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IMPRESSUM

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EDITORIAL

International Journal of Cognitive Research in Science, Engineering and Education (IJCRSEE) is an open access international peer-reviewed, open-access journal, which provides a platform for highlighting and discussing various cognitive science issues dealing with the problems of cognition (and its evolution) within some specific subject field - philosophical, psychological, linguistic, mathematical, psychogenetic, pedagogical, ergonomic. Editorial Board strives to provide a possibility for the scientists of different fields to publish the results of their research, technical and theoretical studies. IJCRSEE is multidisciplinary in approach, and will publish a great range of papers: reports of qualitative case studies, quantitative experiments and surveys, mixed method studies, action researches, meta-analyses, discussions of conceptual and methodological issues, etc. IJCRSEE publisher is The Association for the Development of Science, Engineering and Education, Vranje, Serbia. Co-publishers are: University Business Academy, Faculty of Economics and Engineering Management in Novi Sad, Serbia and Don State Technical University, Rostov on Don, Russian Federation.

IJCRSEE particularly welcomes articles on the results of scientific research in various fields of cognitive science (psychology, artificial intelligence, linguistics, philosophy and neuroscience) catering for international and multidisciplinary audience. Readers include those in cognitive psychology, special education, education, adult education, educational psychology, school psychology, speech and language, and public policy. IJCRSEE has regular sections: Original Research, Review Articles, Studies and articles, Book Reviews, Case Studies, and is published three times a year. This journal provides an immediate open access to its contents, which makes research results available to the public based on the global exchange of knowledge. The journal also offers access to uncorrected and corrected proofs of articles before they are published.

The main aim of the Journal is to discuss global prospects and innovations concerning major issues of cognitive science, to publish new scientific results of cognitive science research, including the studies of cognitive processes, emotions, perception, memory, thinking, problem solving, planning, education and teaching, language and consciousness study, the results of studying man's cognitive development and the formation of basic cognitive skills in everyday life. The Journal seeks to stimulate the initiation of new research and ideas in cognitive science for the purpose of integration and interaction of international specialists in the development of cognitive science as interdisciplinary knowledge.

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IJCREE has an international editorial board of eminent experts in their field from Russia, USA, Republic of Macedonia, Germany, Hong Kong, Greece, Serbia, Australia, United Kingdom, USA, Turkey, Nigeria, Bulgaria, Romania, Spain, Italy, Republic of Srpska, Croatia, Kingdom of Saudi Arabia (KSA), India, China, Thailand, Israel, Malaysia, Morocco, Jordan,, Iran... We are confident that IJCREE will attract a great number of editors, eminent scientists in the field. The selection will be based on the activities of the editors and their desire to contribute to the development of the journal.

IJCREE provides a platform for academics and scientists professionals to refer and discuss recent progress in the fields of their interests. Authors are encouraged to contribute articles which are not published or not under review in any other journal.

Each submitted manuscript is evaluated on the following basis: the originality of its contribution to the field of scholarly publishing, the soundness of its theory and methodology, the coherence of its analysis, its availability to readers (grammar and style). Normal turn-around time for the evaluation of manuscripts is one to two months from the date of receipt.

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Writing – Please write in good English (American or British usage is accepted, but not a mixture of these). For non-native English speakers, and perhaps even for some native English speakers, grammar, spelling, usage, and punctuation of the texts are very important for an effective presentation. Hence, manuscripts are expected to be written in a clear, cogent, and readily understandable by an international readership.

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The submission has not been previously published or presented to another journal for consideration (or an explanation has been provided in Comments to the Editor).

The submission file is in OpenOffice, Microsoft Word, RTF, or WordPerfect document file format.

Where available, DOIs and URLs for the references have been provided.

The text is single-spaced; uses a 12-point font; employs italics, rather than underlining (except with URL addresses); and all illustrations, figures, and tables are placed within the text at the appropriate

points, rather than at the end.

The text adheres to the stylistic and bibliographic requirements outlined in the Author Guidelines.

If submitting to a peer-reviewed section of the journal, the instructions in Ensuring a Double Blind Review have been followed.

A manuscript goes through the peer review process. Authors submit manuscripts to Editorial office via the online system. The acknowledgement letter should be sent to the author to confirm the receipt of the manuscript. The Chief Editor first reviews manuscripts. Chief Editor is assisted by Section Editors (could also be Co- or Associated Editors). The Editor assigns a Section Editor to see the manuscript through the complete review process and return it with a recommendation or decision. The manuscript is checked to see if it meets the scope of the Journal and its formal requirements. If it is incorrect or unsuitable, the author should be informed and the manuscript filed (or returned if requested) – direct rejection. Manuscripts that are not suitable for publication in the Journal are rejected. A Rejection letter is sent to the author stating the reason for rejection. If the manuscript conforms to the aims and scope of the Journal, and formally abides by the Instructions to Authors it is sent out for review. Depending on the type of paper, it could be accepted immediately for publication (invited Editorial, Book review etc) by the Chief Editor.

Check that the manuscript has been written and styled in accordance with the Journal style; that it carries an abstract (if applicable), keywords, correct reference system etc. and check that the correct blinding system has been used. If anything is missing ask the author to complete it before the manuscript is sent out for review.

The manuscript is sent out for review. The reviewer reads and evaluates the manuscript and eventually sends a review report to the Chief Editor. The time for review can be set to 2-6 weeks depending on the discipline (more time is usually given to papers in the humanities and social sciences). Make sure to provide the reviewer with clear instructions for the work, e.g. outlined in the form of a Review report or a number of questions to be considered.

Based on the reviewers' comments the Chief Editor makes a decision to:

- Accept the manuscript without further revision
- Accept after revision
- Ask authors to resubmit
- Reject

An acceptance letter is sent to the author and the final manuscript is forwarded to production. Sometimes, the authors are requested to revise in accordance with reviewers' comments and submit the updated version or their manuscript to the Chief Editor. The time for review can be set to 2-6 weeks depending on the discipline and type of additional data, information or argument required. The authors are requested to make substantial revisions to their manuscripts and resubmit for a new evaluation. A rejection letter is sent to the author and the manuscript is archived. Reviewers might be informed about the decision.

After review a manuscript goes to the Copy Editor who will correct the manuscript concerning the correct referencing system, confirmation with the journal style and layout. When Copy Editor finishes his/her work they send manuscripts to the Layout editor.

Layout Editor is responsible for structuring the original manuscript, including figures and tables, into an article, activating necessary links and preparing the manuscript in the various formats, in our case PDF and HTML format. When Layout Editor finishes his/her job they send manuscripts to Proof Editor.

Proof Editor confirms that the manuscript has gone through all the stages and can be published.

This issue has 17 articles (12 Original researches and 5 Review articles). Our future plan is to increase the number of quality research papers from all fields of science, engineering and education. The editors seek to publish articles from a wide variety of academic disciplines and substantive fields; they are looking forward to substantial improvement of educational processes and outcomes.

Editor in Chief
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Trait Emotional Intelligence and Multiple Intelligences as Predictors of Academic Success in Serbian and Greek IT Students

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Abstract: Even though research on predicting the academic achievement of IT students is not scarce, the inclusion of trait emotional intelligence and multiple intelligences as predictive factors is somewhat novel. The research examined associations between identified profiles of trait emotional intelligence and multiple intelligences, and academic success in the sample of 288 IT students, 208 from Serbia and 80 from Greece. The results show that trait emotional intelligence and multiple intelligences profile both proved to be important predictors of academic success. Another predictor of IT students' academic success was related to their prior schooling success. The results indicate that fostering a student-centered learning model through tertiary education, with special emphasis on students' personal dispositions and traits, could be crucial for their academic success, especially in the multidisciplinary field of information technology.

Keywords: academic success; IT; trait emotional intelligence; multiple intelligences.

Introduction

The academic success of university IT students has been monitored and studied for a long time, but with the trend of increasing prices of education and new demands of the labor market, it is becoming one of the key indicators for both school stakeholders and the economy in general. An aggregate of academic achievement of IT students required for a successful future professional career can be reflected into subsets of specific skills, knowledge, and competencies in specific areas, such are digital literacy, communication, collaboration, digital content creation, safety, and problem-solving (Vuorikari, Kluzer and Punie, 2022) in which they should excel. The general attitude of researchers is that the individual characteristics (qualities) of students are an obvious predictor of their success. When we think of individual characteristics, we primarily think of their intelligence (Mayer, 2020). However, the results of many studies show that general intelligence alone does not exceed 25% of the variance of success (Bergold and Steinmayr, 2018), so other personal dispositions should also be taken into account. Student intelligence combined with other personal dispositions can be observed as general ability which combined with previous achievement researchers identified as the most consistent predictor of success (Richardson, Abraham and Bond, 2012; Stankov and Lee, 2014).

Which IT student characteristics predict higher academic achievement and thus increase the probability of a long-term successful career in the IT industry? To explore possible answers to this question, the research focused on examining the role of trait emotional intelligence and multiple intelligences profile as possible precursors of academic success. Besides traditional statics analysis methods, educational data mining was used in the form of a artificial neural network for predicting academic success. This approach can provide clues on previously unknown trends that relate to student characteristics, behavior, and academic performance (Mahajan and Saini, 2020). Identifying the relevance of the beforementioned personality characteristics to academic achievement is important as it can inform the skills, knowledge, and methods on which teachers and curriculum creators should focus while designing and implementing the process of education.

The rest of the paper is organized as follows. The next section presents previous research on

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academic success prediction using trait emotional intelligence and the theory of multiple intelligences. The research methodology is described in the following section. Results are then presented and discussed, followed by concluding remarks.

Related work

Academic performance is heavily influenced by biological and psychological traits independent of standard notions of cognitive ability (Nye et al., 2012). Trait emotional intelligence concept concerns individual belief about own emotions (Petrides and Mavroveli, 2018), but it is not a synonym with emotional intelligence and should not be observed as a cognitive ability, competency, or skill (Siegling, Saklofske and Petrides, 2015). Sanchez-Ruiz, Mavroveli and Poullis (2013) reported that personality characteristics and trait emotional intelligence were better predictors of university students' academic performance than fluid intelligence. Emotional experience is defined by the emotional intelligence model and by its nature is a subjective one (Matthews, Zeidner and Roberts, 2008), thus not amenable to valid measurement via self-assessment tools. The research on trait emotional intelligence significantly expanded in the past decade, including new assessment procedures by developing several questionnaires, their localization, and psychometric evaluation (Dåderman and Kajonius, 2022; Herrera Torres, Buitrago Bonilla and Cepero Espinosa, 2017; Jolić-Marjanović and Altaras-Dimitrijević, 2014; Pérez-Díaz and Petrides, 2021; Stamatopoulou, Galanis and Prezerakos, 2016). These self-assessment questionnaires may also be used as a diagnostic tool for identifying personality disorders as scores negatively correlate to most disorders (Cuesta-Zamora, González-Martí and García-López, 2018; Sinclair and Feigenbaum, 2012). There are four subdimensions (factors) of trait emotional intelligence: Well-Being, Self-Control, Emotionality, and Sociability (Petrides, 2009). Trait emotional intelligence construct shows rigidity when compared to other higher-order personality traits (Big Five) (McAdams, 1992; Soto and Jackson, 2013), revealing that about 40% of the variance can be directly attributed to genetic factors and secondarily correlated to non-shared environmental factors (Vernon et al., 2008). Self-motivation is often observed as a lower-order trait, but its high levels directly lead to forming purposeful and achievement-oriented individuals which in terms positively reflect on superior academic success (Tepper, Duffy and Shaw, 2001). Students with a higher level of self-control tend to avoid temptation-related external stimuli and are better at pursuing established goals (Fujita, 2011). Researchers often point to the negative correlation between neuroticism and academic performance as its higher level leads to negative emotions in a stressful situation, such as evaluation (Martínez-Monteagudo et al., 2019). Taneja et al. (2020) emphasized that higher levels of trait emotional intelligence positively influenced student academic performance as their interaction with peers and greater social interaction enable adaptive social functioning. Several recent studies reported modest correlations on the samples of high-school and university students (Parker et al., 2004; Perera and DiGiacomo, 2015) which aroused interest for further investigation and consequently nominated the construct to be included in this research. Based on these considerations, even though the trait emotional intelligence model was not constructed as a cognitive ability, it is expected to positively correlate with the academic success of IT students.

The theory of multiple intelligences (Gardner, 1993) models a unique set of various personal characteristics, eight in total (Gardner, 2000): musical/rhythmic, body/kinesthetic, logical/mathematical, visual/spatial, verbal/linguistic, interpersonal, intrapersonal, and naturalist. Even though it was not initially intended for educational application, a group of practitioners embraced the model and started adapting their teaching practice to meet the perceived student individual capabilities and provide them with useful and relevant information to gain more efficient learning. Multiple intelligences profile can also be used for indirect assessment of various other students' personal characteristics (Aleksić and Ivanović, 2017; Sajjadi and De Troyer, 2022). The assessment procedure should be a part of the educational process (Almeida et al., 2010) so that each intelligence type serves as a framework for cognitive and/or emotional transfer (Bellarmen, 2021). However, even though over three decades have passed since introducing the theory, there still is no valid practical alternative to self-assessment questionnaires. The fact that multiple intelligence types all interact with one another to some degree, presents a challenge to profile validation. Nevertheless, this interference also signifies that multiple intelligences may impede one another so that the model performs to its full potential. Each intelligence possesses clear and distinct cognitive-neural correlates (Shearer, 2020). Various researchers explored the impact of multiple intelligences theory on academic performance (Aguayo, Ruano and Vallejo, 2021; Liliawati, Zulfikar and Kamal, 2018; Soleimani et al., 2012; Šafranjan and Živlak, 2018). Yaghoob and Hossein (2016) observed the positive correlation between verbal and visual intelligence with academic performance and reported on the relationship between higher verbal, logical-mathematical, and intrapersonal intelligence and academic success. The number of studies that focused on higher education academic success was particularly limited, which

further adds to the importance of this research.

Materials and Methods

The research problem is how IT students' trait emotional intelligence and multiple intelligences profile are related to academic success. The aim of the research is to examine the presumption that the academic success of IT students can be predicted based on the assessed levels of trait emotional intelligence factors and multiple intelligences profile. The results may inform whether trait emotional intelligence and multiple intelligences profile assessment should be included as factors when designing curriculum and delivering educational content to IT students.

Two research goals were defined:

1. Examination of the significance of trait emotional intelligence factors predicting the academic success of IT students.
2. Examination of the significance of multiple intelligences profile predicting the academic success of IT students.

In accordance with the defined aim and goals, two research hypotheses were formulated and are further explained.

H1: The identified trait emotional intelligence factors are the predictors of IT students' academic success.

Rationale: The expectation is based on referent research ([Laborde, Dosseville and Scelles, 2010](#)) that concluded the existence of a relationship between trait emotional intelligence scores and academic performance.

H2: The identified multiple intelligences profile is the predictor of IT students' academic success.

Rationale: The expectation is based on referent research ([Gardner, 2000](#); [Soleimani et al., 2012](#); [Yaghoob and Hossein, 2016](#)) that concluded the existence of a relationship between multiple intelligences profile and academic performance.

The first part of the questionnaire was used to gather the basic sociodemographic information. The following independent research variables were defined: Gender, Type of settlement, English proficiency level, Type of secondary school graduated, and Secondary education GPA. Following the hypotheses, five trait emotional intelligence factors (including global trait) were assessed in the second part of the questionnaire via the TEIQue-SF psychometric instrument in the form of a 30-item seven-point Likert type scale ([Dăderman and Kajonius, 2022](#); [Jolić-Marjanović and Altaras-Dimitrijević, 2014](#)). The third part of the questionnaire was the assessment of student multiple intelligences profile via IPVIS instrument ([Aleksić, & Ivanović, 2016](#)) in the form of 119-item six-point Likert type scale. All the activities listed above were time-restricted.

The research was realized in 2022 at the Faculty of Technical Sciences in Čačak, University of Kragujevac (Serbia) and the School of Informatics, Aristotle University of Thessaloniki (Greece). A total of 288 IT students 19 to 31 years of age participated in the research, out of which N = 208 (72.2 %) were from Serbia, and N = 80 (27.8 %) were from Greece. The selection was made with the goal of representing various geographic, economic, and socio-cultural environments. Students completed the three-part questionnaire anonymously and voluntarily at the school facilities in about 60 minutes.

Following the theoretical-empirical nature of the research, and with the goal of exploring defined hypotheses, the participants were examined by the descriptive-analytical non-experimental method, based on which the distribution of properties was established and the relationships among variables were analyzed. The statistical data analysis was performed using IBM SPSS Statistics v22 and IBM SPSS Modeler v18 software packages. The following methods were used: descriptive statistics (frequency, percentage, arithmetic mean, standard deviation, minimum, maximum, skewness, kurtosis), Shapiro-Wilk test, correlation analysis, χ^2 test, Independent samples t-test, Cronbach's alpha internal consistency coefficient, Kaiser-Meyer-Olkin (KMO) measure of sample adequacy, Bartlett's test, exploratory factor analysis, analysis of variance (ANOVA), Tukey HSD test, Kruskal-Wallis H test, regression analysis, and educational data mining.

Results

The valid sample of N = 288 students consisted of N = 143 (49.6 %) male and N = 65 (22.6 %) female IT students from Serbia, and N = 64 (22.2 %) male and N = 16 (5.6 %) female IT students from Greece. The average age of the participants was 21.1 years (SD = 1.28). In total, N = 173 (60.1 %)

students were living in urban areas (57.2 % in Serbia and 67.5 % in Greece) and N = 115 (39.9 %) were living in rural areas (42.8 % in Serbia and 32.5 % in Greece). When asked about the perceived English proficiency level, N = 69 (24.0 %) reported advanced, N = 115 (39.9 %) reported upper intermediate, N = 83 (28.8 %) reported intermediate, N = 20 (6.9 %) reported elementary, and N = 1 (0.3 %) reported beginner. An independent samples t-test was conducted to examine whether there was a significant difference between IT students in relation to their English proficiency level. The test revealed a significant difference between students $t(286) = -4.37$; $p < .001$. Students from Greece reported significantly higher English proficiency level ($M = 4.16$, $SD = .834$) than students from Serbia ($M = 3.66$, $SD = .880$) on a scale from 1 to 5.

The average secondary education GPA was 3.39 ($SD = .753$). An independent samples t-test revealed no significant difference for the average secondary education GPA between IT students in Serbia and Greece. Most of the students graduated their secondary education in the field of IT, computer science or electrotechnics ($N = 118$; 41.0 %) ($GPA = 3.44$), $N = 98$ (34.0 %) graduated gymnasium ($GPA = 3.37$), $N = 31$ (10.8 %) graduated economy or law ($GPA = 3.39$), $N = 13$ (4.5 %) graduated in mechanical engineering, traffic or construction ($GPA = 3.23$), and $N = 28$ (9.7 %) graduated some other vocational school that was not listed in the questionnaire. An independent samples t-test was conducted to examine whether there was a significant gender difference between IT students concerning their secondary education GPA. The test revealed a statistically significant difference between students $t(173.8) = -2.12$, $p = .035$. Females ($M = 3.53$, $SD = .654$) achieved significantly higher secondary education GPA than males ($M = 3.34$, $SD = .783$). There was no significant effect on secondary education GPA for type of living environment. A Pearson correlation coefficient was computed to assess the relationship between English proficiency level and secondary education GPA. There was no significant association between the two variables, $r(286) = .18$, $p = .079$.

Trait emotional intelligence factors

The inter-item correlation matrix for each of the five TEIQue-SF factors (including global trait emotional intelligence) shows the existence of statistically significant correlations that confirmed the validity of TEIQue-SF. The average inter-item correlation for each trait emotional intelligence was as follows: well-being (.354), self-control (.207), emotionality (.186), and sociability (.087). The existence of a positive statistically significant correlations between individual traits and global trait emotional intelligence in the range (.602÷.840) confirmed the construct validity (Clark, & Watson, 1995) of TEIQue-SF. The internal consistencies for the scores in this study are presented in Table 1.

Table 1
Trait emotional intelligence rating

Trait emotional intelligence	Items	α	Male		Female		Serbian students		Greek students	
			M	SD	M	SD	M	SD	M	SD
Well-being	6	.757	65.9	17.3	70.9	16.9	71.1	17.7	57.2	11.3
Self-control	6	.610	57.6	14.8	54.9	18.3	59.0	16.6	51.1	12.1
Emotionality	8	.639	58.4	18.4	65.4	18.3	67.6	15.2	41.6	12.7
Sociability	6	.525	55.4	13.6	55.5	14.2	57.7	13.7	49.5	12.0
Global	30	.834	59.6	12.7	62.5	12.9	64.6	11.6	49.3	8.3

An independent samples t-test was conducted to examine whether there was a significant gender difference between IT students in relation to their trait emotional intelligence. The test revealed a significant gender difference between students in well-being trait $t(286) = -2.23$; $p = .026$ and emotionality trait $t(286) = -2.87$; $p = .004$. Female students achieved significantly higher scores in well-being trait ($M = 70.9$, $SD = 16.9$) than male students ($M = 65.9$, $SD = 17.3$). Female students also achieved significantly higher scores in emotionality trait ($M = 65.4$, $SD = 18.3$) than male students ($M = 58.4$, $SD = 18.4$). The t-test revealed no significant difference in self-control $t(122.8) = 1.17$, $p = .244$, sociability $t(286) = -.021$, $p = .984$, nor global trait emotional intelligence $t(286) = -1.77$, $p = .079$.

An independent samples t-test was also conducted to examine whether there was a significant difference between IT students in relation to their country of origin. The test revealed a significant

difference between students in well-being trait $t(222.7) = 7.89$; $p < .001$, self-control trait $t(195.3) = 4.47$; $p < .001$, emotionality trait $t(269.6) = 14.7$; $p < .001$, sociability trait $t(162.1) = 5.00$; $p < .001$, and global trait emotional intelligence $t(199.8) = 12.5$; $p < .001$. Students from Serbia achieved significantly higher scores than students from Greece in all trait emotional intelligence factors: well-being ($M = 71.1$, $SD = 17.7$) to ($M = 57.2$, $SD = 11.3$), self-control ($M = 59.0$, $SD = 16.6$) to ($M = 51.1$, $SD = 12.1$), emotionality ($M = 67.6$, $SD = 15.2$) to ($M = 41.6$, $SD = 12.7$), sociability ($M = 57.7$, $SD = 13.7$) to ($M = 49.5$, $SD = 12.0$), and global ($M = 64.6$, $SD = 11.6$) to ($M = 49.3$, $SD = 8.28$).

The t-test revealed no significant difference for type of living environment between IT students in relation to their trait emotional intelligence.

A Pearson correlation coefficient was computed to assess the relationship between English proficiency level and trait emotional intelligence scores. There were very weak negative correlations between the English proficiency level and well-being trait score [$r(286) = -.178$; $p = .002$], emotionality trait score [$r(286) = -.174$; $p = .003$], and global trait emotional intelligence score [$r(286) = -.139$; $p = .019$]. Increases in the proficiency level of English were correlated with decreases in well-being trait, emotionality trait, and global trait emotional intelligence scores.

There were statistically significant differences between groups when the effect of type of secondary education school on trait emotional intelligence was compared, as determined by Kruskal-Wallis H test for well-being [$\chi^2(4) = 10.6$, $p = .032$] with two highest mean rank scores of 188.8 for economy or law and 144.4 for mechanical engineering, traffic or construction high schools, emotionality [$\chi^2(4) = 19.1$, $p = .001$] with two highest mean rank scores of 186.8 for economy or law and 153.0 for IT, computer science or electrotechnics high schools, and global trait emotional intelligence [$\chi^2(4) = 15.9$, $p = .003$] with two highest mean rank scores of 194.5 for economy or law and 171.0 for mechanical engineering, traffic or construction high schools.

A Pearson correlation coefficient was computed to assess the relationship between secondary education GPA and trait emotional intelligence scores. There was no significant correlation between variables.

Multiple intelligences profile

IPVIS was found to be of excellent overall reliability (119 items; $\alpha = .952$). The inter-item correlation matrix for each of the eight factors shows the existence of statistically significant correlations that confirmed the validity of IPVIS. The average inter-item correlation for each of the multiple intelligences was as follows: musical/rhythmic (.313), bodily/kinesthetic (.224), logical/mathematical (.277), visual/spatial (.280), verbal/linguistic (.284), interpersonal (.166), intrapersonal (.303), and naturalist (.313). The existence of positive statistically significant average inter-item correlations in the range between .146 and .629 confirmed the internal consistency of IPVIS scales (Clark and Watson, 1995). The internal consistencies for the scores in this study are presented in Table 2.

Table 2
Multiple intelligences profile score

Multiple intelligence	Items	α	Male		Female		Serbian students		Greek students	
			M	SD	M	SD	M	SD	M	SD
Musical/rhythmic	14	.869	52.2	19.8	51.0	16.2	49.7	18.5	57.7	18.5
Bodily/kinesthetic	13	.792	56.8	18.4	56.0	18.3	55.5	18.3	59.3	18.2
Logical/mathematical	17	.865	61.1	17.2	63.9	17.9	61.7	17.6	62.3	16.9
Visual/spatial	15	.853	54.1	18.6	56.9	16.9	55.2	17.9	54.2	18.9
Verbal/linguistic	20	.883	55.4	16.5	57.9	16.9	56.7	17.0	54.6	15.7
Interpersonal	18	.765	62.5	12.8	65.4	11.7	63.9	12.6	61.8	12.4
Intrapersonal	9	.786	72.1	16.1	71.3	15.5	74.6	14.9	64.7	16.3
Naturalist	13	.850	60.9	20.3	66.1	17.8	66.1	19.0	52.5	18.0

An independent samples t-test were conducted to examine whether there was a significant gender difference between IT students in relation to their multiple intelligences profile scores. The t-test revealed a significant difference in naturalist intelligence, $t(286) = -2.01$, $p = .045$. Female students achieved significantly higher scores in naturalist intelligence ($M = 66.1$, $SD = 17.8$) than male students ($M = 60.9$, $SD = 20.3$).

An independent samples t-test were also conducted to examine whether there was a significant difference between IT students from Serbia and Greece in relation to their multiple intelligences profile scores. The t-test revealed a significant difference in musical/rhythmic [$t(286) = -3.29, p = .001$], intrapersonal [$t(286) = 4.92, p < .001$], and naturalist intelligence [$t(286) = 5.49, p < .001$]. While students from Greece achieved significantly higher scores in musical/rhythmic intelligence ($M = 57.7, SD = 18.5$) than students from Serbia ($M = 49.7, SD = 18.5$), Serbian students exceeded their colleagues from Greece in intrapersonal intelligence scores, ($M = 74.6, SD = 14.9$) and ($M = 64.7, SD = 16.3$), respectively, and naturalist intelligence scores, ($M = 66.1, SD = 19.0$) and ($M = 52.5, SD = 18.0$), respectively.

When we examined whether there was a significant difference for type of living environment between IT students in relation to their multiple intelligences profile, the t-test revealed a significant difference only in naturalist intelligence, $t(286) = -4.06, p < .001$. Students living in rural areas ($M = 68.0, SD = 18.9$) achieved significantly higher scores in naturalist intelligence than students living in urban areas ($M = 58.6, SD = 19.4$).

A Pearson correlation coefficient was computed to assess the relationship between English proficiency level and multiple intelligences profile. There was very weak positive correlation between the English proficiency level and musical/rhythmic intelligence ($r(286) = .167; p = .005$). Increases in the proficiency level of English were correlated with increases in musical/rhythmic intelligence score.

A one-way between-subjects ANOVA was conducted to compare the effect of the type of secondary school student graduated on multiple intelligences profile. There was a significant effect of type of secondary school student graduated on musical/rhythmic and naturalist intelligence at the $p < .05$ level, [$F(4,283) = 2.64, p = .034, \eta^2 = .036$] and [$F(4,283) = 2.72, p = .030, \eta^2 = .037$], respectively. Post hoc comparisons using the Tukey HSD test indicated that the level of musical/rhythmic intelligence was significantly higher in IT students who graduated gymnasium compared to students who graduated secondary education in the field of economy or law ($p = .042$), likewise for naturalist intelligence ($p = .040$).

A Pearson correlation coefficient was computed to assess the relationship between secondary education GPA and multiple intelligences profile. There was very weak positive correlation between secondary education GPA and logical/mathematical intelligence $r(286) = .135, p = .022$. Increases in secondary education GPA were correlated with increases in logical/mathematical intelligence.

A Pearson correlation coefficient was computed to assess the relationship between trait emotional intelligence and multiple intelligences profile and the result are presented in Table 3.

Table 3
Correlations between trait emotional intelligence factors and multiple intelligences profile

Multiple intelligences	Trait emotional intelligence				
	Well-being	Self-control	Emotionality	Sociability	Global
Musical/rhythmic	.009	-.013	-.071	.021	-.046
Bodily/kinesthetic	.280**	.209**	.129*	.236**	.262**
Logical/mathematical	.188**	.194**	.178**	.299**	.283**
Visual/spatial	.331**	.303**	.227**	.219**	.358**
Verbal/linguistic	.296**	.296**	.266**	.457**	.414**
Interpersonal	.435**	.285**	.312**	.364**	.455**
Intrapersonal	.451**	.318**	.342**	.262**	.484**
Naturalist	.314**	.202**	.384**	.278**	.416**

* $p < .05$; ** $p < .01$

Weak and moderate positive correlations were identified between trait emotional intelligence factors and multiple intelligences except for musical/rhythmic intelligence.

Predicting academic success

Students' tertiary education GPA mean value was 7.72 ($SD = .931$). The t-test revealed no significant difference in gender between IT students concerning their tertiary education GPA $t(286) = -.120, p = .905$.

An independent samples t-test was conducted to examine whether there was a significant difference between IT students from Serbia and Greece in relation to their tertiary education GPA. The test revealed a significant difference between students $t(286) = 4.63, p < .001$. Students from Serbia

achieved significantly higher GPA than students from Greece, ($M = 7.87$, $SD = .897$) and ($M = 7.32$, $SD = .907$), respectively.

There was no significant effect on tertiary GPA for the type of living environment, $t(286) = .201$, $p = .841$.

A Pearson correlation coefficient was computed to assess the relationship between English proficiency level and tertiary education GPA. There was no significant correlation between the two variables, $r(286) = .073$, $p = .218$.

A one-way between-subjects ANOVA was conducted to compare the effect of the type of secondary school student graduated on tertiary education GPA. There were no statistically significant differences between groups when the effect of type of secondary school was compared on tertiary education GPA [$F(4,283) = 2.08$, $p = .084$].

A Pearson correlation coefficient was computed to assess the relationship between secondary education GPA and tertiary education GPA. There was a significant weak positive correlation between the two variables, $r(286) = .360$, $p < .001$. Increases in secondary education GPA were correlated with increases in tertiary education GPA.

A Pearson correlation coefficient was computed to assess the relationship between trait emotional intelligence and tertiary education GPA. There were very weak positive correlations between tertiary education GPA and emotionality trait [$r(286) = .142$; $p = .016$], sociability trait [$r(286) = .126$; $p = .033$], and global trait emotional intelligence factors [$r(286) = .142$; $p = .016$]. Increases in the emotionality, sociability or global trait emotional intelligence scores were correlated with increases in tertiary education GPA.

A Pearson correlation coefficient was also computed to assess the relationship between tertiary education GPA and multiple intelligences profile. There were weak positive correlations between tertiary education GPA and logical/mathematical [$r(286) = .221$, $p < .001$], intrapersonal [$r(286) = .178$, $p = .002$], and naturalist intelligence [$r(286) = .140$, $p = .017$]. Increases in logical/mathematical, intrapersonal or naturalist intelligence were correlated with increases in tertiary education GPA.

Educational data mining was used by performing predictive neural network analysis. A multiplayer perception (i.e., MLP) class of artificial neural network was used to build the model and test its accuracy. The data was randomly assigned to training (70%), testing (20%) and validation (10%) subsets. All covariates were normalized before the training. The scaled conjugate gradient method was used for the batch training of the artificial neural network. In order to obtain more accurate prediction, an ensemble was created using boosting. The experimental model presented in Figure 1 was capable of calculating predictor importance for tertiary education GPA based on the 19 input parameters (factors).

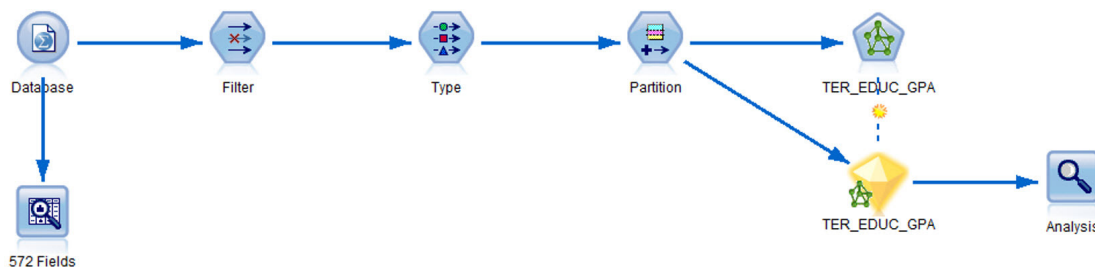


Figure 1. The experimental environment of the predictive neural network model.

MLP class of artificial neural network identified $N = 288$ valid cases for processing, out of which $N = 198$ (68.7 %) was used for training, $N = 44$ (15.3 %) was used for testing, and $N = 46$ (16.0 %) was used for validation, resulting in 96.9 % model accuracy. Architecture selection chose 3 nodes for the hidden layer. The neural network model identified 17 predictors with significant effects. The resulting accuracy in the model summary was satisfactory 96.8 %. The relative importance of the predictors in the model is visualized in Figure 2.

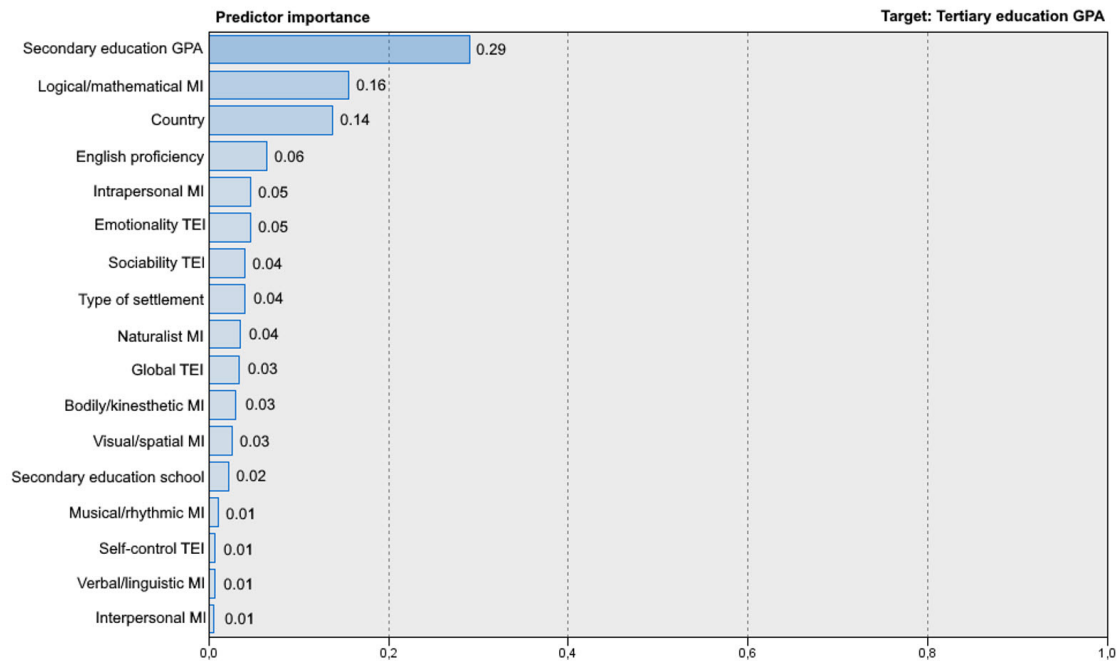


Figure 2. Predictor importance of the effects.

It should be noted that the values of the predictor importance are not the relative proportion of the variable coefficients. These values only describe the effect on the tertiary education GPA if the input variables change. However, the input variables were scaled differently.

Educational data mining provided far more optimized results compared to traditional factor analysis. Out of the 17 identified predictors, the effects of secondary education GPA [$\beta = .34$, $t(270) = 5.24$, $p < .001$], logical/mathematical intelligence [$\beta = .02$, $t(270) = 3.92$, $p < .001$], and the country that students live [$\beta = -.49$, $t(270) = -3.16$, $p = .002$] were far stronger on tertiary education GPA of IT students (and thus their academic success).

Multiple linear regression analysis was used to predict tertiary education GPA based on the five trait emotional intelligence factors (including global trait). A significant regression equation was found [$F(5, 282) = 4.33$, $p = .001$], with an R^2 of .071. It was found that well-being trait [$\beta = -.03$, $p = .001$], self-control trait [$\beta = -.02$, $p = .001$], emotionality trait [$\beta = -.02$, $p = .022$], and global trait emotional intelligence [$\beta = .10$, $p = .001$] significantly predicted tertiary education GPA.

Multiple linear regression analysis was also used to predict tertiary education GPA based on the eight multiple intelligence factors. A significant regression equation was found [$F(8, 279) = 6.25$, $p < .001$], with an R^2 of .152. It was found that bodily/kinesthetic [$\beta = -.01$, $p = .020$], logical/mathematical [$\beta = .02$, $p < .001$], visual/spatial [$\beta = -.01$, $p < .001$], intrapersonal [$\beta = .01$, $p = .031$], and naturalist intelligence [$\beta = .01$, $p = .031$] significantly predicted tertiary education GPA.

