the region, with the number of female students attending a public school increasing from 693 in 1874 to 3,959 in 1894, which, too, may be regarded as quite progressive vis-à-vis the other regions considered. As at 1894, the region had a boy to girl student ratio of 2.7:1. Note that in 1874 the figure was even higher (2.4:1), which was not characteristic of many Russian regions at the time, above all those within the Caucasus Educational District. Within the region's secondary education sector, the boy to girl student ratio was 1.7:1. This can be explained by the region's distinctive economic characteristics, with its primary industrial focus being on fisheries and many women there involved in the processing of caught fish. The success of any region in terms of industry and commerce is normally driven by the education levels of its population, and Astrakhan Governorate had a well-developed economy at the time.

4. Socially, the region's secondary education sector was dominated by children of nobles and functionaries, which must have been associated with an added focus on the prestige of education and on building a successful career. Yet there were times when the share of members of other social estates in the region's student body changed radically and unpredictably.

5. In terms of religious composition, the bulk of the student body was made up of Orthodox Christians. This group outnumbered the rest of the religious groups more than 30 times. This was the case not just in the region's primary education sector but its lower and secondary education sectors as well.

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"Free Will" Education in the Sergius I. Hessen's Pedagogy of Culture

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Abstract

The article presents a theoretical interpretation of the philosophical and pedagogical conception of Sergius I. Hessen, the keynote of which is understanding education as an endless process of the spiritual development of a personality, "free will" education and focus of a personality on cultural values. Sergius I. Hessen's conception of the unity of culture and pedagogy 'paved the way' into the European educational space for the Russian émigré community of the first half of the 20th century. Having generalized and rethought the experience and traditions of the world pedagogy, Sergius I. Hessen substantiated the promising ideas of younger generation education and upbringing in Europe. The philosophical and pedagogical heritage of the scientist is based on the postulates of the values of humanism, freedom and independence of individuals, their responsibility, solidarity and tolerance. Therefore, his scientific works were extremely in demand in the development of educational policy and school reforms in Italy, Poland, Czechoslovakia, Germany and France.

The conception of Sergius I. Hessen's education content, in which the space of the world of culture is consistently expanding for a student, is more relevant than ever, since the renewal of the world by means of new cultural achievements is the main mission of future generations.

Keywords: Sergius I. Hessen, "free will" education, culture, pedagogy, collaboration, creativity.

1. Introduction

An endless series of technological, environmental, epidemiological and sociocultural challenges of the present have objectively generated a request for the world community to "be together". At the same time, the problem of preserving individual 'cultural codes', achieving homeostasis between cultural tradition and innovation in the new global world remains extremely urgent. Science is trying to overcome this contradiction by creating various models and forms for

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education of different levels, in which, on the one hand, individual freedom and creativity would be the main priorities, and, on the other hand, special attention is paid to education of personalities whose creativity would serve the process of structuring their national culture as such.

In recent years, philosophers, historians, sociologists, and educators have been increasingly focusing their attention on the experience of the representatives of the Russian pedagogical émigré community of the first half of the 20th century, who, in a relatively short time, were able to create a unique cultural and educational space of the "Russian world". Therefore, there is a real need for scientific reflection on the ideas of outstanding Russian pedagogical theorists and practitioners of pedagogical science, who, living in a foreign cultural environment, laid the foundation for the best education system in the world.

Sergius I. Hessen's pedagogy of culture is in demand and need to be studied thoroughly, since the researcher's philosophical and pedagogical conception is forward-looking and is built on the ideas of humanism, freedom and spirituality.

Analysis of recent publications on the problem. The scientific discourse on the creation of cultural strategies for the development of a personality at all levels of education is represented by a number of works. The works of Russian researchers such as A.Z. Beisenov and R.S. Musaeva. (Beisenov et al., 2015), G.A. Bordovsky, S.A. Pisareva and A.P. Tryapitsyna (Bordovsky et al, 2018), V.E. Deryuga (Deryuga, 2017), Ya.D. Gushchin (Gushchin, 2021), E.V. Ivanov (Ivanov, 2020), N.A. Lurya (Lurya, 2017), A.V. Mudrik (Mudrik, 2018), I.N. Popova (Popova, 2017), T.P. Razbeglova (Razbeglova, 2019), L.E. Shaposhnikov (Shaposhnikov, 2016), E.E. Sedova (Sedova, 2019), M.V. Vorobiev (Vorobiev, 2017), L.N. Yakovenko (Yakovenko, 2015), O.A. Yanuts (Yanutsh, 2018), M.Yu. Zagirnyak (Zagirnyak, 2021), etc. are devoted to the study of various aspects of the philosophical and pedagogical heritage of Sergius I. Hessen.

Pedagogical practices of using the concept of "free will" education, the theory of cultural and historical work in educational institutions are presented by empirical studies of European scientists such as R. Barrow and R. Woods (Barrow et al., 2021), J. Pintassigo and de A.N. Andrade (Pintassilgo et al., 2020), M.B. Postholm and K.F. Vennebo (Postholm et al., 2021), J.B. Rius (Rius, 2017).

2. Materials and methods

The sociocultural approach in understanding the phenomenon of "free will" education in the pedagogy of culture is the fundamental one, since it allows considering Hessen's conception of social education, its evolution, theoretical and practical significance in the most complete, holistic and system way in the conditions of multicultural modern world.

The main source of the research data are the scientific works of Sergius I. Hessen written in the first half of the 20th century. The studies of the philosophical and pedagogical heritage of Sergius I. Hessen conducted by Russian and foreign scholars made it possible to form a theoretical basis for the study, to structure and generalize the material obtained. The retrospective and possibilities of using the pedagogy of culture are considered applying interdisciplinary approach in terms of philosophy, pedagogy, cultural studies and Russian history.

In each era, the pedagogical picture of the world has a different social and cultural content, including a value one. Therefore, the use of narrative (biographical) and general scientific research methods such as historicism, data systematization, comparison, collation, and generalization made it possible to characterize the scientific concepts of Sergius I. Hessen in the context of determining their scientific and practical significance.

3. Discussion

The beginning of the 20th century was marked by the search for new models and methods of upbringing and education of the younger generation carried out by the scientific community. Unique cadet education institutions were created in Russia; they have proved their worth over the years (Abramov, 2014). The pedagogy of culture is evidenced in the K. N. Venttsel's works devoted to the methodology of collaboration (Abramov, 2021), in S. T. Shatsky's conception of educating the individuality of a student (Chuikov et al, 2018). Educational systems of V. N. Soroki-Rosinsky laid a new direction in the creation of pedagogical doctrines of conscious individual creativity (Abramov et al., 2019).

Addressing the pedagogical heritage of European scientists, including those from the Russian educators' émigré community, expands the boundaries of modern pedagogical innovations and determines the direction of sociocultural cooperation (Bordovsky et al, 2018).

In this process, a significant role was played by the Russian pedagogical émigré community. A large number of Russian children and outstanding scientists were in exile. As it is rightly pointed out by E. E. Sedova, these two main factors influenced the formation of educational conceptions and specific pedagogical practices of the Russian émigré community (Sedova, 2019). In the 20-30s of the 20th century, Russian émigré educators created a unique philosophical and pedagogical conception of education, which was based on the ideas of Sergius I. Hessen.

Hessen's works became the basis for organizing the system of education built by Russian educators' émigré community in Europe. It is no coincidence that among the Russian scientific émigré community Hessen's work on the basics of pedagogy was recognized as an "outstanding" pedagogical book of the 20th century (Zenkovsky, 2001).

According to O.A. Yanutsh, the relevance of Hessen's ideas for Cultural studies of education lies in the fact that at the turn of the 19th-20th centuries he characterized the positive and negative aspects of multicultural (global) education (Yanutsh, 2018).

T.P. Razbeglova interpreted Hessen's philosophical and educational theory as the beginning of the formation of the anthropocentric educational paradigm in Europe in the first half of the 20th century (Razbeglova, 2019).

The origins of the cultural creativity of Sergius I. Hessen were revealed by I.N. Popova, who focuses her attention on the activity of an individual and the unity of the "pedagogy – culture – education" triad. Paying attention to Hessen's distinctions, the author notes his message that it is cultural activity that becomes the main condition for the development of human society (Popova, 2017).

The results of Sergius I. Hessen's research formed the basis for the definition of the culture of education as a single social space and the process of building an individual world of culture for an individual given by modern Russian scientists. In such a world, tolerance becomes a defining value guideline, which overrides violence and arbitrariness in civil society (Chupakhin et al., 2016).

The followers of Hessen's ideas confirm that the goals of education and the goals of culture are identical. The objective of modern education is to transform a natural human being into a cultural one (Beisenov et al., 2015).

A.V. Mudrik defines Hessen's conception of social education as a typical middle-level theory, the originality of which lies in its free essence (Mudrik, 2011). According to the researcher, the fundamental concept of this theory is the community in which the whole range of formal and informal sociocultural interactions is formed (Mudrik, 2018).

In his studies, M.Yu. Zagirnyak analyzes the concepts of an individual and the society and their interaction in Hessen's socio-philosophical theory. It is shown how the axiology of neo-Kantianism influenced the interpretation of the system of social relations and the understanding of the free will of an individual as a social subject. Social reality as a culture created in the process of communicative activity of individuals allows us to consider sociability as a system-forming concept in the neo-Kantian conceptions of the Russian émigré community. An individual is a particular human being who has his own will and can interact with others, while a personality is an individual who realizes him/herself in creativity, participates in the embodiment of a value in reality (Zagirnyak, 2021).

N. A. Lurya substantiates Hessen's idea that the ratio of freedom and the type of coercion in the system of education is a reflection of the changing values of culture and significantly depends on how these values penetrate the education system (Lurya, 2017).

Hessen's conceptual provisions on the freedom of the individual are reconstructed in the legal field by M.V. Vorobiev and presented as a system of "personality – culture – general will – law – state" (Vorobiev, 2017).

Ya.D. Gushchin disclosed the category of "freedom" in Hessen's interpretation from the philosophical viewpoint. Freedom in human existence acts as a way to determine good and evil in daily cultural practices (Gushchin, 2021).

L.E. Shaposhnikov gives his assessment of Hessen's attempt to synthesize philosophy and pedagogy. The author criticizes the categorical nature of the thesis on the close relations of some parts of Philosophy and Pedagogy. The issues concerning the relationship between freedom and

coercion in the educational sphere in Hessen's interpretation are presented in interconnection with creativity and "the development of individuality in a personality" (Shaposhnikov, 2016).

According to Sergius I. Hessen, despite the complexity of their conceptualizing the goals of education and upbringing should be considered in close interrelation with cultural objectives of the particular society to which these teacher and student belong. The main goal of the system of education is to perceive, re-analyze and implement these objectives (Yakovenko, 2015).

The model of solidarity created by Sergius I. Hessen can be considered as a reference, self-valuable model for studying modern local cultures. As it is quite rightly remarked by M.Yu. Zagirnyak, such a model of interpreting culture through the correspondence of a system of institutions to the level of freedom of a certain society makes it possible to evaluate the cultural practices of different eras (Zagirnyak, 2019).

The ideas of "free will" education, taking into account national peculiarities, are still debatable for European researchers. Thus, the ideas of cooperation, co-creation, competitiveness and freedom, which are largely compliant with the Hessen's conception, were subjected to historical and pedagogical interpretation in 1922–1938 in Spain (Rius, 2017). The studies of R. Barrow and R. Woods from the UK are also noteworthy; when studying the system of education, they use such categories as culture, creativity, autonomy, and open learning (Barrow et al., 2021). M.V. Postholm and K.F. Vennebo, their colleagues, insist on using the ideas of a single cultural and educational space for the joint constructing and solving real pedagogical issues (Postholm et al., 2021).