Discussions

The paper analyzed relations between trait emotional intelligence factors, multiple intelligences profile and the IT student academic success. The examination of hypotheses that were formulated following defined aims and goals was performed by empirical research on a sample of 288 university IT students from Serbia and Greece.

Even though secondary education GPA was identified as the most important predictor of university academic success, there was no significant difference detected for this factor between IT students in Serbia and Greece. Students from Serbia did achieve significantly higher tertiary GPA than students from Greece, which explains higher predictor importance of country of origin. In general, increases in secondary education GPA were correlated with increases in tertiary education GPA. These results are consistent with Blackmore, Hird and Anderton (2021), that identified high school STEM subjects' proficiency as a significant determinant of overall GPA, especially for engineering students. However, there were reports that point that high school GPA was not an effective predictor of success at higher levels of education (Noble and Sawyer, 2002). Even though female students reported significantly higher

secondary education GPA than males, gender difference was not identified as significant predictor of university academic success. These findings are not consistent with (Tessema, Ready and Malone, 2012), who reported a statistically significant moderate effect of gender on students' GPA.

The type of living environment (e.g., urban or rural) was not identified as a significant predictor of academic success, which is consistent with (Khan et al., 2012; Kurek and Górowski, 2020).

Students from Greece reported significantly higher English proficiency level than students from Serbia. English proficiency level was a significant predictor of academic performance. These findings are consistent with (Geide-Stevenson, 2018; Martirosyan, Hwang and Wanjohi, 2015).

The validity of Serbian and Greek translated and adapted 30-item versions of TEIQue-SF (Petrides, 2009) was confirmed. These findings are consistent with the results of referent research (Jolić-Marjanović and Altaras-Dimitrijević, 2014; Stamatopoulou, Galanis and Prezerakos, 2016). Students from Serbia achieved significantly higher scores than students from Greece in all trait emotional intelligence factors. There were significant gender differences in trait emotional intelligence factor scores, and female students achieved significantly higher scores in well-being and emotionality trait emotional intelligence. These findings are consistent with (Perera, 2015; Petrides and Furnham, 2000; Petrides and Mavroveli, 2018). There was no significant correlation between trait emotional intelligence and secondary education GPA, which is consistent with (Shiple, Jackson and Segrest, 2010). Contrary to (Herrera Torres, Buitrago Bonilla and Cepero Espinosa, 2017) findings, which reported significantly lower emotional intelligence scores in students living in rural areas, our research did not identify significant differences in the type of living environment. Increases in the proficiency level of English were correlated with decreases in well-being trait, emotionality trait, and global trait emotional intelligence scores. These findings are contrary to Dewaele (2018) who reported that English proficiency level positively correlated with emotionality and global trait emotional intelligence levels.

The educational data mining procedure using predictive neural network model confirmed that emotionality, sociability, self-control, and global trait emotional intelligence factors were significant predictors of tertiary academic success. This can be explained from two aspects. First, the structure of the university IT study programmes is very time and cognitive demanding, having a large number of electable subjects correlated to various areas of IT application, so students are often separated into small groups and directed towards self-regulated learning. Rode et al. (2007) stated that students with higher levels of emotional intelligence are more efficient at upholding the energy needed for high cognitive performance over longer periods of time, and redirecting negative emotions into productive behaviors. Second, university IT students are exposed to higher level of stress due to a large number of various tasks that are often related to the field of technological application and as such require advanced levels of digital skills and competence. In addition, a significant number of lecturers on contemporary IT courses are engaged from the IT industry, and consequently often use questionable teaching methods. Students with higher level of emotional intelligence are associated with lower level of acute and chronic stress (Singh and Sharma, 2012). It should be noted that several researchers reported no significant correlation between emotional intelligence and tertiary academic achievement (Wurf and Croft-Piggin, 2015).

Having in mind the presented findings, it can be concluded that hypothesis H1: The identified trait emotional intelligence factors are the predictors of IT students' academic success is confirmed.

The expected validity of the 119-item version of IPVIS is based on the results of referent research (Aleksić and Ivanović, 2016) that evaluated the instrument and concluded that it was valid and reasonably reliable. Female students achieved significantly higher scores in naturalist intelligence, which is consistent with (Aleksić and Ivanović, 2017). Students from Greece achieved significantly higher scores in musical/rhythmic intelligence. This finding can be explained by the strong socio-cultural influence of music on Greek society which is still permeated with vivid remnants of linguistic, cultural, architectural, and musical spheres of civilization that have flourished from the second millennium BC until the first millennium AD (Charidimou et al., 2022). Students from Serbia exceeded in intrapersonal and naturalist intelligence scores. Until the mid-twentieth century, Serbia remained a country of peasant smallholders starting from the Ottoman conquest in second half of the 14th and the first half of the 15th century (Štjukić, 2006). Most of the Serbian population lived simple lives, focused on themselves, recognizing own abilities, capacities, intuition and recognizing patterns in nature. This behavior patterns inevitably influenced the profile of the people who inhabited it, and obviously can still be recognized. Students living in rural areas achieved significantly higher scores in naturalist intelligence. Predictive neural network model confirmed that all multiple intelligence factors were significant predictors of tertiary academic success. Logical/mathematical intelligence was identified as the most important predictor, following intrapersonal intelligence, naturalist intelligence, etc., which is consistent with (Torreon and Sumayang, 2021) findings. This was expected, as university IT education relies heavily on proficient knowledge and skills in applied mathematics and logic,

that can be observed in programming which is a foundation of every contemporary IT curriculum.

Having in mind the presented findings, it can be concluded that hypothesis H2: The identified multiple intelligences profile is the predictor of IT students' academic success is confirmed.

Limitations

The research was realized with certain limitations. Even the sample was adequate in structure and size, and the psychometric instruments were reliable and valid, the conclusions about identified causal relationship between sociodemographic factors, trait emotional intelligence, multiple intelligences profile, and academic success were impossible to confirm due to the correlation nature of the research, so the focus of these relations should be clarified by longitudinal research which would add dynamic dimension.

Conclusions

With the rapid implementation of various digital educational platforms and services which gained additional importance during the Covid-19 emergency, an extremely large amount of new data on student activities is generated daily. This big data represents an exceptional pool from which various predictions of student behavior and performance can be derived. The present study examined the effects of trait emotional intelligence and multiple intelligences profile of IT students on their academic success at two universities from Serbia and Greece.

Secondary education GPA and logical/mathematical intelligence were the two most significant predictors of university IT students' academic success. In addition to the identified trait emotional intelligence and multiple intelligences profile predictors, further effects are relevant to discuss. Trait emotional intelligence factors related to multiple intelligences profile in a very complex manner. This was expected as both concepts expand the model of general intelligence (Spearman, 1961) by including often similar characteristics such as individual differences, academic intelligence, personality, interests, etc. These findings are consistent with (Keshavarz, Farahan and Khajehpour, 2014) but contrary to (Bay and Lim, 2006) findings that reported a significant number of negative correlations. In general, the developed educational data mining model proved its efficiency. Over 44% of the variance in the IT student tertiary education GPA can be explained. The extent to which the effects of trait emotional intelligence factors and multiple intelligences profile were predictive is remarkable. It should be emphasized that the effects of some factors were controlled by more or less typical predictors, such as prior schooling (secondary education GPA) and English proficiency level.

In the context of academic success, trait emotional intelligence and multiple intelligences profile are especially powerful as they can help university teachers understand IT education holistically. The sphere of IT disciplines and applications is constantly evolving and growing. Traditional software industry is nowadays under the onslaught of machine learning, artificial intelligence, blockchain and metaverse applications, and many new technologies are on the horizon. As more and more jobs in the IT industry are automated and taken over by computers, education stakeholders and university teachers clearly should pay more attention to their timely assessment and adaptation of teaching practice to create a learning environment that will empower students with appropriate current knowledge and skills, such as critical thinking, complex problem solving, design thinking, cognitive flexibility, business analytics, etc. Many of the listed abstract skills students can master much more efficiently if the content and teaching methods are adjusted to their individual characteristics, which can be observed via their trait emotional intelligence and multiple intelligence profile.

Future research will include experimental measurement points to better reflect the complex spectrum of academic performance and success. Due to the sample size and structure, student performance in various courses should be separately analyzed. Regardless of stated limitations, this research supports the importance of fostering a student-centered learning model through tertiary education, with special emphasis on taking into account students' personal dispositions and traits.

Conflict of interests

The authors declare no conflict of interest.

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Author Contributions

Conceptualization, V.A. and D.P.; Resources, V.A. and D.P.; Methodology, V.A.; Investigation, V.A. and D.P.; Data curation, V.A.; Formal Analysis, V.A. and D.P.; Writing – original draft, V.A. and D.P.; Writing – review & editing, V.A. All authors have read and agreed to the published version of the manuscript.

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Personality Traits, Approval Motivation, and Empathy as Predictors of Cognitive Regulation of Emotions and Behavioral Self-Control in Codependent Women

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Abstract: This study examined psychological characteristics and behavioral regulation in codependent women. The study aimed to identify personality traits, approval motivation, and empathy levels as predictors of behavioral regulation in codependent women. A total of 102 women (mean age 30.39 years) in relationships or related to alcohol, drug, or non-chemical addicts participated. Psychological testing and survey were used to assess codependence, aggression, empathy, need for approval, cognitive regulation of emotions, and self-regulation strategies: codependency Self-Inventory scale (CSIS; B. Weinhold, J. Weinhold); questionnaire "Auto- and Aggression to others" (E.P. Ilyin); method "Diagnosis of the level of empathy" (V. V. Boyko); Marlowe-Crowne Social Desirability Scale (adapted by Yu.L.Khanin); The questionnaire of cognitive regulation of emotions (Rasskazova E.I., Leonova A.B., Pluzhnikov I.V.) and the questionnaire "Style of self-regulation of behavior" (Morosanova V.I.). Results suggest that personal characteristics, approval motivation, and empathy can predict the severity of codependence, manifestation of aggressiveness, self-regulation strategies, and cognitive regulation strategies in codependent women.

Keywords: codependency, codependent women, codependent behavior, personality traits, approval motivation, empathy, cognitive regulation of emotions, behavioral self-control.

Introduction

Recent studies of the codependency phenomenon, regardless of the approach, show that codependency can be studied through the specifics of learned behavioral patterns, features of emotional states, adaptation disorders, various personality disorders, etc. (Artemtseva, 2012; Artemtseva and Galkina, 2014; Moskalenko, 2016; Rezvaya, Samsonov and Kutashova, 2019; Askian, et al., 2016; Askian, et al., 2016; Bacon, et al., 2020; Panaghi, et al., 2016; Rozhnova, et al., 2020; etc.). A number of studies, including our previously published works, emphasized a rather high comorbidity with emotional disorders and other forms of addictive behavior (substance abuse, gambling, the Internet, etc.) and show the specifics of codependents psychological characteristics, which manifest themselves in the emotional, behavioral and cognitive aspects (Andronnikova, 2017; Apenok, 2015; Bashmanov and Kalinichenko, 2015; Bereza et al., 2016; Gagai and Selezneva, 2016; Kolenova and Gurtskoy, 2019; Merinov et al., 2015; Perminova, 2017; Pleshakova, 2018; and others).

At the emotional level, the codependency manifestations are closely associated with emotional sensitivity and a high level of empathy, neuroticism, anxiety, externality of control, decreased self-esteem, guilt, and depressive symptoms (Stryapukhina and Posokhova, 2022; Stryapukhina Yu. V., 2021; Shapovalov and Golenischeva, 2022; Orbon M. C. et al., 2021; Kupchenko, 2020; Politica O. I., 2020; Ermakov, Kukulyar and Kolenova, 2018; Tulebaeva, 2017; Kogan, Drozdov and Kardashian, 2012; Moskalenko, 2009). A sample of relatives of drug addicts showed a high level of emotional burnout (Shishkova and Bocharov, 2022). Women in romantic relationships with drug addicts have a low level of

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emotional intelligence, a reduced ability to understand and manage their own emotions (Khazova and Shipova, 2020).

At the cognitive level, codependence is associated with dysfunctional beliefs and certain cognitive errors associated with the need for control and the desire to avoid uncertainty (Artemtseva and Malkina, 2022). It has been shown that codependents have decreased levels of reflection and self-differentiation, emotional reactivity, emotional withdrawal, and merging with others (Lampis, et al., 2017). In addition, features of the time perspective were identified in codependent men and women, which are characterized by an increased focus on the present (Danilova and Gomba, 2021).

In the behavioral aspect, a tendency to obsessions, loss of personal autonomy, a predominance of catastrophizing reactions, a tendency to self-aggression and self-destructive behavior were shown (Stryapukhina, 2021; Kupchenko, 2020; Rozhnova T. M. et al., 2020; Kolenova and Gurtsoy, 2019; Buzik and Efimova, 2019; Perminova, 2017; Merinov et al., 2015). Codependency, as a dysfunctional form of relationships, is significantly associated with negative forms of dyadic adaptation in couples, relationship problems, and reduced life satisfaction (Happ, et al., 2022). There is also evidence of the absence or blurring of psychological boundaries and a tendency to violate them with others, negative attitudes towards their self and others, as well as a lack of personal coping resources (Khazova and Varioshkina, 2022; Kolenova, 2019; Tasheva and Bedredinova, 2016). A decrease in self-regulation at psychological and physiological levels has also been shown (Zielinski, Bradshaw and Mullet, 2019).

Previous studies of the motivational sphere, which are not numerous among codependents, showed a pronounced need for approval and the motive "to be needed" (Stryapukhina, 2021; Vinnikov, 2019). In earlier works, we also managed to establish that the severity of codependency can be determined by deformation of the value-semantic sphere, lack of necessary competencies under the influence of negative experience of dysfunctional relationships with significant others, which is also seen in a number of other codependency studies (Artemtseva and Galkina, 2014; Bereza, et al., 2016; Buzik and Efimova, 2019; Gagai and Selezneva, 2016; Ermakov, Denisova and Kolenova, 2022; Ezin, 2018; Kolenova and Gurtsoy, 2019; Suntsova and Faizova, 2018; Lima, et al., 2019, etc.).

Thus, an analysis of the scientific literature allows us to conclude that the manifestations of codependency are closely associated with early experiences and the emotional and personal characteristics of individuals. Codependents often exhibit specific distortions in the cognitive, emotional, and value-semantic domains, along with distinctive behavioral features. However, despite existing studies on codependent behavior, there is a paucity of empirical research examining the motivational and personal predictors of behavioral regulation in codependent women. Therefore, this article aims to investigate how personality traits, approval motivations, and the level of empathy predict the behavioral regulation of codependent women.

The hypothesis of the study is that personal characteristics, approval motivation, and the level of empathy can determine the characteristics of the manifestation of aggressiveness, the formation of various strategies of self-regulation, and preferences for strategies for cognitive regulation of emotions in codependent women. Additionally, it is assumed that the level of codependency will vary depending on motivational and personal characteristics.

Materials and Methods

Participants

The study involved 102 women aged 18 to 64 years (mean age 30.39 years) who are in a relationship or related to an addict (alcoholism, drug addiction, non-chemical addictions). Including: 52 women who are in a relationship or are related to an alcohol addict; 22 women who are in a relationship or related to a drug addict; 28 women who are in a relationship or are related to non-chemical addicts (gambling, smoking, interpersonal addiction, etc.).

Research methods

In order to study the psychological characteristics of the respondents, psychological testing was carried out using the following methods: codependency Self-Inventory scale (CSIS; B. Weinhold, J. Weinhold); questionnaire "Auto- and Aggression to others" (E.P. Ilyin); method "Diagnosis of the level of empathy" (V. V. Boyko); Marlowe-Crowne Social Desirability Scale (adapted by Yu.L.Khanin); The questionnaire of cognitive regulation of emotions (Rasskazova E.I., Leonova A.B., Pluzhnikov I.V.) and the questionnaire "Style of self-regulation of behavior" (Morosanova V.I.).

In order to collect socio-biographical data, a survey method was used: respondents were asked to

indicate gender, age, describe the type of addiction and their relationship with the addict.

Procedure

The study was conducted in person in online format. Before the start of the study, the purpose of the study was explained to the respondents. Personal data has been anonymized. The participation of respondents was voluntary.

Statistical data analysis

To determine the correspondence of the empirical distribution to the normal law, the Shapiro-Wilk test was used; to divide the sample into subgroups that differ in motivational and personal characteristics, cluster analysis was used (k-means method); to study the significance of differences in the selected subgroups, the nonparametric Kruskal-Wallis test was used (as a posteriori analysis, a pairwise comparison was carried out using the Dunn method). Statistical processing was carried out using the JASP 0.16 software package.

Results

The initial data analysis revealed that the average indicators for the studied scales do not differ from the average values given in the description of the psychological tests used. At the same time, the standard deviation on some scales of personality traits, empathy, and approval motivation indicated a significant spread of values within the sample. In this regard, at the second stage, the procedure for clustering the sample according to the studied indicators was carried out. To level the differences in scales of different methods, the clustering procedure was preceded by the translation of empirical values of the Big Five questionnaire (B5-10), Social Desirability Scale and the "Diagnostics of the level of empathy" questionnaire into standard z-scores. The number of clusters was chosen based on the results of preliminary calculations. Using cluster analysis (k-means clustering) 4 clusters that differ significantly in the scales of personality traits, empathy, and approval motivation were identified. The first cluster included 21 women (mean age 25.14 years), the second - 11 women (mean age 30.45 years), the third - 35 women (mean age 32.77 years), the fourth - 35 women (mean age 31.14 years).

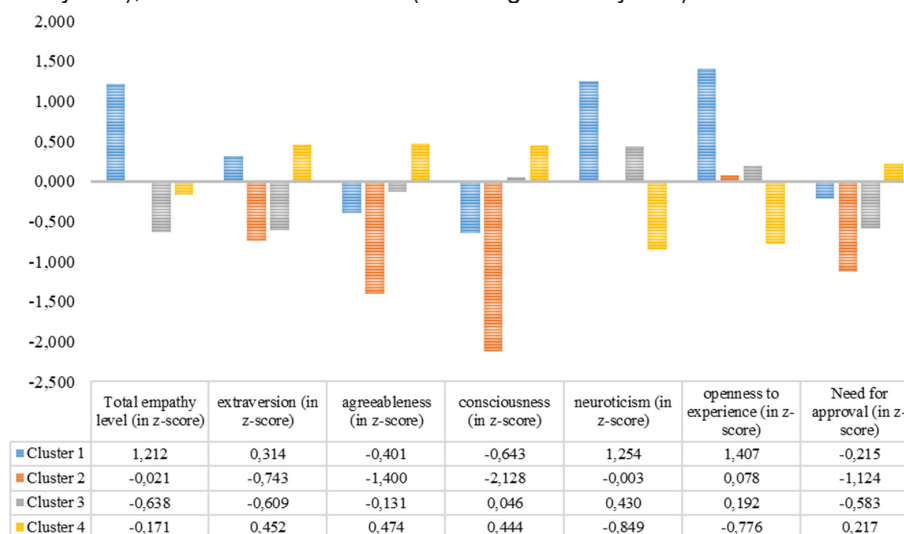


Figure 1. Clusters means for the studied indicators

The analysis revealed significant differences in the average z-scores of the studied indicators among the identified clusters (see Figure 1). Respondents included in cluster 1 exhibit high scores on the scales of neuroticism, openness to experience and demonstrate a high level of empathy. Cluster 2 has low agreeableness and conscientiousness, as well as average indicators of extraversion and need for approval. Cluster 3 respondents are closer to the introversion pole, have reduced levels of empathy, need for approval, and relatively high levels of neuroticism. Cluster 4 showed low values of neuroticism and openness to experience, low empathy, increased values of extraversion, agreeableness, conscientiousness and need for approval.

Analysis of variance (ANOVA) showed that all variables significantly contributed to the clustering of the sample (Table 1).

Table 1
Results of cluster analysis (analysis of variance (ANOVA))

	SS	MS	F	p
Total empathy level (in z-score)	46,776	66,813	23,33707	<0,001
extraversion (in z-score)	28,369	70,974	13,32355	<0,001
agreeableness (in z-score)	32,049	56,344	18,96058	<0,001
consciousness (in z-score)	61,723	52,760	38,99674	<0,001
neuroticism (in z-score)	63,628	46,177	45,93013	<0,001
openness to experience (in z-score)	63,059	40,888	51,40850	<0,001
Need for approval (in z-score)	19,942	75,498	8,80466	<0,001

Legend: SS (Sum of Squares) shows the sum of the squared deviations of the cluster means from the total mean; MS (Mean Square) shows the between-group variance which is equal to the result of division of SS by the degrees of freedom number; as this number is equal to the number of clusters minus 1, in this case SS=MS; Fisher's F-test is the indicator of the correctness of cluster discrimination; p – p-value.

To assess the significance of differences in the severity of behavioral regulation indicators among the selected clusters of codependent women, a comparative analysis was conducted (see Table 2). Prior to the analysis, a preliminary test was conducted to examine the distribution of data on the studied scales in the overall sample and within each cluster. The results indicated that the empirical distribution mostly deviated from normality, necessitating the use of the nonparametric Kruskal-Wallis test to investigate differences between the clusters.

Table 2
Mean scores and the results of the analysis of differences in regulation indicators of the codependent women behavior in clusters

	Cluster 1 (n=21)	Cluster 2 (n=11)	Cluster 3 (n=35)	Cluster 4 (n=35)	Kruskal-Wallis Test	p
Codependency Scale	46,333	44,909	43	38,857	14,142	< 0,003
Self-aggression	5,714	4	3,8	2,486	25,456	< 0,001
Aggression to others	5	4,909	3,543	2,686	13,863	< 0,003
planning	14,81	13,727	16,629	17,571	10,503	< 0,015
modeling	12,095	13,636	14,286	16,686	17,964	< 0,001
programming	16,143	13,727	16,714	18,457	17,586	< 0,001
results rating	16,143	15,636	17,057	17,086	3,745	0,29
flexibility	17,857	16,545	16,457	18,857	5,571	0,134
independence	15,095	16,636	16,229	15,457	2,154	0,541
General level of self-regulation	77,571	75,545	82,571	88,8	18,894	< 0,001
Self-accusation	14,381	12,364	12,371	11,914	7,5	0,058
Acceptance	13,714	14,182	12,229	13,029	4,626	0,201
Ruminations	14,952	13,636	12,657	12,486	8,525	< 0,036
Positive refocus	11,381	11,182	11,257	12,057	1,803	0,614
Focus on planning	14,095	14,273	13,2	14,2	2,47	0,481
Positive reappraisal	14,571	13,818	14,086	16,057	7,71	0,052
Putting into perspective	13,143	13,091	12,229	12	1,996	0,573
Catastrophization	9,714	9,818	9,057	7,4	13,946	< 0,003
Blaming others	8,286	8,636	8,143	7,6	2,795	0,424

Analyzing the average values, it can be observed that within the first cluster, the “flexibility” strategy of self-regulation is most prominent (cluster mean: 17.86). In the second cluster, the most notable strategies are “flexibility” (cluster mean: 16.55) and “independence” (cluster mean: 16.64). The third cluster exhibits a prominent “assessment of results” strategy (cluster mean: 17.06), while the fourth cluster demonstrates a higher emphasis on the “programming” (cluster mean: 18.46) and “flexibility” (cluster mean: 18.46) strategies.

Regarding cognitive emotion regulation strategies, the analysis revealed that the first cluster exhibits pronounced tendencies towards self-blame (cluster mean: 14.38), rumination (cluster mean: 14.95), focus on planning (cluster mean: 14.09), and positive reappraisal (cluster mean: 14.57). In the second cluster, the most prominent strategies are acceptance (cluster mean: 14.18) and focus on planning (cluster mean:

14.27). The third cluster shows a notable inclination towards positive reappraisal (cluster mean: 14.09), while the fourth cluster also demonstrates a higher tendency for positive reappraisal (cluster mean: 16.06).

In analyzing the significance of differences between the identified clusters, it was observed that significant distinctions were found in the scales of codependence, self-aggression, aggression towards others, and strategies of self-regulation such as planning, modeling, and programming. Furthermore, significant differences were observed in the general indicator of self-regulation, as well as in the strategies of rumination and catastrophization (Kruskal-Wallis Test; $p < 0.05$).

Then, for a more detailed analysis of the differences between the selected clusters, a posteriori analysis was carried out by pairwise comparison using the Dunn method.

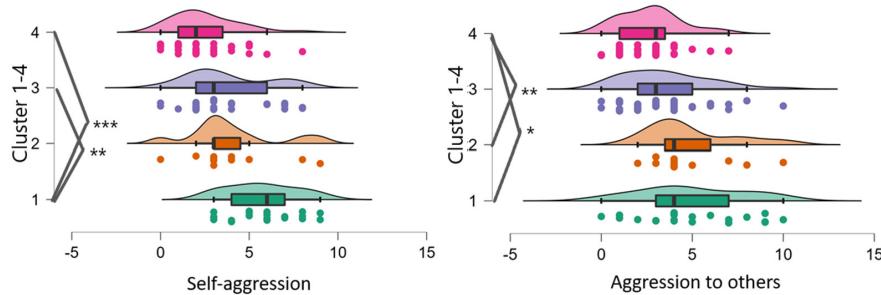


Figure 2. Comparisons of indicators of aggression in codependent women between clusters (Kruskal-Wallis test; $p < 0.003$)

Legend: * indicates the level of significance of the pairwise comparison results according to Dunn's method (* - $pholm < 0.05$; ** - $pholm < 0.01$; *** - $pholm < 0.001$).

Comparison of self-aggression and aggression towards others revealed a consistent pattern of increasing indicators from the fourth cluster to the first (Figure 2). In pairwise comparisons, the level of self-aggression was significantly higher in the first cluster compared to the third ($pholm < 0.007$) and the fourth ($pholm < 0.001$) clusters. Similarly, the level of aggression towards others was higher in the first cluster compared to the fourth cluster ($pholm < 0.004$). Additionally, there were differences in the level of aggression towards others between the second and fourth clusters ($pholm < 0.017$). These findings indicate that the highest levels of both types of aggression are observed in the first and second clusters.

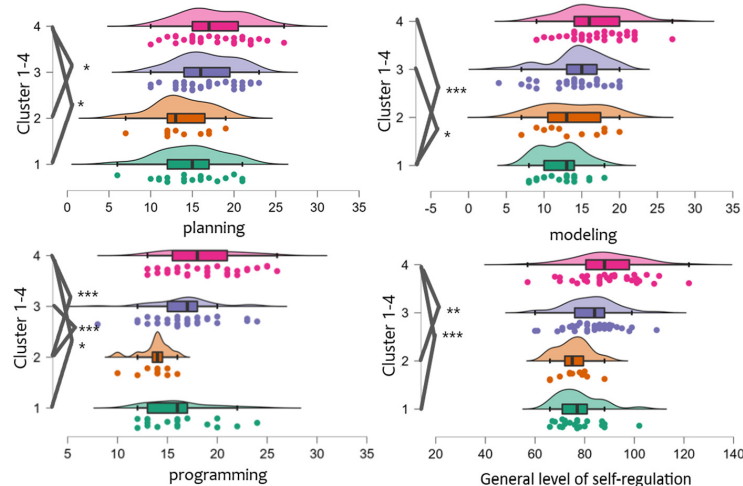


Figure 3. Comparisons of indicators of self-control in codependent women between clusters (Kruskal-Wallis test; $p < 0.015$)

Legend: * indicates the level of significance of the pairwise comparison results according to Dunn's method (* - $pholm < 0.05$; ** - $pholm < 0.01$; *** - $pholm < 0.001$).

Comparison of indicators of behavioral self-control revealed that the highest level of self-regulation is observed in the third and fourth clusters (Figure 3). In pairwise comparisons, significant differences were primarily found between the first and fourth clusters ($pholm < 0.05$). The second and third clusters showed a significant difference on the programming scale ($pholm < 0.007$), while the third and first clusters differed significantly on the modeling scale ($pholm < 0.048$). The second cluster exhibited significant differences

with the fourth cluster in planning ($p_{holm} < 0.021$), programming ($p_{holm} < 0.001$), and the general level of self-regulation ($p_{holm} < 0.002$).

Comparison of indicators of cognitive strategies of emotion regulation showed that the highest level of the strategy of rumination and catastrophization was significantly more often observed in the first and second clusters (Figure 4). Cluster four showed most differences in pairwise comparisons. Within this subgroup, the level of self-accusation ($p_{holm} < 0.05$), rumination ($p_{holm} < 0.05$), and catastrophization ($p_{holm} < 0.01$) was significantly lower compared to the first cluster. When compared to the third cluster, significant differences were observed in positive reappraisal ($p_{holm} < 0.05$) and catastrophization ($p_{holm} < 0.05$), while in comparison to the second cluster, there was a significant difference in catastrophization ($p_{holm} < 0.05$). Furthermore, significant differences in the severity of catastrophization were noted between the first and third clusters ($p_{holm} < 0.05$).

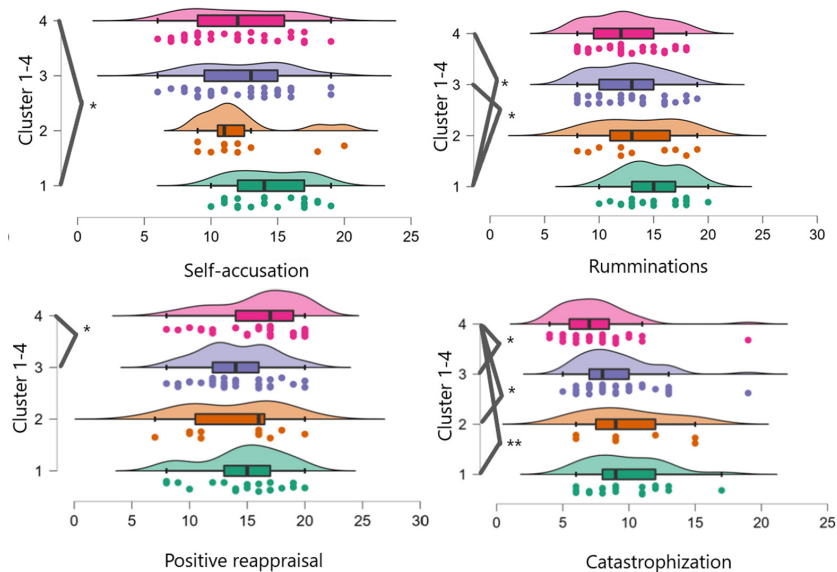


Figure 4. Comparisons of cognitive strategies for emotion regulation in codependent women between clusters (Kruskal-Wallis test; significant differences and trends; $p < 0.05$ and $p < 0.06$)

Legend: * indicates the level of significance of the pairwise comparison results according to Dunn's method (* - $p_{holm} < 0.05$; ** - $p_{holm} < 0.01$; *** - $p_{holm} < 0.001$).

When comparing the levels of codependency, it was observed that there is a consistent pattern of increasing codependence from the fourth cluster to the first (Figure 5). In pairwise comparisons, the fourth cluster exhibited the largest number of differences, including at a trending level, indicating the lowest level of codependency.

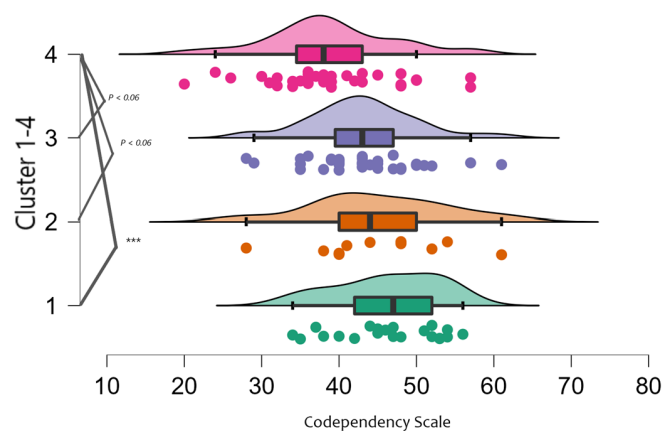


Figure 5. Comparisons of indicators of codependency in codependent women between clusters (Kruskal-Wallis test; $p < 0.003$)

Legend: * indicates the level of significance of the pairwise comparison results according to Dunn's method (* - $p_{holm} < 0.05$; ** - $p_{holm} < 0.01$; *** - $p_{holm} < 0.001$).

The results largely indicate that the behavior of codependent women is influenced by differences in personality traits, empathy, and motivation.

In Cluster 1, respondents exhibit high scores on the scales of neuroticism and openness to experience, and they demonstrate a high level of empathy. In this cluster, there are elevated levels of self-aggression (above average) and the aggression towards others (both low and high values with a large spread). Autoaggression surpasses the aggression towards others, indicating a prevalence of destructive coping strategies. Furthermore, higher levels of self-accusation and rumination also suggest a predominance of destructive coping mechanisms. The self-regulation strategy flexibility is also notably present, which, in conjunction with reduced self-regulation indicators, may indicate a tendency to conform and adapt to meet other people's expectations or societal stereotypes of "normality." Comparatively, Cluster 1 exhibits higher levels of self-blame, rumination, catastrophization, and codependency. It is possible that having an addict in their lives provides them with a sense of personal significance and necessity, or there may be a pronounced fear of abandonment. Furthermore, it is noteworthy that Cluster 4 comprises the youngest participants, with an average age of 25.14 years. This observation may suggest that their regulatory processes are not yet fully developed or that such behavioral patterns are characteristic of individuals who grew up in families affected by addiction.

Cluster 2 comprises individuals with low agreeableness and conscientiousness, as well as reduced extraversion and need for approval. In this cluster, there are average levels of self-aggression and elevated levels of the aggression towards others. The most prominent self-regulation strategies observed are flexibility and independence, along with acceptance and focus on planning. Compared to other clusters, Cluster 2 exhibits the lowest levels of self-blame and rumination, a relatively high level of codependence, and the lowest level of self-regulation. These characteristics suggest a somewhat self-centered (potentially narcissistic) and highly functional profile, with a tendency for manipulation, impulsiveness, and ambivalent behavior patterns. Maintaining a sense of control may be crucial for individuals in this cluster, and the addict may serve the purpose of preserving their high self-esteem by being easily manipulated and providing emotional validation.

Respondents in Cluster 3 lean towards introversion, display reduced levels of empathy and need for approval, and relatively high levels of neuroticism. They exhibit average levels of autoaggression and elevated levels of aggression towards others. Notably, they demonstrate a reasonably high level of self-regulation in their behavior and display self-assessment skills regarding the outcomes of their actions. In challenging situations, they tend to maintain a positive outlook, even in the face of genuinely negative events. Compared to other clusters, Cluster 3 has an increased level of self-blame and a relatively low level of codependence, suggesting some isolation, passivity, and possibly emotional exhaustion or a lack of resources for more proactive forms of behavior regulation. Given that this cluster has a somewhat older average age (32.77 years) than the others, it can be inferred that this behavior pattern is typical for parents of addicts (where self-accusation prevails) or women who have been in co-dependent relationships for an extended period (in which case, they may lack the resources or may be held back by pronounced self-blame).

Cluster 4 exhibits low values of neuroticism and openness to experience, low empathy levels, and increased levels of extraversion, agreeableness, conscientiousness, and need for approval. Respondents in this group demonstrate quite constructive strategies for self-regulation and regulation of emotions (programming, flexibility, and positive reassessment). They predominantly have low values of autoaggression and aggression towards others. In comparison with other clusters, they have a lower level of self-blame, rumination, and catastrophization, a lower level of codependency, and a high level of self-regulation. This indicates a certain "front" of being, an orientation towards maintaining a certain image, conformity with external norms, and social stereotypes. A high level of self-regulation suggests that they successfully cope with the peculiarities of living with an addict, which makes their perception of a difficult situation less vivid and probably reduces the motivation to leave such a relationship.

Discussions

The described results of the study demonstrate the importance of personal characteristics, motivation, and empathy not only in the severity of codependency but also in the manifestation of aggression and behavior regulation in codependent women.

Overall, the behavioral regulation features observed in the clusters align with existing concepts and classifications of codependent behavior found in professional literature, including the Sharon Wegscheider-Cruze classification (Stryapukhina, 2021; Kupchenko, 2020; Rozhnova, et al., 2020; Kolenova and

Gurtskoy, 2019; Tasheva and Bedredinova, 2016; Artemtseva, 2012). However, the identified clusters offer a fresh perspective on the relationship between personal characteristics and behavioral regulation, as well as provide insights into the role of motivation and empathy in the adaptation mechanism within codependent relationships.

A comparative analysis of the selected clusters revealed significant differences in self-aggression and aggression towards others, which somewhat contradicts previous findings that suggest a strong association between codependency severity and self-aggression (Buzik and Efimova, 2019; Perminova, 2017; Merinov, et al., 2015). Our study shows that auto-aggression is not a universal descriptive characteristic of codependent behavior and it is not present in some specific groups of codependents.

Studies on coping mechanisms of codependents emphasize the prevalence of dysfunctional attitudes, including catastrophizing and self-blaming responses (Happ, et al., 2022; Kupchenko, 2020; Politika, 2020). However, our findings reveal a variety of coping strategies, indicating a more diverse coping mechanisms. Strategies such as self-blame, rumination, and catastrophization are not present in all clusters, with some clusters predominantly exhibiting strategies considered constructive in the literature. The level of self-regulation also varies and is not universally reduced across all groups.

The limitation of this study is in the sample size, which restricts further differentiation and clarification of the effects of age factors and the nature of the relationship with the addict. Future research should aim to expand the sample size and consider the nature of the relationship with the addict, as well as factors such as self-relationship, basic beliefs, and the severity of depressive symptoms in code-pendent women.

Conclusions

The objective of this study was to comprehensively examine the influence of personality traits, approval motivation, and empathy level on the behavioral regulation of codependent women.

The analysis of the obtained results leads to the conclusion that personal characteristics, approval motivation, and empathy level can serve as predictors of codependency severity, aggressiveness manifestation, formation of self-regulation strategies, and preference for cognitive emotion regulation strategies in codependent women. Specifically, it was observed that codependent women in Cluster 1, characterized by high levels of neuroticism, openness to experience, and empathy, exhibit the highest levels of auto-aggression. They also demonstrate a high degree of regulatory flexibility, although their overall level of self-regulation is reduced. Furthermore, a wide range of emotion regulation strategies was observed within this cluster. In comparison with other clusters, these individuals exhibit higher levels of self-blame, rumination, catastrophization, and codependence. Codependent women in Cluster 2, characterized by low levels of friendliness, conscientiousness, and need for approval, also display a variety of regulatory mechanisms. However, their behavior tends to be more manipulative and shows aggressive tendencies. Cluster 3 comprises introverted codependent women with reduced levels of empathy, need for approval, and relatively high neuroticism. They demonstrate a fairly high level of self-regulation in their behavior and possess the ability to accurately assess the discrepancy between their goals and the obtained results. They employ both constructive and destructive strategies for emotion regulation. Codependents in Cluster 4, characterized by elevated levels of extraversion, agreeableness, conscientiousness, and need for approval, demonstrate the most constructive strategies for self-regulation and emotion regulation. They possess a high overall level of self-regulation and exhibit less propensity for auto-aggression and self-blame.

The findings of this study have practical implications in psychological practice, particularly in the development of effective intervention strategies and individualized programs aimed at assisting codependents. Furthermore, these results can be utilized to identify risk factors associated with maladaptation in codependents and to develop educational and outreach programs that increase awareness of codependency and foster the development of behavior and emotion regulation skills.

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Author Contributions

A. K. conceived of the idea, determined and verified the research methods, managed the data collection, reviewed and edited the final version of the manuscript. E. D. conducted a theoretical analysis of the problem, performed statistical analysis, translated and edited the final version of the manuscript. A. K. participated a theoretical analysis of the problem, participated in the data collection and discussion the results. P.E. participated a theoretical analysis of the problem, oversaw the organization of the study, reviewed and edited the final version of the manuscript. All authors discussed the results and contributed to the final manuscript. All authors have read and agreed to the published version of the manuscript.

Conflict of interests

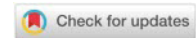
The authors declare no conflict of interest.

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Systematic Review About Students' Conceptions of Engineering Accessed Through Drawings: Implications to STEAM Education

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Abstract: We aim to review students' conceptions of engineers and engineering accessed through their drawings. Accordingly, we enrolled in a systematic review following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) protocols. For that, we established the Web of Science as the source of information. After applying eligibility criteria, the search resulted in ten records. We observed that many reviewed studies enrolled in research designs which contained comparisons of groups, cohorts (cross-age) or pre-post-tests. However, they generally overlooked appropriate statistical tests. Overall, the studies evidenced that most students conceive engineers as males who work individually in manual activities and outdoor environments. The major contribution of this study is providing an overview of the investigation of children's conceptions of engineering. Additionally, we call attention to the need for more research, teacher training, and carefully planned and executed activities that enhance students' conceptions of engineers and engineering instead of worsening stereotypes—especially considering current curriculum proposals, such as STEAM education embracing engineering at precollege levels.

Keywords: Draw an Engineer Test, drawing, students, precollege engineering, STEM education, STEAM education.

Introduction

Educational approaches such as STEM (Science, Technology, Engineering and Mathematics) and STEAM (Science, Technology, Engineering, Arts/Humanities, and Mathematics) have gained ground worldwide (Marín-Marín et al., 2021). Countries such as The United States of America (NGSS, 2013), Korea (KOFAC, 2012), and Spain (MEFP, 2022) have incorporated them into their curriculum. Such educational approaches place interdisciplinarity as a crucial aspect of education, especially under the claim that siloed disciplines cannot address complex matters, e.g. sustainability which encompasses economic, environmental, and social spheres (Rodrigues-Silva and Alsina, 2023a; Guyotte, 2020).

Alongside interdisciplinarity, STEM or STEAM entails inserting into the precollege curriculum engineering—a discipline generally absent at this level. In this vein, discourses that promote STEM or STEAM mention the urge to increase students' interest in pursuing technical careers such as engineering, which would be highly required in a technological world (Perignat and Katz-Buonincontro, 2019). At the same time, researchers defend precollege engineering to increase girls' interest towards this career and, therefore, tackle the sustainable development goal of reducing the existent gender gap in engineering (Aurava and Meriläinen, 2022; Cabello et al., 2021; United Nations, 2015).

Conversely, practices involving precollege engineering might side effects engineering image if pedagogical planning and management overlook stereotypical conceptions (Fleer, 2021). For example, Fleer (2021) proposed a free play activity wherein preschool children were incentivised to imagine themselves as engineers while building bridges. The authors witnessed that boys mainly occupied the “engineering area”—a space with tools to design and construct the bridge—while girls avoided this area. Consequently, this activity may have reinforced their conception of engineering as a male profession. Contrary to simply incorporating engineering, Moore et al. (2014) presented a precollege engineering education framework and remarked that developing students' conceptions of engineers and engineering is essential. They argue that an accurate idea of engineering prevents reinforcing stereotypical views and

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gives meaning to learning the following knowledge and abilities related to engineering.

Willing to access children's conceptions of engineers, Knight and Cunningham (2004) proposed the Draw an Engineer Test (DAET) as an instrument that to explore their ideas through drawings. This instrument follows the theory of figurative thinking as the underpinning rationality of its analysis. According to this theory, children's symbolic expressions (signifiers) represent personal systems of mental images about objects (signifieds) (Piaget and Inhelder, 1971). In this sense, interpreting the results obtained through DAET is possible under the conception that children's drawings may offer insights into their mental images of engineering (Capobianco et al., 2011).

Researchers have applied this instrument in countries like the United States, China, and Turkey (Capobianco et al., 2011; Diefes-Dux and Capobianco, 2011; Knight and Cunningham, 2004). Results from those studies highlighted problems such as children's misconceptions of engineering that might prevent them from envisioning it as an intellectual activity. Additionally, from a very early age, children already express gender bias toward engineering as a male career. Such an image likely averts some girls from pursuing this profession.

In sum, countries gradually adopt educational approaches incorporating engineering at precollege levels; studies identify children expressing misconceptions about engineering and gender bias, and weakly structured activities are likely to worsen those misconceptions. This configuration conduces to two research questions. First, how have students' conceptions of engineers and engineering been investigated through drawings? Furthermore, what are students' conceptions of engineers and engineering?

Currently, no systematic review addressed studies exploring students' engineering conceptions through their drawings. In this sense, the literature lacks studies that provide an overview of this topic. Line up to those interrogations and the identified gap in the literature. We aim to review students' conceptions of engineers and engineering accessed through their drawings.

Materials and Methods

Considering this research goal, we enrolled in a systematic literature review following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) protocols. Accordingly, the investigation process is informed to guarantee its rigour and reproducibility (Moher et al., 2015). It was structured into the phases: 1) Search elements and Boolean logic, 2) Eligibility criteria, 3) Information sources, 4) Data collection, and 5) Data analysis.

Search elements and Boolean logic

First, we identified engineer and engineering as central terms of the research goal. Then, the words draw and drawing were acknowledged as appropriate terms to filter studies that applied drawings to access people's conceptions. Two additional words, conception and stereotype, were considered to refine the search in order to prevent finding studies on engineering technical drawing. Given all that, the Boolean logic was created: ENGINEER* and DRAW* and (CONCEPTION or STEREOTYPE). Moreover, we established that the word engineer should be scanned in the title—given its centrality in this study—and the other terms of the Boolean logic in the title, abstract, author, keywords, or keywords plus.

Eligibility criteria

In this second phase, we established the eligibility criteria applied in this review, as presented in Table 1. First, we fixed that the documents should be peer-reviewed because this evaluation indicates some research quality. Following this, we established that the records could have the format of an article or conference proceedings. We included documents published since 2004, which correspond to when the DAET instrument was created by Knight and Cunningham (2004). Since we are interested in students' conceptions, we secure that the document was classified in the educational research area and the population was centred on students. Finally, we included documents published in English because it is considered a universal language in the current scientific community. Moreover, we were open to considering Spanish and Portuguese documents to profit authors' knowledge in those languages to broaden the research scope. The exclusion criteria were essentially antonyms of the inclusion ones.

Table 1
Eligibility criteria

Criteria	Inclusion	Exclusion
Type of document	Article or conference proceedings	Other formats
Publication period	From 2004 to 2022	Before 2004
Research area	Education	Other areas
Population	Students	Teachers and student teachers
Language	English, Spanish, and Portuguese	Other languages

Information sources

In this third phase, we selected the Web of Science (WoS) index from Clarivate as the information source because of its recognised rigour and importance in science, particularly in the educational field.

Data collection

Once the Boolean logic, the eligibility criteria, and the source of information are established, we finally move to the review's fourth phase, which consists of collecting and treating data. A scan enrolled on 30 October 2022 resulted in 74 records. We used the WoS platform to filter the type of document, publication period, research area, and language. After that, we read the abstract and full texts to ensure the documents included were correct—DAET instrument and focused on students.

At this point, we observed that three articles were non-eligible—Thomas et al. (2020, 2016) had to be discarded because they were focused on students but developing a rubric and validating a modified version of the DAET, and Diefes-Dux and Capobianco (2011) study because they presented a specific analysis of data from another study which was already contemplated in the list of reviewed articles (Capobianco et al., 2011). Eventually, as shown in Figure 1, the data collection process was conducted to a final list of ten documents—articles and conference proceedings.

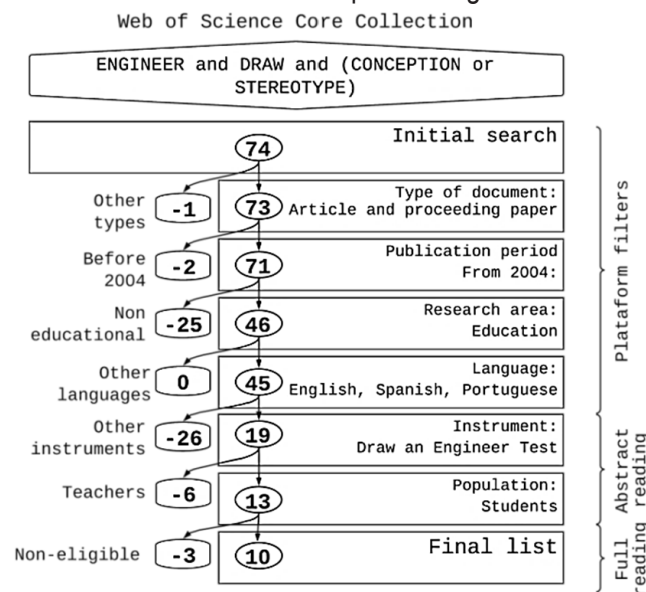


Figure 1. Data collection process.

Data analysis

We used the Atlas-ti program to provide the word occurrence from those ten selected articles. For this, we excluded numbers and set the threshold of 80 accounts. Then, we plotted the information in word cloud format to visually analyse the accuracy of those documents concerning the Boolean logic and the research goal.

During analysing data, we did several reads and comparisons between the documents. We observed categories of information that could be organised into three blocks:

- **General research features:** methodology approach, sample size, design, intervention, educational level, publication year and region;
- **Data collection instrument and procedure details:** the instruction for making the drawing,

the instructions and questions asking for a description of the drawing, application time, applicants, and complementary interviews;

• **Common results:** students' conception of gender (male or female), place of work (out-door or indoor), activity (manual or intellectual), and work setting (individual or collective). Moreover, we addressed the interventions, gender, and age comparisons.

For this last part regarding studies' typical results, whenever necessary, we recalculated the frequency percentages of the four variables— students' conception of gender, place of work, activity, and work setting— considering the total sample size of each study. [Matusovich et al. \(2021\)](#), for example, represented the results of students' opinions on engineering activities through a horizontal bar chart. In this case, we had to estimate the values using the scale presented in the figure.

Moreover, we run one-sample proportion tests on Statistical Package for the Social Sciences (SPSS) program to verify whether the frequency differs statistically between the levels of each variable— using a threshold of 5% of significance. Furthermore, researchers were not always able to interpret, for example, the gender portrayed in the drawings; children may not have pictured a human figure or represented both. Therefore, we created an extra class for each variable to account for indiscernible information from drawings.

Regarding the conception of engineers' activities, we accounted as manual undertaking: fix, build, construct, repair, drive, make a single product (craft), and operate machines. Furthermore, as an Intellectual undertaking, the activities: create, optimise, invent, design, supervise/observe, use math, use science, use technology, solve problems, research, experiment, test, and teach. We clarify that occasionally, engineers can be involved with all those activities, but engineering primarily deals with highly complex issues that demand more cognitive abilities ([Moore et al., 2014](#)).

We did not further the review aspects evaluated by a few researchers, such as skin colour ([Ergun and Balcin, 2019](#); [Fralick et al., 2009](#)), smiling faces ([Ata-Aktürk and Demircan, 2021a](#)), and the presence of engineers in students' family ([Capobianco et al., 2011](#)).

Results

Now on, we present the review results. Beforehand, we highlight the scarcity of studies exploring students' conceptions of engineering since only ten documents were eligible. In Figure 2, a word cloud demonstrates that the terms engineers, drawn, students, education, and conceptions are frequently written in the reviewed documents. This result confirms a substantial relationship between the selected manuscripts and our research goal. Additionally, we call attention to the words test, DAET, gender, design, and STEM occurrence. Those elements will be further addressed in this review.

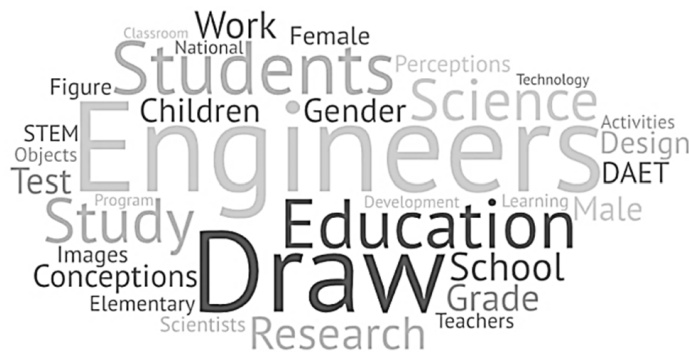


Figure 2. Word cloud of the reviewed documents.

Review of general research features

Table 2 summarises the first block of information that explores general research features: author, year of publication, region, educational level, sampling, sample (N), intervention, grouping, design, and statistics. It is observable that authors contributed with only one record each, which indicates that no researcher could be considered an exponent of the topic. Regarding geographic distribution, the United States of America outstand as the country with more studies—six in total. Turkey has two studies, while China and Mexico have only one each.

Table 2
General research features

Author	Region	Level	Sampling	N	Intervention	Grouping	Design	Statistics
Ata-Aktürk and Demircan (2021a)	Turkey	Preschool	Purposeful	436	No	One	Cross-sectional	Descriptive
Capobianco et al. (2011)	United States	Elementary school	Purposeful	396	No	One	Cohort (1-5th grade)	Chi-Square
Carr and Diefes-Dux (2012)	United States	Elementary school	Purposeful	173	Yes	One	Cohort (2-4th grade) and pre-post	Descriptive
Chou and Chen (2017)	China	Elementary school	Purposeful	750	No	Two (urban and suburban areas)	Cohort (4-6th grade)	Descriptive
Ergun and Balcin (2019)	Turkey	Middle School	Purposeful	119	No	One	Cross-sectional (5-7th grade)	Descriptive
Fralick et al. (2009)	United States	Middle School	Purposeful	744	No	One	Cross-sectional	Descriptive
Knight and Cunningham (2004)	United States	Elementary and Middle School	Purposeful	384	No	Two (male and female students)	Cohort (3-9th grade)	Descriptive
López et al. (2013)	Mexico	Higher education	Purposeful	124	No	Two (public and private universities)	Cross-sectional	Descriptive
Matusovich et al. (2021)	United States	Middle School	Purposeful	757	Yes	One	Pre-post	Descriptive
Rivale et al. (2020)	United States	Elementary school	Purposeful	355	Yes	Two (male and female tutors)	Pre-post and two cohorts	ANOVA

Note: Cohort here is understood as a longitudinal-like design conceived through a cross-sectional collection of data, which means participants responded only once, but they have similarities that permit inferring a temporal relationship.

Table 3
Data collection instrument and application procedure details

Author	Instruction for drawing	Description of the drawing	Time (min)	Applicant	Complementary Interview
Ata-Aktürk and Demircan (2021a)	Draw an engineer at work	Children were assumed as illiterate	20	Teachers	What is happening in your drawing? Is there an engineer in this drawing? What is this engineer doing?
Capobianco et al. (2011)	In the space below, draw an engineer doing engineering work	What is your engineer doing?	30	Teachers	Is your engineer a boy or a girl? What is the engineer doing? What can you tell me about this person? Complete: an engineer is a person who...
Carr and Diefes-Dux (2012)	Draw an engineer doing engineering work	Write about what this engineer is doing	-	-	No
Chou and Chen (2017)	How do engineers look? Please, draw an image of an engineer	Give a name to your engineer. Where does your engineer work? What is your engineer doing?	30	Teachers	30 unstructured interviews
Ergun and Balcin (2019)	Draw a picture of an engineer at work	Give a name to your engineer. What are the personal characteristics of an engineer? How is the work environment of an engineer? What kinds of work does an engineer do? What is the engineer you drew doing?	45	Researchers	No
Fralick et al. (2009)	Draw an engineer at work	Engineer's name. Describe your engineer a) personal information, b) Work setting, c) Job description. What is the engineer in your drawing doing?	-	Teachers	No
Knight and Cunningham (2004)	Draw a picture of an engineer at work	What does an engineer do?	15	Teachers	No
López et al. (2013)	Participants were asked to close their eyes and imagine an engineer at work. Then they were required to draw it	Describe what the engineer is doing in your drawing. List at least three words/phrases that come to mind when you think of an engineer. What kinds of things do you think an engineer does?	25	Researchers	28 unstructured interviews
Matusovich et al. (2021)	Draw a picture of an engineer at work	What does an engineer do? Do you know any engineers? Who are they?	15	Researchers	No
Rivale et al. (2020)	Draw a picture of what an engineer looks like	Name one thing invented by an engineer	-	-	No

As presented in Figure 3, the reviewed documents are steadily distributed in time. Despite some gaps, since DAET's creation in 2004, there has been no production peak and a maximum of two papers published during the same year.

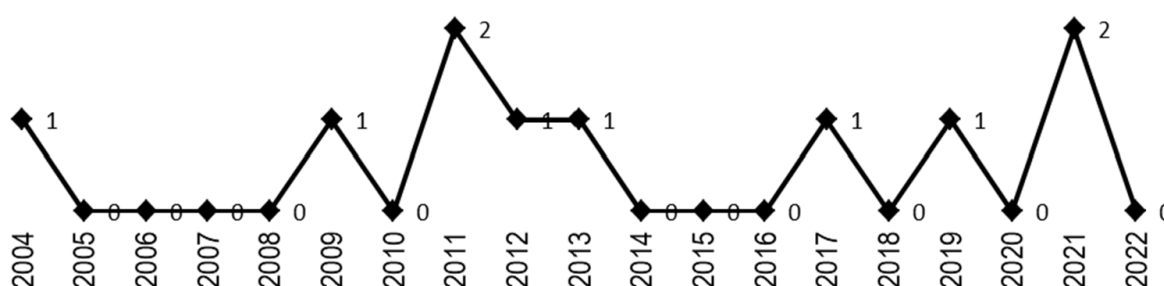


Figure 3. Time distribution of publications on the Web of Science of studies on students' conceptions of engineering through drawings.

Then addressing students' educational level, most documents investigated elementary or middle schools. [Ata-Aktürk and Demircan \(2021a\)](#) explored preschool students replacing the DAET written part with a short interview about the drawing (different modifications of this instrument will be seen later on). Studies on higher education were not frequent either. [López et al. \(2013\)](#) addressed higher education to observe how incoming engineering students conceive their course.



Figure 4. Educational levels addressed in the reviewed articles.

All studies followed purposive sampling and a non-randomised selection method—strategies commonly used in qualitative research. In this case, investigators select the participants from a particular context or reason (Lawson, Faul and Verbist, 2019). However, studies have relatively large samples of qualitative research standards. Figure 5 shows the sample size distribution: three studies have between 100 and 200 participants; four studies lay in a middle range of 350 to 450 participants, and the last three pieces of research had extensive samples with more than 700 participants each.

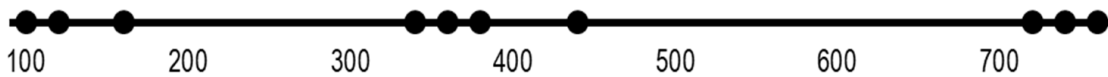


Figure 5. Sample size distribution of the reviewed articles.

Studies applied the DAET as their primary research data collection instrument. Consequently, they used similar strategies to analyse data—basically inducing categories by contrasting the drawings and the explanations about it provided by open-ended questions or complementary interviews. Nonetheless, researchers reached no consensus on whether this configuration of inquiry has a qualitative, quantitative or mixed approach. The confusion may be because the information source is qualitative, but subsequently, categories are created and treated as constructs with frequency quantification.

Ata-Aktürk and Demircan (2021a), for example, specified that their study had a phenomenography approach. They presented a cross-sectional study, no comparison groups, and not aiming to evaluate an intervention. Coherently to a qualitative approach, they focused on exploring the quality (phenomenon) of students' conceptions of engineers and engineering. In contrast, Capobianco et al. (2011) reported using qualitative data but, coherently to a (cross-age) cohort design, they had a quantitative part and, therefore, applied statistical testing. Similarly, Rivale et al. (2020) also used statistical tests (ANOVA). We clarify that here cohort is understood as a longitudinal-like design but through a cross-sectional data collection. It means participants respond only once, but as they keep common characteristics (being students), they are related to each other regarding the different grades, so we can infer a temporal change (Lawson, Faul and Verbist, 2019).

The remaining seven documents have at least one comparison condition: two groups, cohort design, intervention and a pre-post design (results of those articles will be explored later on). Notwithstanding, they present only descriptive statistics, and frequencies are directly compared without running hypothesis testing. Figure 6 shows the methodological panorama of the reviewed articles. We highlighted that “two groups”, “cohort or pre-post design”, and “intervention” are comparison conditions that should inherently be accompanied by hypothesis testing.

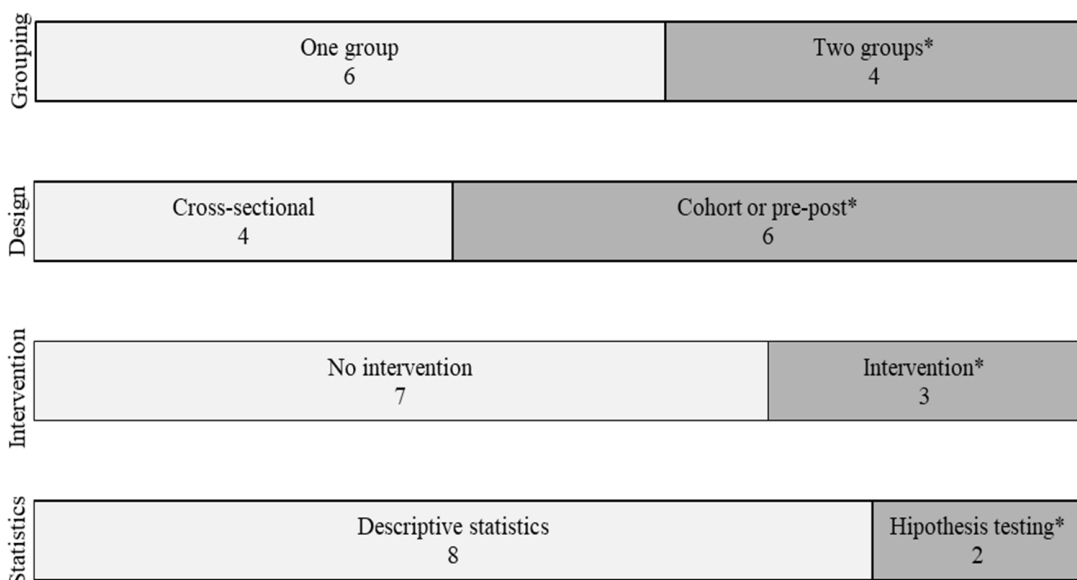


Figure 6. Methodological panorama of the reviewed articles.

Review of data collection instrument and procedure details

In the following paragraphs, we explore the second block of information concerning the data collection instruments of the reviewed documents. As stated earlier, authors used the DAET as their primary research instrument, but with some

variations and adaptations (Table 3). Next, we address the DAET regarding the instruction for drawing, description of the drawing, time of application, applicant, and complementary interview.

[Knight and Cunningham \(2004, p. 3\)](#) created the DAET with the primary instruction, “Draw a picture of an engineer at work.” After that, the authors repeated this instruction in their research. Following the same idea, [López et al. \(2013\)](#) asked students to close their eyes, imagine an engineer at work, and then draw it. Differently, [Chou and Chen \(2017, p. 478\)](#) concentrated on engineers’ appearance. They wrote, “How do engineers look? Please, draw an image of an engineer”. Similarly, [Rivale et al. \(2020, 22.552.1 to 22.552.12\)](#) used, “Draw a picture of what you think an engineer looks like”.

Additionally to DAET’s primary instruction, [Knight and Cunningham \(2004\)](#) included the open-ended question, “What does an engineer do?” to help interpret students’ drawings regarding the engineering activity. Equally, all authors had those auxiliary requests. However, while some of them kept the question about the general action of engineers ([López et al., 2013; Matusovich et al., 2021](#)), other authors modified it to address what the portrayed engineer was doing in the drawing ([Capobianco et al., 2011; Carr and Diefes-Dux, 2012; Chou and Chen, 2017; Ergun and Balcin, 2019; Fralick et al., 2009](#)). Additionally, three studies demanded the participants to name their engineers—helpful information for gender interpretation—and to describe the work environment ([Chou and Chen, 2017; Ergun and Balcin, 2019; Knight and Cunningham \(2004\)](#)). Any question directly requests the gender and the working setting—whether the engineer works individually or collectively.

[Rivale et al. \(2020\)](#) required students to cite one thing invented by engineers before drawing. This approach will likely have biased students to conceive engineers as inventors/designers.

In half of the reviewed studies, researchers counted on teachers to be the applicants of the DAET. Some authors commented on how teachers were prepared to do it properly. For example, [Capobianco et al. \(2011, p. 310\)](#) remark that “teachers were provided written directions describing the procedures for administering the drawing test”. Also related to the application of the DAET, the average time designated to it was 25 minutes (SD 10 minutes).

Moreover, four studies mentioned an interview to clarify the drawings’ reasons. Among those interviews, we highlight the work of [Capobianco et al. \(2011, p. 310\)](#), the sole document that reported directly addressing gender, “Is your engineer, boy or girl?”. We also remark that [Ata-Aktürk and Demircan \(2021a\)](#) applied the Draw-and-tell technic—a quick (5 min) and informal narrative about the drawing. They claimed this strategy was an age-appropriate way of working with preschool students who were assumed illiterate and could feel uncomfortable with formal interviews.

The idiom is likely to influence children’s image of engineering. For example, [Chou and Chen \(2017\)](#) consider that students might conceive engineering as manual work because the word labourer in Chinese shares its initial character with the word engineer. Similarly, [Knight and Cunningham \(2004\)](#) observed that some students’ answers indicated a vocabulary problem in English that may have misdirected their conception of engineering. They explain that students probably related engineering with the word engine and associated this profession with cars. For instance, one student wrote, “Engineer has the word engine in it, so I guess they must work with engines”.

In this same vein, [López et al. \(2013\)](#) warn that the Spanish language places genders to nouns, so they included male and female engineers (ingenieros y ingenieras) in the DAET instrument. However, explicitly naming male and female engineers may have influenced the children to consider both genders. [Silva-hormazábal, Rodrigues-Silva and Alsina \(2022\)](#) proposed a STEAM activity of interdisciplinarity between engineering and mathematics using a Spanish version of the DAET. They suggested writing the expression “draw a person that does engineering—dibuje una persona que hace ingeniería” because “persona” is a gender-neutral term.

Review of common results

Next, we review the results of the articles. As stated in the methodology, we identified aspects commonly studied between the documents, viz., students’ conception of engineers’ gender, place of work, activity, and work setting. Table 4 presents the frequency distribution of those aspects considering the total sample of each study—we bold the proportions statistically different. We gathered individuals from all groups and cohorts and considered only the pre-test results.

Table 4

Typical results regarding students’ conception of engineers’ gender, place of work, activity, and work setting

Author	Gender			Place of work			Activity			Work setting		
	Male	Female	Indiscernible/both	outdoor	Indoor	Indiscernible/both	Manual	Intellectual	Indiscernible/both	Individual	Collective	Indiscernible/both
Ata-Aktürk and Demircan (2021a)	46%	19%	36%	34%	6%	60%	70%	4%	25%	71%	4%	25%
Capobianco et al. (2011)	58%	18%	24%	-	-	-	72%	6%	22%	-	-	-
Carr and Diefes-Dux (2012)	-	-	-	-	-	-	69%	8%	24%	-	-	-
Chou and Chen (2017)	80%	16%	4%	73%	-	-	55%	35%	10%	-	-	-
Ergun and Balcin (2019)	87%	12%	2%	56%	35%	10%	36%	44%	20%	87%	13%	0%
Fralick et al. (2009)	49%	13%	38%	32%	15%	51%	42%	16%	42%	79%	21%	0%
Knight and Cunningham (2004)	15%	10%	75%	-	-	-	67%	27%	6%	-	-	-
López et al. (2013)	69%	23%	8%	-	-	-	-	-	-	-	-	-
Matusovich et al. (2021)	-	-	-	-	-	-	24%	62%	14%	-	-	-
Rivale et al. (2020)	55%	17%	28%	-	-	-	-	-	-	-	-	-

Note: Multiple one-sample proportion tests show that frequencies of detectable levels of each category are statistically different, considering a significance threshold of 5%—highlighted in bold. Except for the gender distribution (male/female) in the work of [Knight and Cunningham \(2004\)](#).

Engineers' gender and engineering activity are the most studied domains, followed by the place of work and work setting. We comment that Knight and Cunningham (2004) had an oddly high level of indiscernible gender (75%). Those authors explained that about half of the drawings were "stick figures", which prevented discerning the representation of gender. Additionally, they explain that they observed an unusually higher occurrence of drawings depicting female engineers because two female undergraduate engineering students had worked with those students for a few months before the instrument application.

In this respect, we observed that researchers used stereotypical features associated with gender to analyse the drawings. López et al. (2013) explained that they considered dress, skirt, long hair, painted lips, and long eyelashes as female characteristics. Knight and Cunningham (2004) explained that they regarded short hair, square shoulders, and necktie as male characteristics, while long hair was considered a female trait. Researchers used questions to address gender so that such stereotypical analysis could be avoided. For example, Capobianco et al. (2011, p. 310) used the open-ended question, "Is your engineer a boy or a girl?" Differently, Fralick et al. (2009) demanded that the children give a name to their engineers so that this information could help infer the gender.

Matusovich et al. (2021) plotted a bar chart which shows that students' responses to an open-ended question on what engineers do have a high frequency of intellectual tasks such as design, solving problems, and using math and science. However, analysis associated with their drawings evidenced the verbs building and fixing and the nouns vehicle and tools, which are terms more closely related to manual tasks. Similarly to other studies, blueprints had a much lower occurrence.

In the sequence, we present Figure 7, which shows the aggregated results to account for a mean frequency distribution throughout the reviewed studies regarding students' conception of engineers' gender, place of work, activity, and work setting. Notably, students primarily conceive engineers as males who work individually in manual activities and outdoor environments.

Gender	Male 55%	Female 16%	Indecirnible/both 29%
Place of work	outdoor 55%	Indoor 10%	Indecirnible/both 36%
Activity	Manual 51%	Intelectual 28%	Indecirnible/both 21%
Work setting	Individual 75%	Collaborative 16%	Indecirnible/both 8%

Figure 7. Aggregation results regarding students' conception of engineers' gender, place of work, activity, and work setting.

Researchers observed that girls draw more female engineers than boys. However, both girls and boys draw more male engineers in total (Chou and Chen, 2017; Knight and Cunningham, 2004). Despite the difference in gender representation, girls and boys have similar conceptions of engineers and engineering—activity, place of work and work setting (Chou and Chen, 2017).

Moreover, a more significant proportion of students from lower grades represent engineers incorrectly as other professions, such as doctors and bombers, while higher grades demonstrate more accurate views of engineering activity. However, Ergun and Balcin (2019) observed that the frequency of female engineers' portrayed decreased among students from higher grades. Similarly, Chou and Chen (2017) concluded that younger students (4th grade) were more likely to picture female engineers compared to older ones (5th and 6th grades).

Now addressing the interventions enrolled in the reviewed articles, Carr and Diefes-Dux (2012)

studied teachers who participated in a professional program designed to increase technological literacy and knowledge of the roles and types of engineers. For that, those teachers engaged in interdisciplinary engineering, math and science activities. Then, teachers were asked to practise at least one engineering design activity in their class. DAET showed that the number of students who conceived engineers as designers increased from 5 to 80 in a pre-post configuration. Qualitatively, the authors observed students portrayed engineers designing various objects such as bicycles, clocks, and a safer playground. They concluded that the teacher training on engineering had a positive outcome since it eventually impacted students' conceptions of engineering.

Additionally, gender representativeness seems influential in students' conception of engineering. Rivale et al. (2020, 22.552.1 to 22.552.12) comment that the gender of the tutor who conducted engineering activities impacted the frequency of female characters' drawings among the girls. According to them, "81% of the girls taught by a female fellow drew a female engineer, compared to 41% of the girls taught by a male fellow".

Notably, depending on the subject and pedagogical approach, engineering activities may reinforce the stereotype of engineering as manual work. For example, Matusovich et al. (2021, p. 894) proposed some engineering activities, such as the maintenance of a flashlight. Throughout the activities, they also reported discussions centred on subjects such as cars and buildings. Afterwards, the authors observed students' images of engineering distanced from cognitive tasks. Such a non-intellectual perception hindered them from seeing engineering as a field connected to other knowledge areas, such as mathematics and science.

Data revealed an increase in the frequency of responses coded as having the root terms of fix, build, and works on with a decrease in the frequency of the root terms create, help, and design when comparing pre and post-classroom engagement responses. Although low to start with, responses about using math and science and solving problems declined further on the post-test (Matusovich et al., 2021, p. 894).

Some researchers also analysed objects portrayed. Ata-Aktürk and Demircan (2021a), e.g. report that almost half of the drawings presented civil structures such as houses, schools, and roads. Comparatively, design-related objects were found in approximately 6% of them. Likewise, Chou and Chen (2017) highlighted that elementary children tended to draw civil structures and workers with tools such as cranes or drilling machines. The authors pinpoint that few images included design-based architectural engineers who created blueprints for residential buildings.

Discussions

We aimed to review students' conceptions of engineers and engineering accessed through their drawings. Accordingly, we discuss the results of this literature review regarding the two research questions. Initially, we inquire how students' conceptions of engineers and engineering have been investigated through drawings.

First, we identified a dearth of research investigating students' conceptions of engineering through drawings, especially at the preschool level. One point that explains the literature gap is that engineering was traditionally absent at precollege levels (Moore et al., 2014). In this regard, we high-light the increasing interest in interdisciplinary approaches such as STEAM education—referring to integrating Science, Technology, Engineering, Arts/Humanities, and Mathematics (Marín-Marín et al., 2021; Rodrigues-Silva and Alsina, 2023b). Countries like The United States (NGSS, 2013), Korea (KOFAC, 2012), and Spain (MEFP, 2022) are recently adopting those interdisciplinary approaches in their curricula. This curricular change inherently incorporates engineering at school, which could foster investigations regarding students' conceptions of engineering. Especially addressing the lack of research in preschool, this stage has historically received less attention in research than other educational levels. Preschool is not mandatory in many countries, and it comprises a diversity of organisational formats (Davis, 2009). Such complexity is accompanied by specific ethical considerations to investigate very young children that may discourage some researchers (Abbott and Langston, 2005). Particularly referring to inquiry on students' conceptions of engineering, perhaps some researchers felt the DAET instrument was inappropriate for early children due to its written part. Notwithstanding, we suggest the strategy used by Ata-Aktürk and Demircan (2021a); they assumed preschoolers were illiterate and complemented the instrument with the

Draw-and-tell technique, consisting of informal and quick questions while children draw.

Additionally, we suggest investigations using DAET should be held in different parts of the world since the current ones are concentrated in the United States. Different cultural and socio-economic backgrounds can influence children's conception of engineering. Some researchers, for instance, observed that children's native language impacts children's understanding of engineering activities (Chou and Chen, 2017; Knight and Cunningham, 2004; López et al., 2013).

We highlight that many studies underwent quantitative research, including comparison groups, cohort (cross-age) or pre-post-test designs. However, they generally identified their methods as qualitative approaches and lacked statistical tests. In those cases, we suggest that authors embrace mixed research methodologies—while having qualitative data nature, they ought to use appropriate hypothesis testing if enrolling in such designs. Additionally, DAET could complement other research instruments to understand children's engineering conception comprehensively. Some studies have already applied complementary interviews (Capobianco et al., 2011; Chou and Chen, 2017). Likewise, researchers could combine it with concept mapping, focus groups, and surveys. Beyond the instruments mentioned, we highlight the potentiality of incorporating DAET in case studies that explore children's involvement in engineering-related activities. Accordingly, field observations, video recordings, and evaluations of their productions could provide valuable insights into their engineering conceptions.