Portuguese scholars focus on the need for pedagogical renewal of the educational environment based on the principles of freedom and cooperation of teachers and students (Pintassilgo et al. 2020).

As we can see, Hessen's conception of the pedagogy of culture still continues to draw attention of many scientists from all over the world.

4. Results

Intensive scientific and pedagogical activity of Sergius I. Hessen prevailed in the period of emigration. In different years, working in Germany, Czechoslovakia, and Poland, the scientist participated in many international forums on the issues of pedagogy of culture and education of the younger generation, held in many capitals of European countries such as Berlin, Warsaw, Vienna, London, Paris, and Prague. Thanks to Sergius I. Hessen, the values of the "Russian world", based on the postulates of Goodness, Truth, Freedom and Justice, became the property of the education systems of many European countries. The scientific works of the Russian emigrant were published in many languages and served as the basis for the creation of national systems of education.

According to Sergius I. Hessen, an individual and culture, represent a single social continuum in which culture is reproduced by a society consisting of many individuals, its members. In turn, each individual, constantly entering into sociocultural relationships, makes his/her own possible contribution to the cultural change of the whole society, provided that he/she is able to understand what needs to be changed in it.

The formation of the human personality occurs under the influence of the culture of a particular society. According to Sergius I. Hessen, upbringing and education of such a personality, capable of changing the world of culture, constitute an inseparable dyad.

Individual's freedom, according to Sergius I. Hessen, is affirmed as the main factor of cultural continuum. The researcher comes to the conclusion that "Freedom is creation of the new, which has not existed in the world before. I am free when I resolve some difficult life task that has arisen before me in my own way, in a way that no one else could solve it. And the more irreplaceable, individual my action is, the freer it is" (Hessen, 1995). In cultural continuity, the most important role is played by the individual as a free creature. Sergius I. Hessen uses the concept of "individual" to characterize a personality as a participant in social practices (Hessen, 1999).

Moral laws, principles of reason, independence, self-education and self-discipline form a free person; following them not only organizes human life, but also forces persons to organize their sociocultural interactions in the space of freedom, organize their thinking and mind in the legal field.

It is the person who, on the one hand, is capable of self-discipline and, on the other, can concentrate his/her will without any form of coercion on the part of society, can be recognized as a free moral person. Otherwise, we will get an immoral, selfish personality. Such a pedagogical conception is based on the principles of moral education and upbringing (Hessen, 2010).

According to Sergius I. Hessen, moral education should not perform the task of preparing for a specific profession; to create a thinking person is the main objective in this process. It is freedom which is far from mechanical, artificial culture that is presented as the main means of survival of such persons.

Turning to J.-J. Rousseau's works, Hessen agrees with the educator, noting that it is nature that should become the best educator of an individual. At the same time, the teacher needs to protect culture and individuals in every possible way (Rousseau, 1989).

Hessen's philosophical and pedagogical conception was formed as a result of an axiological approach to the analysis of the ideas of freedom of the French enlighteners such as J.-J. Rousseau and D. Diderot; I. Kant, the founder of German classical philosophy, and his opponent G. Rickert; P.P. Blonsky, the representative of the "human" education, and L.N. Tolstoy's moral freedom of a person. Hessen's methodology wove together the past, present and future, ensured the interconnection and continuity of unique educational models of different times and peoples. (Hessen, 1995).

Taking the position of J.-J. Rousseau, who argued that a free and whole person is the main content of that ideal of "nature", which is opposed to any culture in general, Sergius I. Hessen specifies the tasks of education and upbringing:

– cultural socialization aimed at accepting the values of the society to which an individual belongs;

– the formation of a cultural person from a natural individual.

Culture, like the entire education system, according to Sergius I. Hessen, can be subdivided into several types. In accordance with this division, the general conception of education and upbringing can be divided into theories of scientific, moral, aesthetic, technical, artistic and religious education. The main thesis of the educator is that it is possible to educate and bring up only where there is culture. There should be exactly as many cultural values as there are types of education. Moreover, the goals of culture must be linked with the goals of education and upbringing (Hessen, 1995).

Free actions differ from arbitrary ones. The actions of a free person are necessarily accompanied by some restrictions: internal laws, cultural patterns, self-discipline. If there are no such restrictions in the structure of a person, we will get arbitrariness in his/her actions. According to Sergius I. Hessen, coercion should be put into educational practices only when it is necessary. It is important to make sure that such coercion is ultimately accepted by the trainee as his/her own choice. Freedom and discipline are in close relationship and become the main pedagogical discourse in practical school activities. Therefore, coercion is defined by Sergius I. Hessen as an important attribute of training and education, of "critical didactics".

According to Sergius I. Hessen, the main pedagogical goal is the formation of the inner 'core' in the structure of the trainee's personality with the help of which he/she will gain freedom and the ability to be creative. External socio-cultural barriers and restrictions should not be removed artificially.

In his viewpoint, school discipline is the necessary form of coercion. At the same time, it should not constrain the independence of students, their initiative within certain limits, which are established by the teacher (Ivanov, 2020).

Education and upbringing are represented as a multilevel, contradictory and hierarchical process by Sergius I. Hessen. Each level involves clearly defined goals, objectives and ways of implementing pedagogical practices:

– a psychophysiological level, at which students will be helped to form their own "self", which will allow them to solve complex socio-cultural and other life tasks;

– a social level which presupposes developing (forming) a personality of a student as a representative of a specific social group, a carrier and an active conductor of the values and norms of the society to which he/she belongs;

– a cultural level, which determines the general direction of the educational model for the reproduction of a free creative person capable of creating new cultural patterns;

– a spiritual level involves training and education aimed at consolidating the individuals' abilities for self-development, self-education and spiritual growth.

Coercible (forced) educational practices are used at the first and second levels. The subsequent ones open the way of free creativity for a person and his/her transmission to the external socio-cultural world (Deryuga, 2017).

According to Hessen, freedom, equality, creativity and the integrity of an individual are the basic principles of the "new school". Persons learn during all their lives. Similar to socialization, which continues throughout the conscious life of an individual, the process of education is endless. "Only an uneducated person can claim that he has completely solved the educational problem for himself" (Hessen, 1995).

Hessen's analytical works on the activities of J. Gentile (Hessen, 1952), J. Dewey (Hessen, 1953), G. Lobardo-Radice and J. Kershensteiner (Hessen, 1954), scientific essay on "Pedagogy and the World of Economics" (Hessen, 1954) determined the course of school reform in Italy. In Poland, theorists and practitioners of problem-based learning still apply the conception of "critical didactics" and educational methods of the Russian educator.

The words of the scientist, which reflect the socio-cultural reality of the beginning of the third decade of the 21st century, sound truly prophetic: "The era of crisis, the disintegration of the personality, individual's freedom and morals is coming. A personality who has not kept up with the rapid pace of external culture in his/her internal development is lost in the mass of new impressions that immediately surrounded him/her. The centrifugal forces of external cultural contents overcome the centripetal forces of the personality, and the personality is, as it were, torn apart, broken under the burden of the mechanisms generated by the personality. There comes the domination of the form over the spirit, the letter over the content, the mechanism over freedom. The individual loses him/herself, begins to think with other people's thoughts, feel with other people's feelings, act as someone else. The original personality gives way to those soulless automatons who, in Rousseau's rhetoric, do not dare to "be themselves" and whose wisdom boils down to the rule "one must act like others". Outwardly, this disintegration of the personality is manifested in the loss of his/her stability in relation to the temptations of the environment and the decay of morals associated with this. The disintegration of the personality is finally followed by the decline of cultural creativity in general, i.e., the disintegration of the external culture itself, which expands extremely outside, but dries up in its own depths. This is how the features characteristic of any "enlightenment" arise: the replacement of science with scholasticism, of art with academic aestheticism, in which an encyclopedist dominates instead of a researcher, and an art critic dominates instead of an artist" (Hessen, 1995).

Sergius I. Hessen tried to remedy this situation by proposing his philosophical doctrine, which accumulated the pedagogical experience of the age of Enlightenment, Soviet practices of upbringing and education, and European scientific schools. As a result, a single cultural pedagogical matrix 'crystallized', and the works of the researcher were recognized the best books of the 20th century. Hessen's conceptions united the most important challenges of all levels of education. A special place in the doctrine of "free will" education is given to the theory of the university. Sergius I. Hessen saw the ideal model of the university as an educational institution, the center of science, as a 'reservoir' that absorbs small 'separate streams', which make up "a stream of scientific legend, pouring out in new streams and eventually turning into an eternally seething flow" (Hessen, 1995).

Therefore, the cultural 'bridge' between Europe and Russia, laid from the past to the present by Sergius I. Hessen, can become a prototype of the future for the scientists all over the world.

5. Conclusion

Pedagogy of culture, specified by Sergius I. Hessen in the concept of "free will" education, found its practical implementation in the creation of a single unique cultural and educational space, had a real impact on the development of educational policy in many European countries. Hessen's philosophical and pedagogical heritage turned into reality from a projection into the future, being reflected in the Bologna process, which brought together and harmonized the systems of higher education in Russia and Europe. New generations will have to renew the world with the discovery of new cultural achievements. It is these discoveries that ensure intergenerational harmony and continuity of culture.

The study of the philosophical and pedagogical heritage of Sergius I. Hessen is determined by the logic of the development of the modern multicultural world, in which education both in Europe and around the world is focused on freedom, dialogue, openness and is designed to form:

– An educational space based on mutual understanding, recognition and respect for cultural diversity;

– The ability to carry on dialogues between different cultures while maintaining people's cultural identity;

– Respect for a person, his/her rights and freedoms;

– A system of interstate educational exchange, which is designed to ensure social well-being and political stability throughout the world;

– Concern for the preservation of ecological European and world balance;

– The desire to preserve peace.

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The System of Public Education in Sukhumi District in the Period 1900–1914

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Abstract

This paper explores the system of public education in Sukhumi District in the period 1900–1914. It examines the region's secondary, lower, and primary education sectors and the student body in each of them, with information provided on the latter's size and its gender, ethnic, social-estate, and religious composition.

The work primarily relies on the annual Reports of the Trustee of the Caucasus Educational District and the Most Faithful Reports of the Chief Procurator of the Holy Synod. In addition, use was also made of certain relevant documents from the Russian State Historical Archive (Saint Petersburg, Russian Federation), which helped establish the total number of school-age children in Sukhumi District. The valuable data on the ethnic composition of the region's population were taken from the First General Census of the Russian Empire of 1897.

The study's conclusion is that by 1914 secondary education in the region was accessible to both boys and girls only in its capital, Sukhumi. Lower education was accessible to boys in Sukhumi and Ochamchire. It became accessible to both genders in 1913 in Gudauta. As far as primary education, Sukhumi District had 64 schools run by the Ministry of Public Education and 74 parochial schools run by the Holy Synod, which, combined, had an enrollment of around 6,500 students. Despite the substantial successes of the region's education system, just 68 % of its school-age children attended school in 1914, with these including 33 % of the total number of Abkhazian, 80 % of the total number of Georgian, and 22 % of the total number of Armenian children of school age in the region.

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Keywords: Sukhumi District, system of public education, Caucasus Educational District, early 20th century, period 1900–1914.