Regarding the data collection instrument, the authors made minor modifications in the DAET, mainly regarding the complementary questions about the drawing. We suggest that, once children have finished their drawings, authors should consider using complementary questions about students' conception of gender, place of work, activity, and work setting portrayed. That way, researchers prevent applying bodily stereotypes such as long hair, eyelashes, and clothing to analyse portrayed genders. In addition, the indiscernible information rate will probably reduce.

In this same direction, Thomas et al. (2020, 2016) proposed a modified version of DAET, which explores students' opinions about how engineering is connected to mathematics and science. This contour may be attractive considering educational approaches such as STEAM education, which proposes integrating Science, Technology, Engineering, Arts/Humanities, and Mathematics knowledge areas (Perignat and Katz-Buonincontro, 2019). Additionally, using DAET consistently, such as adopting their version, would enhance the comparability of results among future studies.

For this literature review, we also query—what are students' conceptions of engineers and engineering? Overall, researchers concluded that students conceive engineers as males who work individually in manual activities and outdoor environments. Those conceptions are observed from a very early age, and they are likely to be a response to different sources of information. In this vein, the literature has shown that children's picture books carry misconceptions and gender stereotypes about engineers and engineering (Ata-Aktürk and Demircan, 2021b).

We verified that researchers qualified and quantified various actions related to engineering—such as fixing, constructing, observing and designing—but their conclusions were commonly centred on whether portrayed engineers were pursuing manual or intellectual tasks. Even though engineering may sometimes be involved in manual actions or processes, engineers are not likely to be those who physically execute them. Accordingly, we suggest differentiating one simple product construction from conceiving a product that will be reproduced. The former is more connected to crafting, while the latter relates to engineering design.

The reviewed studies showed that older students perceive engineers more accurately as designers. Cohort studies with appropriate statistical comparisons are needed to check whether older students tend to view engineering as a collective, intellectual, and indoor activity. However, studies already point out that gender stereotypes intensify with age. Those findings reinforce the urge to address Education for Sustainability (EfS) since Early Childhood Education (ECE) (Rodrigues-Silva and Alsina, 2023a; UNESCO, 2008), precisely the sustainable development goal of pursuing gender equity (United Nations, 2015). In this sense, while studies with DAET evidence gender stereotypes, to an extent, they indicate the necessity of developing strategies to inverse the critical gender inequality in technical areas. Ata-Aktürk and Demircan (2021a), for example, evidenced that picture books for children aged 3 to 6 years from Turkey mainly represent engineers as male characters. Accordingly, the authors suggest increasing children's contact with cultural content developed through a gender-inclusive prism. In a similar direction, Knight and Cunningham (2004) indicated that exposing children to female engineers' role models likely increased their perception of women in engineering. Furthermore, parents' and teachers' conceptions of engineering should be explored and developed so children's environment and social interaction do not transmit and reinforce gender stereotypes—studies utilising DAET with teachers observed they similarly represent more male engineers (Vo and Hammack, 2022).

Teacher education is vital for effectively addressing and challenging these stereotypes in engineering. Literature warns that poorly planned activities in engineering worsen stereotypical gender (Fleer, 2021; Matusovich et al., 2021). Gender equality concerns could be incorporated into teacher training programs focused on developing teachers' STEAM planning ability (Rodrigues-Silva and Alsina, 2022).

STEAM education fundamentally requires beyond diagnosing students' conceptions of engineers and engineering and providing pedagogical strategies to develop such conceptions. In this sense, Moore et al. (2014) recommend a framework wherein they claim the conception of engineers and engineering must be a topic for precollege engineering teaching.

Therefore, there is a need for activities that enhance the conceptions of engineering. Knight and Cunningham (2004) incentivised the teacher applying the DAET to seize the opportunity and have a discussion class about engineering after the students responded to the instrument. In this vein, Silva-Hormazabal, Rodrigues-Silva and Alsina (2022) proposed a STEAM activity wherein students from primary education responded to the DAET and then enrolled in a statistical investigative cycle. Children formulated hypotheses and analysed their drawings in class. For that, students count the frequency of similar categories presented in this review, such as gender, and eventually, they discuss the results.

Studies show that teachers lack knowledge about STEAM as an educational approach (López et al., 2021). Overall, the literature in STEAM education carries misconceptions of engineering and frequently reduces it to crafting. Specifically, teachers report unfamiliarity and difficulty integrating engineering and technology into their lesson plans (Rodrigues-Silva and Alsina, 2022). In this sense, studies using DAET showed teachers present similar misconceptions of engineers and engineering of those to the students (Hammack and Vo, 2019; Vo and Hammack, 2022). Notwithstanding, we should highlight that an inappropriate pedagogical approach to engineering may induce misconceptions about it. This unintended effect occurred, for example, with the interventions reported by Matusovich et al. (2021), wherein students did activities such as fixing flashlights and discussing cars and civil constructions. Pre and post-test indicated that more students perceived engineering as manual work. In this case, the pedagogical planning of those activities failed to remark that engineers are involved with electrical devices, machinery, and civil structures, but their activity is not about manually fixing or constructing them. On the contrary, engineers deal with intellectual tasks such as designing electrical devices, machinery, and civil structures; and planning and supervising production and maintenance processes.

Conclusions

The major contribution of this study is providing an overview of the investigation of children's conceptions of engineering through their drawings. There were no similar previous systematic reviews, and related work concerns empirical studies which address specific regional contexts.

The results of this review allow drawing some conclusions on exploring children's conceptions of engineers and engineering:

- There is a dearth of studies investigating students' conceptions of engineering through drawings;
- Researchers should converge DAET instructions to help comparability of results and prevent misguided analysis such as applying stereotypes to identify genders;
- Researchers undergo complex research designs such as comparison groups, cohort (cross-age) or pre-post-test using DAET. However, those studies frequently lack appropriate statistical tests;
- At a very early age, children already exhibit misconceptions or stereotypes of engineering as a profession of men working individually in manual activities and outdoor environments;
- Teachers must have the proper training to embrace precollege engineering activities. Otherwise, they will likely enrol in poorly designed activities that worsen misconceptions about engineering.

The study provides exciting insights for research and educational practices, especially considering the current interest in engineering in interdisciplinary STEAM education and the aspiration of a sustainable society which pursues gender equity. Among the future directions, we highlight using the draw-and-tell technique for more studies in preschool age. Consistently writing DAET instructions and questions for drawings descriptions, such as proposed by Thomas et al. (2020, 2016) version, to enhance comparability among the studies. Asking children directly about the gender portrayed prevents applying stereotypes to infer gender representations. Finally, conceiving activities explicitly addressing engineering and placing it more accurately as an intellectual practice instead of one product construction such as crafting.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, J.R.-S. and Á.A.; methodology, J.R.-S. and Á.A.; formal analysis, J.R.-S.; writing—original draft preparation, J.R.-S.; writing—review and editing, Á.A.; supervision, Á.A. All authors have read and agreed to the published version of the manuscript.

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Project-Based Learning in Early Childhood Education in Serbia: First Experiences of Preschool Teachers

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Abstract: The aim of the research was to examine the attitude of preschool teachers towards the implementation of project-based learning within the system of preschool education in the Republic of Serbia, with a special emphasis on the identification of its advantages and disadvantages. The research sample comprised 410 preschool teachers from 9 cities in Serbia. The findings showed that preschool teachers have a moderately positive attitude towards the benefits of the project-based learning for children and preschool teachers ($M=4$). The respondents also agree with all the statements from the questionnaire which relate to the difficulties in implementation of the project-based learning approach. A statistically significant difference among preschool teachers in relation to the academic level and length of work experience, occurred only in case of one item, which is related to the lack of didactic materials ($p=0,008$; $p=0,02$).

Keywords: project-based learning approach, preschool age, preschool teacher.

Introduction

Educational trends have been constantly changing and developing primarily in accordance with the results of new researches and information on children's development. One of these trends refers to designing a preschool curriculum which is based on the idea that children learn through practical, significant experiences which are focused on their interests. Accordingly, in the Republic of Serbia, since 2019, the implementation of the New Basics of the Preschool Curriculum, called "Years of Ascent" has started. The new curriculum has started to be implemented in a successive manner as of September 1, 2019, with the intention to make its implementation mandatory as of 2023, for all preschool institutions (*Years of Ascent: The Basics of the Preschool Education Curriculum, 2019*). The concept of the Basics of Curriculum "Years of Ascent" is based on the integrated approach to learning through which, by means of relations and actions, the welfare of a child is supported. In the implementation of the integrated approach, according to which various learning situations in authentic preschool contexts pervaded by contents from different fields, the project-based learning has a significant role. Project-based learning is a form of learning based on constructivist approach according to which children construct new knowledge by upgrading the existing knowledge and experience through social interactions. In relation to this, four fundamental pillars essential for project-based learning can be identified from the corpus of constructivist elements and guidelines: a) basically, construction of knowledge begins with the leading investigative question; b) children's investigation is based on decisions and choices, with the support of their teacher (preschool teacher); v) collaborative work and communication are dominant; g) projects should be authentic – aimed at real life problem solving (Ristanović, Stojanović and Živković, 2018; Lev, Klark and Starki, 2022; Shah and Kumar, 2019).

The main value of project-based learning reflects in the fact that it enables children to investigate and engage in personally meaningful situations, in which they relate their previous and new experiences in a creative way. Instead of guiding children to find the fastest and most successful solution, the aim of the project is to enable them to search for the authentic solution through personally meaningful investigative

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activities. In this process, the preschool teacher provides support to children and facilitates the learning process itself (Evtimov and Petrović, 2021).

In the project-based learning approach, children learn through collaboration with their peers and adults, contribute and influence their own learning as active and competent participants and they learn through taking part in the local community and experiencing themselves as valuable community members. In this approach, children make choices while investigating, enjoy the investigation, take the initiative and experience learning as a meaningful, creative, relevant process, building trust in their own investigative abilities and developing strategies how to investigate something, accept other children, the preschool teacher and other adults as their co-participants and co-investigators, participating together with the adults in the joint investigation, getting positive feedback related to their personal and cultural diversity from the local community members (Krnjaja and Pavlović Brenešević, 2022; Lev, Klark and Starki, 2022). The project-based approach enables creation of the atmosphere in which the children's needs, wishes and emotions are respected, children feel comfortable and productively take part in the learning process. Positive emotions such as curiosity, enthusiasm and joy promote the learning process and make it more successful (Stojanović, Cirkovic-Miladinovic and Milovanovic, 2021).

Review of the literature dealing with the project-based learning approach shows that it can be applied to all educational levels (Katz and Chard, 2000; Rinaldi, 2006; Petrović and Hoti, 2020) and that it contributes to long-term academic and social development of children, that children learn through project-based activities memorize content longer and have deeper understanding of what they learn (Beneke and Ostrosky, 2015; Harris-Helm and Katz, 2011). It has been established that this approach provides a set of cognitively appropriate activities which set to motion a new curriculum and discussion about the learning and teaching process. Since the focus is on the learning process, planning and creation of activities have not been anticipated. Project can promote and reflect cohesion of the curriculum and its integration through school subjects and/or developmental domains (Marshall, 2017; Vengopal, 2016).

Other studies also present benefits of the project-based learning approach. Research results showed that the project-based learning has a positive influence on children's social skills, problem solving, investigation and interaction and that it promotes collaboration among children (Beneke and Ostrosky, 2015; Farida and Rasyid, 2018; Sumarni, Putri and Andika, 2022).

In addition to the perceived benefits of a project-based approach to learning, some researchers (Holen, 2000; McPhee, 2002) have identified problems for students working with this model. They also indicate that issues associated with group work including dynamics, personality conflicts and conformity have limited the effectiveness of some groups in problem solving. Dahlgren and Dahlgren (2002) found out that this approach prevented some students' ability to deal with the problem itself, which led to the conclusion that taking part in the project-based learning approach does not have to be a positive experience for all students. Eden (2000) had a similar experience, since the findings showed that some students were actually anxious, instead of being engaged and excited, due to the open and flexible nature of the project-based learning approach. However, as any approach, the project-based approach shall probably bring about some problems and frustrations, along with the benefits for its participants (Edwards, and Hammer, 2007).

Considering advantages as well as the difficulties in implementation of the project-based learning approach, this paper deals with surveying preschool teacher's opinion on their first experiences in the implementation of the New Basics of the Curriculum and Project-based Learning Approach, as an integral part of the Curriculum.

Materials and Methods

Research aim

The research aim is to explore previous experience and attitudes of preschool teachers in reference to the implementation of the project-based learning approach, with a special emphasis on the benefits and difficulties in the process of implementation of this model.

Sample

The research was conducted in preschool institutions in 9 towns in central Serbia: Arandelovac, Brus, Čuprija, Jagodina, Kragujevac, Kovin, Petrovac na Mlavi, Zaječar, Beograd. The research sample consisted of 410 preschool teachers in total. The respondents, preschool teachers, differ in terms of the level of their academic education (two-year Higher school for vocational studies for preschool teachers, three-year College of vocational studies for preschool teachers, four-year bachelor academic studies

and master academic studies), and according to the length of their working experience. Considering the successive implementation of the New Basics of Preschool Curriculum in preschool institutions, preschool teachers have different experiences in the implementation of the project-based learning approach.

Instruments

For the purpose of this research, a Questionnaire was created and used for collection of data on the opinion of preschool teachers about the implementation of the project-based learning approach. The Questionnaire consists of 16 questions of different types: close-ended and open-ended questions and two five-point Likert-type scale questions (Strongly disagree, Disagree, Undecided, Agree, Strongly agree) regarding the statements provided.

Cronbach's Alpha reliability coefficient measuring internal consistency on this scale is 0.912, thus we can come to a conclusion that the internal consistency of the scale is satisfactory and that the scale has satisfactory reliability.

Procedure

The data regarding experience and opinion of preschool teachers about the project-based learning approach was collected in the period October-December 2022. Preschool teachers were given the Questionnaire and provided with the explanation regarding the research aims and they were asked to answer the Questionnaire questions.

Analysis Procedures

Data processing included descriptive statistics methods (frequency, mean value), as well as analytical statistics methods for the statistical evaluation of statistically significant difference.

Results and Discussion

In order to establish the preschool teachers' attitude towards the advantages of the project-based learning approach that children benefit from, firstly, on the basis of their grades in certain category, an average grade was calculated (Table 1).

Table 1.
Advantages of project-based learning children benefit from

	N		Median	Std. Deviation	Percentiles		
	Valid	Mean			25	50	75
Learns through collaboration with peers.	410	4.34	4.00	.759	4.00	4.00	5.00
Contributes to and influences own learning as an active and competent participant.	410	4.26	4.00	.742	4.00	4.00	5.00
Learns through participation in the local community, and experiences him/herself as a valuable member of the local community.	410	3.98	4.00	.984	3.00	4.00	5.00
Makes choices while investigating in relation to the form of participation and expression.	410	3.99	4.00	.862	4.00	4.00	5.00
Enjoys the investigation, has initiative and experiences learning as a meaningful, creative process.	410	4.20	4.00	.811	4.00	4.00	5.00
Strengthens his/her own self-esteem	410	4.28	4.00	.753	4.00	4.00	5.00
Accepts other children, preschool teachers and other adults as co-participants.	410	4.34	4.00	.739	4.00	4.00	5.00
Gets positive feedback on accepting personal and cultural diversity from the local community members.	410	3.97	4.00	.960	3.75	4.00	5.00

Based on the results obtained, we can see that in all benefits categories of the project-based learning approach, preschool teachers said that they have a moderately positive attitude, since the Median value is $Md=4$ for all items, i.e. majority of preschool teachers said that they "mostly agree" with the provided statements. Such attitudes of preschool teachers were expected, since the benefits regarding advantages of the project-based learning approach have already been a common knowledge. Results of many studies confirm the benefits stated in this questionnaire (Evtimov and Petrović, 2021; Farida and Rasyid, 2018; Lev, Klark and Starki, 2022; Vengopal, 2016). A difference of opinion of preschool teachers in relation to academic education and work experience length (calculated using the Kruskal-Wallis test) was not found, since the p values for all items were $p>0,05$.

The next objective of this research was to examine the opinion of preschool teachers about the advantages of project-based learning approach that preschool teachers can benefit from (Table 2).

Table 2.
Advantages of project-based learning approach that preschool teachers can benefit from

	N		Mean	Median	Std. Deviation	Min	Max	Percentiles		
	Valid	Missing						25	50	75
A preschool teacher develops a quality relationship and creates a collaborative learning environment	410	0	4.12	4.00	.758	1	5	4.00	4.00	5.00
He/she enables relating the life of a child with the immediate life context	410	0	4.30	4.00	.719	1	5	4.00	4.00	5.00
When working with children, the focus is on developing a learning disposition, instead of individual knowledge and skills	410	0	4.17	4.00	.755	1	5	4.00	4.00	5.00
A preschool teacher documents the activities and learning in such way that they are transparent to the children, their parents, other preschool teachers and the community	410	0	4.35	4.00	.735	1	5	4.00	4.00	5.00
He/she develops a strong partnership with children, families, colleagues and wider community	410	0	4.46	5.00	.706	1	5	4.00	5.00	5.00
He/she cooperates with other institutions and professionals working with children and families	410	0	4.19	4.00	.813	1	5	4.00	4.00	5.00
He/she develops a learning culture through his/her own reflexive practice and research	410	0	4.28	4.00	.786	1	5	4.00	4.00	5.00

The results are identical as for the previous question. Majority of respondents has moderately positive attitude towards the benefits of the project-based learning approach for the preschool teachers. In case of one statement only, "A preschool teacher develops a strong partnership with children, families, colleagues and wider community", it was interesting to notice that the attitude of preschool teachers was extremely positive – "Strongly agree". This indicates that preschool teachers extremely value a good relationship and quality communication with all participants of the educational process in a preschool institution, thus this advantage of the project-based learning approach was highlighted as the most important one and it is considered to be the most significant advantage in their opinion. Various authors have been drawing our attention to this particular aspect of the project-based learning approach (Farida and Rasyid, 2019; Lev, Klark and Starki, 2022; Sumarni, Putri and Andika, 2022; Krnjaja and Pavlović Breneselović, 2022), thus pointing out that this approach enables a child to build and promote interaction, communication, cooperation and development of the feeling of care and empathy towards their friends. It is similar when it comes to the preschool teachers who have the opportunity, during the process of planning and implementing their projects, to cooperate with their colleagues, children's parents and members of the local community. Statistically significant differences among the respondents in relation to their level of education or work experience length were not found in this question either.

In this research, our intention was to examine, besides the advantages of the project-based learning approach, the difficulties and problems the preschool teachers encounter during the project implementation. The results have been presented in Table 3.

Table 3.
Problems and limitations of the project-based learning approach

	Mean	Median	Std. Deviation	Min	Max	Percentiles		
						25	50	75
Insufficient knowledge on the project-based learning	3.24	4.00	1.216	1	5	2.00	4.00	4.00
Vague instructions for project planning and implementation	3.19	3.00	1.209	1	5	2.00	3.00	4.00
Insufficient materials for the project-based learning project implementation	3.93	4.00	1.078	1	5	4.00	4.00	5.00
Introduction of younger children in project planning and implementation	3.51	4.00	1.091	1	5	3.00	4.00	4.00
Difficulties related to monitoring and recording project results	3.42	4.00	1.121	1	5	2.00	4.00	4.00
Parents' lack of motivation to participate actively in planning and implementation of the project objectives	3.40	4.00	1.267	1	5	2.00	4.00	4.00
Difficulties related to cooperation with the local community	3.20	4.00	1.303	1	5	2.00	4.00	4.00

Majority of preschool teachers expressed a moderate attitude (“Agree”) in relation to the statements referring to difficulties such as: insufficient knowledge on the project-based learning approach, insufficient didactic materials for the project implementation, children’s age as one of the issues (especially in cases of project implementation involving younger children), having problems in the process of monitoring and recording project results, parents and members of the local community showing lack of motivation to participate actively in planning and implementation of the project activities. A special emphasis should be put on the fact that in case of the statement “Vague instructions for project planning and implementation”, preschool teachers had a neutral attitude $Md=3$, i.e. “Indecisive”. Such attitude can be explained by the fact that the implementation of the New Basics of the Curriculum and Project-based Learning Approach was conducted successively, thus not all respondents had the equal opportunity to spend the same amount of time on the implementation of the project-based learning approach in the immediate educational practice. Accordingly, they cannot assess to what extent the instructions they get are significant and clear. At this point, we should question the motivation of preschool teachers themselves for the implementation of the project-based learning approach. The results of the research conducted by [Deci and Rian \(2000\)](#), the motivation of those working in the field of education for the implementation of the project-based learning approach should actually be considered. They claim that educators often implement projects because they have been “forced” to do so and that most likely they will not take part in this process with joy and enthusiasm; they shall simply carry out orders in order to meet the project requirements. The aim of educational institutions, however, should be further development through the participants who actually implement the projects, i.e. preschool teachers ([Vojáčková, 2020](#)). Unfortunately, our research does not offer the opportunity to examine this important aspect of work, which is the motivation of preschool teachers to implement this learning model.

Considering the opinion of preschool teachers about the problems and difficulties during the implementation of the project-based learning approach, in relation to the educational level variable, in case of most statements, no statistically significant differences were noticed, except for one statement, which is “Insufficient materials for the implementation of the project-based learning approach”. Namely, the value $p=0,044$, measured using the Kruskal-Wallis test, showed a statistically significant difference, yet not showing clearly in comparison of which groups this statistically significant difference occurred, which led to conducting a subsequent Mann-Whitney Test (Table 4).

Table 4.
Mann-Whitney Test

Ranks				
	Academic level	N	Mean Rank	Sum of Ranks
Insufficient materials for the project-based learning approach implementation	Higher school for preschool teacher education	163	113.37	18478.50
	Master studies, Preschool teacher course	78	136.96	10682.50
	Total	241		
Test Statistics ^a				
	Insufficient materials for the project-based learning project implementation			
Mann-Whitney U			5112.500	
Wilcoxon W			18478.500	
Z			-2.639	
Asymp. Sig. (2-tailed)			.008	
a. Grouping Variable: academic level				

The results show that there is a statistically significant difference between the preschool teachers with completed higher school for education of preschool teachers, on one hand, and those with completed master academic studies, on the other hand. We presume that this difference, in favour of preschool teachers with completed master academic studies, occurs due to the fact that those preschool teachers are better acquainted with the project-based learning approach, thus they realize that there is a need to have various didactic materials in educational groups, in order to implement the projects in a good quality manner.

A statistically significant difference occurred for the same item "Insufficient materials for project-based learning approach implementation" between the preschool teachers with different work experience. The Kruskal-Wallis test showed a statistically significant difference in the attitudes of preschool teachers with different levels of education, $\chi^2=13.564$, for $df=4$ and $p=0.09$, whilst the value of the Mann-Whitney test was $p=0.02$, for the preschool teachers with up to 5 years of work experience, who think that insufficient materials do not represent a huge difficulty for the implementation of the projects, whilst the preschool teachers with the 20-30 years of work experience point out this as a serious difficulty in the implementation of project-based learning approach.

Conclusion

Considering the fact that project-based learning approach within the New Basics of the preschool Curriculum started to be implemented in 2019, in preschool institutions of the Republic of Serbia, the aim of this research was to examine the opinion of preschool teachers about the implementation of the project-based learning approach, with the special emphasis on its advantages and disadvantages occurring in the process of its implementation. The results showed that preschool teachers understand the benefits children have from the project-based learning approach, since they expressed moderately positive attitudes ($M=4$). Also, the respondents agreed that the project-based learning approach has positive effects on preschool teachers as well. When it comes to difficulties and problems occurring during the project implementation, preschool teachers evaluated that they do not have sufficient knowledge on the project-based learning approach, that there are problems of technical nature, such as insufficient materials, and finally, that they do not have adequate support provided by the parents and members of the local community. Preschool teachers with higher levels of education and preschool teachers with longer work experience, estimate that didactic materials are some of the more important prerequisites for the implementation of the project-based learning approach, since this item showed presence of statistically significant differences.

In spite of the research limitations (unspecified problems from the educational practice related to the implementation of the project-based learning approach, unspecified methods preschool teachers apply in planning and implementation of projects with children, appropriate sample, etc.), we consider the findings of this research relevant because they show how preschool teachers evaluate their first

experiences based on the project-based learning approach implementation.

Taking into account the significance and role of the project-based learning approach in working with preschool children, research results lead to a conclusion that it is necessary to continue working on improving the quality of project-based learning approach implementation, primarily on providing preschool teachers with adequate training and motivating them to implement this learning method. Hopefully, the above stated results shall have the capacity to initiate some new research studies.

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Author Contributions

Conceptualization, B.S., D. R. and P.Ž.; data curation, B.S., and M.D.Ž.; methodology, B.S., P. Ž. and M.D.Ž.; resources, B. S. and M.D.Ž.; formal analysis, B. S. and D.R.; validation, P. Ž.; writing—original draft preparation, B.S. and D.R.; writing—review and editing, B. S. and P.Ž. All authors have read and agreed to the published version of the manuscript.

Conflict of interests

The authors declare no conflict of interest.

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The Importance of the Digitization Process for the Promotion of Cultural Heritage of the Republic of Serbia: Empirical and Statistical Findings

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Abstract: Timely, comprehensive, and continuous protection, as well as the use and presentation of authentic tangible and intangible cultural-historical heritage of a certain area can greatly contribute to the economic, ecological and social development of the community and the strengthening of the competitive position. Digitization should relax all previously known forms of cultural expression and enable access to the broadest audience and their participation in cultural life. This paper has the ambition to contribute to a more comprehensive appreciation of the digitization process, facilitate access to digital content and motivate new thinking about the continuous improvement of the availability of movable and immovable cultural assets, as well as intangible cultural heritage. A primary questionnaire was created in order to assess the views and opinions of the citizens of the Republic of Serbia on the importance of the digitization process for the promotion of cultural heritage. The research sample was an opportunistic, convenient sampling of residents of the Republic of Serbia from all 5 regions (n=138). The importance of the digitization process for the promotion and preservation of cultural heritage has been established. Modern technologies are insufficiently represented in the promotion and preservation of cultural heritage, while this attitude is supported by a slightly higher percentage of respondents with the highest level of education. The importance of the digitization process for the promotion and preservation of cultural heritage has been proven, and respondents with the highest level of education attach the highest degree of importance to it. The greatest contribution can be seen in the preservation of the national identity and cultural diversity of the national communities, of our region, with social networks being the media that can contribute the most to the promotion of cultural heritage.

Keywords: cultural heritage, digitization, national identity, media.

Introduction

The digital revolution has changed the conventional way of acquiring images and reproducing the existing or imaginary world, leading to new forms and dimensions of reality. New approaches, through 360° technology, augmented reality (AR), mixed reality (MR) or virtual reality (VR) platforms, serve the purpose of studying, preserving, and improving the promotion of cultural heritage (Belhi et al., 2017; Siountri et al., 2019). Such an approach to digitization sets even higher standards, requiring more significant institutional and public participation of cultural heritage in the overall cultural exchange, thus contributing to the protection and preservation of cultural heritage for future generations.

The digitalization process has subjected institutional cultural memory to significant changes. The focus is on three areas: digitization of cultural assets as a technical activity, creation of digital access to cultural artifacts, as a relevant prerequisite for the entire concept of digitization, and transformation of the management process and performance of institutional work within the sector (Schilz and Rehbein, 2022). Digitization of tangible entities, as noted by Pavlidis and Koutsoudis (2022), is a process that focuses on the transformation of the real world, and its features, into a virtual world, which comes together with a typical set of rules, advantages, limitations, and possibilities. Digitization of valuable entities not only protects them in the virtual world, but opens new horizons for presentation, dissemination of knowledge, research and study, conservation, and even physical reproduction. Some authors put the relevance of storytelling along the same value plane for articulating the value and impact of digitized material that is

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preserved in cultural heritage institutions (Marsh et al., 2015).

The identification, protection and valorization of cultural and historical heritage, along with the integration and synergistic reflections of numerous related activities, can significantly strengthen the sustainable economic and ecological development of the community and contribute to strengthening the competitive position (Sančanin et al., 2023), appreciating that cultural heritage has a cohesive force to link different research activities (architectural history, geomatics, drawing and measurement, restoration, regeneration and design), thereby creating the conditions for developing tools for rapid research and multi-level readings, as well as robust procedures for interventions and recycling on different levels of built heritage (Alici et al., 2019).

Focusing on archaeoacoustic research, Dorđević et al. (2019) emphasize that the digitization of cultural heritage must systematically include acoustic heritage proving that the sound of historic sites can be explored and that it can be shown to contribute to our knowledge of past building practices. The authors suggest the development of guidelines for the digitization of acoustic heritage and its presentation through auralization, which will make the heritage available for further use.

Horvat and Živković (2010) actualize the question of copyright issues related to cultural heritage, pointing to the lack of databases or registers containing data on authors, as well as to the different approaches of institutions to digital copies. Namely, some institutions are of the opinion that digitization is a means of protecting originals, while others emphasize themselves as publishers and holders of rights to new digital editions. Digitized material that appears on the global network is free for private exploitation, or for scientific research activities, while use for commercial purposes must be paid for so that part of the funds will be used as financial support for further digitization. Peña, Jaramillo and Peña(2023) indicate that in case of cultural heritage, which consists of digital elements that need to be preserved due to their cultural value, unknowns have emerged regarding their legal protection. One of the challenges is the lack of precision on how the elements that make up heritage should be protected, which creates doubt as to how intellectual property can help resolve the identified ambiguities.

In 2011, the European Commission adopted a recommendation on digitization and online availability of cultural material and digital preservation, with the aim of optimizing the economic and cultural potential of cultural heritage via the Internet. Digitization and the provision of broader access to cultural resources offer enormous economic opportunities and is an essential condition for the further development of Europe's cultural and creative capacities and its industrial approach in this area (European Commission, 2011).

The Rulebook on closer conditions for the digitization of cultural heritage (Official Gazette of RS, 2018) defines that digitization, in the Republic of Serbia, should ensure the protection and long-term preservation of digital objects in order to ensure the availability of information on cultural heritage, the exchange of data between protection institutions, the creation of new and the addition of existing documentation on cultural heritage, followed by its promotion and presentation, as well as increasing the number of users, creating new content and introducing new services.

It is a general opinion that the spread of information and communication technologies (ICT) in cultural institutions can affect their mission and activities, reshaping their role as producers and distributors of cultural content. In this sense, Cavalieri et al. (2023) found that supply, demand, and contextual factors, throughout the territory of Italy, are significantly related to the use of ICT by museums and similar institutions.

Great Britain implemented the "Culture Online" project from 2002 to 2007 in order to provide easier access to cultural content using new technologies. Through the Icons program, intended primarily for children and young people, an Internet site about the cultural material of England was created, and already in the first year it had recorded about a million visitors (Vukićević, 2011).

Analyzing the digitalization strategies of heritage in Doha (Qatar) and Singapore, Molho (2023) recalls that new technologies trigger a more inclusive heritage discourse with numerous narratives. These cities have invested significant resources in preserving and protecting heritage and digital technology, consolidating their positions on the platform of smart, creative and culturally diverse urban centers.

There are more and more ways for cities in post-authoritarian, post-war or post-colonial countries, which have been largely damaged and significantly structured by severe physical destruction, displacement, and other traumas, to experience political and social transformation, using the past as a resource. In this context, Törnquist – Plewaa and Pietraszewski (2022) offer as an illustrative example the transformation of the Polish city of Wrocław, which after the fall of communism was transformed from a slum into an attractive neighborhood and a representation of how the local environment functions with its challenging, dissonant heritage. Namely, after the Second World War, German heritage was suppressed and the Polish authoritarian communist regime established a hegemonic and nationalist narrative for

remembering Wrocław as “always a Polish city”. Today the city is a successful example of creating a cultural heritage for a cosmopolitan, more inclusive future and an inspiration for practitioners in other cities.

However, there are also numerous examples of permanent loss of heritage. The destruction of ancient sites and monuments across the Middle East and North Africa (MENA) has prompted the international community to act to fund initiatives aimed at recording, preserving, and restoring endangered archaeological heritage across the region. These activities refer not only to large-scale destruction, but also to a more damaging and persistent form of low-level vandalism of isolated rural sites that can destroy entire heritage landscapes, especially if the loot reaches the antiquities black market (Greaves et al., 2023).

Materials and Methods

The primary survey was created to assess the views and opinions of the citizens of the Republic of Serbia on the importance of the digitization process for the promotion of the cultural heritage of the Republic of Serbia. Accordingly, the following research questions were asked:

Q1. How and to what extent are modern technologies represented in the cultural heritage plans of the Republic of Serbia?

Q2. How and to what extent is the digitization process important for the promotion of the cultural heritage of the Republic of Serbia?

Q3. What is the biggest contribution of cultural heritage digitalization?

The data was collected using a survey method via Google Forms. Participation in the survey was voluntary for the purposes of this paper and may not be used for other purposes. The research sample was opportunistic, convenient sampling of residents from each of the five regions of the Republic of Serbia. The pilot survey included 27 respondents. After the analysis of the pilot research, which involved checking the content validity of all aspects measured in this research through the prism of assessing the importance of modern technologies and digitalization of the cultural heritage of the Republic of Serbia, the final version of the questionnaire was compiled and the research was conducted on a new group of 138 respondents (n=138). Period of data collection from March 2023 to May 2023.

The questionnaire consisted of two parts. The first part consisted of general questions on gender, region, current level of education and age. In the second part, students evaluated, on a scale, the importance of the digitalization process on the promotion of cultural heritage, as well as the influence of certain social networks (1-I don't agree at all/ No input at all, 7-I completely agree/ Great contribution), the contribution of digitalization promotion for cultural heritage, and adequate representation of modern technologies in the digitalization plans of the cultural heritage of the Republic of Serbia. In order to obtain answers to the research questions, descriptive measures, measures of dispersion and measures of symmetry were calculated. Non-parametric techniques (Chi-square Test, Mann-Whitney U test, Kruskal-Wallis test) were used for hypothesis testing. Data was processed using the SPSS software package.

Results and Discussion

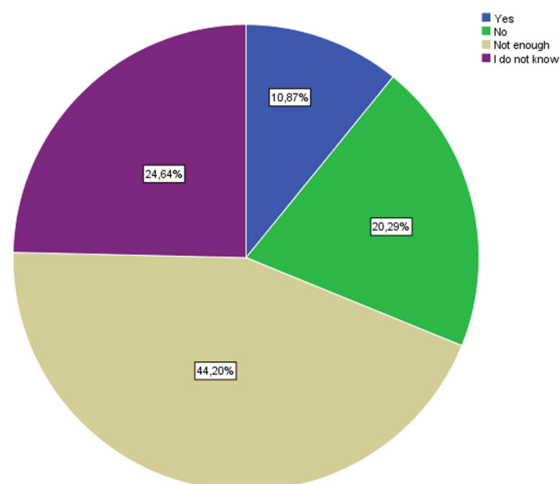
The research results are based on the “Influence of the media on the promotion of the cultural heritage of the Republic of Serbia” questionnaire. As previously stated, 138 respondents participated in the research, of which 75 (54.3%) were Male and 63 (45.7%) were Female. The average age of the respondents was 33.71 years, and the median was 27 years of age. However, we can see that the largest percentage of respondents was between 18 and 25 years of age (50%), as well as that the largest percentage of respondents had a current level of high school education (47.8%). See Table 1 for more.

Table 1
Summary of demographics

		Frequency	Percent
Gender	Male	75	54.3
	Female	63	45.7
	Total	138	100.0
Age Category	18-25	69	50.00
	26-33	8	5.80
	34-41	16	11.60
	42-49	20	14.50
	50-57	11	8.00
	58+	14	10.10
	Total	138	100.00
Region	Vojvodina	30	21.7
	Belgrade	33	23.9
	Southern and Eastern Serbia	62	44.9
	Šumadija and Western Serbia	13	9.4
	Total	138	100.0
Level of Education	High school	66	47.8
	Higher education	6	4.3
	College	40	29.0
	Magister, Master of Science	13	9.4
	Doctor of Science, PhD	13	9.4
	Total	138	100.0

Source: Authors (2023), results of primary research

Adequate representation of modern technologies in cultural heritage digitization plans according to respondents was “Not enough” for 44.2% of them, 24.6% responded with “I do not know”, 20.3% stated “No”, while 10.9% stated “Yes”.



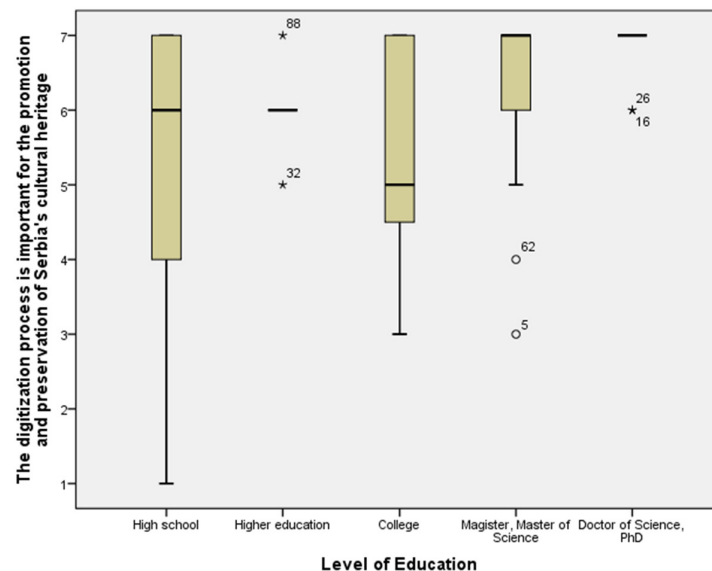
Graph 1. Representation of modern technologies within digitization plans
Source: Authors (2023), results of primary research

The Chi-square test of independence did not show a significant relationship between the attitude about the representation of modern technologies in the digitalization of cultural heritage and the gender of the respondents, $\chi^2(3, n=138)=6.625, p=0,100$, while a slightly higher percentage of female respondents, 52.4% of them, were of the “Not enough” opinion compared to 37.3% of Male respondents. In addition, 25.3% of Males had a “No attitude” opinion, compared to 14.3% of Female respondents. The “Yes” attitude was held by 14.7% of Male and 6.3% of Female respondents. In addition, the Chi-square test of independence did not show a significant relationship between the attitude about the representation of modern technologies in the digitalization of cultural heritage and the current level of education of the respondents, $\chi^2(12, n=138)=11.539, p=0,483$. What can be noticed is that the “Yes” attitude had the highest percentage of High school respondents 16.7%, the “No” answers were provided by 38.5% of Magister, Master of Science respondents, while the “Not enough” attitude had the highest percentage of Doctor of Science, PhD respondents with 61.6%. If we look at the representation of modern technologies within cultural heritage digitization plans, in relation to the age of respondents by category, respondents aged 18-25 gave an approximate percentage for each of the answers (“Yes”, “No”, “Not enough”, and “I do not know”). Respondents in the other groups gave the “Not enough” answer in a much higher percentage, about 60%.

The respondents rated the importance of the digitization process for the preservation of cultural heritage with an average score of 5.68, the median was 6 and the mode was 7, the first quartile (Q1) was 5 and the third quartile (Q3) was 7. The variable shows strong negative asymmetry (Skewness=-1.00) and relatively weak variability, the coefficient of variation was 27.17%, it its outlier data and IQR was 2. Females gave a slightly higher average score of 5.75 to the importance of the digitization process on the preservation of cultural heritage, compared to Males who give an average score of 5.63. What should be emphasized is that respondents with the Doctor of Science, PhD level of education gave a much higher average score than the other groups of respondents, namely 6.85.

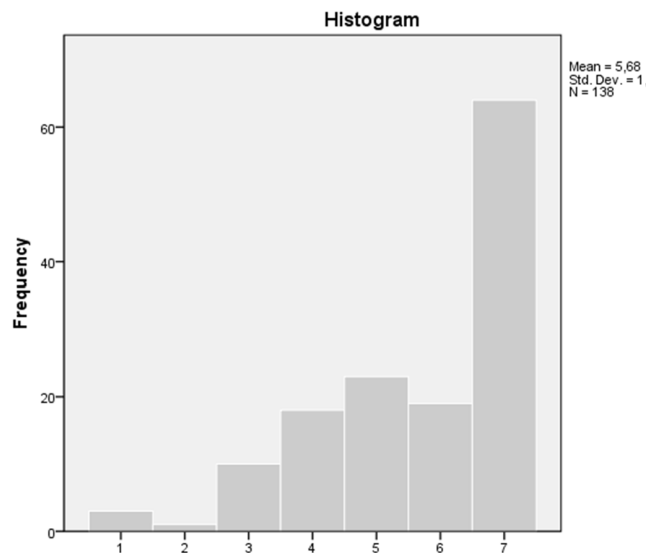
The Kruskal Wallis test revealed a statistically significant difference related to the importance of the digitization process for the preservation of cultural heritage for five groups of educational level (Gp1, n=66: High school, Gp2, n=6: Higher education, Gp3, n=40: College, Gp4, n=13: Magister, Master of Science, Gp5, n=13: Doctor of Science, PhD), $\chi^2(4, n=138)=11.611, p=0,020$. The group of respondents with the Doctor of Science, PhD degree had the highest Mean Rank.

The Mann-Whitney U test did not reveal a statistically significant difference related to the importance of the digitization process on the preservation of cultural heritage for Magister, Master of Science (Me=7.0, n=13) and Doctor of Science, PhD (Me=7.0, n=13), $U=55.500, z= -1.828, p=0.068$, however, respondents with the Doctor of Science, PhD level of education had a higher Mean Rank.



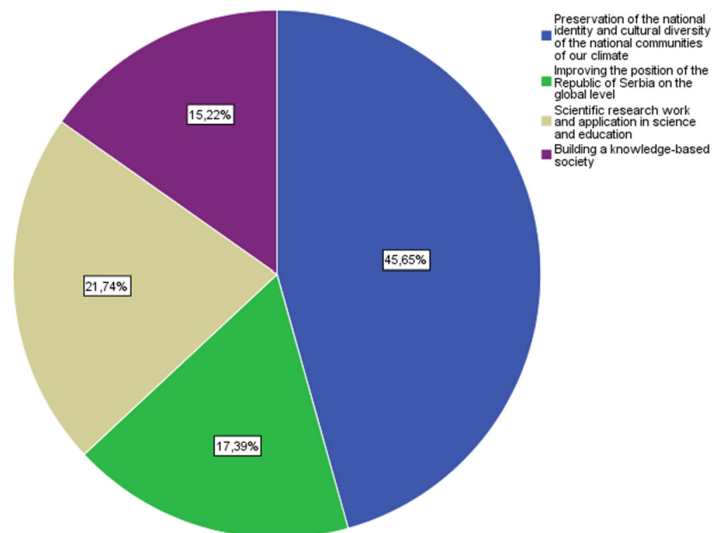
Garaph 2. The importance of the digitization process on the promotion of cultural heritage in relation to the degree of education

Source: Authors (2023), results of primary research



Graph 3. The importance of the digitization process on the promotion of cultural heritage
Source: Authors (2023), results of primary research

Digitization of cultural heritage, according to respondents, can contribute the most to “Preservation of the national identity and cultural diversity of the national communities of our climate”, which is supported by 45.65% of respondents, all other reasons are represented in an approximate percentage. If we look at the contributions in relation to the current level of education of the respondents and the region in which they live, 69.2% of the respondents with the level of education Doctor of Science, PhD, as well as 53.8%, respondents from the region of Šumadija and Western Serbia think that it is “Preservation of the national identity and cultural diversity of the national communities of our climate”, while other groups of respondents estimate this item with around 45%. The highest percentage, 23.1% for the item “Building a knowledge-based society” was also given by the group of respondents with the level of education Doctor of Science, PhD, the group of respondents from the region of Sumadija and Western Serbia, and a slightly higher percentage of Female respondents 17.5% compared to Male 13.3 % respondents.



Graph 4. Contribution of digitization of cultural heritage
Source: Authors (2023), results of primary research

“Social networks” (66.7%), followed by “TV” (26.8%), “Printed media” 4.3% and “Radio” 2.2% have the greatest contribution to the promotion of cultural heritage. Respondents with a lower level of education (High school and Higher education), in a higher percentage of about 80%, think that “Social networks have a greater contribution to the promotion of cultural heritage than other media”, while respondents with higher levels of education estimate the importance of Social networks compared to other media at about

50 %. Respondents with a Magister, Master of Science and Doctor of Science, PhD level of education give greater importance to Printed media's contribution to promotion with about 8% compared to respondents with a lower level of education.

The Chi-square test of independence showed a significant relationship between the type of media that contributes to the promotion of cultural heritage and the region where the respondents live, $\chi^2(9, n=138)=21.008, p=0,013$. The value of Cramer's V was 0.225, so we can say that the influence is medium (R-1/K-1 is 3 (four categories)) (Gravetter and Wallnau, 2004, 2012). The values in the Adjusted Residual cell (in the SPSS report) for respondents from Belgrade and "TV", as well as for respondents from Southern and Eastern Serbia and "Social networks" are greater than 2 and amount to 3.2 and 2.4 respectively, which indicates that the number of cases is significantly higher than expected, while the values in the Adjusted Residual cells for respondents from Belgrade and "Social networks", as well as for respondents from Southern and Eastern Serbia and "TV" are less than -2 and amount to -2.1 and -3.7 respectively, which indicates that the number of cases is significantly lower than expected.

Table 2
Crosstab

			Which of the above, in your opinion, contributes the most to the promotion of cultural heritage				Total
			Printed media	Radio	TV	Social networks	
Region	Vojvodina	Count	2	0	10	18	30
		% within Region	6,7%	,0%	33,3%	60,0%	100,0%
		Adjusted Residual	,7	-,9	,9	-,9	
Belgrade	Belgrade	Count	0	0	16	17	33
		% within Region	,0%	,0%	48,5%	51,5%	100,0%
		Adjusted Residual	-1,4	-1,0	3,2	-2,1	
Southern and Eastern Serbia	Southern and Eastern Serbia	Count	4	3	7	48	62
		% within Region	6,5%	4,8%	11,3%	77,4%	100,0%
		Adjusted Residual	1,1	1,9	-3,7	2,4	
Šumadije and Western Serbia	Šumadije and Western Serbia	Count	0	0	4	9	13
		% within Region	,0%	,0%	30,8%	69,2%	100,0%
		Adjusted Residual	-,8	-,6	,3	,2	
Total	Total	Count	6	3	37	92	138
		% within Region	4,3%	2,2%	26,8%	66,7%	100,0%

Source: Authors (2023), results of primary research

Conclusions

Despite the unequivocal recognition of the numerous and diverse benefits of digitization such as the preservation, accessibility and presentation of cultural heritage, the results of this research show that modern technologies are insufficiently represented in plans for the digitization of cultural heritage. This attitude is held by a slightly higher percentage of respondents with the highest level of education, i.e., Doctor of Science, PhD. Respondents aged 25+ are also more knowledgeable about the representation of modern technologies within cultural heritage digitization plans. The importance of the digitization process for the promotion and preservation of cultural heritage has been proven, and respondents with the degree of education - Doctor of Science, PhD, attach the highest degree of importance. The implications of the research results are presented through the key contribution of the digitalization of cultural heritage, i.e., through the visualization of the continuous process of preserving national identity, as well as through the cultural diversity of the national communities of our region. However, respondents with the highest level of education also see great importance in building a society based on knowledge. The media that can contribute the most to the promotion of cultural heritage are social networks. Digitization of cultural

heritage remains a significant issue for every segment of the entire cultural heritage sector. It is important to point out that it is essential that with the increase in the volume of digitized heritage, institutions that deal with cultural heritage should actively participate in the establishment of quality standards for digitized content, and the reasons can most often be detected in the growing demand of various interested parties: researchers, educators, the culture sector, as well as the IT sector. Cultural institutions face great challenges and opportunities in implementing a wide range of artificial intelligence methods and tools, while respecting legislative and ethical limitations.

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Author Contributions

Conceptualization, B.S. and A.P; methodology, B.S. and A.P; software B.S. and A.P.; formal analysis B.S. and A.P; validation, B.S. and A.P; writing—original draft preparation, B.S. and A.P; writing—review and editing, B.S. and A.P. All authors have read and agreed to the published version of the manuscript.

Conflict of interests

The authors declare no conflict of interest.

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Cyber-victimization and Its Impact on Victim's Psychosomatic Status

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Abstract: Cyberbullying is an important issue to discuss and investigate. This study is a theoretical and empirical research aimed at proving cyber-victimization's negative impact on psychosomatic health. A direct relationship between these two phenomena is that poor mood regulation in childhood entails dissatisfaction with surrounding world causing rage against weaker peers, victimization, which affects victims' psychosomatic status. Methods used are literature analysis for the research and empirical part assessing aggressiveness in children (Buss-Darkey Inventory), their emotional state and psychosomatic health problems caused by victimization (authors' questionnaire). As a result young victims' psychosocial problems are seen as having negative consequences in later life. Because of these consequences, bullying becomes a hot topic and causes researchers, parents', as well as school teachers and school psychologists' concern. Cyberbullying will continue as long as electronic gadgets and communication devices are plugged in and used which is becoming an increasing problem due to dissemination of information, telecommunication technologies and the involvement of children and adolescents in the widespread digitalization of various spheres of life. In conclusion we recommend teachers and parents to develop understanding of cybervictimization, besides to pay attention to their children's emotional intelligence development that should help them resist victimization and avoid health problems.

Keywords: victimization, bullying, cyber attack, violence model, cyber-bullying model, motivation, aggressive personality, cyberspace aggression, cyber-victimization.

Introduction

School bullying is defiant behavior initiated by one or more individuals against a victim, verbal or physical abuse, bullying and humiliation. Although the name suggests a specific location, bullying can take place anywhere (school, schoolyard, park, street, etc.). In addition to the direct participants in bullying, there are also passive (or active) witnesses of bullying who either take sides or simply observe the process. Many studies identify witnesses as important contributors to bullying and cyberbullying incidents (Salmivalli, 2014), which can worsen or improve the victim's situation by supporting or alleviating their suffering (Pepler, Craig, and O'Connell, 2010, pp. 249). It has been proven that witnesses react negatively to victims who post too much personal information and brag about their achievements (Schacter, Greenberg and Juvonen, 2016). Also evidence exists that adolescents tend to overestimate the salvific help of witnesses, who, as a rule, are wary of being in the position of a victim or of lowering their status in a social group, so they always support the strongest or prefer not to interfere. An important fact is that schools with no bullying are characterized by cohesion and a variety of extra-curricular forms of interaction between students. "Not only an active social life, but also the atmosphere of openness, the possibility of clarifying conflicts under the guidance of a caring teacher - these are the conditions for resisting bullying" (Lane, 2001, pp. 240-274).

The well-being of citizens is recognized as an important indicator of a country's development. In many countries, various aspects of children and adolescents' well-being - from psychosomatic health to children's rights respect - are becoming the focus and goals of government's social and educational policies. Particularly often discussed is the ways children and adolescents' well-being is being influenced by digital technologies spread that has fundamentally changed life in the 21st century. Modern life is

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inconceivable without electronic gadgets and telecommunication devices. However, it is obvious that children and adolescents are most vulnerable to the risks associated with the digital technologies' negative impact. Computer games, social networks and telecommunication gadgets are often blamed for impairing children's psychological well-being, for putting in jeopardy their somatic and psychological health, and interfering with learning and communication.

At the same time, there are not enough scientific studies that would unmask digital technologies influence on children and adolescents' psychosomatic condition. The results of the present research are contradictory and topical. In our study we analyze digitalization's major impact on various aspects of children and adolescents' psychosomatics. Modern digital technologies offer various opportunities, from distant learning at the world's best universities to searching for information that can help protect a person's health, safety and rights. But mainly children from well-to-do and educated families can benefit from these opportunities. Others, even if they would like to use the Internet, they may not have the necessary equipment or skills to use advantages of modern technologies. The problem is due to the easy and fast access to the Internet and other information technologies.

It should also be noted that the Internet and social media is a space where children face age-specific problems that they also face in real life. Therefore, in matters of listing Internet threats and offering means for their prevention, both increasing digital literacy and systematic support of children and adolescents in solving the classic problems of uncertainty about the future, unstable self-esteem, seeking recognition, dissatisfaction with oneself, etc. are important.

A variety of research works are devoted to different aspects of cyberbullying and cyber-victimization: "these are gender-age, social activities, life-style and sexual inclinations" (Frolova and Senina, 2005; Shalaginova, Kulikova and Cherkasova, 2014; Soloviev, 2012; Soloviev, 2015; Zvereva, 2008). The conclusion of these studies is that cyberbullying is based on images of sexual humiliation, death threats, and highlighting teens' external flaws or mental abilities.

Numerous studies have defined cyberbullying as a deliberate and aggressive act carried out via electronic media. Cybervictimization is mainly related to the misuse of digital devices and gadgets such as mobile phones (text messages, calls) or the Internet (instant messaging, gaming sites, social networking sites, email, chat rooms). It is a real problem that adolescents' Internet activities are not controlled by parents or other adults. Disguised, unnoticed cyberbullying leads to dire consequences - at the worst - to adolescent suicidal behavior, but it also destroys a constructive, development-oriented and creative atmosphere of cooperation and trust in other people. Among the main consequences of cyberbullying there is a suicidal behavior, the development of depressive and anxiety states, self-injury, psychoactive substances intake, psychosomatic symptoms, the development of anorexia, bulimia, insomnia as a result of decreased self-esteem due to bullying. Recipients also report higher levels of internalizing, cognitive and motor impulsiveness and emotional dysfunction. Alexithymia is also possible.

Traumatic experience and childhood abuse were found to contribute to psychopathological problems and dissociative symptoms (Zych et al., 2017; Chang, et al., 2019; John et al., 2018; Pozzoli and Gini, 2020). It was also concluded that the time the cyber attack lasts matters causing more serious impact, especially symptoms associated with sleeplessness, decreased immunity, frequent and severe headaches, eating disorders, or attention deficit. Added to this, conflicts with parents, with other students or teachers at school, emotional and mental disorders are also the symptoms. Increased anxiety, unreasonable anger, experienced loneliness, frustration, and deep depression are often highlighted as results of cyber-victimization. Some studies have found emerging mental health issues: negative body image, problems with mood swings. Narcotic substances intake, theft, hooliganism, self-injury, harm and rule breaking were found among external behavioral problems.

While cyberbullying seriously affects children and adolescents' psychological health, there are a number of factors that can reduce this impact. Overall satisfaction with life, friendly family relationships (as compared to satisfaction from socializing with classmates or academic achievement) reduce the likelihood of suicidal thoughts and intentions. A factor that reduces the risk of suicidal behavior in cyberbullying victims is the experience of belonging to a school, a peer group, and their social support (Grebentkin, 2006).

The contemporary research of children and adolescents' cyberspace aggression remains amazingly high due to the ongoing increase of digital communication rates, social media development and new interaction formats and the socialization via digital devices peculiarities. It should be mentioned that information technology development has changed modern society life as a whole and communication in particular.

Unfortunately, such changes affect people not only in a positive way, but also negatively. Due to its anonymity the Internet provides virtual interaction as a free choice of social roles and activities. This

type of communication is unsafe and can damage the children and adolescents' psychological health, thus contributing to some psychosomatic issues. Analyzing aggressive and destructive behavior in the Internet, we can find it relevant "to an excessive self-disclosure in social networks and posting extremely frank, provocative content, an increased interest in the details of personal lives of others, but a surprisingly low level of friendly support, negative family impact and sexual violence" (Volkova, 2008). One of the dangers of online communication is the ever-increasing cyberbullying and cybervictimization. "When new computer technologies and social networks have entered our life, school bullying has evolved into a completely new and sophisticated form of abuse in cyberspace" (Audmaier, 2016). This concept was first defined as "the use of information and communication technologies to support repeated hostile behavior aimed at a person or group of people with the purpose of insulting and humiliating (verbal aggression)" (Belsey, 2019). Since then, cyberbullying and cybervictimization definitions have changed dramatically, getting more aggressive and sophisticated due to technology development and improvement, and it is usually aimed at people who cannot confront insult or withstand attacks. Analyzing different definitions found in the studies it is easy to formulate differences between cyber-victimization and traditional bullying: while traditional bullying (sometimes called a school-yard bullying) implies direct contacts between a bully and a victim which can end up in a physical violence, all actions aimed at a person in cyberbullying take place in virtual space anonymously, never get physical and is always disseminated across the cyberspace within incredibly short time. If a teenager can hide in the safety of a house and escape ordinary school bullying, there is no escape from cyberbullying that exists everywhere, where any electronic device or gadget is connected to the Internet. But this difference is by no means the only one, and others relate not to the victim, but to the bully. In the virtual space, a teenager can choose any social role; it becomes possible to create an alternative "image of oneself". In addition, the real personality can be deformed, as a result of which teenagers cease to be themselves, to feel responsibility for their actions in front of other people or in their own eyes.

In most cases, cyberbullying is still associated with bullying at school; however, the distinctive features of each of these aggression forms must be recognized. With the Internet aggression, a bully can be a complete stranger or distant acquaintance, compromising photos or pictures can be easily copied and disseminated (thereby increasing the ability to cause harm even after the aggressor has ceased his activities), and the victim cannot hide from the attack (without stopping the use of the network Internet, getting in social isolation). However, the victim is often at a physical distance from the attacker during the attack, which can also affect the perception of the severity of violence.

Surveys of adolescents in many countries (Gaffney and Farrington, 2018; Herrera-López, Romera and Ortega-Ruiz, 2018; Riddell, Pepler and Craig, 2018) show that cyberbullying is a fairly common form of interpersonal communication and a form of virtual extremism in today's youth world. Its intensity varies depending on a number of demographic characteristics (gender, age, race, religion, ethnicity, sexuality) that are important for researching the problem and for developing preventive measures and recommendations. Adolescents with behavior deviations are characterized by high personal inclusiveness, overestimated self-esteem, lack of criticism, while adults (parents and teachers) do not pay enough attention to such acts of misbehavior and often evaluate the deviant behavior as "growing up" issues and a manifestation of adulthood. Most often, juvenile delinquency is directed against peers, in many countries of the world it is characterized as a violation of the individual's rights and safety, that is, some kind of punishment is supposed. Take Germany for example, the Parliament of the country adopted a law against cyber aggression in 2015; according to this law unified standards of counteractions against cyber victimization were introduced. Violators of this law can get as long as two years of imprisonment.

Cyberbullying is also related to antisocial aggression caused by grudge against more socially adapted and successful peers, and it appears as an unfriendly manifestation towards classmates. Less successful adolescents use aggressive behavior to avoid emotional dependence, do not trust anyone or feel guilty for their misbehavior or have internal restrictions; usually they believe in external restrictions and administrative punishment. Such adolescents act almost to their own detriment, as they fall under the strict authoritative control. Many countries follow Germany's example and adopt legislation to combat cyber-aggression and to prevent cyber-victimization development.

Like other forms of violent behavior, cyberbullying is associated with human relationships, power and control. Those who mock others, try to establish power and control over the "weaker" ones, want their victims to feel insecure, to lower their self-esteem, to begin to doubt their adequacy, "thereby shifting the locus of control, attributing to victims responsibility for the contretemps that happen to them" (Kondakov and Nilopets, 1995).

Cyberbullying differs from other forms of bullying in many ways: while ordinary school bullying is something that often goes unnoticed by adults and is perceived by them as a part of the growing up process,

the so-called "school of life", cyberbullying is becoming an integral part of today's life for young people who are a generation that is "always in touch", so cyberbullying is felt most acutely. A new generation of electronic communications users is increasingly communicating in ways that are unknown to adults and are away from their supervision. Cyberbullying is also different in that it is a particular form of aggression, since it is easy for bullies to hide behind the anonymity that the Internet provides. Cyber bullies can deliver their offensive messages to a very wide audience at astonishing speed. Most importantly, cyberbullying does not provide any tangible feedback on the consequences of using information technology to intimidate others, so bullies do not see the suffering of their victims, do not feel empathy, regret or remorse. Cyber hooligans may not admit their actions, since it is usually very difficult to identify where the message has come from (they use fake accounts and nicknames), so they are not afraid of the consequences and punishment for their actions. Unlike regular school bullying, cyberbullying is often out of the reach of school administrators, as aggressive behavior often occurs outside school, messages coming to students' personal computers or through mobile phones.

Accordingly, the recent boom in the use of Smartphones, social media, online multiplayer gaming and chatting by young people has not only opened up new places for social interaction and communication, but also a space dominated by violence and aggression that victimizes children and adolescents. It is a new virtual space that breaks down the old boundaries of family and community that might have protected teens from aggression in the past. Global electronic communications have not created new psychological threats, but they have made it much more difficult to protect adolescents from risks, as a result of which many of them are exposed to blackmail, psychological pressure, humiliation, which only a few children could face in life before. Now it's not just teenagers left to their own devices and raised in the street or influenced by bad guys, they can be abused and bullied without even leaving the comfort of their homes. "Virtual" bad company is easily accessible to most children and young people.

In the studies carried out by Russian and European researchers, aggressive behavior usually is aimed at causing harm (physical or moral) to another person. Violence involves not only actions, but also the intention to harm physically or verbally. With technological progress it is impossible to define aggression monosemantically as today it includes many different types of behavior that do not correspond to the generally accepted meaning of violence. Definitely, we should consider physical aggression first as it varies from brawl to serious assault and even murder, but verbal aggression is no less serious as it can cause moral and emotional problems in victims, most of them in the long run. In our study, "violent behavior" is not to describe physical aggression that has a significant risk of causing serious injury to the victim, since we focus primarily on cyberbullying as the most dangerous and wide-spread form of violence, as there is no shelter to hide from it. Despite the fact that Internet bullies cannot physically harm the victim, cyber-victimization can be accompanied by significant psychological or psychosomatic consequences, many of them will stay with the victim in the long term. With regard to the subject of our research, the following factors of the cyberbullying phenomenon can be distinguished: a) the child's propensity for aggression (for example, instability, moral promiscuity, etc.); b) previous experience of bullying (stressors); c) constraints associated with cyberspace (for example, the strength of the virtual disinhibition effect and technological efficiency); d) parenting factors (for example, relationships with parents, monitoring of interaction technologies).

Cyberbullying involves verbal abuse and manipulation, but online insults and rumors are also considered. Violent acts are rarely the result of one cause; rather, many factors contribute to deviant behavior. Accordingly, media impact can be considered as one of the factors that impact cyber aggression and cyber victimization growth and spreading. We will not argue that the violence that teens see in the media (movies with violent content, video games with violent scenes, abuse and harassment in the reality shows) is the direct cause of teens' violent behavior online and in real life. However, research on violence in the media and games shows that online violence reinforces existing aggression. Violence in the media is perceived differently by different researchers. Likewise, there is no common definition in public opinion of what aggressive and violent behavior on the Internet might be. However, most researchers have a clear understanding of what media violence and violent behavior is in online games (Berkowitz, 2001). Most of them define violence in the media as a visual depiction of physical aggression acts by one person or group of people towards others (Maltseva, 2009, pp. 11). This definition appeared as consequences theories of media violence developed, and now it is an attempt to describe the type of violence that causes the viewer to be more violent, not only online, but also in everyday life. "Bullying on the Internet, even for adults with good self-esteem, is not an easy trial. It is important for parents to understand that this is not some kind of mythical threat, but absolutely real. Indeed, for a modern child, the telephone and social networks are real life, an analogue of a courtyard company of friends, where everything is in plain sight. It is impossible to deprive a child of communication in social networks, but it is important to control and limit

this communication, protecting a child" (Malkina-Pykh, 2006).

The theoretical approaches refer to biological processes in explaining aggression by emphasizing psychological mechanisms involved in any aggressive behavior. It should be noted, however, that the earliest trend in the theoretical development of this tradition - the psychoanalytic interpretation of aggression according to Z. Freud - was also based on a biological approach, understanding aggressive behavior as an expression of a genetically rooted instinct. Aggression is seen by Sigmund Freud as a reaction to blocking or destructing of libidinal impulses; aggressive behavior is not only innate, originating from the death instinct built-in into a person's consciousness, but aggression is also inevitable, because if the "death drive" is not turned outward, it will soon lead to personality destruction. Freud's metapsychology (Freud, 2021) includes topographic, dynamic, structural, genetic, economic and adaptive approaches.

Aggression is understood very broadly in psychoanalytic literature. It can involve physical or verbal action; conscious or unconscious desires of tension, a specific type of psychic energy and the idea of the death instinct (Storr, 1969, pp. 97). The theory of aggression by Z. Freud and K. Lorenz is built on the idea of aggression as an instinct that was originally inherent in biological species; it ultimately finds a definite expression in the verbal or physical aggression of a human being. Both Z. Freud and K. Lorenz came to the conclusion that in case aggression does not find a way out, it will lead to tragic consequences. But that was the only point they agreed on. In other respects, their views seem to be the opposite. Z. Freud declared the theory of aggression as the instinct of destruction doctrine while K. Lorenz considered such a theory unacceptable from the biological viewpoint, since he believed aggression as an instinct serves the cause of life, while Z. Freud considered it as the "service of death".

Their disagreement disappears when K. Lorenz talks about the initial function of aggression in species-preserving during the evolutionary process. "K. Lorenz is trying to substantiate and strengthen his hypothesis that a person's defensive aggression turns into a constantly acting and self-developing intention, which makes him seek and find conditions for relaxation, or leads to an explosion if there is no way to find a suitable stimulus" (Fromm, 2021). According to Fromm if there are no suitable causative agents of serious manifestations of aggression in socio-economic structure, the pressure of the instinct is so strong that a human being is forced to change social conditions, if they don't or can't it might lead to unexpected and inevitable violence outbursts and unreasonable aggression manifestations. K. Lorenz (Lorenz, 1994) believes that a thirst for destruction drives a person through life; this viewpoint actually coincides with Z. Freud's ideas about aggression and death (Fromm, 2021) with one discrepancy: according to Z. Freud, the passion for destruction opposes sexuality and life in general, while K. Lorenz believes in love as the result of aggressive drives.

Materials and Methods

As a research method, a theoretical analysis of researchers' articles and books (more than 100 sources) found in electronic libraries ScienceDirect, Jstor, Springer, Cyberleninka, SAGE etc., mostly for the last 5 years was carried out. Emphasis was made to search for articles and books describing original research using author's methods of research and models of aggression, violence, cybervictimization and victims of cyberbullying psychosomatic problems. The theoretical review was to generalize the results of previous research in Western scientific thought on the topic of cyberbullying and victimization, to identify the links between the studied phenomena, and to systematize consistent or contradictory data. The term "victimity" means realized or potential predisposition, the ability to become a victim crime under certain circumstances, or avoid danger where it is objectively preventable due to objective and subjective circumstances. In other words, the victimization of a person is made up of personal and situational components that are interconnected and interdependent. In addition, there is a general victimization, depending on social, role, gender, age characteristics of the individual, and special, implemented in attitudes, properties and attributions of the personality. Victimization is divided into eventual, i.e. random, causal an investigative complex of factors under certain conditions to become a victim of criminal encroachment, i.e. the ability to become a victim as a result of making a victimogenic decision and/or victimizing activity.

The authors' questionnaire on cyberbullying designed for sociodemographic variable recipients and describing its consequences, diagnostics of the state of aggression (Buss-Darkey questionnaire), emotions test (Buss-Darkey test modified by G. Rezapkina) were used as methods assessment and evaluation in the study that involved 151 people (118 females and 33 males) - schoolchildren of secondary schools and students of secondary vocational education (University level). In our survey (2021-2022), 93% of adolescents who experienced cyber-victimization before believe that the experience negatively

affected them (e.g., “caused depression and/or self-doubt, unwillingness to socialize with peers”). To further complicate the measurement of this phenomenon, we considered the time during which the respondent experienced cyberbullying (during certain periods of time, for 2-3 months for 5 years or for 2-3 weeks). As with any new psychological phenomena rapidly developing, researchers have not yet established a standard accepted method or measuring tool. Instead, each research group independently develops its own survey instrument to assess teen cyberbullying and the victimization it causes. As a basis, we took the traditional Olvæus-Likert scale, “a psychometric scale developed by R. Likert in 1932 (a scoring scale for each individual item)” (Wuensch, 2009). For the study, we have chosen the following definitions of cyberbullying that include not only a computer, but also other means of communication, have suggested the regularity of bullying (for example, at least once or twice in the last few months), and estimated approximately 2- 3 month time period of bullying. We have considered cyberbullying in a modern digital society as a threat to the psychological well-being of all the participants. The statements in the questionnaire were consistent, simple in wording, unambiguous for perception. However, the novelty of constructing such a scale for cyberbullying and the ability of even one incident to cause noticeable discomfort and / or deterioration in the psychological or psychosomatic condition of the respondent led to the fact that we used less stringent assessment criteria (i.e. requiring that bullying or victimization take place at least 2-3 times a month for categorization). Nevertheless in the research the types and key indicators of cybervictimization have been identified.

Results

“Although cyberbullying is a new and notorious social phenomenon, much of the research has its roots in the traditional research on school bullying. The current focus of our study was the demographic characteristics of those who were engaged in cyberbullying. In particular, we assumed that the degree of cyber participation would differ depending on age, gender, and personality characteristics previously identified and described” (Makarova, Makarova and Makhrina, 2016). Extensive research has identified gender differences in aggressive behavior. Male respondents are more likely to be perpetrators and victims of direct forms of bullying (e.g. physical bullying), female respondents are more likely to engage in verbal and social forms of bullying (spreading rumors, arranging social isolation, boycott or socializing restrictions). Based on these patterns and the fact that innovative communication technologies enable verbal and social aggression, we hypothesized that girls are more likely to be the victim than the aggressor in cyberbullying, thus getting more psychosomatic problems as a result. While most studies did not find gender differences—girls and boys are equally likely to be both victims and perpetrators—our study found gender differences that differ by type of involvement (for example, boys are more likely to become cyberbullies, while girls are more likely to become victims of cyberbullying). The survey revealed that the number of girls in grades 6-8 was disproportionate in the sections of victims and bullies. Our results (Figure 1 and Figure 2) also show a discrepancy between the final data, which was difficult to explain.

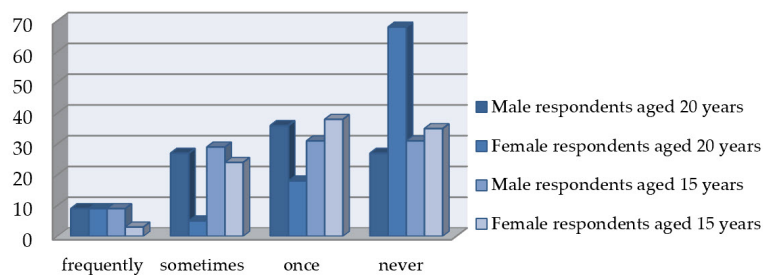


Figure 1. Frequency of cyberbullying experiences by male and female respondents

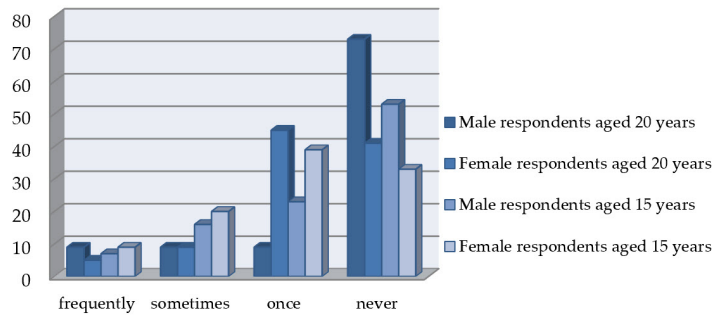


Figure 2. Frequency of psychosomatic problems male and female respondents have as cyberbullying victims

However, these results indicate that gender differences may in particular be caused by age - gender differences disappear among the older adolescents surveyed. Age is another demographic variable that has been extensively studied in bullying and victimization studies. There is an opinion that bullying gradually decreases with the age, the highest level of participation was registered among secondary school students (i.e. ages 10-14). Physical forms of bullying typically decrease as adolescents gain verbal and cognitive skills. Bullying, however, does not disappear, but rather becomes more subtle and difficult to detect, as in the case of social bullying or cyberbullying, so the trends in traditional bullying most likely reflect not only an increased tendency for young children to bully peers, but also problems with self-identification, measuring the degree of bullying and defining the boundaries of what is permitted. Therefore, it is not surprising that the age trend for cyberbullying is exactly the opposite of what researchers have already found in traditional bullying. Studies have shown that the participation of adolescents in cyberbullying tends to increase with age. This difference may reflect not only the accessibility of communication technologies during adolescence, but also the difference in how the dynamics of the need for self-assertion are revealed. In addition, the older adolescents are, the more willingly they report their participation in cyberbullying: 8% in 7th grade, 12% in 8th and 9th grades, 23% in 10th and 11th grades.

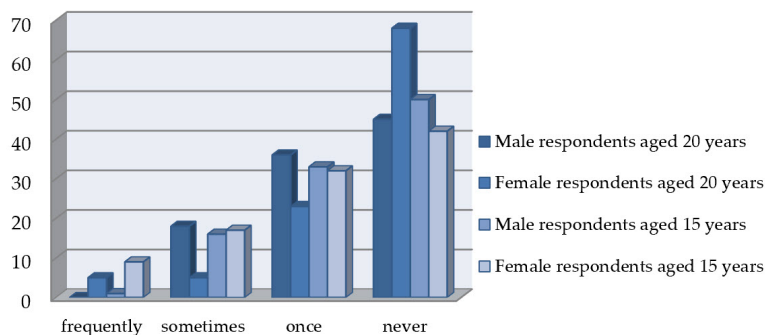


Figure 3. Frequency of psychosomatic problems male and female respondents have as cyberbullying victims

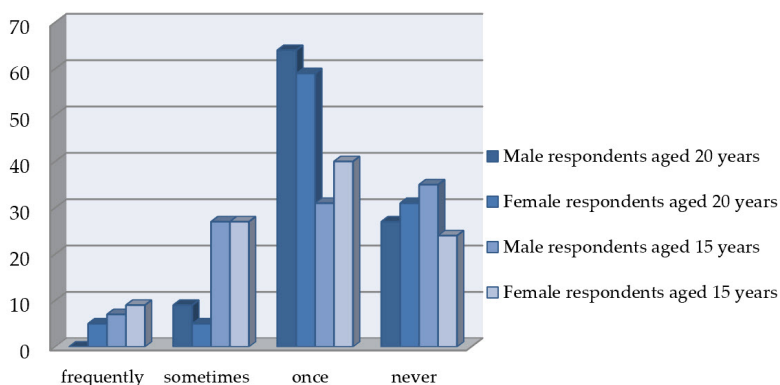


Figure 4. Frequency of psychosomatic problems male and female respondents have as cyberbullying victims

Our study shows that cyberbullying and cybervictimization are the cause of a number of psychological, social, somatic and behavioral problems and disorders. Victims often report symptoms of depression, fear, social anxiety, and suicidal ideation. They tend to suffer from low self-esteem and have negative image not only of themselves, but also of their peers, socialization in general and friendships in particular. Bullying is also associated with external behavior disorder (e.g., deviant and delinquent behavior), internalization of distress (e.g., depression, suicidal attempts etc.) In addition, victims of bullying have a reduced ability to empathize, especially express emotional empathy, which may be caused by frequent and non-random physical and socio-psychological bullying. Not surprisingly, new evidence suggests that cyberbullying is associated with significant stress and emotional discomfort. It turned out that victims of the Internet aggression, regardless of gender and age, were 2.5 times more likely to show depressive symptoms. Personal self-esteem also suffers, with 35% respondents reporting low self-esteem. According to a schoolchildren's survey, adolescent delinquent or deviant behavior, depressive symptoms and suicidal attempts, addictions and chemical substance intake are directly associated with cyberbullying. Moreover, as acts of bullying become more frequent, the aggravation and intensity of the youth's psychosocial, psychosomatic and behavioral deviations increase. This finding is consistent with the data presented that the frequency of traditional bullying in school is associated with mental health problems; to these we can add depression, anxiety, psychosomatic symptoms, alcohol and psychoactive substances consumption, and suicidal behavior. In addition, the history of cyberbullying research is still very young, so the important variables previously identified in traditional bullying (anxiety, self-esteem, lack of empathy) are not yet sufficiently explored in cyberbullying victims.