1. Introduction

Sukhumi District was created in 1883 based on the following three historical regions: Abkhazia, Samurzakano, and Tsebelda. Up to 1903, the district was part of Kutaisi Governorate; it subsequently became a special district treated as a governorate. Its capital was Sukhumi. The system of public education in this region was subordinate to the Sukhumi Inspectorate of the Ministry of Public Education (Otchet, 1915: 684). The district had a fairly motley population, as was the case throughout Transcaucasia. Based on data from the First General Census of the Russian Empire of 1897, Sukhumi District had a population of 106,179, with 58,600 (55.2 %) of these being Abkhazians, 23,800 (22.4 %) – Mingrelians, 6,500 (6.1 %) – Armenians, 5,900 (5 %) – Greeks, 5,100 (4.8 %) – ethnic Russians, 1,800 (1.7 %) – Georgians, and 1,300 (1.2 %) – Turks. The rest of the ethnicities, combined, accounted for less than 1% of the population (Pervaya vseobshchaya perepis'..., 1905).

2. Materials and methods

The work primarily relies on the annual Reports of the Trustee of the Caucasus Educational District and the Most Faithful Reports of the Chief Procurator of the Holy Synod. In addition, use was also made of certain relevant documents from the Russian State Historical Archive (Saint Petersburg, Russian Federation), which helped establish the total number of school-age children in Sukhumi District. The valuable data on the ethnic composition of the region's population were taken from the First General Census of the Russian Empire of 1897 (Pervaya vseobshchaya perepis'..., 1905).

In terms of methodology, use was made of the historical-statistical method, which helped determine the numbers and types of educational institutions (secondary, lower, and primary) in the region and establish the size and the ethnic, social-estate, gender, and religious composition of its student body.

3. Discussion

The historiography on the subject remains fairly thin, as to date there been no dedicated research on the system of public education in this region. Nevertheless, there has been some research on the system of public education in Kutaisi Governorate, which incorporated Sukhumi District in the very late 19th and early 20th centuries (Mamadaliev et al., 2021; Mamadaliev et al., 2021a; Mamadaliev et al., 2021b). In addition, life in the Sukhumi Diocese and the parochial education sector run by it was researched by G. Rajović and colleagues (Rajović et al., 2022). Private education in the Caucasus was researched by K.V. Taran and colleagues (Taran et al., 2021).

In terms of education in other regions close to Sukhumi District, the system of public education in Black Sea Governorate was researched by A.A. Cherkasov and colleagues (Cherkasov et al., 2020; Cherkasov et al., 2020a) and that in Kuban Oblast was researched by V.S. Molchanova and colleagues (Molchanova et al., 2019; Molchanova et al., 2019a; Molchanova et al., 2020).

4. Results

At the start of the 20th century, the system of public education in Sukhumi District was divided into the following three levels: 1) secondary education (Grades 5–8); 2) lower education (Grades 3–4); 3) primary education (Grades 1–2). In the period 1912–1913, the Russian Empire as a whole and the Caucasus in particular witnessed a trend toward the reorganization of urban schools into six-grade higher primary schools, which was facilitative of the development of secondary education. Each level is examined in detail below.

Secondary education

The development of secondary education in Sukhumi District officially began on September 8, 1882, when Sukhumi Urban School, opened in 1870, was reorganized into Sukhumi Female Progymnasium (Otchet, 1905: 163). By 1900, this school was the only secondary educational institution in Sukhumi District. As a result, secondary education was long inaccessible to boys in the region, with many parents having to place their sons in schools in other regions of the empire.

The situation began to change on May 30, 1904, when the region became home to a secondary educational institution for boys – the seven-grade real school in the capital, Sukhumi (Otchet, 1915: 140).

On September 1, 1909, Sukhumi Female Progymnasium was reorganized into an eight-grade female gymnasium (Otchet, 1915: 256, 302). Thus, by 1909 secondary education was accessible in the district to girls and boys alike. Table 1 displays the numbers of secondary educational institutions run by the Ministry of Public Education and students in this sector in the region in the period 1900–1914.

Table 1. Numbers of Secondary Educational Institutions Run by the Ministry of Public Education and Students in This Sector in Sukhumi District in the Period 1900–1914 (Otchet, 1901: 214; Otchet, 1905: 134, 211; Otchet, 1908: 78, 127; Otchet, 1909: 80, 131; Otchet, 1910: 80, 129; Otchet, 1911: 80, 193; Otchet, 1912: 80, 163; Otchet, 1913: 68, 179; Otchet, 1914: 68, 179; Otchet, 1915: 124, 256)

Year	Gymnasiums		Progymnasiums		Real schools	Total	Number of students		
	Male	Female	Male	Female			Boys	Girls	Total
1900	-	-	-	1	-	1	-	116	116
1904	-	-	-	1	1	2	108	148	256
1907	-	-	-	1	1	2	172	172	344
1908	-	-	-	1	1	2	200	212	412
1909	-	1	-	-	1	2	212	253	465
1910	-	1	-	-	1	2	231	274	505
1911	-	1	-	-	1	2	247	306	553
1912	-	1	-	-	1	2	233	306	539
1913	-	1	-	-	1	2	247	300	547
1914	-	1	-	-	1	2	165	280	445

As evidenced in Table 1, by 1913 the size of the student body in the region's в secondary education sector grew nearly 5 times, from 116 to 547 students. In 1914, the number of students in this sector sharply reduced following the beginning of World War I and the region turning into a frontline area. In terms of the gender composition of the student body in this sector, girls outnumbered boys. This in part was due to the fact that secondary education became accessible to girls in the region back in 1882 – i.e., the region already had a tradition of providing secondary education to females. The second reason was that there were no lower educational institutions for girls in the region at the time.

Table 2 displays the distribution of the student body in the region's secondary education sector by religious affiliation in the period 1900–1914.

Table 2. Distribution of the Student Body in the Secondary Education Sector in Sukhumi District by Religious Affiliation in the Period 1900–1914 (Otchet, 1901: 215; Otchet, 1905: 134, 211; Otchet, 1908: 78, 127; Otchet, 1909: 80, 131; Otchet, 1910: 80, 129; Otchet, 1911: 80, 193; Otchet, 1912: 80, 163; Otchet, 1913: 68, 151; Otchet, 1914: 68, 179; Otchet, 1915: 126, 262)

Year	Orthodox Christians	Catholics	Armenian Gregorians	Other Christians	Jews	Muslims	Other non-Christians
1900	103	3	1	5	4	-	-
1904	233	6	1	1	8	-	2
1907	305	3	9	8	18	1	-

1908	354	5	13	13	23	2	2
1909	405	3	17	11	27	1	1
1910	449	4	13	9	25	2	3
1911	483	3	20	11	31	3	2
1912	463	5	25	14	29	1	2
1913	456	7	30	16	33	5	-
1914	365	8	24	9	20	3	16

As evidenced in Table 2, in 1900 Orthodox Christians accounted for 88 % of the student body in this sector (96.5 % combined with members of other Christian denominations). The remaining 3.5 % was accounted for by Jews. There were no Muslims. By 1913, i.e. the last pre-war year, Orthodox Christians accounted for 83.3 % of the sector's student body (93 % combined with members of other Christian denominations). The remaining 7 % was accounted for by Jews (6 %) and Muslims (1%). Of note is that the education of the region's Jewish children was characterized by relative permanence – i.e., most of them would go on to the next grade level. This was not the case with Muslim children. Specifically, in 1907–1909 secondary school was attended in Sukhumi District by Muslim boys only. In 1910, it was attended by 1 boy and 1 girl (the first time that a Muslim female attended secondary school in the region). In 1911, there were 2 boys and 1 girl. In 1912, there were no boys and there was 1 girl. In 1913, the number of Muslim students was 5 (3 boys and 2 girls). However, in 1914, there were only 2 boys and 1 girl. By 1914, not a single Muslim student received secondary education in the region.

Table 3 displays the distribution of the student body in the region's secondary education sector by social estate in the period 1900–1914.

Table 3. Distribution of the Student Body in the Secondary Education Sector in Sukhumi District by Social Estate in the Period 1900–1914 (Otchet, 1901: 215; Otchet, 1905: 134, 211; Otchet, 1908: 79, 127; Otchet, 1909: 81, 131; Otchet, 1910: 81, 129; Otchet, 1911: 81, 193; Otchet, 1912: 81, 163; Otchet, 1913: 69, 151; Otchet, 1914: 69, 179; Otchet, 1915: 127, 263)

Year	Children of nobles and functionaries	Children of persons of ecclesiastical status	Children of distinguished citizens and merchants	Children of urban commoners and guilded craftspeople	Children of Cossacks	Children of peasants	Children of foreigners	Other
1900	48	3	2	44	12	6	4	-
1904	94	20	9	96	31	-	1	-
1907	141	18	53	85	-	39	8	-
1908	256	24	50	123	-	53	4	2
1909	154	30	69	129	-	59	14	10
1910	168	39	68	124	19	70	12	5
1911	181	37	63	141	-	107	14	10
1912	234	26	40	150	35	143	11	1
1913	158	32	72	146	1	119	19	20
1914	122	23	41	105	2	118	15	18

As evidenced in Table 3, in 1900 children of nobles and functionaries accounted for the majority in the region's secondary education sector, 41.3 %, followed by children of members of the urban estates, 37.9 %, and then children of peasants, 5.1 %. By 1913, there was a sharp increase in the number of peasant children, with the picture being as follows: children of nobles and functionaries – 28.8 %; children of members of the urban estates – 26.6 %; children of peasants – 21.7 %. In addition, there was a sharp increase in the number of children of members of other social estates. Thus, by 1913 children from each social estate made up a sizable share of the student body in the region's secondary education sector.

In terms of the ethnic composition of this sector's student body, of note is that because information on this characteristic was not published for 1912–1914 there is no separate table in the present study relating to it. Nevertheless, it is worth noting that in 1900 Sukhumi Female Progymnasium was attended by 36 ethnic Russians, 7 Georgians, 3 Armenians, 0 Tatars,

48 mountaineers, 1 Jew, and 18 members of other ethnicities (Otchet, 1901: 214). Mountaineers (Abkhazians) led the way in 1900, accounting for 41.3 % of the sector's student body, followed by ethnic Russians, 31 %, and then members of other ethnicities (Greeks), 15.5 %. Georgians accounted for just 6 % of the student body in this sector.

In 1911, the region's secondary education sector had now a student body of 553 learners, with 217 of these being ethnic Russians, 131 – Georgians (of whom 100 were girls), 20 – Armenians, 0 – Tatars, 48 – mountaineers (28 girls), and 137 – members of other ethnicities (23 girls) (Otchet, 1912: 114, 215). The ethnic composition of the student body changed substantially. The number of Abkhazian students remained at the same level – 48 in 1900 and as many in 1911. The way was now led by ethnic Russians, 39.2%, followed by members of other ethnicities (Greeks), 24.7%, and then Georgians, 23.6%, Abkhazians accounted now for just 8.6% of the student body in this sector.

There was a sound focus on independent student work in this sector, which was facilitated by the good library stock in it.

In 1900, Sukhumi Female Progymnasium had a library stock of 1,618 (713 items in the fundamental library section and 905 items in the discipular one) (Otchet, 1901: 170-171).

In 1914, Sukhumi Real School had a library stock of 8,110 items (4,516 items in the fundamental library section and 3,594 items in the discipular one) (Отчет, 1914: 142), and Sukhumi Female Gymnasium had a library stock of 2,715 items (985 items in the fundamental library section and 1,730 items in the discipular one) (Отчет, 1915: 314). The combined library stock was 10,825 items. Thus, over the 14-year period the library stock in the region's secondary education sector increased 6.5 times.

Lower education

The region's lower education sector was represented by the following two types of educational institution: 1) the mountain school; 2) the urban school.

The region's first lower educational institution was opened back during the Caucasian War – in 1863. It was Sukhumi Mountain School (Otchet, 1915: 530). The system of lower education in the region received further development only in the early 20th century. Specifically, on September 1, 1900, the region became home to Sukhumi Urban School (Otchet, 1913: 274). On September 1, 1909, the region became home to the four-grade urban school in Ochamchire, and on December 12, 1913, it became home to the six-grade higher primary school in Gudauta (Otchet, 1915: 522, 524). On January 1, 1914, Sukhumi Urban School was reorganized into a six-grade higher primary school (Otchet, 1915: 522, 524).

Table 4. Numbers of Lower Educational Institutions Run by the Ministry of Public Education and Students in This Sector in Sukhumi District in the Period 1900–1914 (Otchet, 1901: 360, 417; Otchet, 1905: 358, 413; Otchet, 1908: 236, 237; Otchet, 1909: 273, 275; Otchet, 1910: 299, 301; Otchet, 1911: 299, 301; Otchet, 1912: 299, 301; Otchet, 1913: 250-254, 260; Otchet, 1914: 304-306; Otchet, 1915: 466-469, 480)

Year	Higher primary schools	Urban schools	Mountain schools	Tradesman's schools	Total	Number of students		
						Boys	Girls	Total
1900	-	1	1	-	2	185	-	185
1904	-	1	1	-	2	325	-	325
1907	-	1	1	-	2	335	-	335
1908	-	1	1	-	2	316	-	316
1909	-	2	1	-	3	338	-	338
1910	-	2	1	-	3	408	-	408
1911	-	2	1	-	3	467	-	467

1912	-	2	1	-	3	481	-	481
1913	1	2	1	-	4	576	18	594
1914	3	-	1	-	4	388	29	417

As evidenced in Table 4, the number of lower educational institutions in the region rose 2 times in the period 1900–1914, from 2 to 4. With that said, three of those educational institutions experienced a major qualitative boost by 1914 – they transformed from four-grade urban schools into six-grade higher primary schools. Here, too, World War I had a significant impact on the size of the student body, which in 1914 decreased sharply. Therefore, we will be taking the year 1913 as a basis. By 1913, the number of students in the region's lower education sector rose 3 times, from 185 learners in 1900 to 594 learners in 1913. The schools in Sukhumi and Ochamchire, as well as the mountain school in Sukhumi, admitted boys only. Only in 1913, following the opening of the higher primary school in Gudauta, would lower education in Sukhumi District become accessible to girls as well (it was the only such facility in the region, though).

Table 5. Distribution of the Student Body in the Lower Education Sector in Sukhumi District by Ethnicity in the Period 1900–1914 (Otchet, 1901: 360, 417; Otchet, 1905: 358, 413; Otchet, 1909: 349, 351; Otchet, 1910: 374-375; Otchet, 1911: 374, 376; Otchet, 1912: 374, 376; Otchet, 1913: 320, 322, Otchet, 1914: 406, 408, 410; Otchet, 1915: 636, 638, 644)

Year	Ethnic Russians	Georgians	Armenians	Tatars	Mountaineers	Other ethnicities	Total
1900	28	36	19	-	62	40	185
1904	54	16	24	2	142	73	325
1907	-	-	-	-	-	-	Data not published
1908	62	120	17	-	39	78	316
1909	57	125	34	1	64	57	338
1910	61	185	35	4	79	54	408
1911	70	196	45	6	92	58	467
1912	37	130	46	4	77	187	481
1913	114	118	64	1	155	145	594
1914	79	132	91	-	-	115	417

As evidenced in Table 5, in 1900 the way in terms of the share of the student body by ethnicity was led in the region by mountaineers (Abkhazians), 33.5%, followed by members of other ethnicities (Greeks), 21.6 %, Georgians, 19.4 %, and ethnic Russians, 15.1 %. By 1913, the situation remained pretty much the same: Abkhazians – 26 %, Greeks – 24.4 %, Georgians – 19.8 %, and ethnic Russians – 19.1 %. Thus, in the period under review, the number of Abkhazian students in the region's lower education sector began to drop, which, among other things, was associated with the opening of new educational institutions there.

Table 6. Distribution of the Student Body in the Lower Education Sector in Sukhumi District by Religious Affiliation in the Period 1900–1914 (Otchet, 1901: 361, 417; Otchet, 1905: 358, 413; Otchet, 1908: 236, 237; Otchet, 1909: 273, 275; Otchet, 1910: 299, 301; Otchet, 1911: 299, 301; Otchet, 1912: 299, 301; Otchet, 1913: 258, 260; Otchet, 1914: 316, 318, 320; Otchet, 1915: 486, 488, 494)

Year	Orthodox Christians	Catholics	Armenian Gregorians	Other Christians	Jews	Muslims	Other non-Christians
1900	152	18	1	1	3	5	-
1904	277	22	2	5	13	5	1
1907	294	-	17	7	12	5	-
1908	271	2	17	7	12	7	-
1909	283	2	34	5	11	3	-
1910	347	2	31	5	10	13	-

1911	389	1	44	6	10	17	-
1912	397	2	41	13	9	19	-
1913	490	4	65	9	8	20	2
1914	347	2	41	11	3	13	-

As evidenced in Table 6, the region's lower education sector was always dominated by Orthodox Christians. In 1900, they accounted for 82.1% of the student body (92.9% combined with members of other Christian denominations). In 1913, the number of Orthodox Christians was about the same – 82.4 % (95.6 % combined with members of other Christian denominations). The number of Jews began to drop after some growth up to 1911, and by 1913 the number of Muslims increased 4 times, from 5 to 20 learners.

Table 7 displays the distribution of the student body in the region's lower education sector by social estate in the period 1900–1914.

Table 7. Distribution of the Student Body in the Lower Education Sector in Sukhumi District by Social Estate in the Period 1900–1914 (Otchet, 1901: 361, 417; Otchet, 1905: 358, 413; Otchet, 1908: 236, 237; Otchet, 1909: 273, 275; Otchet, 1910: 299, 301; Otchet, 1911: 299, 301; Otchet, 1912: 299, 301; Otchet, 1913: 259, 261; Otchet, 1914: 317, 319, 321; Otchet, 1915: 487, 489, 495)

Year	Children of nobles and functionaries	Children of persons of ecclesiastical status	Children of distinguished citizens and merchants	Children of urban commoners and guilded craftspeople	Children of Cossacks	Children of peasants	Children of foreigners	Other
1900	38	1	-	24	4	110	3	-
1904	42	6	-	61	2	212	2	-
1907	43	2	16	75	1	189	4	5
1908	45	3	11	65	1	181	6	4
1909	34	2	2	54	1	243	2	-
1910	59	3	3	61	-	282	-	-
1911	67	5	-	45	-	322	28	-
1912	66	4	3	42	1	364	-	1
1913	69	8	-	79	-	439	4	-
1914	45	4	2	47	-	317	-	-

As evidenced in Table 7, in 1900 the region's lower education sector was dominated by peasant children, 59.4 %, followed by children of nobles and functionaries, 20.5 %, and then children of members of the urban estates, 12.9 %. In 1913, the share of children of peasants became larger, growing to 73.9 %, with this group followed by children of members of the urban estates, 13.2 %, and then children of nobles and functionaries, 11.6 %. The reason behind the sharp drop in the number of children of nobles and functionaries attending lower school in the region must have been the opening of Sukhumi Real School, which made possible the pursuit of a higher level of education.

In terms of the sector's library stock, in 1900 the newly established Sukhumi Urban School had a library stock of 34 books in the fundamental library section (it had no discipular section as of yet) (Otchet, 1901: 298). Sukhumi Mountain School had a library stock of 1,436 items (1,078 items in the fundamental section and 358 items in the discipular one) (Otchet, 1901: 402). In 1900, the combined library stock was 1,470 items.

In 1914, the sector's library stock was as follows: Gudauta Higher Primary School – 272 items (46 items in the fundamental section and 226 items in the discipular one) (Otchet, 1915: 532); Ochamchire Higher Primary School – 997 items (560 items in the fundamental section and 437 items in the discipular one) (Otchet, 1915: 534); Sukhumi Higher Primary School – 3,254 items (1,556 items in the fundamental section and 1,698 items in the discipular one) (Otchet, 1915: 534); Sukhumi Mountain School – 1,934 (1,313 items in the fundamental section and 621 items in the discipular one) (Otchet, 1915: 540). The combined library stock was 6,457 items.

Thus, in the period from 1900 to 1914 the library stock in the region's lower education sector rose 4.3 times.

Primary education

In 1911, data on the number of primary educational institutions in Sukhumi District were published as part of the information on the number of primary educational institutions in Kutaisi Governorate, which makes it difficult to tell what the region's figure was in that year (Otchet, 1912: 448). Table 8 displays the data for the period 1912–1914.

Table 8. Numbers of Primary Schools Run by the Ministry of Public Education and Students in This Sector in Sukhumi District in the Period 1912–1914 (Otchet, 1913: 336; Otchet, 1914: 428; Otchet, 1915: 672, 682-683)

Year	Number of schools	Number of students		
		Boys	Girls	Total
1912	54	1,977	642	2,619
1913	60	2,307	748	3,055
1914	64	2,410	805	3,215

As evidenced in Table 8, compared with the region's secondary and lower education sectors, World War I had no impact on the size of the student body in its primary education sector following the start of the military conflict, with the number of schools in the sector continuing to increase as well.

It is worth noting that in 1914 the majority of primary educational institutions in the region were mixed – 46 out of the 64. Among the rest of its educational institutions, 10 were boys- and 8 were girls-only (Otchet, 1915: 682-683).

Table 9. Distribution of the Student Body in the Primary Education Sector in Sukhumi District by Ethnicity in the Period 1912–1914 (Otchet, 1913: 343; Otchet, 1914: 435; Otchet, 1915: 682-683)

Year	Ethnic Russians	Georgians	Armenians	Tatars	Mountaineers	Other ethnicities	Total
1912	189	242	40	-	943	1,717	2,619
1913	234	1,073	63	16	1,172	497	3,055
1914	236	1,295	83	10	1,118	473	3,215

As evidenced in Table 9, a large ethnic group became part of the 'Other Ethnicities' grouping in 1912. The size of this grouping was much smaller in 1913 and in 1914. Considering that in 1913 and in 1914 there was a significant increase in Georgian students in the sector, it appears that in 1912 Mingrelian students were part of the 'Other Ethnicities' grouping, whilst in 1913 and in 1914 they now figured as part of the Georgian students group. This seems the only explanation for this phenomenon.