Discussions

Modern adolescents are worried about many issues - rapid physiological growth, puberty, professional self-determination, the desire to be happy in their personal life, and many others. Often, adolescents are not aware of their goals and desires, and therefore, a feeling of anxiety, emptiness, and fear of communication, hostility, and dissatisfaction with oneself may emerge (Mukhina, 2004). Adolescence is becoming a key issue in terms of relationships with people around them.

Moreover, a developmental forecast is necessary for comprehending how violence in media causes adolescents' behavior, also for recommending how to prevent risks and cope with adjacent problems. Not necessarily all aggressive children with antisocial behavior become violent when they grow up. However, "recent studies showed that adolescents and adults with serious abuse problems often were very aggressive and even abusive in their childhood" (Vorobieva, 2008, pp. 48). The best, though not the only, predictor of aggressive behavior in adolescents and even adults is aggressive behavior in childhood. Thus, anything that contributes to the aggressive behavior of young children is statistically a risk factor for the formation of violent behavior in adults (Figure 5).

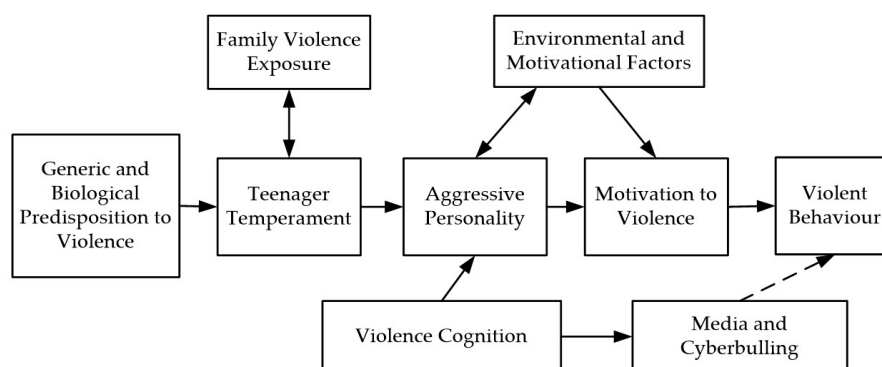


Figure 5. Cyberbullying and Violence Model

"Cyberbullying is a phenomenon in which people with certain psychological characteristics are involved" (Glazman, 2009, pp. 159). It is customary to distinguish three roles in this process: an aggressor (bully), a victim and observers (witnesses). Character traits of all participants of the process are: "a persecutor is an impulsive person who wants to dominate, has leader's skills, demonstrates aggression, does not feel

remorse or compassion for people” (Makarova, Makarova and Makhrina, 2016, pp. 293), family violence can contribute greatly for aggressive behavior in adolescents with these character traits. The victims, on the contrary, demonstrate shy, anxious disposition, they are prone to tears, uncommunicative, have inferiority complex, feel dependence on circumstances and surrounding people. Various demographic characteristics (Figure 6) such as gender, age, ethnicity, religion and income level can be predictors of emotional maladjustment; a wide range of personality characteristics - from introversion to intelligence level - can also be used to predict the behavior of victims of cyber-victimization. As for the observers, they often feel fear, helplessness and at the same time they usually support the persecutor as they are afraid of becoming a victim, so they take the side of the strongest, etc.

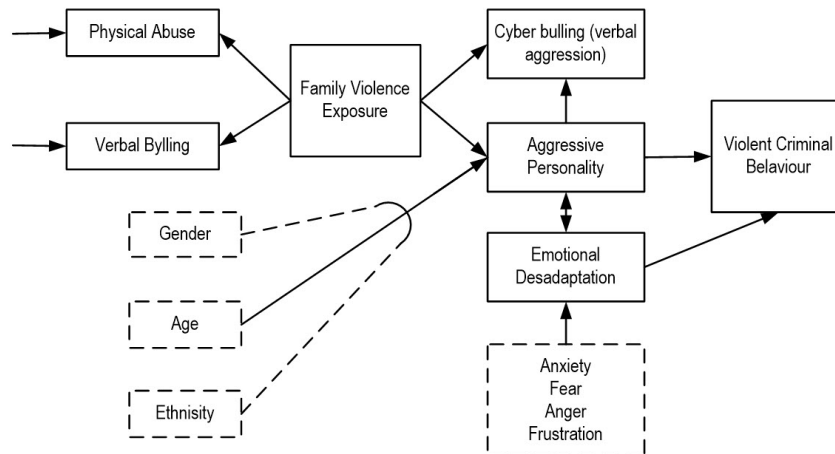


Figure 6. Elements of Cyberbullying Model

According to a meta-analysis of several studies, cyberbullying and victimization rates differ depending on these phenomena definitions. Overall, most studies on cyberbullying show adolescent prevalence and engagement rates between 10% and 40%, with 15% of the same adolescents being cyber-victimized. Unlike traditional bullying, cyberbullying poses particular challenges to prevention and intervention due to Internet unique features such as “complete anonymity, rapid social dissemination, and increased free access to a victim’s account” (Romera et al., 2017, pp. 1184). Thus, cyberbullying experiences are invariably associated with a wide range of negative consequences. For example, young people who experienced cyberbullying in childhood have significantly higher rates of psychosomatic problems (Beckman, Hagquist and Hellström, 2012), higher levels of depression symptoms (Nixon, 2014), a higher level of anxiety (Sontag et al. 2011), lower self-esteem (O’Brie and Moules, 2013), and even higher levels of suicidal thoughts and attempts (Gini and Espelage, 2014). In addition, the consequences of cyber-victimization negatively affect the emotional state of victims and their ability to socially adapt (Elipe et al., 2015). In particular, it has been noted that cyber-victimization is associated with negative feelings such as the anger of helplessness, frustration, sadness, fear, shame, guilt, or loneliness (Ortega et al., 2012, pp. 342).

In recent years, cyber-victimization has spread globally, as children and especially adolescents who become victimized and persecuted, all use technical devices in their daily lives on a regular basis, particularly the Internet and mobile phones. To this end, this study proposes to research, on the one hand, the role of intrapersonal factors and self-esteem in the symptoms of depression, and on the other hand, the role of relationships between adolescents in order to understand the psychological profile of persons involved in cyber-victimization as a victim. The model of the three I’s, developed by E.B. Slotter and E.J. Finkel to explain violence, is adapted for the study of cybercrime. It considers both individual and situational variables: “instigation” (incitement, that is, factors that provoke aggression), “impellance” (that is, factors that contribute to cyberbullying), and “inhibition” (inhibition, that is, factors that reduce cyber stalking) (Slotter and Finkel, 2011, pp. 36).

When adults do not pay enough attention to victimization by peers, it can influence internal and external problems of development that lead to a decrease in the overall level of well-being (Makarova, Makarova and Mishchenko, 2021, pp. 147). However, not all cyber victims have the same negative results; the degree of intensity is also not the same (Dredge, Gleeson and Garcia, 2014, pp. 13). Certain risk factors are thought to contribute to “cognitive and emotional adaptation important aspects” (Kowalski et al., 2014, pp. 1073). Research shows that certain cognitive socio-emotional variables can determine the effects of cyber-victimization on psychosomatic well-being, such as “social ability, empathy or personality

traits" (Tofi, Farrington and Lösel, 2014, pp. 1). Over the past two decades, one variable has been identified and developed that demonstrates growing evidence of its important role as "a buffer against cyberbullying negative impacts, this variable is emotional intelligence" (Extremera, Duran and Rey, 2007, pp. 1069). Studies have shown that people process information differently during stressful events that are emotionally meaningful to them, the way they do it is important for healthy everyday functioning and positive relationships with other people. "Emotional intelligence is conceptualized as a group of abilities to perceive emotions, access emotions, amplify thoughts, understand emotions and emotional knowledge, and regulate emotions for intellectual growth. Understanding emotional intelligence is associated with the ability of people to track both their own and others' emotions in order to further use the information received in various activities" (Vorobieva, 2008). In other studies, along with the term "emotional intelligence" such concepts as "emotional thinking, emotional potential, emotional consciousness, emotional competence, emotional sensitivity" are applied as synonyms or constituent elements of emotional intelligence as a whole (Alexandrova, 2009, pp. 71). Several studies have shown that "adolescents with advanced emotional intelligence are able to use and regulate their own emotions and negative emotions of others to improve psychological health and prevent psychological maladjustment" (Fernandez-Bercoval and Extremera, 2016, pp. 311). Previous research on both traditional bullying and cyber-victimization has shown that students at higher levels of emotional intelligence are less exposed to peer pressure and even exhibit more positive social behavior (Garaibordobil and Onederra, 2010, pp. 243). Scientists recently found that high levels of emotional clarity but low levels of emotional recovery in cyber victims contribute to negative emotional impact, while high levels of attention, coupled with high levels of recovery, tend to reduce anger and depression (Elipe et al., 2015). These results suggest the decisive role of the variable "emotional intelligence" in cyber-victimization, especially in the field of emotion regulation, demonstrate the relevance of influence on health and social adaptation indicators. In terms of emotions, cyber victims have a higher ability to respond to others' emotions and a lower ability to regulate and understand their own feelings and emotions. In Russian psychological studies of emotional intelligence the problem was analyzed from the application point of view: in the framework of psychological counseling, training and education, activities management and others. One of the first emotional intelligence definitions was given by Garskova G.G. Unlike other researchers the author describes the concept as "the ability to understand a person through emotional manifestations, intellectual analysis and synthesis makes it possible to manage the person's emotional sphere" (Golubina, 2013). I. N. Andreeva in her monograph "Emotional intelligence as a phenomenon of modern psychology" considers emotional intelligence models, their structure, gender differences in emotional intelligence sphere. According to I. N. Andreeva, "emotional intelligence is nothing but a set of mental abilities for identifying, understanding and managing emotions" (Andreeva, 2011).

Taking into account all the above considerations, the purpose of our study was threefold: first, to analyze emotional intelligence's role in relations to victims of cyber-victimization. Second, we aimed to investigate whether there is a meaningful interactive model that includes emotional intelligence as a predictor. Third, we examined cyber-victimization and its impact on the psychosomatic status of the victim.

In addition to those above, there are several more definitions of emotional intelligence that we have used in our study as a working one: integrity of a person's intellectual and emotional-volitional sphere (Davydov, 2011); "training providing comprehension of a person's own feelings and emotions and comparing them with other people's feelings allowing for successful interpersonal interaction" (Golubina, 2013); and "an internal emotional resource of human emotional regulation" (Kiseleva, 2015), this one helps keeping emotions under control in uncertain and dangerous situations.

Analyzing all the above definitions, we link emotional intelligence with the ability to interpret emotions in order to organize effective interaction in society and avoid conflicts, psychological and psychosomatic problems as a result of these conflicts. "The content side of the term makes it possible to clarify the essential features of emotional intelligence. These include the ability to manage emotions inducing actions, to understand others' emotions, emotional awareness, to influence other people, to distinguish between genuine emotions and their malingering, to determine emotions causes and consequences" (Meshcheryakova, 2011).

There is no consensus between Russian and European viewpoints on emotional intelligence and what advantages this type of intelligence gives to a person. According to D. Goleman, "highly developed emotional intelligence makes people socially active and successful; their life is full of events and ethical principles; there is no place for anxiety reflections, while those with underdeveloped emotional intelligence tend to hesitate, procrastination ultimately affects their activity productivity" (Goleman, 2009).

According to I.N. Andreeva (Andreeva, 2011), the presence of emotional intelligence contributes to a person's adjustment to changes through the ability of internal impulse control and restriction. On the other

hand, a group of American psychologists adheres to the belief that “the presence of a highly developed ability to understand and interpret other people’s emotions, as well as an increased sensitivity to positive as well as negative emotional states, often lead to depression” (Ciarrochi, Dean and Anderson, 2002), thus proving that low emotional sensitivity has not only disadvantages, but also advantages. According to N.P. Alexandrova, emotional intelligence cannot be considered a “communication success predictor” or “counteraction measures to aggression and violence”, although a person can achieve certain success making a correct use of its presence (Alexandrova, 2009). Despite the existing discrepancies between the researchers’ opinions, some of them believe in the ability to manage emotions as a prerequisite for successful integration into society, interaction and social communication, so we may say it is vital to develop all the above mentioned skills.

According to Russian researcher V.K. Zagvozdkin (Zagvozdkin, 2008), students of many US schools are taught coping strategies with the help of which they develop emotional intelligence competencies and practice resolving conflicts – reacting to fear; aggression; anger and other emotions. The advantage of such training is that emotional intelligence competencies development covers all spheres of human activity – “students learn how to plan interaction in advance; what communicative partners to choose for interaction, how to define a safe topic for communication”. They are also taught how to get aware when something goes wrong and change a topic of interaction before it is too late. Coping strategies can be found on the Internet, a person can choose from a variety of them and adjust them to their own emotional challenges. Programs aimed at special needs students’ emotional intelligence within the inclusive education framework are also gaining their popularity because inclusive education is spreading widely within the mainstream.

Wrapping up the discussion, it is important to mention that at the present level of society development, emotional intelligence is becoming a vital personal competence, allowing interaction development in different situations, facing a challenge, avoiding conflicts and choosing the most effective way to reach the goal. In our study we focused not only on cyber-bullying, but mostly on interrelations between emotional intelligence development and cyber-victimization confrontation.

Conclusions

In conclusion, we use the findings of previous studies on this topic (Makarova, 2019; Makarova, Makarova and Maximets, 2020; Makarova, Makarova and Korovin, 2022) to develop understanding of cybervictimization. The present study results are to contribute to further investigation of cyber-victimization problems. The main factors contributing to cyberbullying and cyber-victimization are the risky use of information and communication technologies. Internet addiction also predicts aggression through cyberbullying. The online evil experience may be associated with some problems: victims’ low self-esteem and self-efficacy, eternal locus of control, dissatisfaction with life, deterioration of school achievements and attitudes towards education.

Cyber-victimization and personality psychosomatic changes are interconnected, therefore it is necessary to analyze and take into consideration the moderating role of emotional intelligence in this association. Our research has confirmed the results of previous studies and their findings, the positive role of emotional skills in preventing psychosomatic changes in adolescents and regulating the level of cyber-victimization. In addition, our findings confirmed the results of earlier studies, finding evidence that emotional intelligence lies at the heart of a mechanism that could soften attitudes, resist and counter cyber-victimization (Makarova and Makarova, 2019).

Based on previous research on traditional school victimization and cyber-victimization (Bjelajac, Filipovic and Stosic, 2022), the present study found that higher levels of general emotional intelligence were significantly associated with lower rates of cyber-victimization. Our findings in this case are consistent with the assumption that “peer cyber-victimization propensity is to some extent related to emotional maturity or lack thereof” (Stosic and Jankovic, 2022).

Future research should carefully examine this issue, using age and gender criteria for emotional intelligence development to summarize and draw conclusions. It is possible that differences in the process of emotional regulation between men and women can form the basis for the study of a higher prevalence of emotional maladjustment in women and the use of maladaptive coping strategies in men. While the gender difference in relation to cyber-victimization warrants further research, one explanation is that adolescent girls tend to be more susceptible to indirect forms of bullying than adolescent boys, and the negative impact or even anticipation of stressful life events can impact psychosomatic status of teenagers, can lead to mood swings and cause increased anxiety, anger, depression, insomnia, loss of appetite,

addiction, self-harming behavior, and even suicide. Based on research, it can be argued that teenage girls tend to pay attention to mood and emotions compared to boys. This is why teenage girls are more likely to be victims of cyber-victimization. This clearly highlights the relationship between emotion regulation and cyber victimization. Moreover, we found that emotion regulation works differently depending on the level of emotional intelligence, influencing other areas of psychology, such as interpersonal relationships or psychological adaptation. Deficiency in emotion regulation is thus seen as a risk factor for cyber-victimization.

Therefore, the future implementation of any programs aimed at reducing risks of cyber-victimization should take into account emotional deficiencies or underdeveloped emotional intelligence in order to develop more effective training that focuses on the regulation of emotions and understanding the emotions of other people, and empathy development. It can be assumed that the formed skills of emotion regulation can provide significant support in predicting risks and in the fight against cyber-victimization. Prevention and intervention strategies should be tailored to the specific needs of adolescents and to anticipate the experience and social desirability of the intervention. It is also necessary to take into account the diagnosed psychosomatic problems associated with the experience of cyber-victimization, which will increase the generalization of results and help to use a wider range of prevention and intervention approaches (e.g. parents, school psychologists, peers). Understanding the design of professionally managed interventions focused on emotional knowledge, emotional self-efficacy, and emotional intelligence capabilities aims at reducing the risks of cyberbullying among children and adolescents and eliminating the negative consequences of cyber-victimization in the form of psychosomatic disorders. Incorporating aspects of emotional intelligence into online bullying programs, using a gender-responsive approach, will provide new insights into the interactive role that emotional intelligence, personality traits and social skills play in reducing negative psychosomatic symptoms.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, E.A.M., .E.L.M.; methodology, E.A.M.; formal analysis, E.L.M.; writing—original draft preparation, E.A.M.; writing—review and editing, E.A.M. and E.L.M. Both authors have read and agreed to the published version of the manuscript.

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Online Course Viewings and Their Effects on Performances in Covid-19 Distance Education Period

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Abstract: Despite numerous studies examining student preferences in terms of live and recorded lecture viewings, the effects of lesson viewings on online platforms have been limitedly studied. In this study, the rates of attending live lectures and viewing lecture recordings in the Covid-19 era were examined, and attendance and viewings effects on final scores in these courses were evaluated. For this purpose, data from online education systems of live and record viewings for Turkish Literature, mathematics, and biostatistics classes in the spring semester of 2021-2022, belonging to 13 Turkish universities and 2082 students, were utilized. We found that (1) Thirteen percent of the students did not view any live or recorded courses, and approximately one-third did not enter the final exam; (2) The students in state universities have significantly higher record viewing rates than those in private universities with medium effect size, (3) Females present significantly higher live viewings and record viewing rates than males with small effect sizes; (4) Biostatistics has moderate-high correlations between viewing rates and final scores. On the other hand, there are no or weak relationships between the viewing rates and final scores for Turkish literature and mathematics, in which study materials can be widely accessed from many sources different from biostatistics.

Keywords: distance education, final scores, live lecture attendance, recorded lecture viewing.

Introduction

It is believed that increasing class attendance enhances class engagement and success (Moore, Birdi and Higson, 2019; Wongtrakul and Dangprapai, 2020). Hence, minimum attendance requirement to classes is mandatory in most universities. While some studies support this fact, some studies have concluded that attendance does not affect course success (Gomis-Porqueras and Rodrigues-Neto, 2018; Kaushik, Kumar and Kumar, 2021). Even if the students physically attend the lessons, they may not provide behavior engagement, emotional engagement, and cognitive engagement, which are three dimensions of class engagement (Hu and Li, 2017; Qiping Kong, 2003). Compulsory attendance to the course may lead the students to attend the course without listening to the course, such as surfing the internet, and so this does not contribute to their success (Nieuwoudt, 2020). Kaushik, Kumar and Kumar (2021), stating that compulsory attendance may hinder academic success, defined the reasons for this as students wasting the interval when the course intervals are long, spending too much time on their way to and from school, and thinking that asynchronous courses would be sufficient for some courses. Some of these reasons do not apply to distance education. Because in online education, time is not spent going to school; the students can watch the lectures anywhere and anytime they want. So the effects of physical attendance on success can be different for online courses.

So far, the comparison of live and recorded lecture viewing is mostly about students' preferences, and studies measuring their effects on academic achievement are limited (Islam, Kim and Kwon, 2020; Howard, Meehan and Parnell, 2018; Trenholm, Alcock and Robinson, 2012; Nieuwoudt, 2020; Kahui et al., 2022; Le, 2022). In addition, generally studies in literature are limited mostly with schools or lectures. We want to evaluate student live and recorded course viewings, which are very important parts of the distance education system, especially in the Covid-19 period. We hope that this study will be beneficial for policy makers, education system developers and educators interested in online lesson viewings in

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universities' distance education. This study is important for the evaluation of selected three courses in 13 universities. First we have seen that in the literature (For example: [Shahabadi and Uplane, 2015](#)), students have different perspectives for synchronized and recorded lectures. Hence, we classified our viewed classes in two classes as synchronized and live lectures. Existing studies indicated that based on gender, there would be some differences in distance education as well ([Gupta and Saks, 2013](#); [Kahui et al., 2022](#)). Hence, we created a category for gender. On the other hand, we have not come up with any literature regarding the differences in public and private university students' interests in viewing the online lectures. In order to provide support to the literature, we also investigated public and private university difference in our study. Finally, whether students attend the final or not was the third category in our study. We also investigated the participants online class participation in all these categories specifically for Covid 19 period. Hence, we propose the following hypothesis.

RQ1- What are the rates of viewings (live & record) and entering final exams of the students in the Covid-19 in Turkey?

RQ2- Are there any significant differences between viewings (live & record) based on gender, university type, and final taking tendency?

RQ3- Are there significant relations between viewings (live & record) and final scores?

The remain of this study continues with literature review. In the third section of this study, download and data preparation processes are explained. In the fourth section, analyzes and findings are provided. In this section, first of all, descriptive statistics about lesson viewings, and the distribution of student lecture viewings and entering the final exam are given. Afterward, we investigated whether there were significant differences in lesson viewings according to gender, type of university, and entering the final exam. Later, it was investigated whether the lectures' viewing rates had an effect on final scores. In the last section, the findings were also elaborated.

Literature Review

With Covid-19, face-to-face teaching was suspended in schools to a large extent, and distance education decisions were taken not to interrupt education during this period. Universities in Turkey also followed this suit and carried out the 2020-2021 spring academic period with online courses to prevent the risk of Covid-19 contamination in the classroom environment and to ensure the continuation of the education. In distance education, teachers and students work on educational materials in different places and sometimes at different times ([Gunawardena and Mclsaac, 2013](#)). Distance education, which was previously carried out through channels such as radio and television, continues with web-based training widely with the development of information technology and the spread of the Internet. Web-based online courses can be given as synchronously or asynchronously. While synchronous education offers the opportunity to interact between the teacher and the student, asynchronous education offers the option of using course records that can be watched at any time by adjusting the video speed and moving back and forth. When these educations with different advantages are compared, students generally preferred recorded video lectures to live lectures ([Islam, Kim and Kwon, 2020](#); [Howard, Meehan and Parnell, 2018](#); [Trenholm, Alcock and Robinson, 2012](#)). However, students stated that they still attach importance to live lectures for existence of sense of community and quick feedback ([Trenholm, Alcock and Robinson, 2012](#)). Motivations and cognitive strategies affect students' decision whether to attend the courses face-to-face or online ([Bassili, 2008](#); [McKenna and Kopittke, 2018](#)). Since most students consider the interaction in face-to-face courses important, they continue to attend the lessons even though online accessible class records are uploaded to the system ([Yoon, Oates and Sneddon, 2014](#); [Fei et al., 2013](#); [Gysbers et al., 2011](#); [Alamer and Alharbi, 2021](#)). For example, only 58 per cent of university students, who can take distance or face-to-face education, preferred and participated in face-to-face education, and less than 15 per cent of those who did not take the any preference to downloaded courses, yet did not watch them ([McKenna and Kopittke, 2018](#)).

At the beginning of the Covid-19 period in Turkey, students stated that both theoretical and practical courses would be insufficient with distance education. They did not think of suspending study, but thought that the school time would be extended ([Kursuncu and Kurt, 2020](#)). Although the students did not encounter any technical problems in the distance exams, they stated that they were worried because they would deal with power cuts and internet connection problems before the exam ([Ilgaz and Afacan Adanir, 2020](#)). Different results were obtained to student satisfaction in the studies conducted during the Covid period. In a survey evaluating the distance education of undergraduate dentistry students in Turkey during pandemic, students complained that practical training could not be given online and the lectures

were inefficient (Cirakoglu and Ozbay, 2022). On the other hand, Tayem et al. (2022) reported that most of the students were satisfied with distance education and would prefer the theoretical courses to be given remotely and the practical courses to be given face-to-face. With a similar inference, educators who give anatomy education think that the loss of quality experienced in the distance teaching in theoretical courses will be less than that of distance practical courses (Ozen, Erdoğan and Malas, 2022). For some courses, distance education can be as effective as traditional education, if it is supported by simultaneous education (Alamer and Alharbi, 2021). In the distance education system, it was observed that especially male students were more satisfied and found the lectures more effective and flexible (Buluk and Equalti, 2020; Turan, Kucuk and Cilligol Karabey, 2022). In another survey conducted with undergraduate students, students stated that they were provided time flexibility and course content flexibility in distance education. Yet, student satisfaction was generally low because of the complexity of teaching materials (Turan, Kucuk and Cilligol Karabey, 2022). On the other hand, in Nieuwoudt's study, it is found that viewing live lectures or watching videos of course recordings can have the same effect as face-to-face education. It is emphasized that there may be different reasons for students not attending the live courses in distance education, therefore they should be given the right to attend the course by watching the lecture records (Nieuwoudt, 2020).

Data Preprocessing

ALMS is one of the two most used learning management systems in Turkey (Durak, Çankaya and İzmirli, 2020). The system records data of the students and teachers in order to measure the efficiency of their online activities. To examine the course viewing rates of students and their effects on their success in the 2020-2021 spring semester of Covid period, we selected the courses that are commonly given in different departments of universities. We preferred these courses to be in different categories: numerical, verbal, and departmental. These courses were mathematics, Turkish literature and biostatistics. We downloaded the records of these courses given in 13 different universities and 21 different departments. We filtered the dataset in such a way that the names of the courses included as mathematics, Turkish literature, biostatistics, or the words with the same meaning as them, such as calculus. In addition, we have removed the courses that evaluate the final of the courses as homework from the dataset. All characters in the downloaded dataset texts are converted to lowercase. Since some of the gender data of the users was missing from the database, the missing places were added manually.

Each lecture recorded by the teachers in the dataset is added to the system as a separate record for each student. These records include student times of viewing live lectures. Viewing recorded lectures are assigned as zero at first. As viewing activities of students' change, these values are altered. We summed students' live attendance times and also summed up their replay (record viewing) times for each lecture and saved them in a new database. So in the new database, there was a single record for each student-lecture. In addition, we summed the recording times of the teacher in the live lectures for each lecture during 14-weeks and we found the total live time for each lecture. In some lectures, we observed that the live lectures were not given, instead, the videos uploaded or recorded by the teacher to the system were watched. We removed these course records from the prepared dataset. Afterward, we divided the total live viewing time and the total record viewing time of the courses by the total recording time of the live lectures and multiplied by 100 (1, 2). So we normalized the viewings by replacing them with their percentages. These records were joined on the dataset containing the final scores of the students where student numbers and course numbers were equal, and the data set preparation process was completed.

$$\text{Live Attendance (\%)} = \frac{\sum \text{Live Viewing Time}}{\sum \text{Live Lecture Time}} \times 100 \quad (1)$$

$$\text{Record Viewing Rate} = \frac{\sum \text{Record Viewing Time}}{\sum \text{Live Lecture Time}} \times 100 \quad (2)$$

Analyzes and Findings

Descriptive Analyses with Student Rates of Viewing Lessons and Entering Final

There are 2082 records in the prepared dataset. In this prepared dataset, the numbers of records for mathematics, Turkish literature, and biostatistics are respectively; 251, 1277 and 604. While the numbers of females and males are 1374 and 708, respectively, there are 1434 state, 648 private university

students. At the end of the semester, 1410 of the 2082 students entered the final exam, 672 of them did not. All variables are not normally distributed. The average percentage of viewing for live lectures is 28.1 per cent and for viewing recorded lectures' range is 46.4. The highest average viewings, belonging to biostatistics, female, state schools' courses and students entered the final are presented below (Table 1).

Table 1
Descriptive Statistics

		Live Attendance (%)					Record Viewing Rate		
		n	%	Mean	Sd	p	Mean	Sd	p
All		2082	100.0	28.1	28.9	0.00	46.4	87.2	0.00
Lesson	T. literature	1227	58.9	27.7	28.8	0.00	47.3	97.8	0.00
	biostatistics	604	29.0	32.5	29.6	0.00	54.3	74.3	0.00
	math	251	12.1	19.5	25.6	0.00	22.6	48.3	0.00
Gender	female	1374	66.0	31.2	29.8	0.00	51.7	90.8	0.00
	male	708	34.0	22.1	26.2	0.00	35.9	78.7	0.00
Type	state	1434	68.9	29.0	29.9	0.00	57.9	97.0	0.00
	private	648	31.1	26.1	26.6	0.00	20.7	51.5	0.00
Exam	entered	1410	67.7	28.5	31.4	0.00	48.3	91.4	0.00
	not entered	672	32.3	27.1	22.9	0.00	42.4	77.7	0.00

We want to investigate students' attention to the online lectures. To evaluate this, we examined viewing and entering final rates. We observed that, 13,4 per cent of the students did not attend any live classes in the chosen courses and did not view any video lectures (Table 2). The percentage of students in private universities not viewing any lectures is the highest with 32.25 per cent. In the Turkish literature course, 19.8 per cent of the students did not view any lecture. On the other hand, biostatistics has the lowest percentages of not to watch course with 2.48 per cent. One third of the students approximately (32.28 per cent), did not enter the final. 251 of 708 (35.45 per cent) male students, 421 of 1374 (30.64 per cent) female students, 326 of the 1434 (22.73 per cent) state university students, and 346 of the 648 (53.4 per cent) private university students did not take the final exam (Table 2).

Table 2
Rates of students who didn't watched any online classes and did not enter the finals

	all	Univ. Type		Gender		Course		
		state	private	female	male	T. literature	biostatistics	math
N	2082	1434	648	1374	708	1227	604	251
N (Never Watched)	280	71	209	187	93	243	15	22
% (Never Watched)	13.4	4.95	32.25	13.61	13.14	19.8	2.48	8.76
N (Not Entered Final)	672	326	346	421	251	281	337	54
% (Not Entered Final)	32.28	22.73	53.4	30.64	35.45	22.9	55.79	21.51

Differences Analyses

We want to analyze differences for viewing rates with different features. These features are male and female, type of universities as state and private universities, entering final exam and not entering final exam. Each student attends only one course in the dataset, so each record is independent from the other courses and the data values in each group are nonparametric. Thus, we applied the Mann-Whitney U Test for all to see if there was a significant difference between two groups in live attendance rates (record viewing rates).

- H1: There is a significant difference between male and female students' live attendances.
 H2: There is a significant difference between male and female students' record viewings.
 H3: There is a significant difference between state and private university students' live attendances.
 H4: There is a significant difference between state and private university students' record viewings.
 H5: There is a significant difference between the students' who taking final and who the students' not taking final live attendances.
 H6: There is a significant difference between the students' who taking final and who the students' not taking final students' record viewings.

We evaluated the significance level at the 0.01 value and we calculated the effect sizes (r) of through division of Z on N square (Corder and Foreman, 2009) for significant tests. It was seen that the group with the most different viewing rates, with a medium effect size ($r = -0.371$), was between state and private university students' record viewings (Table 3). That is, the rate of record viewings of students at state universities (15.70) is significantly higher than those at private universities (0.13) ($U = 250635$, $p = 0.00$). Also, the percentage of female students' live attendance (24.23 per cent) is significantly higher than the percentage of male students' live attendance (10.64 per cent) ($U = 403653$, $p = 0.00$). Likewise, the rate of female students' record viewing (11.945) is significantly higher than the record viewing rates of male students (3.195) ($U = 414842$, $p = 0.00$). However, the effect sizes of gender differences for both live and record viewings are small ($r = -0.141$ and -0.121 sequentially). While there is a significant difference between state university students (18.49) and private university students in the live viewing, the effect size of this difference is also small ($r = -0.06$). On the other hand, there are no significant differences between the rates of those who took the final and those did not take the final in both live and record viewings.

Table 3
Evaluation of the differences in viewing percentages between Female-Male, State-Private, and Taking Exam-Not Taking Exam

		N	Median	Mean Rank	Mann-Whitney U	P	Z-score	r
Live Attendance (%)	Male	708	10.64	924.6	403653	0.000	-6.434	-0.141
	Female	1374	24.23	1101.7				
	State	1434	18.49	1065.8	429829	0.006	-2.768	-0.060
	Private	648	20.26	987.8				
	Taking Exam	1410	15.97	1021.9	446236	0.030		
	Not Taking Exam	672	24.96	1082.5				
Record Viewing Rate	Male	708	3.195	940.4	414842	0.000	-5.529	-0.121
	Female	1374	11.945	1093.6				
	State	1434	15.79	1190.7	250635	0.000	-16.919	-0.371
	Private	648	0.13	711.3				
	Taking Exam	1410	9.505	1060.9	446354	0.031		
	Not Taking Exam	672	4.675	1000.7				

Correlations Between Final Scores and Viewings

For Turkish literature, biostatistics, and mathematics courses, we desired to examine the relationships between online course viewings and students' performances. For the evaluation of student performance, the final exam grades entered by the students at the end of the semester and were taken as a basis, and the data of the students who did not participate the final were excluded from the analysis.

- H7: There is a relationship between the live viewing rates and Turkish Literature final scores.
 H8: There is a relationship between the record viewing rates and Turkish Literature final scores.
 H9: There is a relationship between the live viewing rates and biostatistics final scores.
 H10: There is a relationship between the record viewing rates and biostatistics final scores.
 H11: There is a relationship between the live viewing rates and mathematics final scores.
 H12: There is a relationship between the record viewing rates and mathematics final scores.

When the data of the students who took the final exam were filtered, and the distributions of live viewing and recording of the Turkish literature, biostatistics, and mathematics courses were examined, we have seen that all distributions did not fit with the normal distribution (Table 1). Hence, Spearman's Correlation method was run to see the relations. The highest correlation is found, as 0.665 at a 0.01 significant level, between biostatistics live viewings and final scores (Table 4). The second highest correlation is 0.1962, also between the biostatistics course live viewings and the record viewing rates, at a 0.01 significant level. Mathematics' final scores have no significant correlation with live viewings, but a positive low correlation ($r=0.1885$) with record viewings. For Turkish literature course, there are again low, but positive ($r=0.1164$) correlations between final scores and live attendance rates and negative correlations ($r=-0.1128$) between final scores and record viewing rates.

Table 4

The correlations between the rates of (live-record) viewing and final scores for the students who entered the final

Spearman's rho		Final Score		
		T. Lit.	Bio.	Math.
	n	946	267	197
Live Attendance (%)	Cor Coeff	0.1164	0.6651	-0.0358
	Sig	0.00	0.00	0.6179(n.s)
Record Viewing Rate	Cor Coeff	-0.1128	0.1962	0.1885
	Sig	0.00	0.0013	0.008

Discussion and Conclusion

The average live and record viewing rate values, which are found to be 28.1 per cent and 46.4 respectively. These values present that attendances to lectures in Turkish universities are low during the pandemic period. A significant number of students (13.4 per cent) have never attended any live lecture and watched any recording lecture. A similar conclusion is also reached in the study belongs to the beginning period of Covid19 for Turkey. [Can \(2020\)](#) concluded that the course data for five courses in the first weeks of distance education due to the pandemic in Turkey (23 March 2020-07 April 2020) and students' participation in live virtual classrooms and record viewing rates are low. Students mainly preferred access to written materials and course presentations during this period ([Can, 2020](#)). Before the pandemic, universities in Turkey required attendance to classes based on the institutional requirements and regulations, and students who did not achieve a certain attendance rate would fail the class. Since the sudden transition to distance education during the Covid-19 period could cause problems on an institutional and individual basis, this obligation was suspended in Turkey. However, in countries where attendance is mandatory, during Covid 19 pandemic, the online class attendances are observed to be low as well. For example, although dentistry students attending a prosthetics course in China must attend 95 per cent of the lectures to pass the course in Covid-19 period, about a third of the students did not attend almost any lecture, and half of them attended only 10 per cent of the lectures ([Yang et al., 2021](#)). Similarly, in New Zealand during 2020 lockdown period because of Covid 19, 34 per cent of students did not view any live or recorded lectures ([Kahui, 2022](#)). This may indicate the existence of some technical, social, or cultural difficulties for countries in distance education. Lack of strong telecommunication infrastructure, inability to abandon cultural habits, insufficient technical personnel, and financial reasons can be seen as the main problems encountered in distance education to be overcome ([Mirza and Al-Abdulkareem, 2011](#); [Basha, Hussein and Maklad, 2021](#)).

When females and males are compared in terms of both live and record viewing rates in Turkey during the Covid 19 period, it is seen that females' viewing rates are significantly higher than those of males. But these differences have low effect size ($r=-0.141$ and $r=-0.121$ for live and record viewings sequentially) and variables don't explain each other very well (Table 3). In [Kahui, Kumar and Kumar \(2020\)](#) study for Covid 19 lockdown, New Zealand's students attended only 20 to 23 per cent of the live lectures, and this figure is three times higher for females than males. On the other hand, in 2013 study of medical students found that while females attended more live lectures than males, they viewed fewer recorded lectures ([Gupta and Saks, 2013](#)). Yet, the widespread use of computers may have probably increased women's ability to access and use computers since then.