In 1914, the student body in the region's primary education sector was dominated by Georgians, followed by mountaineers (Abkhazians) and then members of other ethnicities (Greeks). As mentioned earlier, as at 1897 Sukhumi District had the following population composition: Abkhazians – 55 %, Mingrelians jointly with Georgians – 24.1 %, Armenians – 6 %, and Greeks – 5 %. It is known that as at January 1, 1915, the region had 12,852 children of school age (8 to 11 years), who accounted for about 9 % of its total population (RGIA. F. 733. Op. 207. D. 39. L. 1). Using this information, we can estimate the district's total population in 1914. If 12,852 people accounted for 9 % of the population, then 1 % equaled 1,428 people, which means that the region had a population of 142,800. Based on the 1897 proportions, it can be surmised that in 1914 the region was inhabited by 78,540 Abkhazians, 36,556 Georgians (inclusive of Mingrelians), 8,568 Armenians, and 7,140 Greeks. This enables us to determine the approximate numbers of school-age children across the region's ethnicities. Specifically, in 1914 there were approximately 7,000 Abkhazian, 3,289 Georgian, 765 Armenian, and 639 Greek children of school age. It appears that primary school under the purview of the Ministry of Public Education was attended by 15.9 % of the region's Abkhazian, 39.2 % of its Georgian, and 10.8 % of its Armenian children of school age. Combined with the numbers for its primary parochial education sector

(Table 10), Sukhumi District had the following figures on school-age children attending primary school across its ethnicities – 33% of the total number of Abkhazian, about 80 % of the total number of Georgian, and about 22% of the total number of Armenian children in the region. These estimates do not, obviously, factor in the data for the region's secondary and lower educational institutions, as well as its private schools.

Parochial schools

Sukhumi District had an entire network of primary schools subordinate to the Holy Synod. Up to 1908, information on the region's parochial schools was available only as part of aggregate information for the Sukhumi Diocese (which incorporated Black Sea Governorate too). Only in 1908 would Sukhumi District begin to figure in the Most Faithful Report of the Chief Procurator of the Holy Synod.

Table 10. Numbers of Parochial Schools and Students in This Sector in Sukhumi District in the Period 1908–1914 (Vsepoddanneishii otchet, 1911: 220-221, 244-245; Vsepoddanneishii otchet, 1913: 112-113; Vsepoddanneishii otchet, 1913a: 178-179, 206-207; Vsepoddanneishii otchet, 1915: 122-123; Vsepoddanneishii otchet, 1916: 124-125)

Year	Number of schools				Number of students		
	Two-grade	One-grade	Literacy schools	Total	Boys	Girls	Total
1908	10	44	22	78	2,162	552	2,714
1909	10	64	-	74	2,135	586	2,721
1910	10	64	-	74	2,032	497	2,529
1911	11	65	-	76	2,613	748	3,361
1912	10	66	-	76	2,665	774	3,439
1913	9	65	-	74	2,714	825	3,539
1914	10	64	-	74	2,585	857	3,442

As evidenced in Table 10, in 1914 the region witnessed a small decrease in the size of the student body in this sector. The figure had remained virtually unchanged since 1909. In 1908, girls attending parochial school in the region accounted for 20.3% of the total student body, and in 1914, the figure was 24.8%, i.e. there was an increase in the number of female students in this sector.

Private education

Up to 1912, the region's private educational institutions were counted among those in Kutaisi Governorate, which makes it difficult to tell what the figure was prior to that year (Otchet, 1913: 466).

In 1912, Sukhumi District had 1 lower and 4 primary private educational institutions (Otchet, 1914: 486). In 1913–1914, the sector was composed of primary educational institutions only (Otchet, 1915: 784).

Table 11 displays the numbers of private educational institutions and students in this sector in Sukhumi District in the period 1912–1914.

Table 11. Numbers of Private Educational Institutions and Students in This Sector in Sukhumi District in the Period 1912–1914 (Otchet, 1914: 486-487; Otchet, 1915: 784-785)

Year	Number of schools	Number of students		
		Boys	Girls	Total
1912	5	243	217	460
1913	6	217	204	421
1914	3	124	93	217

As evidenced in Table 11, the region's private education sector was an unstable one, with the composition and number of its student body changing all the time, which was typical throughout the Caucasus (Taran et al., 2021).

By January 1, 1915, out of the 12,852 school-age children (ages 8 to 11), the region's schools across the main levels of its education system run by the Ministry of Public Education were attended by a combined 5,787 students (RGIA. F. 733. Op. 207. D. 39. L. 1). In addition, the region's parochial schools were attended by a combined 3,442 students. Thus, school in Sukhumi District was attended by 8,729 children, or 68 % of its school-age children.

5. Conclusion

By 1914, secondary education in the region was accessible to both boys and girls only in its capital, Sukhumi. Lower education was accessible to boys in Sukhumi and Ochamchire. It became accessible to both genders in 1913 in Gudauta. As far as primary education, Sukhumi District had 64 schools run by the Ministry of Public Education and 74 parochial schools run by the Holy Synod, which, combined, had an enrollment of around 6,500 students. Despite the substantial successes of the region's education system, just 68 % of its school-age children attended school in 1914, with these including 33 % of the total number of Abkhazian, 80 % of the total number of Georgian, and 22 % of the total number of Armenian children of school age in the region.

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The System of Public Education in Dagestan Oblast (1860–1917). Part 3

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Abstract

This work explores the system of public education in Dagestan Oblast in the period 1860–1917. The present part of the work examines the period 1900–1917.

The principal source used in this study is the reports of the Trustee of the Caucasus Educational District released between 1900 and 1914. Use was also made of certain relevant materials from the Russian State Historical Archive (Saint Petersburg, Russian Federation). Owing to this study, some of these materials were introduced into scholarly discourse for the first time.

The study's findings revealed that the period 1900–1914 witnessed an average increase of 3.5 times in the number of educational institutions in Dagestan Oblast. There was an increase of nearly 4 times in the size of its student body. Furthermore, the period witnessed the first attempts in the direction of the provision of vocational education in the region. Secondary education was available to both males and females in all of the region's major cities – Temir-Khan-Shura, Derbent, and Petrovsk. Lower education was available in certain outlying areas of the region as well (e.g., Kazikumukh). Primary schools accounted for the majority of all schools in the region. The ethnic makeup of the region's student body was pretty much the same in the early 20th century as it was in the late 19th century. There were changes in the social-estate composition of the student body within the region's secondary education sector – children of nobles and functionaries (the majority in 1900) were displaced by children of members of the urban estates as the dominant group. Nevertheless, despite the region's successes in public education, more than 80 % of its

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school-age children remained in 1915 out of school. In fact, Dagestan Oblast was the worst performer in this respect in the Caucasus.

Keywords: Dagestan Oblast, Caucasus Educational District, period 1860–1917, history of pedagogy, ethnic composition of the student body.

1. Introduction

Dagestan Oblast was established in 1860. At the start of the 20th century, it remained one of the problem regions of the Caucasus. Despite strenuous efforts from the Russian government to develop the education system in this multi-ethnic region, where the bulk of the population was made up of mountaineers, the process was a slow one. The present part of the work will examine the development of the system of public education in Dagestan Oblast at the start of the 20th century, more specifically in the period 1900–1917.

2. Materials and methods

The principal source used in this study is the reports of the Trustee of the Caucasus Educational District released between 1900 and 1914. Use was also made of certain relevant materials from the Russian State Historical Archive (Saint Petersburg, Russian Federation). Owing to this study, some of these materials were introduced into scholarly discourse for the first time.

As already mentioned in its first and second parts (Rajović et al., 2022; Rajović et al., 2022a), the research reported in this work was conducted with observation of the following major historical research principles: historicism, systematicity, and objectivity. The principle of historicism helped explore the process of development of the system of public education in Dagestan Oblast in its historical sequence. The principle of systematicity helped examine the system of education in the region across the secondary, lower, and primary levels. The principle of objectivity was employed to ensure an unbiased approach in respect of the statistical sources employed and conclusions drawn in the work. Wide use was made of the statistical method to summarize the extensive statistical material on the system of public education in Dagestan Oblast at the start of the 20th century.

3. Discussion

The relevant historiography dealing with the period 1900–1917 can be divided into the following two parts: 1) the research devoted to regions within the Caucasus Educational District; 2) the research devoted to other regions of the Russian Empire.

The first group, most notably, includes 'The Making of the System of Public Education in the Caucasus (1802–1917): Distinctive Features' by N.A. Shevchenko and her colleagues (Shevchenko et al., 2016), which is one of the first serious attempts to explore public education in the imperial-period Caucasus. Private education in the imperial-period Caucasus was explored in 'Private Educational Institutions in the Caucasus in the Period 1846–1914: A Historical-Statistical Study' by K.V. Taran and his colleagues (Taran et al., 2021). In terms of public education in the early-20th-century Caucasus, the systems of public education in Kutais and Erivan Governorates were explored in the studies by A.M. Mamadaliev and his colleagues (Mamadaliev et al., 2021; Mamadaliev et al., 2022). T.A. Magsumov masterminded the studies into public education in Baku and Elisabethpol Governorates and in Kars Oblast (Magsumov et al., 2021; Magsumov et al., 2022; Magsumov et al., 2020), and A.A. Cherkasov directed the studies on public education in Terek Oblast and in Black Sea Governorate (Cherkasov et al., 2020; Cherkasov et al., 2021). Public education in Stavropol Governorate was explored in the study by O.V. Natolochnaya and her colleagues (Natolochnaya et al., 2020). The study by V.S. Molchanova and her colleagues investigated public education in Kuban Oblast (Molchanova et al., 2020).

The second group, most notably, includes A.A. Cherkasov's 'All-Russian Primary Education (1894–1917): Developmental Milestones' (Cherkasov, 2011). The study by S.I. Degtyarev and his colleagues investigated the government's policy on public education in the Russian Empire's Ukrainian governorates (Degtyarev et al., 2020). Similar issues in the Don region were explored in the study by A.Yu. Peretyatko and T.E. Zulfugarzade (Peretyatko, Zulfugarzade, 2019). Public education in Penza Governorate was investigated in the study by A.M. Mamadaliev and his colleagues (Mamadaliev et al., 2022a).

4. Results

For the most part, the system of public education in the Russian Empire was comprised of the following four major levels: higher, secondary, lower, and primary. There were no higher educational institutions in Dagestan Oblast at the start of the 20th century. Accordingly, the present work will only focus on the remaining three levels – secondary, lower, and primary.

Secondary education

By 1900, the only two secondary educational institutions in Dagestan Oblast were the female gymnasium and the seven-grade real school, both in the region's capital, Temir-Khan-Shura.

As a reminder, the female gymnasium was established in 1875 as a progymnasium (it was subsequently reorganized into a gymnasium). The real school was opened in 1880 (Rajović et al., 2022: 658).

On August 19, 1902, Derbent became home to another secondary educational institution – Derbent Real School (Otchet, 1905: 105). Two years later, on July 1, 1904, the city became home to a female progymnasium, which as early as 1907 would turn into a female gymnasium (Otchet, 1905: 163; Otchet, 1908: 147). In addition, on September 1, 1903, a female progymnasium was opened in Petrovsk (Otchet, 1905: 163). Thus, the period 1902–1904 witnessed the opening of more secondary educational institutions in the region than it had in place prior to 1900.

The region's secondary education sector continued to grow. On September 1, 1905, Petrovsk became home to a male progymnasium (Otchet, 1908: 27). On September 1, 1908, Petrovsk Female Progymnasium was reorganized into a female gymnasium (Otchet, 1909: 151). On September 1, 1910, Petrovsk Male Progymnasium was reorganized into a six-grade male gymnasium (Otchet, 1911: 27).

Table 1 displays the numbers of secondary educational institutions and students in them in Dagestan Oblast in the period 1900–1914.

Table 1. Numbers of Secondary Educational Institutions under the Purview of the Ministry of Public Education and Students in Them in Dagestan Oblast in the Period 1900–1914 (Otchet, 1901: 109, 138, 166, 214; Otchet, 1905: 105, 134, 162-163, 210-211; Otchet, 1908: 8, 27, 75, 78, 120-121, 126-127; Otchet, 1909: 2, 27, 77, 80, 131-132, 151; Otchet, 1910: 24, 77, 80, 124-125, 128-129; Otchet, 1911: 2, 8, 77, 80, 192-193; Otchet, 1912: 2, 8, 77, 158-159, 162-163; Otchet, 1913: 3, 64-65, 148-149; Otchet, 1914: 3, 64-65, 172-175; Otchet, 1915: 3, 122-123, 256-257)

Year	Gymnasiums		Progymnasiums		Real schools	Total	Number of students		
	Male	Female	Male	Female			Boys	Girls	Total
1900	-	1	-	-	1	2	359	197	556
1904	-	1	-	2	2	5	556	510	1,066
1907	-	2	1	1	2	6	751	566	1,317
1908	-	3	1	-	2	6	748	596	1,344
1909	-	3	1	-	2	6	871	624	1,495
1910	1	3	-	-	2	6	948	693	1,641
1911	1	3	-	-	2	6	1,001	699	1,700
1912	1	3	-	-	2	6	1,013	759	1,772
1913	1	3	-	-	2	6	1,028	780	1,808
1914	1	3	-	-	2	6	1,024	768	1,792

As evidenced in Table 1, the number of secondary educational institutions in the region rose 3 times at the start of the 20th century. With that said, both boys and girls benefitted in equal measure. Secondary educational institutions for both sexes were opened in all of the region's major cities, namely Temir-Khan-Shura, Derbent, and Petrovsk. Of note is the fact that in 1900 girls

accounted for 35 % of the student body within the region's secondary education sector, whereas in 1914 the figure rose to 43 %.

In 1900, the student body within the region's secondary education sector had the following ethnic makeup: 359 ethnic Russians, 14 Georgians, 47 Armenians, 12 Tatars, 64 mountaineers, 44 Jews, and 16 members of other ethnicities (Otchet, 1901: 138, 214). Due to the absence of data on the ethnic makeup of the region's student body in 1914, it may be worth considering the statistics on the students' religious affiliation. Specifically, there were 967 Orthodox Christians (ethnic Russians and Georgians), 47 Catholics (members of other ethnic groups), 267 Armenian Gregorians (Armenians), 9 members of other Christian denominations, 245 Jews, 256 Muslims (Tatars and mountaineers), and 1 member of a different religious denomination (Otchet, 1915: 12-13, 126-127, 262-263). Thus, whereas in 1900 ethnic Russians and Georgians accounted for 67 % of the student body, in 1914 the figure was 53.9 %. At the same time, the numbers of Armenians, Jews, and Tatars and mountaineers virtually evened up, reflecting the growing level of interest in secondary education among the locals.

In terms of social-estate composition, in 1900 the student body within the region's secondary education sector was dominated by children of nobles and functionaries (Otchet, 1901: 138). By 1914, the way was now led by children of members of the urban estates (574), followed by children of nobles and functionaries (523) and then children of peasants (314) (Otchet, 1915: 12-13, 126-127, 262-263).

In 1900, the combined library stock within the region's secondary education sector was 11,917 items (9,356 items in the fundamental library section and 2,561 items in the discipular one) (Otchet, 1901: 111).

In 1914, the combined library stock within this sector was 39,768 items (18,627 items in the fundamental library section and 21,141 items in the discipular one) (Otchet, 1915: 46, 142, 314).

Thus, by 1914 the combined library stock within the region's secondary education sector increased more than 3 times.

Lower education

By 1900, the only two lower educational institutions in Dagestan Oblast were the urban school in Derbent (established in 1837) and the urban school in Petrovsk (established in 1897) (Rajović et al., 2022: 659; Otchet, 1899: 295).

On July 1, 1902, Temir-Khan-Shura became home to another urban school (Otchet, 1905: 293).

Nine years later, on November 23, 1911, the region became home to its first vocational school – the tradesman's specialized school in Temir-Khan-Shura (Otchet, 1912: 407).

In 1912, the first six-grade higher primary schools emerged in the Caucasus – all of them were the result of reorganization of urban schools. However, neither in that year nor in 1913 was one such school launched in Dagestan Oblast (Otchet, 1913: 250).

On January 1, 1914, the urban schools in Temir-Khan-Shura, Derbent, and Petrovsk were reorganized into six-grade higher primary schools (Otchet, 1915: 522-524). In addition, on October 5, 1914, the region became home to the higher primary school in Kazikumukh (Otchet, 1915: 522).

Table 2 displays the numbers of lower educational institutions and students in them in Dagestan Oblast in the period 1900–1914.

As evidenced in Table 2, in the period under review the number of lower educational institutions in the region increased 2.5 times – from 2 to 5. There also was a boost in the quality of this type of education – through the reorganization of four-grade urban schools into six-grade higher primary schools. Furthermore, during that period the region also became home to its first vocational school – the tradesman's specialized school in Temir-Khan-Shura. Of note is the fact that prior to 1913 the student body within the region's lower education sector was made up of boys only. In 1913, the urban school in Temir-Khan-Shura admitted 32 girls. The figure increased to 40 in 1914. The school was the only lower educational institution in the region that could be attended by girls.

Table 2. Numbers of Lower Educational Institutions and Students in Them in Dagestan Oblast in the Period 1900–1914 (Otchet, 1901: 296, 362; Otchet, 1905: 293, 359; Otchet, 1908: 237, 259; Otchet, 1909: 272; Otchet, 1910: 298, 320; Otchet, 1911: 298, 320; Otchet, 1912: 298, 320, 391, 395; Otchet, 1913: 258, 346-347; Otchet, 1914: 304-307, 438-439; Otchet, 1915: 523-525, 690-691)

Year	Urban schools	Tradesman's specialized schools	Higher primary schools	Tradesman's schools	Total	Number of students		
						Boys	Girls	Total
1900	2	-	-	-	2	413	-	413
1904	3	-	-	-	3	453	-	453
1907	3	-	-	-	3	498	-	498
1908	3	-	-	-	3	513	-	513
1909	3	-	-	-	3	490	-	490
1910	3	-	-	-	3	549	-	549
1911	3	1	-	-	4	593	-	593
1912	3	1	-	-	4	602	-	602
1913	3	1	-	-	4	531	32	563
1914	-	1	4	-	5	464	40	504

By 1912, the size of the sector's student body increased 50% on 1900. However, the figure dropped during the following 2 years. A drop in this figure also took place in 1909, which may have been associated with the events of the First Russian Revolution. The drop may also have been a result of the growing number of secondary educational institutions in the region.

In 1900, the student body within the region's lower education sector had the following ethnic makeup: ethnic Russians – 238, Armenians – 57, Tatars – 55, Georgians – 1, mountaineers – 4, Jews – 42, and Europeans – 11 (Otchet, 1901: 362). In 1914, the student body was comprised of 278 Orthodox Christians, 8 Catholics, 27 Armenian Gregorians, 2 members of other Christian denominations, 55 Jews, and 134 Muslims (Otchet, 1915: 486-489, 698-699). In 1900, Orthodox Christians accounted for nearly 58 % of the student body. The figure remained just about the same in 1914 –55.1 %. Of note is the fact that in 1914 the region became home to an educational institution that would be attended by Tatars exclusively – the higher primary school in Kazikumukh.

In terms of social-estate composition, both in 1900 and in 1914 the sector was dominated by children of members of the urban estates (Otchet, 1901: 363; Otchet, 1915: 486-489, 698-699).

Thus, by 1914, the region's lower education sector had an established student body in terms of ethnic composition, and it continued to be dominated by children of members of the urban estates.

In 1900, the region's lower education sector had a combined library stock of 3,319 items (2,369 items in the fundamental library section and 950 items in the discipular one) (Otchet, 1901: 300).

In 1914, the sector's combined library stock was 14,651 items (6,334 items in the fundamental library section and 8,317 items in the discipular one) (Otchet, 1915: 532, 535, 720).

Thus, by 1914 the sector's combined library stock increased more than 4 times.

Primary education

As a reminder, as at 1884 Dagestan Oblast had seven primary schools under the purview of the Ministry of Public Education (three rural state-run schools, one urban school, two rural schools run by the Ministry of Public Education, and one school run by a benevolent society) (Rajović et al., 2022: 659). By 1914, the number of primary schools in the region rose to 71.

Table 3 displays the numbers of primary schools under the purview of the Ministry of Public Education and students in them in Dagestan Oblast in the period 1900–1914.

Table 3. Numbers of Primary Schools under the Purview of the Ministry of Public Education and Students in Them in Dagestan Oblast in the Period 1900–1914 (Otchet, 1901: 536, 566; Otchet, 1905: 532, 562; Otchet, 1908: 350, 352; Otchet, 1909: 392, 394; Otchet, 1910: 390, 392; Otchet, 1911: 390, 392; Otchet, 1912: 448, 450; Otchet, 1913: 334-336; Otchet, 1914: 426-429; Otchet, 1915: 668-669, 672-673)

Year	Number of schools	Number of students		
		Boys	Girls	Total
1900	19	627	254	881
1904	31	1,118	432	1,550
1907	31	1,260	531	1,791
1908	35	1,528	548	2,076
1909	36	1,633	607	2,240
1910	33	1,505	613	2,118
1911	35	1,760	712	2,472
1912	46	2,212	803	3,015
1913	69	2,931	1,023	3,954
1914	71	3,101	1,138	4,239

As evidenced in Table 3, the region experienced brisk growth in the number of primary educational institutions in the period 1902–1903, and later in the period 1912–1913. At the start of the 20th century, the number of primary schools in the region rose 3.5 times, while the size of the student body in this sector increased more than 4 times. Nevertheless, the gender balance remained just about the same – girls accounted for 28.8% of the student body in 1900 and 26.8 % in 1914.

In terms of ethnic composition, in 1900 the student body was dominated by mountaineers (418), followed by ethnic Russians (286), Jews (82), Armenians (56), Tatars (38), and Georgians (6) (Otchet, 1901: 566). The situation was similar in 1914, with Muslims leading the way (2,226 students, with only 167 of these being girls), followed by Orthodox Christians (1,451), Jews (438), and Armenian Gregorians (67) (Otchet, 1915: 672-673).

These statistical data indicate that by 1914 Dagestan Oblast had a more or less established student body in terms of ethnic composition within its primary education sector.

Private education

Prior to 1900, the region's private education sector lacked stability and was characterized by the opening and closing down of educational institutions of different levels. There often were periods when the region had no private educational institutions in place. The situation remained pretty much the same at the start of 20th century.

In 1907, there was one lower educational institution (a boys-only facility) (Otchet, 1908: 454). In 1908, there was one secondary educational institution. It closed down in 1909 (Otchet, 1910: 464).

No data on the number of schools within this sector in 1910 were published (Otchet, 1911: 464). No data are available for 1911 either, which has to do with the fact that a general report was produced covering more than one region (Otchet, 1912: 466). The case is the same with the period 1912–1913 (Otchet, 1913: 392; Otchet, 1914: 486). There were no private educational institutions in the region in 1914 (Otchet, 1915: 784).

Table 4. Numbers of Private Educational Institutions and Students in Them in Dagestan Oblast in the Period 1900–1914 (Otchet, 1901: 518, 526; Otchet, 1905: 514; Otchet, 1908: 454; Otchet, 1909: 466; Otchet, 1910: 464)

Year	Number of schools	Number of students		
		Boys	Girls	Total
1900	2	22	23	45
1904	-	-	-	-

1907	1	138	-	138
1908	1	169	-	169
1909	-	-	-	-
1914	-	-	-	-

As evidenced in Table 4, the sector lacked stability, and its role in the development of the region's education was insignificant. The rare attempts undertaken in the area of private education at the start of the 20th century had a pronounced gender bias – education would be available to boys only.