Our results also indicate that approximately one-third (32.28 per cent) of the students didn't take the final in the spring semester of 2021-2022 semester (Table 2). More than half of the private university students did not take their final exams (53.4 per cent), and in state universities, we saw that this ratio is somewhat lower (22.73 per cent), (Table 2). We couldn't find a significant relationship between students' live classes attendance and taking final exams. Similarly, we couldn't find a significant relationship either between students taking their final exams and recorded lecture viewings (Table 3). This is surprising and why students do not take the exam is an issue that needs to be investigated. We may think that some students did not intend to fail some classes, do their viewings normally like other students, and yet at the end of the semester, prefer not to take their final exams. Biostatistics is the class, the highest ratio of students missed final exam (53.4 per cent), at the same time has the highest ratio of live attendance (32.5 per cent) and recorded lecture viewings (54.3 per cent). We may conclude here that although students largely viewed live and recorded classes, since some students did not understand the lectures, they preferred not to take the final exam.

Another remarkable result is that, in state and private universities, students' lecture records viewing have differentiated as middle effect ($r = -0.371$) in viewing class recordings (Table 3). The median value of recorded lecture viewings in private universities is close to zero (0.13). The issue of why students in private universities in Turkey do not watch recorded lectures despite their participation in live online lectures also needs to be studied and understood.

In mathematics and Turkish literature classes, zero to low correlations were found between live/recorded viewings and final scores (Table 4). Similar results were obtained for 31 students, enrolling in the "Volcanology and Geohazards" course at the University of Liverpool. In that study, no positive or negative relationship was observed between live and recorded viewing rates and performances (Jones, 2022). Therefore, the authors think that instead of observing these statistics, it would be better to invest in systems where students can monitor active participation, such as answering questions in live lessons. In addition, the author also states that students who know that statistics such as clicks and page refreshes are measured may be inclined to cheat the system. With new technologies such as the use of face recognition systems may students' entry into the system be controlled in the future (Ozdemir and Ugur, 2021), but these technologies have not become widespread yet. On the other hand, in the bio-statistics course, which has more limited learning resources, a moderate-high correlation was found between students' viewings and final scores. For the biostatistics course, live viewings have a much more significant impact on final grades than recorded lecture viewings. Le (2022), in his study, compared the academic success of those who watch only live lectures with those who watch only video lectures, and similarly, she found that those who watch live lectures become more successful. We observed from the results that for the Turkish literature course also, online live attendance has a higher effect on the final score than the record viewing rate. The low correlations in mathematics and Turkish literature courses could be because these courses are taught as a repetition of the similar courses in high school, and the content of these courses can be accessed from different sources easily.

When the survey studies between January 2000 and May 2021 were examined, teachers evaluated their digital competence as low or medium-low and admitted that they did not have some competence in educational practices (Basilotta-Gómez-Pablos, 2022). The highest negative factor among teachers in distance education was evaluated as the difficulty in preparing the lesson technically and attracting the attention of the student (Sorochinsky, 2021). More frequent and effective use of distance educational systems' features such as polls, chats, breakout rooms, and giving extra time to gather their courage after questions asked can enable students to participate more actively in the lesson (Nichols et al., 2022). It will be also beneficial for scientists, psychologists, game developers, teachers and software developers to work together in order to increase students' active participation in classes and teaching achievements in future.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, E.D. and Ç.E.; resources, E.D.; methodology, E.D. and Ç.E.; software, E.D.; formal analysis, E.D. and Ç.E.; supervision, A.H.T.; writing—original draft preparation, E.D. and Ç.E.; writing—review and editing, Ç.E. and A.H.T. All authors have read and agreed to the published version of the manuscript.

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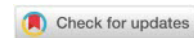
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Multicultural Competence as a Teacher's Metacognition to Achieve a Positive School Climate

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Abstract: Our modern times are marked by socio-economic and cultural processes whose effects are rapidly crossing national borders and creating a global community for which multiculturalism is no longer just a concept but a social reality. As a key tool for its harmonization, intercultural education is determined, which provides conditions for interaction between cultures and prepares multicultural individuals. There is a need for the teacher to acquire the appropriate intercultural readiness and competence to enable her to posit the climate in the classroom. At the same time, there is a lack of research on the psychological climate in culturally mixed classrooms, characteristic of most schools today. The aim of the study is to investigate the importance of teachers' "intercultural readiness" factors for achieving a positive psychological climate in a multicultural educational environment. The research instrument synthesizes questionnaires on the classroom, on the organization of the educational environment and on the psychological climate and adapts them to the level of primary school education. The sample consisted of 95 teachers from Attica in Greece. The data were analyzed with the statistical package SPSS and one-way ANOVA was applied. The research assumption is confirmed that universities preparing pedagogical specialists are responsible for developing master's degree programs in intercultural education or courses for additional professional qualification with a focus on the formation of intercultural competence as a teacher's metacognition.

Keywords: transgressive education, multimodal educational environment, preschool age.

Introduction

In recent decades, Western societies have faced an intense immigration and refugee phenomenon, which has led to the creation of diverse societies, giving them a strong multicultural character (Parthenis and Fragoulis, 2016). In the context of the given situation, various theories were developed and new terms emerged, such as "multiculturalism", "intercultural education", "intercultural psychology", "intercultural competence", "intercultural readiness" etc.

Multiculturalism, according to Hohmann (Govaris, 2011), is the social situation that arises due to immigration, while intercultural education is the pedagogical programs that are developed, in relation to the problems created by immigration (Govaris, 2011). In other words, multiculturalism is considered a given social reality, while intercultural education is considered the "means" of creating conditions for the interaction of cultures (Parthenis and Fragoulis, 2016).

Multiculturalism is a phenomenon that has been observed for decades in Greece as well and has a strong impact on Greek education. In particular, nowadays the increase in foreign students studying in Greek schools is remarkable. At the center of interest are mainly the performance and the socialization process of foreign students (Georgoyiannis, 2009). As it turns out, multicultural education tends to be included in the educational curriculum of the majority of countries.

The purpose of intercultural education is to:

- a) increase awareness of the extent to which our thoughts, values and behaviors are products of our own culture and not necessarily functional,
- b) increase capacity and skill for interacting with people, who have different norms, values, ways of thinking and perspectives, and
- c) increase the ability to control our behavior so that it is maximally effective in our relationships with people of different cultures (Zoniou and Haramis, 1997).

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Theoretical basis

It is established that many factors, such as social stratification, can lead to the differentiation of students' learning readiness and abilities. It is the responsibility of the school to try to compensate for any cultural and educational deficits, through the implementation of compensatory educational programs and differentiated teaching (Matsangouras, 2007). In order to cope with the given reality, teachers, as scientists but at the same time as professional educators, need not only basic professional education, but also continuous training and education within the context of the school itself. The need therefore arises for the teacher to acquire the appropriate "intercultural readiness and competence" that will enable her to cope with today's school reality.

The term "intercultural readiness" of the teacher refers to her ability to respond to the special requirements imposed by the composition of the student ethnicity and culture of a class, in which students with different linguistic and socio-cultural characteristics study. The term "intercultural competence" refers to the creation of feelings, behaviors and opinions of a person, towards the "other", through his education, and it is possible to be influenced by the knowledge of their own culture and the foreign culture respectively (Hall and Toll, 1999). Also, by the term "intercultural competence", is meant any theoretical, scientific, research and didactic knowledge of the teacher about cultures, languages, living conditions, etc. of individuals who come from different countries and are integrated into the social fabric of another country (Bobaridou-Kuneli and Georgoyiannis, 2004).

The modern social reality, characterized by fluidity, increasing trend of globalization, multiculturalism, and competition, seeks an appropriate school and pedagogical environment which is capable of contributing both to the harmonious integration of the student into society, and to the framing of practices that ensure equal opportunities for both gender, people with special educational needs and abilities, but also people with special cultural and linguistic characteristics (Markou and Parthenis, 2011).

With reference to the psychological and emotional formation of attitudes and opinions towards multicultural school environments as well as the theoretical and practical preparation of teachers for them, the above situations are found both in the Greek and foreign literature under the terms "inter-cultural competence" and "intercultural readiness" (Bobaridou-Kuneli and Georgoyiannis, 2004; Spinthourakis and Karatzia-Stavlioti, 2006; Hall and Toll, 1999). The intercultural competence and readiness of the teacher should be the goals and conditions for the correct performance of her pedagogical activities (Markou and Parthenis, 2011).

By "educational competence", we mean all the necessary knowledge that the teacher must have in order to be theoretically, scientifically, research and teaching qualified. This knowledge is acquired in the context of her education in the University Departments, but also at a later level. According to Babiniotis (1998), teaching proficiency is the certificate of teaching ability granted by a higher state body such as the Ministry of Education, to holders of certain diplomas of a specific cognitive subject and is necessary for the teaching of this subject (Babiniotis, 1998). The degree granted as a teaching certificate includes all the necessary knowledge, but also the skills required by the teaching process so that the teacher is able to cope with his educational duties (Georgoyiannis, 2009).

The term "intercultural psychology" refers to the science that investigates the degree to which the cultural identities (both at individual and group level) of mobile populations differ, since the developing individual is a product of social processes, but also the degree of differentiation of the prevailing national identity of the host country (Georgoyiannis, 2009).

In the context of the new social data, there should be a redefinition of education as it determines the cultural and intellectual capital of society. According to the views of social psychology, the perceptions that man forms about "others", about the phenomena and things around him, derive from the mental behavior of the system of values and norms of each culture (Markou and Parthenis, 2011). Through the process of socialization, the individual learns to identify similarities and differences, and to assign an emotional character to his evaluations of others. Depending on the organization of the respective social order, the "other" can be defined as a "stranger". "Foreigner" is defined as "one who is not foreseen as part of the established cultural reality and can question the self-evident elements of this reality" (Govaris, 2011: 21).

According to Simone de Beauvoir (Andreou, 2011), "The category of the Other is as primordial as consciousness itself", and "no community is ever defined as a unit without automatically confronting it with the Other. For the villager, everyone who does not belong to his village is "other" and suspect. For the inhabitants of one country, the inhabitants of other countries are strangers." The above position has particularly attracted the interest of the social sciences, expressing the well-known distinction between "in-groups" and "out-groups" (Andreou, 2011: 198). In the context of "in-groups", which are also called "we" groups, "social identities" are created, i.e. the perceptions of people, which make them experience the

feeling of "belonging". As "out-groups" or otherwise groups of "others", are defined those groups to which we do not belong and therefore there is no identification on our part with them. The two groups above are separated from each other by a social boundary, which can be either spatial (e.g. neighborhoods, communities, countries, etc.), or social (e.g. different ethnicity, gender, religion, class, profession etc.).

Thus, by creating a sense of "us and others" in a group, certain boundaries are automatically created within it, as well as exclusion zones, which prevent any other person from joining it, naturally causing negative feelings of competition, disgust, and enmity on the part of the members of the "outgroup" and feelings of security and solidarity within it (Andreou, 2011). The changes that take place in the modern era due to the continuous movements of the population and globalization, make it imperative that people adapt to the new social reality. They force the person's unhooking from their primordial characteristics and the acceptance of the new reality, so that the person led from the initial state of manipulation and alienation, to emancipation and autonomy. This will be achieved according to Plato's work through education (Govaris, 2011).

It is this maxim that affirms the key importance of the school age for the harmonious integration of the student in society, on the one hand, and on the other – as the sensitive period in which the awareness of the multi integration process is operationalized. The role of the teacher who accompanies and supports the adolescent in the process of self-realization stands out, as well as the expectations for competent stimulation of the transformations of the Self from ethnocentrism to ethnorelativism. Overcoming difficulties and negative experiences arising from cultural differences at the school age stage requires psychological-pedagogical work with students based on acceptance of the whole personality, formation of pro-sociality, and cultural sensitivity by creating for students a "psychological and social space where they can be accepted with understanding and faith in their abilities" (Tasevska, Dyankova and Dermendzhieva, 2017: 1403).

That is, the opinion is confirmed that the implementation of such educational interactions exceeds the traditional professional skills of the teacher and implies the development of specific meta-pedagogical competencies in the modern teacher.

In conclusion, the formation of "multicultural personalities" is mentioned as a goal in the above context. According to this term, man/citizen is equipped with cultural capital, which has been acquired through his socialization, but on the other hand he has both the ability and readiness to adopt additional elements from different cultural contexts. Also, he becomes able to communicate effectively with people with different cultural capital (Kesidou, 2008). So also in the microcosm of the school, if students learn to live with the "other", the different, then as a rule they will in the future be able to interact successfully with people from different linguistic and cultural backgrounds and at the macro-level of society (UNESCO, 2002). The ultimate goal of all people living in a country, regardless of cultural and linguistic origin, is to provide for the possibility of personal development and self-realization, but also ultimately the creation of a society, which will not be characterized by the phenomena of social exclusion, xenophobia, of racism, etc. With the "progressive operation of the school", it is therefore possible to pursue and achieve the reformation of society in the desired directions (Kesidou, 2008).

The psychological climate of the classroom is characterized as a key factor that affects children's school learning, contributes to their socialization through their adaptation to school and wider social life and finally ensures children's mental health. A positive climate is recognized as a key factor in successful and effective schools. It is the result of social interactions between students and between students and their teachers, and is influenced by both educational and social values (Koth, Bradshaw and Leaf, 2008). Plenty of research highlights the importance of a positive classroom climate in improving both school performance and student socialization (Brock et al, 2008).

However, the absence of research on the psychological climate of the classroom in culturally mixed classrooms, which characterize the majority of schools today, is evident.

Materials and Methods

A "closed-ended" questionnaire was used to collect the data, including various questions about demographic factors, intercultural readiness and teachers' classroom climate. The graded five-point Likert scale was chosen in most questions, while multiple-choice answers were included. The obtained data are analyzed with statistical package SPSS and one-factor analysis of variance (one-way ANOVA, one-factor ANOVA) is applied.

The research took place between May and June 2022 and results from the participation of 95 teachers who teach in General Primary Schools in various regions of Attica. Different areas of Attica

were selected to include schools with many foreign-language student populations and schools with a less multicultural student population. The different gradation of the percentage of multicultural student potential supports the research on the relevance of this element to the intercultural readiness of teachers and, by extension, to the psychological climate that prevails in these classes.

The writing of the questionnaire is based on an improvised questionnaire that was used in similar research ([Sotiriou and Iordanidis, 2014](#)), but was shaped by the bibliographic study of the present work on the intercultural readiness of teachers and the psychological climate of the classroom. Thus, the questionnaire concerned questions related to the investigation of teachers' intercultural readiness and questions related to the psychological climate of their classroom. It also included an introductory note clarifying the purpose of the research while clarifying the anonymity of the data. In addition, it was made clear that the resulting data would be used exclusively for the work and that completing the questionnaires was extremely helpful for preparing said work. The questions were demographic, i.e. they related to age and gender. At the same time, they were followed by questions related to the level of education of the teachers, their teaching experience in multicultural classes and the intercultural approach to teaching (implementation of the curriculum and education models, the approach to the "different" and development of intercultural communication).

Overall, theoretically and empirically, the questions concerned the teacher's intercultural preparedness. In the continuation of the questionnaire, the questions related to the investigation of the existence of a positive psychological climate in the classroom from the teachers' point of view.

Questions were used from a questionnaire drawn from similar research investigating the relationships between classroom climate and teacher job satisfaction. This questionnaire, as presented in the given research, is a synthesis of questions from various questionnaires.

It consists of the following:

- a) my Classroom Questionnaire ([Matsangouras, 1998](#)),
- b) questions from the Order and Organization scale of the Classroom Environment Scale,
- c) questions from the Student Relations scale of the Revised School Level Environment Questionnaire ([Johnson, Stevens and Zvoch, 2007](#)), adapted to the level of primary school classes and
- d) questions formulated based on the conceptual definition of climate ([Sotiriou and Iordanidis, 2014](#)).

The contact with the participating teachers and the completion of the questionnaires was done through visits to the schools after prior consultation with the Principals, the School Counselor and the teaching staff so as not to disrupt the orderly operation of the school units. The teachers' participation was completely optional, and their participation was their only choice. The questionnaires were completed outside of their teaching hours.

Results

According to the results of the statistical analysis, most of the teachers of the sample teach in the first grade (43%), and are women (63%). Additionally, most of them are 31-40 years old (42%) and 41-50 years old (39%) and have a master degree (67%). Almost half of the sample has not attended seminars (49%), and 36% have attended intercultural education conferences, which is an important percentage (Table 1). Most of the teachers of the sample have 6-10 years' work experience in teaching and 1-5 years' work experience in teaching in multicultural classrooms (63%).

Table 1.
Participant statistics

Variable	N	%
Gender		
Male	35	36,5
Female	60	62,5
Age (M=40,73)	95	100
Educational level		
Bachelor	25	26,0
Master	64	66,7
PhD	6	6,3
Participation in continuing qualification to acquire multicultural competence		
Intercultural training seminars	14	14,6
Intercultural education conferences	34	35,8
None of the above	47	49,0

Table 2.
Distribution of responds (N/%)

	Research items	Not at all	A little bit	Enough	Very	Very much
1.	Do you use alternative teaching models adapted for multicultural environments?	7 (7,3%)	12 (12,5%)	23 (24%)	34 (35,4%)	19 (19,8%)
2.	Do you think the teaching methods you use are suitable for multicultural environments?	-	11 (11,5%)	17 (17,7%)	43 (44,8%)	24 (25%)
3.	Is it considered that you can meet your educational tasks in classes with linguistically and culturally diverse students?	5 (5,2%)	15 (15,6%)	33 (34,4%)	32 (33,3%)	10 (10,4%)
4.	Do you think you can respond satisfactorily to managing problems and conflicts with students from different cultural groups?	3 (3,1%)	21 (21,9%)	41 (42,7%)	22 (22,9%)	8 (8,3%)
5.	Do you find it useful to participate in training programs concerning multicultural classroom management issues?	6 (6,3%)	12 (12,5%)	25 (26%)	38 (39,6%)	14 (14,6%)
6.	Are the students in your class cooperative?	3 (3,1%)	18 (18,8%)	55 (57,3%)	16 (16,7%)	3 (3,1%)
7.	In this class most of the children struggle with the exercises we do and need help.	10 (10,4%)	41 (42,7%)	25 (26%)	14 (14,6%)	5 (5,2%)
8.	For children in this class, school work is difficult.	12 (12,5%)	32 (33,3%)	21 (21,9%)	26 (27,1%)	4 (4,2%)
9.	Among children in this class, children dominate conflict interactions.	5 (5,2%)	39 (40,6%)	35 (36,5%)	11 (11,5%)	5 (5,2%)
10.	In this class there is a competitive atmosphere both during the lesson and during the breaks.	11 (11,5%)	23 (24%)	36 (37,5%)	15 (15,6%)	9 (9,4%)
11.	In this class most children work well together.	4 (4,2%)	25 (26%)	36 (37,5%)	25 (26%)	5 (5,2%)
12.	In this classroom, a positive climate basically prevails.	5 (5,2%)	17 (17,7%)	45 (46,9%)	21 (21,9%)	7 (7,3%)

Table 2 reflects the summary of the data obtained by registering information on the number in absolute value (N) and in percentage (%).

Fifty six percent of the teachers use “very” or “very much” alternative teaching models adapted for a multicultural environment and 70% think that the teaching methods they use are “very” or “very much” suitable for multicultural environments. Additionally, 44% meet “very” or “very much” their educational tasks in classes with linguistically and culturally diverse students 43% answered that they can respond satisfactorily enough to managing problems and conflicts with students from different cultural groups. It is important to notice that 55% of the teachers find it “very” or “very much” useful to participate in training programs concerning multicultural classroom management issues.

As concerns the climate of the classroom, 58% of the teachers answered that their students are cooperative enough, 54% answered that their student struggle a little bit or not at all with the exercises they do, 45% answered that the children in their class fight a little bit or not at all and 38% answered that there is enough competitive atmosphere in their class.

Also, 47% answered that in their classroom there is a positive enough climate.

The data collected in the process of empirical research were statistically processed and the results of the applied analysis are presented in detail in Table 3.

Table 3.
Descriptive statistics

	N	Minimum	Maximum	Mean		Std. Deviation
	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic
1	95	1,00	5,00	3,4421	,11946	1,16433
2	95	2,00	5,00	3,6421	,07764	,75675
3	95	1,00	5,00	3,2421	,10007	,97540
4	95	1,00	5,00	3,1158	,09798	,95498
5	95	1,00	5,00	3,4526	,11276	1,09902
6	95	1,00	5,00	2,9789	,08056	,78522
7	95	1,00	5,00	2,6105	,10613	1,03446
8	95	1,00	5,00	2,7684	,11442	1,11520
9	95	1,00	5,00	2,7053	,09568	,93255
10	95	1,00	5,00	2,8632	,11359	1,10714
11	95	1,00	5,00	3,0000	,10150	,98930
12	95	1,00	5,00	3,0947	,09822	,95732
Valid N (listwise)	95					

Discussion

In this context, experimental data are subjected to additional statistical processing, according to their specificity, scale of measurement and type of sample.

As a result of the application of one-factor analysis of variance (one-way ANOVA, one-factor ANOVA) only the statistically significant regularities for the studied variables were derived and discussed discursively. Several hypotheses have been tested sequentially, and the results discussed reflect statistically significant differences, namely:

1. A legitimate statistically significant difference was found in the responses of the men and women participating in the study regarding:

- “the use of alternative teaching models adapted for a multicultural environment” (F=83.225, p=0.000);
- “the use of teaching methods suitable for a multicultural environment” (F=58.839, p=0.000);
- “the possibility of completing educational tasks in classes with students of different linguistic and cultural diversity” (F=57.439, p=0.000);
- “satisfactory response in managing problems and conflicts with students from different cultural groups” (F=7.721, p=0.007);
- “participation in training programs concerning the problems of multicultural classroom management” (F=63.038, p=0.007);

- "cooperativeness of students in class" ($F=10.221$, $p=0.002$).

The stated finding testifies to the ability of the respondents to manage the pedagogical interaction in the multicultural educational environment. Their level of intercultural readiness is actually the result of their professional competence to adequately respond and satisfy the linguistically and culturally diverse needs of students. Therefore, the overwhelming positive responses found in the group of female teachers regarding the use of alternative teaching models adapted for a multicultural environment; teaching methods suitable for a multicultural environment; educational tasks differentiated according to the different linguistic and cultural status of the learners, reflect the intercultural sensitivity encoded in their competence profile.

Given the research assumption that multicultural competence is meta-level competence, the statistically significant difference found explains the factor weight of intercultural sensitivity as a determinant of intercultural readiness.

This is associated with the peculiarities of women's role models in traditional and modern society, as well as with the biologically determined maternal instinct. In this context, the results reveal the positive attitude of female teachers regarding the professionally stated position of managing problems and conflicts with students from different cultural groups; for participation in training programs concerning the problems of multicultural classroom management and for the application of cooperative learning as an effective pedagogical technology in a multicultural educational environment favoring a positive school climate.

No statistically significant difference was found in the perception of men and women regarding "students' difficulties with the exercises and the need for support" ($F=3.224$, $p=0.076$). The indicated finding identifies in the professional-competence profile of the respondents from both groups the presence of pedagogical responsibility in the performance of the professional role, primarily oriented to the quality of the pedagogical interaction and to a high degree of academic success of students in a multicultural educational environment.

2. Participation in seminars related to continuing qualification for the acquisition of multicultural competence directly influenced the competence of pedagogical specialists to organize an environment guaranteeing the possibility of "students working together" ($F=3.191$, $p=0.046$). The results of this item highlight the perceived need by the respondents to expand and upgrade their professional competencies in view of the specificity of pedagogical interactions in the heterogeneous classroom. The research assumption is confirmed that the intercultural readiness of the teacher and his ability to create a positive psychosocial climate in school is a consequence of active inclusion in the forms of continuing pedagogical qualification for work in a multicultural educational environment.

3. A regular relationship was established between the language training of pedagogical specialists and the "predominance of a positive climate in the classroom" ($F=3.582$, $p=0.032$). The research assumption is confirmed that the intercultural readiness of the teacher is directly dependent on his skills to implement relationships of participation, recognizing and making use of valuable funds of knowledge in culturally and linguistically differentiated communities.

4. No statistically significant difference was registered for the organization of intercultural interaction and the educational level of the pedagogical specialists. The indicated finding reveals an alarming trend that the educational qualification of the teacher does not have a factorial weight in relation to the readiness to work in a multicultural educational environment. The research assumption is confirmed that universities preparing pedagogical specialists are responsible for the development of master's degree programs in intercultural education or courses for additional professional qualification with a focus on the formation of intercultural competence as a teacher's metacognition.

Conclusions

In summary of the interpretive analysis of the key concepts of the problem and according to the results of the conducted research, the following findings are necessary:

- the degree of awareness, training and competence in matters of intercultural education of pedagogical specialists trained in Greek universities is low;
- the higher pedagogical education in Greece does not provide full academic training in the context of the needs of the multicultural educational environment and the formation of the necessary intercultural readiness of the modern teacher.

For this reason, the majority of teachers are insufficiently effective in carrying out their teaching tasks in classes with linguistically and culturally diverse students. The identified results reveal deficits in the intercultural readiness of Greek school teachers and problematize the issue of the quality of higher pedagogical education in the context of multiculturalism.

In the modern Greek school, the composition of the student population has changed and multiculturalism is now a common feature of almost every classroom. Therefore, in the face of the new multicultural reality, the school must adapt the system and teaching methods to the new data in order to effectively help foreign students. Therefore, the role of teachers is decisive for the smooth integration of students as it implements the educational policy.

For this reason, not only their intercultural competence, but also their intercultural readiness is of particular importance. The interculturally prepared teacher has the theoretical knowledge but also the ability to put into practice the principles of intercultural pedagogy in her teaching. In addition, she can handle issues related to diversity and problems arising from the coexistence and interaction of culturally diverse students with fluency.

In the management of multicultural classrooms, programs of teachers' training are essential for their competence in the relative theoretical and practical developments, provided that they contribute to their intercultural readiness (Coelho, 2007). Still, the programs of continuing education encourage collaborations and create safe environments for the growth of experimentation and innovative practices, so that all kinds of exclusions and stereotypes are diminished and the school can ensure all children have the knowledge and the dexterities they need, in order to become complete and active citizens (Bowman, 1993).

Finally, it adopts a multicultural perspective, establishes intercultural behavior in the classroom and creates a positive psychological climate away from prejudice and xenophobia for all students.

Therefore, as a priority for educational policies, the need for the principles of intercultural education to enrich all teacher training programs in universities and institutional training institutions stands out.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, G.D. and S.N.; methodology, S.N.; writing – original draft preparation, G.D. and S.N.; writing – review and editing, G.D. and S.N.; Analysis, discussion and conclusion, G.D. and S.N.; All authors have read and agreed to the published version of the manuscript.

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The Impact of the Covid-19 Pandemic on Higher Education Students' Perceptions of Educational Applications and Platforms

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Abstract: The contemporary development of education is marked by the rapid expansion of online educational applications and platforms. Consequently, it is becoming clear that teachers must consider them and in light of their changing role, know what they can offer in their field to be able to recommend them to students to get additional knowledge or even to integrate them into their teaching. As students in the field of computer science and informatics are particularly accustomed to considering online knowledge resources, we decided to investigate their perception of educational applications and platforms. Based on the analysis of the results of their testing of educational platforms and applications, we found that for them the most important is *content*, followed by *personal preferences*, *reason*, *user experience*, *price*, etc., and only in the last place is *a certificate*. The most frequent word in their research reports proved to be *knowledge*, which we included under the code *reason*, followed by *research*, *content*, *time*, *free*, *variety*, and *quality*. It also turned out that students' experience of testing educational applications and platforms is predominantly positive and has even improved over the course of the last three years, which we attribute to the effects of the Covid-19 coronavirus epidemic. The comparison of pre-pandemic and post-pandemic data also revealed that positive sentiment came to the front, while students now prioritize *user experience*, *reason*, and *quality* over the *content* and *personal preferences* compared to the pre-pandemic period, while they are still aware of the need for exploration.

Keywords: e-education, e-learning, higher education teaching, educational applications, educational web platforms.

Introduction

Teachers play many roles in classrooms, including inspiring students, stimulating their interest in the subject, and serving as a source of knowledge and information. Besides, commitment and passion are required, while a combination of teaching paradigms is needed to maintain momentum and transform the classroom into a learning environment full of enthusiasm and interest (Powell et al., 2012).

Teachers increasingly complain that their students do not show interest, do not prepare for lessons, have passive attitudes toward learning activities, and limited awareness of their own learning process (Buijs and Admiraal, 2013). This, and the contemporary competence-oriented higher education, requires a correspondingly strong focus on pedagogy. But there is also a growing recognition that to develop the knowledge and skills needed for the 21st century, we also need innovations in the field of teaching (Paniagua and Istance, 2018).

As explained by Heacox and Pengal (2009), the greatest challenge for today's teacher is to respond to the increasingly diverse learning needs, styles, and social backgrounds of students, which affect their willingness to learn, learning styles, motivation, interests, attitudes to learning, and self-confidence. He, therefore, suggests that differentiation of instruction, which puts students at the center of teaching and learning and also allows learning needs, learning styles, and interests to guide instructional design, can be very helpful, including varying the pace of learning, the level of difficulty and the way instruction is delivered (Heacox and Pengal, 2009).

The traditional lecture is not an effective learning environment for many students, as many do not actively participate during a traditional lecture (Bajpai, Biberman and Ye, 2019). The goal is to keep students active, and approaches to learning are changing. In student-centered learning, the focus is on students' needs, abilities, interests, and learning styles, and the teacher is only a facilitator of learning. Due

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to the development of the World Wide Web and search engines, 'on-demand' information has become a reality (Hirsh, 2018). In this context, students need to be active and responsible participants in the learning process, and the teacher plays a key role in the whole process.

E-learning uses various information-communication technology (ICT) tools to make the teaching and learning process more effective (Bajpai, Biberman and Ye, 2019). As a result, classroom lectures, whose main objective is to cover the content of the course, can be expected to become obsolete, as can the willingness of students to attend these classroom lectures, as technology allows them to learn at their own pace and in their own time (Moreno, 2018), expanding the possibilities for individualisation and personalisation of learning (Urbančič, 2021). More and more people are realising the benefits of learning at a pace that suits them best, which is why e-learning is on the rise.

E-learning allows the teacher and the student to be independent in terms of location and time, making it a form of distance learning (Bregar, Zagmajster and Radovan, 2010). Furthermore, the advantage of online education is that many courses are very affordable for the value they offer and are aimed at almost every individual in the world, whereas traditional education involves a limited number of students (Krstev, 2019), which is an additional reason for the rapid rise of educational apps and platforms.

While the concept of e-learning generally refers to the methods of education implemented using ICT, ICT in the context of e-learning represents only part of the technological solutions that allow us to complement or enrich the basic foundations and concepts of traditionally based learning (Jagodič, 2010). Nevertheless, ICT is a potentially powerful tool for expanding educational opportunities, both formal and non-formal (Adenusi, Adebayo and Oni, 2019), and it is the development of ICT that has brought about significant changes in the field of education (Semerci and Aydin, 2018).

However, we recognise that teachers need to have certain digital competencies to be able to use online platforms and applications for communication, teaching, and research. Therefore, national projects to promote the use of ICT by (higher education) teachers are very welcome. Teachers play a central role in integrating ICT into the classroom, so improving their digital competencies and attitudes is crucial for the effective integration of ICT in education (Semerci and Aydin, 2018). In addition, it is important to be aware that today's students are so-called digital natives, who are expected to have the knowledge and skills that allow them to handle ICT tools 'naturally' (Boh Podgornik et al., 2016), so it is not surprising that students often expect this from teachers as well.

The introduction of the use, integration, and dissemination of ICT has ushered in a new era in educational methodologies, radically changing traditional teaching methods and learning patterns in the field and offering modern learning experiences for both teachers and students (Adenusi, Adebayo and Oni, 2019). Therefore, different teaching/learning strategies need to be applied in education. This is because digital technologies are often used to support the extension of university education into the home, social and work environments (Castañeda and Selwyn, 2018).

As a result, ICT has a broader role in teaching and learning activities into which it can be integrated as a tool in the learning process (Lautenbach, 2014). Furthermore, the important role of ICT can also be found in activities such as content creation, student performance monitoring, training, knowledge management and organisation, and formative monitoring (Margaret et al., 2018). Black and Wiliam (2009), two of the most referenced authors, established a conceptual framework for understanding formative monitoring through a series of publications that can be traced back at least to the mid-1990s. Formative monitoring can be imagined as a "bridge between learning and teaching". It is based on five key strategies: clarification, participation in setting and understanding learning intentions and success criteria; designing classroom activities that provide evidence of learning; providing feedback; activating students to become teachers to each other; and activating students to self-manage their learning (Palir Mavrič, 2017). The integration of ICT was identified as a good practice, particularly in stimulating and increasing students' motivation. But the use of technology in learning does not automatically result in engagement in learning activities and improved learning outcomes (Sinha et al., 2015), and for this reason, well-designed computer-supported collaborative learning (CSCL) environments for collaborative learning and problemsolving might intensify learning if used based on a teacher's instructional support (Pietarinen, Palonen and Vauras, 2021).

Moreover, teachers and students must understand that independent learning using online applications and platforms has a major disadvantage if not carefully addressed and that is a lack of collaboration. Namely, students generally do not recognise the advantages of collaborative learning, and therefore teachers should play an important role in encouraging and influencing student participation and achievement (Webb et al., 2019). The teacher's role has thus changed to act as a coach and facilitator of students' thinking while modelling the learning process (Anderson, 2002).

ICT tools are thus playing an increasingly important role in the renewal of educational methods.

This is manifested in the form of digital learning materials instead of printed books, interactive materials, e-communication between teachers and students, etc. (Berényi and Deutsch, 2018). While the pandemic has increased the use of and changed teachers' attitudes toward digital learning materials, quality teaching in the digital age would require supporting teachers with training to make working with digital materials routine (Mohar and Kovač, 2021). ICT tools used to create and disseminate knowledge including equipment and software solutions have become an indispensable part of modern culture, which is spreading globally through education (Bajpai, Biberman and Ye, 2019). Software that supports the didactic process in higher education includes internet browsers, office suites, communicators, specialised software suitable for classroom use, software that supports group work, and above all e-learning applications and platforms (Grooms, 2018), which are the focus of our research.

As the use of educational applications and online platforms is growing rapidly (e.g., Data Bridge Market Research, 2022 or Dhawal, 2021), we decided to explore their use for study purposes. To this end, we analysed the opinions of students from four Informatics and Computer Science degree programmes, two first-degree programmes and two second-degree programmes.

We started the survey in 2019 when we first asked students enrolled in their final year of study on these four study programmes about which apps and online platforms, they use to support their studies. Based on the responses we received, we found that the use of apps and online platforms is much more widespread among students and not limited to those suggested by teachers. In addition, the students presented in their research reports the results of the testing of the apps and online platforms they use to complement their studies.

As today's teachers (and especially teachers in information technology) and computer science programmes, due to the specificity of these programmes) are increasingly aware of the need to use and even compete with online educational opportunities, it has become clear that they need to change their teaching methods and see their profession as adding value and upgrading the information that students can obtain via the Internet. Our main research objective is therefore to present the findings of a qualitative analysis of students' views when testing educational applications and online platforms, which we believe could encourage higher education teachers to make greater use of them in their teaching, not as a substitute, but as an additional source of 'on-demand' knowledge and motivation for learning. Finally, this paper aims to encourage higher education institutions to reflect on how encouraging the use of educational apps and online platforms can enable students to perform even better in exams, while also spreading awareness that they can deepen their knowledge in this way too.

Materials and Methods

Statistics (e.g., Wise, 2022) show that e-learning has grown exponentially in recent years. Studies also show (e.g., Suwal and Singh, 2018) that the use of e-learning applications and platforms is well accepted by students as it gives them positive experiences, and consequently, there is a growing need for more integration of e-learning applications and platforms into existing learning activities and practices. In the flood of different types of educational apps and online platforms, it is difficult for a teacher to decide which app or platform is appropriate to use and recommend to students. In addition, more and more new apps and online platforms are emerging, making it difficult to keep up with these advances and the increasing range. In this context, we have identified the need for a systematic review of the educational apps and platforms that students individually choose to use, as well as the way they are perceived. To do so, we have conducted a survey in which students themselves, based on their study interests, chose an app or online platform to test. They presented their views gained during the testing in research reports, which we then used to achieve the aim of our research: to show that teachers need to change their role, as the internet offers instant information on almost any topic and as educational apps and platforms are gaining in importance. Accordingly, teachers also need to change their teaching methods to offer students all they can gain from e-learning.

Based on the content of the students' research reports, we identified the codes and the most frequently written words to give their perspective on the impact and usefulness of some educational apps and platforms in their fields of study, as the research also aims to encourage teachers to reflect on how the integration of apps and platforms in their courses can bring added value. In addition, the Covid-19 coronavirus pandemic has further stimulated the development of online educational resources. Based on this research objective, the following research questions (RQs) were set:

RQ1: What has proved to be most important in the testing of educational apps and platforms by students?

For this question, we were looking for codes that could be extracted from a close reading of the assignments that students had prepared based on testing educational apps and platforms. We assumed that students would put the user experience at the center, and quality would be the decisive factor (as in [Rojko, 2020](#)). On the other hand, although some apps and platforms provide certificates and recognition of the knowledge acquired, we assumed that the absence of formal recognition would demotivate students to learn online on their own initiative.

RQ2: Which words stand out in the research reports of students who have tested educational apps and platforms?

We asked students to use different criteria to test different applications and platforms for their research reports, mainly qualitative but sometimes also quantitative. We anticipated that the words quality, user experience, quantity, price and certificate and their synonyms would appear most frequently. We were also interested in whether positive or negative experiences predominated.