In conclusion, as at January 1, 1915, the region's primary schools under the purview of the Ministry of Public Education had a combined enrollment of 4,240. With that said, Dagestan Oblast had 64,273 school-age children (aged 8 to 11) (РГИА. Ф. 733. Оп. 207. Д. 39. Л. 1). A portion of these children may have attended educational institutions of other types. Even so, the number of school-age children who were out of school in the region exceeded 50,000, the worst figure in the Caucasus.

Of note is also the fact that in the period remaining before the February Revolution of 1917 there were no major changes in the system of public education in Dagestan Oblast, which had to do with the events of World War I.

5. Conclusion

The period 1900–1914 witnessed an average increase of 3.5 times in the number of educational institutions in Dagestan Oblast. There was an increase of nearly 4 times in the size of its student body. Furthermore, the period witnessed the first attempts in the direction of the provision of vocational education in the region. Secondary education was available to both males and females in all of the region's major cities – Temir-Khan-Shura, Derbent, and Petrovsk. Lower education was available in certain outlying areas of the region as well (e.g., Kazikumukh). Primary schools accounted for the majority of all schools in the region. The ethnic makeup of the region's student body was pretty much the same in the early 20th century as it was in the late 19th century. There were changes in the social-estate composition of the student body within the region's secondary education sector – children of nobles and functionaries (the majority in 1900) were displaced by children of members of the urban estates as the dominant group. Nevertheless, despite the region's successes in public education, more than 80 % of its school-age children remained in 1915 out of school. In fact, Dagestan Oblast was the worst performer in this respect in the Caucasus.

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A History of Cherkas Global University Press: The Vestnik Leib-Gvardii Newspaper (1992–1997)

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Abstract

This work explores the history of Cherkas Global University Press. Its primary focus is on the history of the making of the *Vestnik Leib-Gvardii* newspaper, the first periodical published by this publishing house.

The principal source used in the work is materials from the *Vestnik Leib-Gvardii* newspaper, which was published intermittently from 1992 to 1997. Overall, 14 issues of the newspaper were released.

Methodologically, use was made of content analysis with the aim of selecting from the entire material published in the newspaper specifically that which deals with the work of its editorial board. External and internal critical evaluations were also conducted of the issues of the newspaper as a historical source.

The monthly newspaper *Vestnik Leib-Gvardii*, established in 1992, was the starting point in A.A. Cherkasov's creation of his own publishing house, which today is known as Cherkas Global University Press. This publishing house has evolved over the 30-year period from an editorial board handling a single newspaper in the city of Sochi (Russia) to a major academic publishing house with a few dozen journals that is based in Washington, DC (USA).

The external and internal critical evaluations of *Vestnik Leib-Gvardii* revealed that the newspaper went through brisk development in the period from 1992 to 1997. It enjoyed improvements in print quality, more specifically in terms of the technical handling of layout. As early as 1996, A.A. Cherkasov began to enlist on a regular basis the services of third-party specialists to assist the editorial board. Overall, the production of the *Vestnik Leib-Gvardii* newspaper is a worthy exemplar of publishing a noncommercial newspaper in the 1990s.

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Keywords: newspaper, Vestnik Leib-Gvardii, period 1992–1997, small-circulation press, publishing house, Cherkas Global University Press, Journal *History and Historians in the Context of the Time*.

1. Introduction

The first issue of the monthly newspaper *Vestnik Leib-Gvardii*, which would be published intermittently from 1992 to 1997, was released on August 1, 1992. The newspaper was the official organ of the Semyonovsky Leib Guard Regiment military patriotic club, based in the city of Sochi (Russia). In charge of both the club and the newspaper was Aleksandr Arvelodovich Cherkasov, who was 18 at the time. The present work will explore the history of this newspaper and examine its editorial board.

2. Materials and methods

The principal source used in the work is materials from the *Vestnik Leib-Gvardii* newspaper, which was published intermittently from 1992 to 1997. Overall, 14 issues of the newspaper were released. The issues were numbered in a continuous fashion – the first issue came out in August 1992, and the last one, Issue 14, was released in April-May 1997. The newspaper was published on four A4 pages. At different times different rubrics were used in the newspaper, like official documents, local news, articles, and reports. The newspaper carried sources of private origin (e.g., reminiscences by war veterans) and interesting materials from 'The White Book of Russia' and 'A Catechism of Monarchism' and devoted a fair amount of attention to the activity of a Sochi-based military historical society.

Vestnik Leib-Gvardii is the earliest periodical produced by the founder of Cherkas Global University Press, Aleksandr Arvelodovich Cherkasov.

Another source employed in the present work is 'Cherkas Global University (1992–2022): A Collection of Documents' (Cherkas Global University..., 2022).

Use was also made of sources of private origin, namely A.A. Cherkasov's reminiscences regarding the circumstances surrounding the creation of this newspaper and photographs from his personal archive (Personal Archive of A.A. Cherkasov).

Methodologically, use was made of content analysis with the aim of selecting from the entire material published in the newspaper specifically that which deals with the work of its editorial board. External and internal critical evaluations were also conducted of the issues of the newspaper as a historical source. The present work is structured in chronological order, which helps present the work of the editorial board in historical sequence.

3. Discussion

The production of the *Vestnik Leib-Gvardii* newspaper is an exemplar of publishing a noncommercial periodical in Russia in the 1990s. The historiography on the subject is limited.

One of the first recorded mentions of the newspaper dates back to 2019, the year marking the 20th anniversary of the research and pedagogical activity of the newspaper's founder, Aleksandr Arvelodovich Cherkasov. That year scholars V.V Tarakanov and S.D. Ludwig released the article 'Aleksandr Cherkasov: A Scholar, Publisher, and Organizer of Research Collaborations (To the 20th Anniversary of the Scholar's Research and Pedagogical Activity)', which devotes some attention to the experience of publishing the *Vestnik Leib-Gvardii* newspaper (Tarakanov, Ludwig, 2019).

The article 'INCFAR: Characteristics and Challenges (A Fifth Anniversary Tribute)', written by V.V. Tarakanov and M.A. Ponomareva, touches upon the production of *Vestnik Leib-Gvardii*, too (Tarakanov, Ponomareva, 2019: 989).

In 2021, G. Rajović ventured to view *Vestnik Leib-Gvardii* as a historical source (Rajović, 2021). The author shared the following conclusion: "Over the period of its existence, the newspaper enjoyed considerable improvements in quality, with permanent rubrics appearing. In addition, the newspaper published exclusive information about local conflicts that took place in the USSR and member countries of the Warsaw Pact" (Rajović, 2021: 96). All this made the newspaper a valuable source on the development of civil society in southern Russia in the mid-1990s.

That same year, the history of Cherkas Global University was explored by K.V. Taran, who, too, devoted some attention to the production of *Vestnik Leib-Gvardii* (Taran, 2021).

A mention of *Vestnik Leib-Gvardii* is made in I.Yu. Cherkasova's 'Cherkas Global University (1992–2022): Yesterday, Today, and Tomorrow', an article celebrating the 30th anniversary of Cherkas Global University (Cherkasova, 2022).

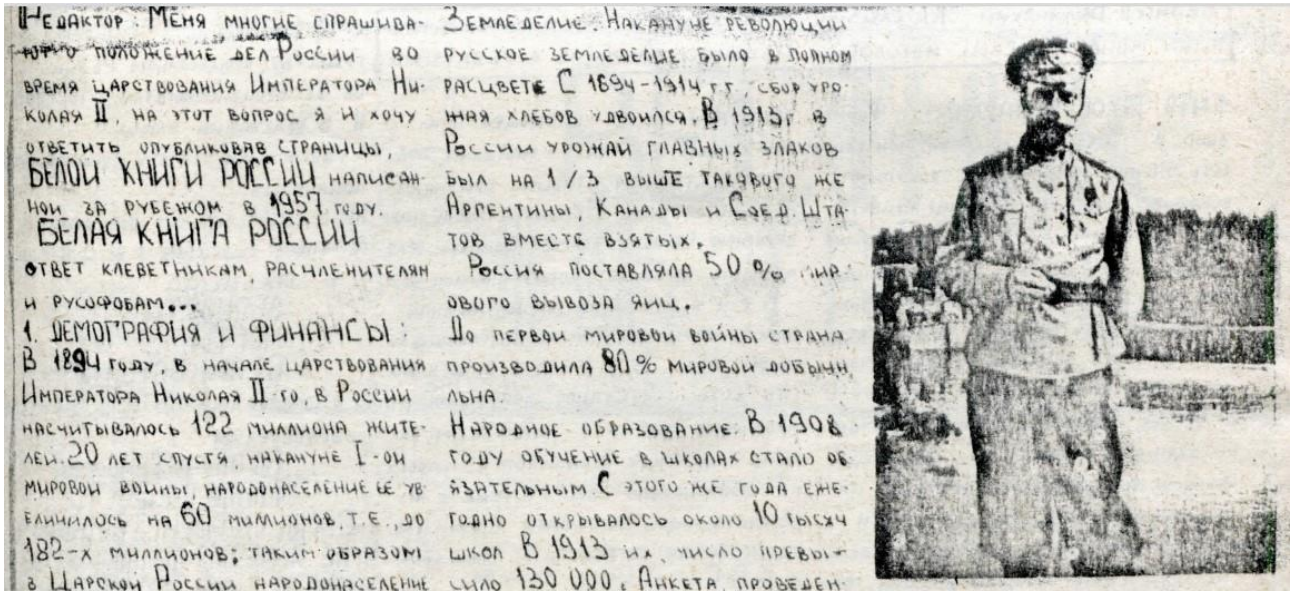
4. Results

The first issue of the *Vestnik Leib-Gvardii* newspaper came out on August 1, 1992. Here is how its founder, A.A. Cherkasov, remembers the circumstances around the creation of the periodical: 'In 1991, right after the breakup of the USSR, I set up a military patriotic club in the city of Sochi. However, with me being just 17 years old in 1991, things were developing quite slowly. After a series of failed attempts to attract friends and acquaintances into the club I realized that it needed a mouthpiece of its own, one that would be distinguished by permanence (periodicity) and serve as a calling card for our organization" (Memories of the military-patriotic club / Personal Archive of A.A. Cherkasov). The result was the launch of a newspaper published on four A4 pages. Initially, *Vestnik Leib-Gvardii* was conceived as a noncommercial publication, meaning it was to carry no advertising. At the time the newspaper was launched, its founder, Aleksandr Cherkasov, was 18 years old. Three weeks after the release of the first issue, A.A. Cherkasov was one of the delegates to the First All-Russian Monarchical Congress, held in Taganrog (Russia) from August 22 to 23, 1992. There is a photograph of a group of delegates to the Congress including A.A. Cherkasov (Figure 1).

Fig. 1. Group of delegates to the First All-Russian Monarchical Congress (August 22, 1992)
A.A. Cherkasov is upper left

All text in the initial issues of the newspaper was handwritten (Figure 2), as during the Soviet period it was very difficult to obtain a typewriter (each typewriter had to be registered with the KGB).

The newspaper was replicated in an original way. Starting in 1989, at the age of 15, A. Cherkasov worked at the Sochi Concrete Products Plant, which had an ERA electric photocopier for use by the Design Department. It was a large camera designed to photograph large-sized images and print them. Up to 1991, it was prohibited to use it for external orders. Things changed later on, with the use of this kind of equipment finally ceasing to be controlled by the government. In the end, all issues of the newspaper for 1992–1993 were duplicated using the machine.



Редактор: Меня многие спрашивают о положение дел России во время царствования Императора Николая II, на этот вопрос я и хочу ответить опубликовав страницы, БЕЛОЙ КНИГИ РОССИИ написанной за рубежом в 1957 году. БЕЛАЯ КНИГА РОССИИ ответ клеветникам, расчленителям и русофобам...

1. ДЕМОГРАФИЯ И ФИНАНСЫ: В 1894 году, в начале царствования Императора Николая II-го, в России насчитывалось 122 миллиона жителей. 20 лет спустя, накануне I-ой мировой войны, народонаселение ее увеличилось на 60 миллионов, т.е., до 182-х миллионов; таким образом в Царской России народонаселение

Земледелие: Накануне революции русское земледелие было в полном расцвете С 1894-1914 г.г. сбор урожая хлебов удвоился. В 1915г в России урожай главных злаков был на 1/3 выше такового же Аргентины, Канады и Соед. Штатов вместе взятых. Россия поставляла 50 % мирового вывоза яиц.

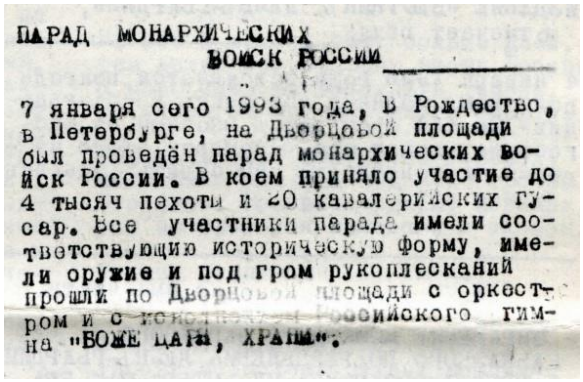
До первой мировой войны страна производила 80 % мировой добычи льна.

Народное образование: В 1908 году обучение в школах стало обязательным. С этого же года ежегодно открывалось около 10 тысяч школ. В 1913 их число превысило 130 000. Анкета проведен-

Fig. 2. Sample handwritten text from the *Vestnik Leib-Gvardii* newspaper (Issue 2 (September) for 1992)

As early as its second issue (September 1992), the newspaper began to publish interesting materials from 'The White Book of Russia' focused on the reign of Emperor Nicholas II (Figure 2).

Keen to do something about the newspaper's handwritten text, A.A. Cherkasov managed to purchase a 1960s typewriter in November 1992. Despite the lacking quality of output on the typewriter, the newspaper was now no longer a periodical composed of handwritten text (Figure 3).

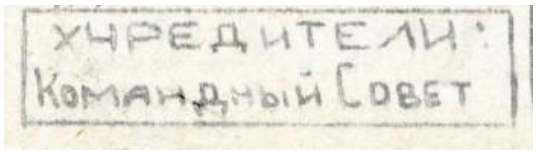


ПАРАД МОНАРХИЧЕСКИХ ВОЙСК РОССИИ

7 января сего 1993 года, в Рождество, в Петербурге, на Дворцовой площади был проведён парад монархических войск России. В коем приняло участие до 4 тысяч пехоты и 20 кавалерийских гусар. Все участники парада имели соответствующую историческую форму, имели оружие и под гром рукоплесканий прошли по Дворцовой площади с оркестром и с исполнением Российского гимна "БОЖЕ ЦАРЯ, ХРАНИ".

Fig. 3. Sample typewriter-typed text in the *Vestnik Leib-Gvardii* newspaper (Issue 6 (January) for 1993)

In the first issue, the section about the periodical itself listed only the organizer – the Command Council (Figure 4).



УЧРЕДИТЕЛИ: Командный Совет

Fig. 4. Information about the organizer in Issue 1 of the *Vestnik Leib-Gvardii* newspaper of 1992

However, as early as its second issue, the newspaper began to list the mailing address for correspondence as well – 'A. Cherkasov P.O. Box 1334 Sochi 354003' (Figure 5). The post office

box was set up by A.A. Cherkasov to enable two-way communication between the newspaper's editorial board and its readers. The newspaper was distributed to monarchical organizations across Russia and abroad, as well as among colleagues and like-minded people across Sochi.

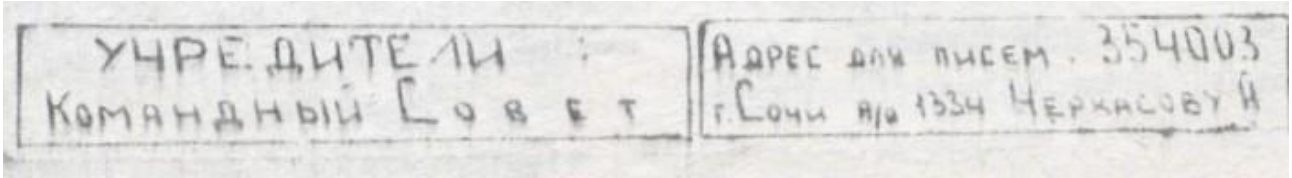


Fig. 5. Information about the organizer and the mailing address for letters published in Issue 2 of the *Vestnik Leib-Gvardii* newspaper of 1992

As of the sixth issue of the newspaper (January 1993), its organizer was the reserve platoon of the Semyonovsky Leib Guard Regiment (Figure 6).

Fig. 6. Information about the organizer and the mailing address for letters in Issue 8 of the *Vestnik Leib-Gvardii* newspaper of 1993

The ninth issue of the newspaper (April 1993) was released with the reserve platoon as its organizer as well. At that point, the publication of *Vestnik Leib-Gvardii* was put on hold.

In December 1996, the publication of the newspaper was resumed. This was preceded by a period of serious organizational work. During this time, the organization had its second team formed in Sochi. Concurrently, such teams were also formed in other regions of southern Russia. This resulted in the formation back in 1994 of the Southern Russia District of the United Imperial Corps, established in August 1992 via a decision made at the First All-Russian Monarchical Congress. The district was headed up by A.A. Cherkasov, a third-year student in the Faculty of History and Philology at the time. In December 1996, the role of the organizer of *Vestnik Leib-Gvardii* shifted to the Staff of the Southern Russia District (Figure 7).

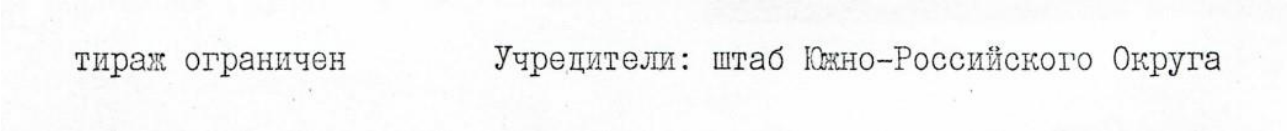


Fig. 7. Information about the organizer in Issue 10 of the *Vestnik Leib-Gvardii* newspaper of 1996

The newspaper became the official organ of the Southern Russia District of the United Imperial Corps (Figure 8).

It is also to be noted that by 1996 the city of Sochi already had in use the latest Xerox copiers, employing which both helped ease the copying process and, most importantly, enhance print quality.

In the fall of 1996, A.A. Cherkasov undertook another attempt to create a military historical organization in the city of Sochi. By that time, he had at his disposal a few classrooms and a gym, which enabled him to attract new members into the organization via its initial ones. One of its new members was a law student named Elena Khramova, who would go on to join the editorial board of *Vestnik Leib-Gvardii* as Layout Editor.

Fig. 8. The front page of the *Vestnik Leib-Gvardii* newspaper of 1996.

On December 4, 1996, during the celebration of the 304th anniversary of the Semyonovsky Leib Guard Regiment, Elena Khramova was awarded a certificate of acknowledgement as a member of the Sochi team (Figure 9).

Fig. 9. E.A. Khramova being awarded a certificate of acknowledgement on December 4, 1996

As early as the 11th issue (January 1997), E. Khramova joined the newspaper's editorial board (Figure 10).

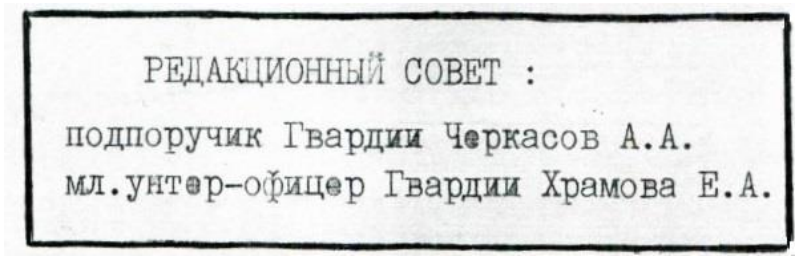

РЕДАКЦИОННЫЙ СОВЕТ :
подпоручик Гвардии Черкасов А.А.
мл.унтер-офицер Гвардии Храмова Е.А.

Fig. 10. Information about the editorial board of the *Vestnik Leib-Gvardii* newspaper of 1997

The 12th issue of the newspaper came out with a modified front page – it carried the emblem of the Southern Russia District with the foundation year on it (1994) in place of the double-headed eagle (Figure 11).

Fig. 11. The front page of the *Vestnik Leib-Gvardii* newspaper of February 1997

Both the emblem and the front page came out improved in the next, 13th, issue of the newspaper (Figure 12).

Fig. 12. The front page of the *Vestnik Leib-Gvardii* newspaper of March 1997.

No more modifications would be made to the publication's front page up until the cessation of its publication in May 1997.

The period 1996–1997 witnessed the publication of a large amount of local material in *Vestnik Leib-Gvardii* (e.g., material dealing with loaded marches, theoretical courses, and production of specialized literature). During that time, Sochi was visited by regional representatives of the Southern Russia District to study the best practices of the Sochi-based organization. One of those visits resulted in a photograph being taken of members of the

periodical's editorial board engaged in the discussion of the possible content of its March issue (Figure 13).

Fig. 13. A.A. Cherkasov and E.A. Khramova photographed while discussing a new issue of the *Vestnik Leib-Gvardii* newspaper on February 16, 1997

The above photograph, which shows members of the editorial board of *Vestnik Leib-Gvardii* engaged in a work-related activity, is the earliest documented evidence of this kind of activity taking place in what would subsequently be known as Cherkas Global University Press. Today, almost all of the issues of *Vestnik Leib-Gvardii* (12 out of its 14 issues) are available at the Library of Congress and are part of certain regional archives and museum collections in Russia.

In May 1997, following the release of its 14th issue, *Vestnik Leib-Gvardii* ceased to be published. A few years later, in 2003, the publication was resumed again, but the name was changed to *History and Historians in the Context of the Time*. The journal with this name is still published today by the publishing house Cherkas Global University Press.

5. Conclusion

The monthly newspaper *Vestnik Leib-Gvardii*, established in 1992, was the starting point in A.A. Cherkasov's creation of his own publishing house, which today is known as Cherkas Global University Press. This publishing house has evolved over the 30-year period from an editorial board handling a single newspaper in the city of Sochi (Russia) to a major academic publishing house with a few dozen journals that is based in Washington, DC (USA).

External and internal critical evaluations of *Vestnik Leib-Gvardii* revealed that the newspaper went through brisk development in the period from 1992 to 1997. It enjoyed improvements in print quality, more specifically in terms of the technical handling of layout. As early as 1996, A.A. Cherkasov began to enlist on a regular basis the services of third-party specialists to assist the editorial board. Overall, the production of *Vestnik Leib-Gvardii* is a worthy exemplar of publishing a noncommercial newspaper in the 1990s.

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