RQ3: Has the impact of the Covid-19 coronavirus pandemic changed the way students view educational apps and platforms?

We expected that some new dominant words would appear in the more recent research reports (from the second half of the academic year 2021/22) compared to the reports from the period before the start of the epidemic (from the first half of the academic year 2019/20). Namely, we observed that the Covid-19 pandemic was reflected in an increased motivation of students to search for additional online education resources and in their increased willingness to try them out, as distance education had been the only option for some time.

The survey was launched in 2019 when we asked students enrolled in the final year of four Informatics and Computer Science degree programmes from Slovenia, which educational apps and platforms they use to support their studies. In addition, the majority of these students also produced a research seminar paper based on the results of their testing.

Students chose and tested the following educational apps and/or platforms (in alphabetical order): ArtofProblemSolving, Astra.si, Bussuu, CK-12, Code With Mosh, CodeAcademy, Codewars, Coursera, Cybrary, Drops, Duolingo, edX, freeCodeCamp, FreeVideoLectures, FunEasyLearn, Khan-academy, KodeKloud, Laracast, LinkedIn learning, Mathway, Memrise, Micro:bit, Mimo, MojeZnanje.si, Photomath, Pluralsight, Programming Hub, Qlango, Scratch, Skillshare, SoloLearn, SQLZOO, Stack Overflow, Symbolab, Treehouse, Tutorialspoint, Udemy, Udacity, W3Schools, Wolfram Alpha, Yoast and YouTube. Note that some students chose the same apps and platforms, and Udemy was the most repeated platform, 18 times.

Some of the educational apps and platforms chosen specialise in one area, others cover several different areas, and students were instructed to focus on one specific subject area for any comparisons. As can be seen from the list of names, some of the listed platforms cover different areas of knowledge, although all students focused on computer science, while the listed apps focus on computer science (most frequently tested), mathematics (medium frequency), and foreign language learning (least frequently tested). The majority of the apps and platforms analysed were international, but two Slovenian platforms, Astra.si and MojeZnanje.si, were also included.

Among the 140 students enrolled in the final year of their first (professional study programmes) and second (masters study programmes) cycle studies in the academic years 2019/20, 2020/21 and 2021/22, 113 (81%) submitted their research seminar paper. Among these, we further excluded those reports in which students tested other applications that they had used during their studies but were not relevant to our research - e.g., for storing data and literature, such as Dropbox, Evernote, Google Drive, OneNote and Zotero. Thus, the final 90 research reports (50 reports by first-cycle students and 40 reports by second-cycle students) were considered, out of these 29 from the academic year 2019/20 (first half of the year (in continuation referred to as the pre-pandemic period) 16 reports), 36 from 2020/21, and 25 from 2021/22 (second half of the year (in continuation referred to as post-pandemic period) 10 reports). We considered the content of research reports as transcripts, which were then subjected to qualitative analysis to answer our research questions. We resorted to manual coding and used the Atlas.ti qualitative analysis tool.

Manual coding (using the open axial coding methodology) required close reading and careful consideration of the students' opinions and observations, taking special care to avoid concepts we had learned from studying the literature and our views and expectations. The attribution of concepts was done both by direct conceptualisation and synonymy. The selection was made based on the conceptual framework and within it based on recurring terms in the students' assignments. Individual terms were further evaluated and linked to semantically equivalent terms, which were grouped into key categories (codes) based on their meaning.

Atlas.ti was used to search for the most frequently repeated words in the assignments. Although this tool also allows the preparation of word clouds based on Slovene texts, it only formats them appropriately in some of the world's leading languages. As the tool is not able to combine Slovenian words in different conjugations, does not correctly identify word types, etc., we first translated the 90 analysed seminar reports, with an average size of one author field (The author's pole consists of 30 000 characters (letters, numbers, punctuation, spaces) or approximately 16 typed pages.), into English. We then extracted nouns, verbs, adjectives, and adverbs, followed by manual removal of the remaining inappropriate words. Finally, for the most common words, we first considered separately the terms for the full spectrum of experience from positive to negative, and then all the remaining most commonly used words.

In addition, we also analysed the research reports from the first half of the 2019/20 academic year (considered as pre-pandemic period reports) and the research reports from the second half of the 2021/22 academic year (considered as post-pandemic period reports) separately and used the results to compare the two periods, which led us to detect the changes in the testing experience as well as in students' attitudes towards educational apps and platforms. To do so, we applied chi-squared test at significance level of 0.05 to find potential association between pre- and post-pandemic periods regarding the testing experience and students' attitudes. In the case of a statistically significant chi-squared test, the association was confirmed and was then tested for strength using the Cramer's V contingency coefficient at 1 degree of freedom. We used the value of the latter to determine whether the association was weak (Cramer's V value between 0.1 and 0.3), moderate (Cramer's V value between 0.3 and 0.5) or strong (Cramer's V value between 0.5 and 1.0). To visually represent the observed associations, we used mosaic plots in which two-dimensional frequency table is displayed using rectangles. The rectangular regions in the mosaic plot are proportional to the cell frequencies they represent, where shadings indicate the residuals between observed and expected frequencies. Positive value of a residual is represented by the blue color, and negative value of a residual is represented by the red color, whereas the shade of color indicates the site of residual: the larger the absolute value of residual, the darker the color, and vice versa, the smaller the absolute value of residual, the lighter the color. This is also presented in the legend added to the mosaic plot (Kabacoff, 2015).

Results

We first present the results of the manual coding (RQ1) and then the results of the analysis using the Atlas.ti tool, which was used to produce linear word clouds for all analysed research reports together (RQ2) and separately based on research reports from before the Covid-19 epidemic and two and a half years later (RQ3).

Coding results

Based on a close reading of a selection of research reports (N=90), we identified 10 key content categories (codes) in the texts: content, personal preference, reason, user experience, price, quantity, basic, development, quality, advanced and endorsement.

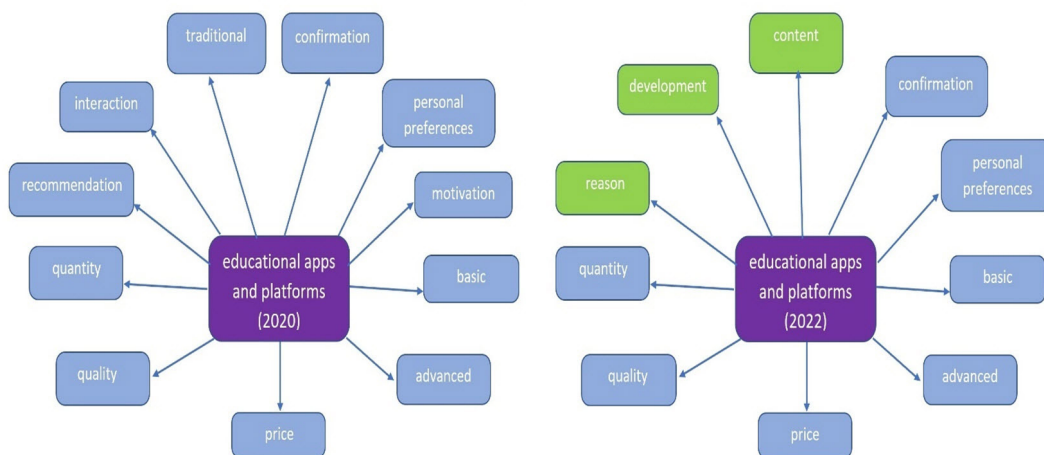


Figure 1. Comparison of paradigm models with Rojko (2020)

Figure 1 shows that our analysis produced slightly different results than [Rojko \(2020\)](#) as interaction, motivation, recommendation, and traditional were replaced by reason, development, and content, in Figure 1 right, according to our findings. Similarly, [Rojko \(2020\)](#) found that quality dominates over user experience and quantity, whereas our findings showed a different picture – as presented in the Figure 2.



Figure 2. Representation of each dominant word by code

Figure 2 shows the representation of each of the dominant words by codes (We did not add the code area to the selection (dominant words: coding, programming, foreign, language(s), technology) because it is not relevant, as these are the fields of study of the students whose research seminar papers are analysed.), which were written at least 200 times in all research reports combined. It turns out that content stands out the most (words: content, tutorial, example, material, new, video, game, help, information, data), followed by personal preferences (words: option, year, years, time, different, decision, way, possibility, relevant, important, choose, criterion, need, work). For content, we would highlight the words video, game, and help as they best convey the students' observations, while for personal preferences we would highlight time, different, and way as they best convey the students' thinking.

Dominant words

The dominant words were extracted using Atlas.ti tool, but despite the translation of the analysed research reports into English, a lot of manual refinement was necessary (see Appendix 1 for a full list of removed words). The words that appear in Figure 3 appear at least 200 times in the analysed reports. The most frequently occurring word is language (N=1476; also, languages in 16th place (N=657)), which in turn refers to the domains of the applications and platforms tested (computer languages, foreign languages). This is also the case for the third-ranked word programming (N=1342), the twelfth-ranked word coding, etc. The second-ranked word is knowledge (N=1419), which we have classified under the code reason. The results based on the most frequent individual words thus show that knowledge is the most important for students, research is needed, followed by content, time is a constraint, and free, variety, and quality are also among the most important.

It should also be noted that it is necessary to group certain words that appear separately in the figure below, e.g. research (N=1318) and search (N=235), information (N=595) and data (N=508), find in the present and past tense (N=559 and N=371), video (N=459) and videos (N=270), year (N=238) and years (N=204), play (N=358) and games (N=205), etc.

language knowledge
programming research content time
free different better new good code education foreign
experience languages way information find help mobile data video
many case level criteria available need work well much skills problem important
results found quality game access example basic suitable choose process step possible
development decision start training certificate easy comparison model interface useful videos paid
result exercises problems rating price like technology features lot years search material advantages similar
individual option description best specific average simple beginners field solution design games evaluation year
difficult understand chosen designed possibility

Figure 3. Dominant words appearing at least 200 times (all assignments).

The sentiment analysis provided by Atlas.ti, without manual cleaning of the results, shows that negative sentiment prevails (2305 in paragraphs and 4131 in sentences) over positive sentiment (1756 in paragraphs and 2593 in sentences). But a quick look at the results shows that a lot of manual cleaning would be needed, as the sentiments are very often improperly attributed. Therefore, to identify the experience from positive to negative, we also focused on the most frequently written words. This revealed that the positive experience of students' testing educational apps and platforms is the predominant one, and Figure 4 shows the words that were used most frequently to describe the experience. These words are also included in Figure 3.

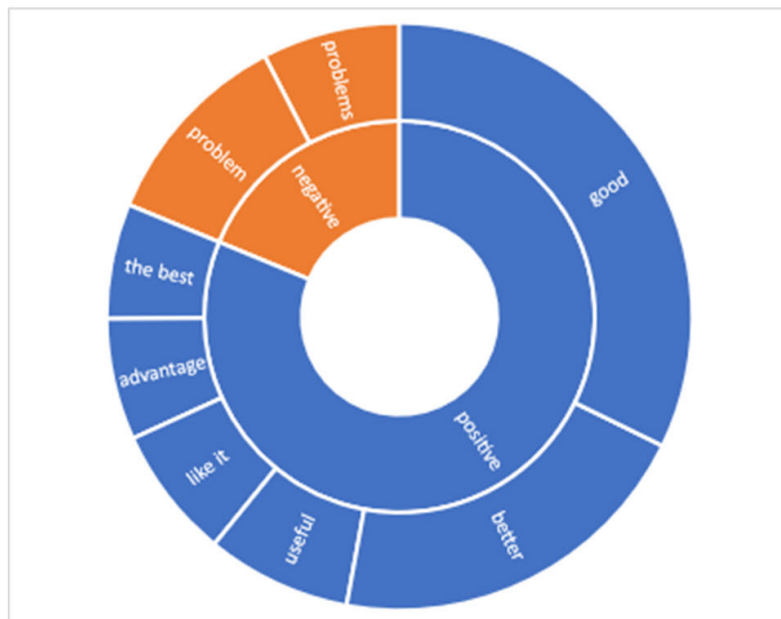


Figure 4. Dominant experience words from positive to negative, occurring at least 200 times (all assignments)

As shown in the figure above, 81% (N=2,781) have a positive sentiment. We would add that the word mediocre also appeared 215 times among the most frequent words, but we did not include it in Figure 4. If we had evaluated it as a neutral sentiment, the positive sentiment would have dropped to 76%. The limitation is that the included words are subjectively classified as sentiment and that only words that appear at least 200 times in all research reports are used, but the result is clear. Again, in personal conversations with each student, we perceived an overwhelmingly positive attitude, although occasionally they encountered some problems when taking the test.

Comparison

Following the findings presented above we also carried out a comparative analysis between the periods before and after Covid-19 pandemic. In this context, we have referred to the research reports from the first half of the 2019/20 academic year as pre-pandemic period research reports, and the research reports from the second half of the academic year 2021/22 as post-pandemic period research reports.

The analysis of the pre-pandemic period research reports considered 16 reports, and the analysis of the post-pandemic period research reports considered 10 reports. They both involved a lot of manual cleaning and Figure 5 shows the result – words that appear at least 50 times. Considering the pre-pandemic period reports, if we remove the words related to the fields of study (programming, coding, and language), we see that the most important are content, reason, and personal preferences, and the top words within the codes are content (N=352), followed by knowledge (N=275) and research (N=166). Also standing out are way, different, video, time, new, experience, find, and information. Considering the post-pandemic period research, we notice that the words relating to the fields of study do not appear first in the top positions (in fact, only language appears in the list, in the 15th position).

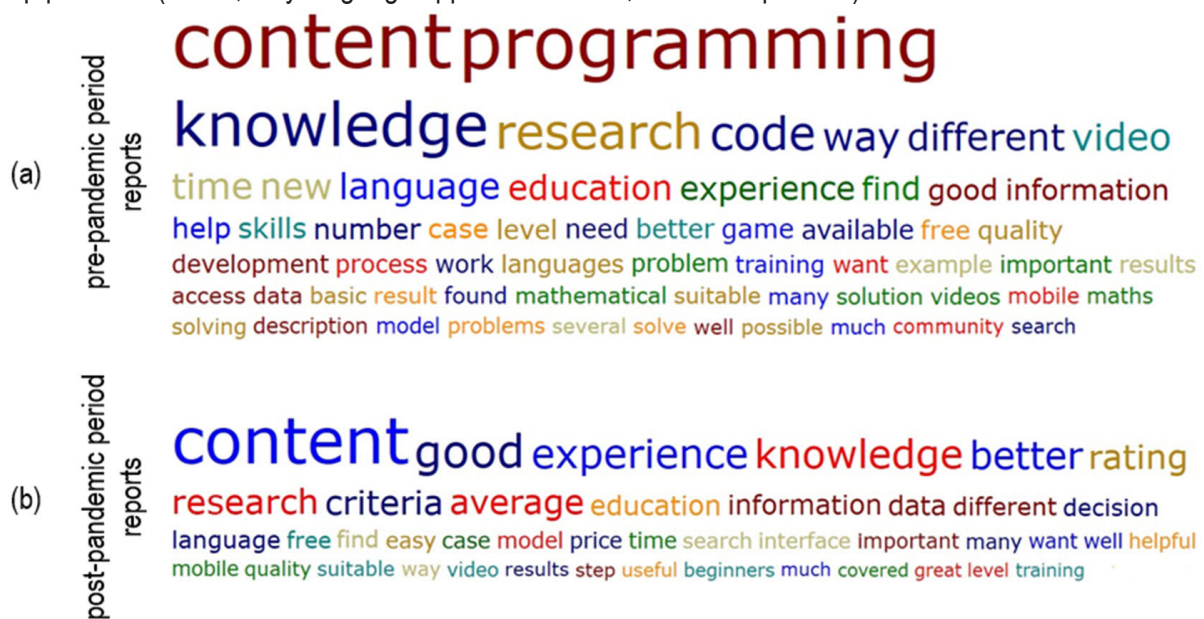


Figure 5. Dominant words appearing at least 50 times: (a) research reports from the first half of the academic year 2019/20 (pre-pandemic period reports), and (b) research reports from the second half of the academic year 2021/22 (post-pandemic period reports)

However, in the post-pandemic period reports content is still the most important for students, while personal preferences and reason changed their position, as personal preferences came as second most important. Namely, the top words within the codes are content (N=311), followed by experience (N=177) and knowledge (N=172). Rating, criteria, education, information, data, different, and decision also stand out. This suggests that students became more focused on their own preferences when choosing educational applications and platforms, likely because they became more acknowledged with the (enlarged) offering compared to pre-pandemic.

The comparison was applied to the sentiment analysis as well. Figure 6 shows the words that were used most frequently to describe the experience in pre- and post-pandemic period reports. We acknowledge that of the sentiment in pre-pandemic period reports, good comes first, followed by better, then problem/issues. Positive sentiment dominates with 64%. In post-pandemic period reports, however, sentiment has come to the front, with the words good and better appearing in the top five.



Figure 6. Dominant experience words from positive to negative: (a) research reports from the first half of the academic year 2019/20 (pre-pandemic period reports), and (b) research reports from the second half of the academic year 2021/22 (post-pandemic period reports)

Thus, in post-pandemic period reports positive sentiment is 100%, as the words problem or problems do not appear, which is one of the most important differences compared to the results of the students' test results two and a half years earlier. This is per our belief due to the changed attitude of students towards this type of learning, but also to the rapid development of educational applications and platforms, which has been accelerated by the pandemic. The word mediocre appears, which, if taken into account, could reduce satisfaction with testing by 33%.

In order to support the findings presented above, we also performed chi-square tests at significance level 0.05 where the strength of the association was determined by the value of the Cramer's V contingency coefficients. Figure 7 represents the mosaic plots for a) dominant words, and b) dominant experience, in both cases comparing the pre- and post-periods periods.

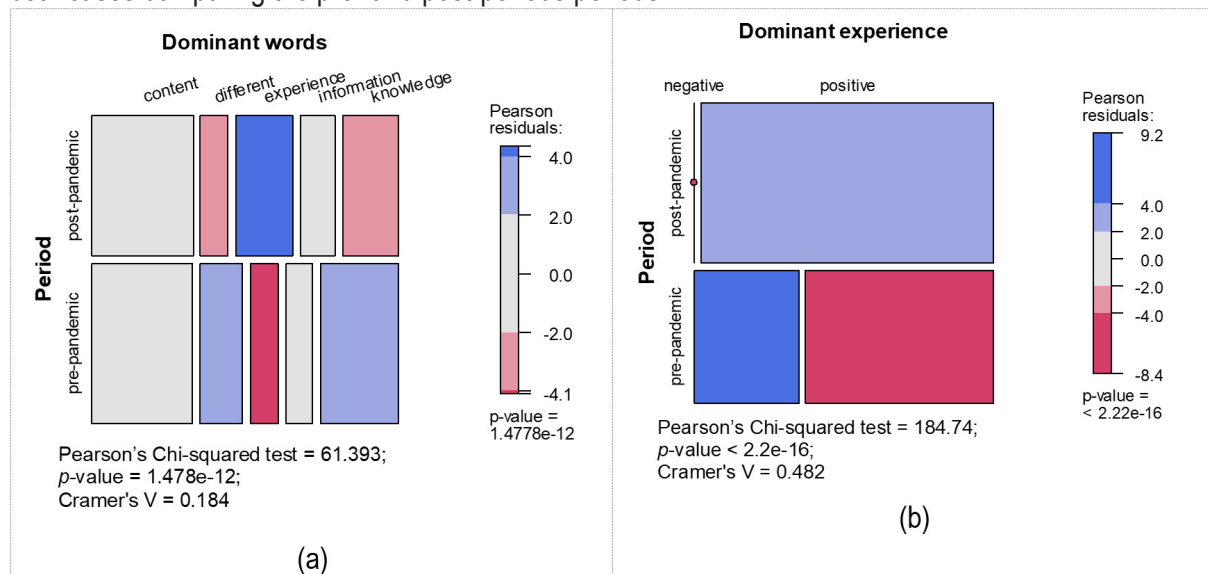


Figure 7. Comparison considering (a) dominant words, and (b) dominant experience in the pre- and post-pandemic period reports

To compare the pre- and post-pandemic period reports regarding the dominant words, we have considered only those words that appear among the dominant ones in both periods. In this case we observe significant ($p < 0.05$) but weak (Cramer's $V = 0.184$) association between pre- and post-pandemic periods. The discrepancies between the two compared periods occur in the case of the words different, experience, and knowledge, where in the post-pandemic period experience has significantly gained in

importance, while the importance of different and knowledge has declined significantly as compared to the pre-pandemic period.

Considering sentiment analysis, we observe strong (Cramer's $V = 0.482$) and significant ($p < 0.05$) association between dominant experience in pre- and post-pandemic period reports, which is consistent with the fact, that positive sentiment among post-pandemic research reports is 100%, as the words problem or problems do not appear. This finding can most likely be attributed to the rapid development of educational applications and platforms, and the accelerated spread of their use as a consequence of the pandemic.

Discussions

The methodology of extracting the main findings from the students' research reports, where we paid attention to the students' opinions and observations without combining them with our views and expectations, proved to be a difficult task but helped us to provide neutral answers to our research questions. The content analysis of the students' reports was carried out using manual coding and the qualitative analysis tool Atlas.ti provided a detailed insight into the students' opinions. Below we summarise the main findings that answered our research questions:

RQ1: What has proved to be the most important in the testing of educational apps and platforms by students?

The most important category was content, where we would point out the following most frequently written words: video, game (including tutorial, example), and help. This is followed by the category of personal preference, as students supplement their education with educational apps and platforms according to their possibilities, needs, and time, and variety and method are also important to them. This is because nowadays, the diversity of learning needs, styles, and social backgrounds of students are increasingly coming to the fore in education (Heacox and Pengal, 2019), which the second-ranked personal preference code confirms. Reason, user experience, price, and other categories follow.

However, we expected that, although some apps and platforms provide certificates of knowledge, the absence of official recognition might demotivate students to learn online on their own initiative. But we found that formal education is not the only criterion for some companies that also seek recruits via e-learning platforms and applications (in the cases studied, these are so far only foreign companies), and the qualitative analysis also resulted in the category of certificate appearing as a certificate in the word cloud (N=303) being ranked last.

RQ2: Which words stand out in the research reports of students who have tested educational apps and platforms?

We expected that the words quality, user experience, quantity, price, and certificate, and their synonyms (as in Rojko, 2020) would appear most often. But it turned out quite differently. If we exclude the most frequent words related to fields of study, the word knowledge ranks highest, which we have placed under the category of reason, followed by research, content, time, free, variety, and quality. The word certificate is ranked only 52nd.

It also showed that students' experience of testing educational apps and platforms is predominantly positive (81%), with the words better, good, useful, like, advantage and best being the most frequent, while negative sentiment is characterised by the word problem or problems.

RQ3: Has the impact of the Covid-19 coronavirus pandemic changed the way students view educational apps and platforms?

While the analysis of the research reports from the first half of the 2019/20 academic year shows that the most important is content, followed by knowledge, research, method and different, the reports from the second half of the 2021/22 academic year the word content also ranks best, followed by good, experience, knowledge and better. Thus, in the post-Covid-19 reports, sentiment has come to the front, with 100% of these research reports expressing positive sentiment, as compared to 64% positive sentiment in the reports from two and a half years ago. We also observe (considering the ranking of words by code) that students now prioritise user experience, reason, and quality over content and personal preferences compared to the pre-pandemic period but are still aware of the need for exploration. Namely, the development of the World Wide Web and search engines has made information 'on demand' a reality (Hirsh, 2018), and technology allows them to learn at their own pace and time (Moreno, 2018).

Conclusions

Our results show that the development of ICT and the related rise of educational applications and platforms is having a significant impact on teaching and learning. This requires teachers to take these applications and platforms into account and to use new teaching methods, the first prerequisite being a certain level of digital competence. However, we have found that this is in fact a huge burden for the majority of teachers, as it requires additional and continuous research and learning. It is also becoming increasingly apparent that traditional education must compete with e-learning opportunities, or the profession may gradually become meaningless for many teachers. It has also become clear that teachers, therefore, need to change their mindset and see their profession as adding value and building on what students can learn online, while at the same time becoming facilitators of such learning.

Although most courses do not yet foresee the use of educational apps and platforms, when teachers use some (at least occasionally) during their teaching, it can further motivate students to participate and pay attention. In addition, teachers can recommend certain apps and online platforms for students to use for self-learning to deepen and consolidate their knowledge. Our research showed that students already know and use many of the apps and platforms, but it turned out that they also appeared to be very interested in exploring and learning about others that exist in their field of interest, as they have certain advantages, disadvantages, and specificities, and they were always very interested to follow the presentations of their classmates' testing results.

Most students do not actively participate during a traditional lecture (Bajpai, Biberman and Ye, 2019), but educational apps require exactly that. Nevertheless, we would like to stress that we do not believe that the integration of apps and online platforms in faculty courses is always necessary or that it can always improve teaching and learning. However, in the spirit of the times, where students are used to being constantly connected to the World Wide Web and using connected devices at the same time for learning, searching for information, communicating, etc., we have decided to present the results of our survey to give an insight into students' opinions and testing results. In addition, this encouraged students to think about the possibilities and options for lifelong learning that will be required of them, especially intensively in the future career field of the students whose research reports were the source of the data of our empirical research. Therefore, this assignment was proposed to final-year students in the field of computer science and informatics.

The limitations of our research are clear; we only present tests of a few online platforms and applications, but the list can never be definitive as it is subject to constant updates. Moreover, depending on the fields of study, we only present the findings of a limited number of students, all from the four Informatics and Computer Science degree programmes from one faculty from Slovenia. Finally, although we do not assess the performance, usability, user experience, etc. of applications and web platforms, we present the main findings of students when testing them to gain insight into their thinking, our assignment of codes is subjective, as is the manual cleaning of the analysis results by Atlas.ti.

Despite these limitations, the scientific contribution of our paper stems from the fact that other authors have not used the same methodology to shed light on the topic of the paper. This topic is also extremely interesting in the so-called post-coronal period, as it shows how quick the change was, due to the coronal period and thus has important practical implications. Moreover, the empirical results of the qualitative analysis of students' opinions are particularly valuable, as their perspective is often neglected. At the same time, we also conducted a personal interview with each student, which allowed us to code and analyse the word cloud more appropriately.

Online education is certainly an area that will continue to grow rapidly in the future. Indeed, with new technologies such as machine learning and 5G, we can expect further rapid growth. But here is the problem – teachers and students do not know what is out there already, which limits them. Therefore, lifelong learning also applies to teachers, who should also spend their working time exploring these possibilities so that they know how to use them and recommend them to students as an additional resource, and their role should focus even more on a mentoring style of teaching. However, this will only be effective if students are committed to this way of learning, which will require them to be even more self-controlled and self-organised.

During the Covid-19 coronavirus pandemic teachers and students experienced a situation where distance teaching and learning became mandatory, requiring them to change their methods significantly, which further increased the use of educational applications and platforms, not to mention the various online communication tools. As Kodelja (2020) states, it is difficult to say how successful distance education has been as a result of the new coronavirus, but it seems that not all the possibilities offered by ICT have been exploited, due to both objective and subjective circumstances. But due to this pandemic, we cannot go

back to the learning and teaching methods we used before. We need to take a further step based on the experiences we have gained and exploit all the possibilities offered by ICT, thoughtfully and adapted for different groups of students.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, K.R. and N.E.; methodology, K.R., and N.E.; formal analysis, K.R. and N.E.; investigation, K.R.; validation, K.R. and N.E.; visualization, K.R. and N.E.; writing—original draft preparation, K.R. and N.E.; writing—review and editing, K.R. and N.E. All authors have read and agreed to the published version of the manuscript.

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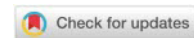
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Characteristics of Students' Burnout and Perfectionism in China and Russia

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Abstract: The problems of studying the relationship between manifestations of perfectionism and emotional burnout are of considerable interest to modern psychology. Prospective participants in such a study are representatives of various professional communities and students as future specialists. The purpose of this work is to consider the manifestations and relationships of emotional burnout, self-esteem, mental states and perfectionism among Russian and Chinese students. A total of 80 people took part in the study (40 Russian and 40 Chinese students). Research Methods applied: 1) multidimensional scale of perfectionism by P. Hewitt and G. Flett, adapted by I.I. Grachev; 2) the burnout questionnaire by K. Maslach adapted by N.E. Vodopyanov; 3) a technique for diagnosing self-assessment of mental states by G. Eysenck. As a result of the use of comparative and correlation types of analysis, intercultural differences and interrelations between the characteristics of perfectionism, self-assessment of the emotional state and characteristics of emotional burnout were found. Respondents from China showed lower results on the "aggressiveness" scale compared to Russian respondents. Russian students showed higher scores on the "anxiety" scale than Chinese students. Meanwhile, Chinese students, compared to Russian respondents, showed higher results in self-confidence and their future. In the course of the study, both groups showed average indicators of rigidity, but the level of rigidity in Russian students was higher than in Chinese students. In conclusion of this scientific study, the main recommendations for the correction of emotional burnout and self-regulation of perfectionism and mental states among students are proposed.

Keywords: emotional burnout, perfectionism, mental states, Russian and Chinese students.

Introduction

In the conditions of emotional tension, which the majority of students and teachers of modern universities find themselves in, it is especially important to work on maintaining their psychological health. Over the past few years, the foreign psychological science has been demonstrating an increased interest in the negative side of perfectionism phenomenon, which is now regarded as one of the main symptoms of the emotional burnout development along with other stable human concepts (Fang and Liu, 2022; Filipkowski et al., 2021; Flett et al., 2016; Martin et al., 2022; Stošić and Fadiya, 2017; Stošić, Dermendzhieva and Tomczyk, 2020; Tomczyk et al., 2022). Perfectionism is a complex phenomenon; its influence can cover all the spheres of human life. Western researchers such as Hewitt, P. and Flett, G. (1991a, 1999, 1991b), Ingrem, S. (1990), and others note, with an incorrect ratio of perfectionist tendencies and their disproportionate development, there is a risk of neurotic perfectionism formation. With the so-called 'normal' perfectionism, a person gets satisfaction from hard work, strives for self-development and results' improvement, while remaining able to accept the fact that there is a limit to their personal or situational perfection (Frost et al., 1993). With neurotic perfectionism, nothing seems perfect enough to an individual. A deep-rooted sense of inferiority and vulnerability plunges him or her into a circle of self-destructive super-efforts, and every case or task turns into another threatening challenge (Antony et al., 1998; Shumaker and Rodebaugh, 2009).

Several studies identify the consequences of the neurotic perfectionism formation, such as depression, anxiety, low self-esteem, alcoholism, drug addictions, etc. (Hewitt and Flett, 1999; Ingrem 1990; Frost et al., 2005; Debrowski 1997; Habke, Hewitt and Flett, 1999). In modern psychology, depending

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on the point of view held by different scientists, perfectionism implies high standards that an individual sets for him/herself; a person's desire for perfection as a whole, and for its individual manifestations, expressed in the improvement of activities and their products, bringing it up to certain intellectual, moral and aesthetic standards (Yasnaya and Enikolopov, 2007; Permyakova and Sheveleva, 2015).

On the one hand, perfectionism as a stable personality quality can be the basis for the development of emotional burnout (Stumpf and Parker, 2000; Rice and Liu, 2020). On the other hand, in the process of developing the syndrome of emotional burnout and alienation from activity, an adult person faces a feeling of inability to meet established personal standards (Orel, 2014; Mikhailova, 2017). It is important to note that perfectionism affects the burnout development not from the point of view of the individual's desire to achieve an ideal, but in connection with his/her constant attempt to assess how much they correspond to this ideal. If a professional feels a low degree of compliance with established standards, he/she is faced with the experience of distress (Terry-short et al., 1995; Stoeber, Harris and Moon, 2007; Spagnoli et al., 2021; Levine and Milyavskaya, 2018).

In medical psychology, perfectionism and hostility are considered as personal factors of depressive and anxiety disorders (Abdollahi, Hosseinian and Asmundson, 2018; Dunkley et al., 2020; Suh et al., 2022; Fernández-García et al., 2022). According to the results of studies conducted under the guidance of N.G. Garanyan, students with an increased level of perfectionism demonstrate high rates of depression, anxiety (both general and social), as well as emotional maladaptation (Garanyan, Andrusenko and Hlomov, 2009). The study of perfectionism in the context of anxiety and depressive disorders was conducted by V.V. Paramonova (Panina, 2020).

Recently, the Russian scientific world has been demonstrating a growing interest in the study of the correlation between perfectionism and emotional burnout syndrome among representatives of various professions. A special place among these works is occupied by studies of perfectionism and emotional burnout manifestations among representatives of the educational environment, in particular, among teachers of secondary and higher schools (Melnichuk, 2017; Suddarth and Slaney, 2001; Hewitt, Flett and Mikail, 2017).

Thus, according to O.I. Kayasheva's research, if a teacher does not carry out the necessary reflection, experiences chronic fatigue and has personal ideals set before him/her, which he/ she strives to achieve in any situation presented by the working environment, perfectionism becomes one of the leading factors in the development of emotional burnout syndrome (Kayasheva, 2018). In her research, the author notes the following features of the correlation between the perfectionism manifestations and emotional burnout among university teachers. With a high level of self-centred perfectionism, teachers experience symptoms of such a burnout phase as 'anxiety tension', represented by the experience of a traumatic situation, as well as symptoms of the 'resistance' phase, expressed in the reduction of professional responsibilities, and symptoms of the 'exhaustion' phase, manifested in depersonalization, i.e., in the teacher's personal detachment. With a high level of perfectionism focused on others, teachers experience such symptoms of the 'resistance' phase as limitation in the emotional response sphere, its inadequacy and selectivity. A high level of socially prescribed perfectionism, in turn, provokes the development of 'exhaustion' phase symptoms in teachers, expressed in emotional deficit and detachment (Kayasheva, 2018; Mikhailova and Farennikova, 2022; O'Connor, Rasmussen and Hawton, 2010).

A.S. Melnichuk's research also confirmed the statement that perfectionism plays a significant role in the emotional burnout development among teachers of higher educational institutions. So, according to the results of his research, there is correlation between the structural components of the burnout syndrome with perfectionism in general and its components in teachers. At the same time, he notes correlation between all the perfectionism components and depersonalization, as well as the connection of socially prescribed perfectionism with the self-assessment of professional effectiveness (Melnichuk, 2017).

If we consider the perfectionism phenomenon as a determining factor in the emotional burnout development, then we can assume that the correlation of these psychological states manifests itself as early as during the period of study at the university, at the time when the professional formation of the student's personality takes place. In the last few years, this problem has been seen particularly relevant in Russian scientific works (Koivula, Hassm and Fallby, 2002; Molnar et al., 2006).

In general, considering the Russian researchers' works on this problem, we can conclude that perfectionism is a fairly stable personality trait of modern Russian students, which manifests itself mainly at the average level (Garanyan, Andrusenko and Hlomov, 2009; Panina, 2020).

From the point of view of emotional burnout prevention and perfectionism correction, it is important to study not only Russian, but also foreign students. Therefore, the purpose of our study was to identify the specifics of perfectionism and emotional burnout manifestations in Russian and Chinese students.

Materials and Methods

The sample of respondents was represented by 80 Russian and Chinese students aged 19 to 25 years: 40 Russian and 40 Chinese students of 2-4 Bachelor's and 1-2 Master's courses studying at the Philology Department at the Peoples' Friendship University of Russia.

In the course of conducting the empirical study, the authors used the following methods: 1) the multidimensional perfectionism scale by P. Hewitt and G. Flett adapted by I.I. Gracheva (Gracheva, 2008); 2) the burnout questionnaire by K. Maslach adapted by N.E. Vodopyanova (Vodopyanova and Starchenkova, 2008); 3) the methodology for diagnosing the self-assessment of mental states by G. Aizenk (Rajgorodskij, 2011). Statistical verification of differences and correlation between perfectionism and emotional burnout indicators, as well as the students' mental states was carried out by calculating the Mann-Whitney U-criterion and correlation analysis using Spearman's rank correlation coefficient.

All the methods used in the course of the study to diagnose the manifestations of perfectionism, emotional burnout and mental states of Chinese students were translated into Chinese using the semantic translation method. We also adjusted K. Maslach's burnout questionnaire. Since this technique is aimed at identifying the emotional burnout indicators in representatives of various professions and is not suitable for studying these indicators in students, we have transformed statements related to professional activity into statements related to educational activity. The need for such transformations was also caused by the fact that there are no burnout questionnaires adapted for students in the scientific literature.

Results and Discussion

Diagnostics of emotional burnout manifestations in Russian and Chinese students using the burnout questionnaire by K. Maslach adapted by N.E. Vodopyanova did not reveal significant differences in the emotional burnout characteristics (Table 1).

Table 1

Results of differences in emotional burnout among Russian and Chinese students (n = 80)

Methodics scale	Average value (Russian students)	Average value (Chinese students)	Mann-Whitney U-criterion	p-level
Emotional exhaustion	24.525	22.85	729.5	0.497
Depersonalization	10.475	11.05	768	0.757
Reduction of academic progress	28.675	26.9	669.5	0.208

Note: * - significance level $p < .05$; ** - significance level $p < .01$

Characterizing the level of emotional burnout in Russian and Chinese students in general, we can note that its indicators are close to high, but there are no significant differences in the indicators of all burnout components between Russian and Chinese students.

The results of the differences in the indicators of the Multidimensional Perfectionism Scale by P. Hewitt and G. Flett adapted by I.I. Gracheva are presented in Table 2.

Table 2

Results of establishing the significance of differences in the level of perfectionism indicators in Russian and Chinese students (n = 80)

Methodics scale	Average value (Russian students)	Average value (Chinese students)	Mann-Whitney U-criterion	p-level
Self-centered perfectionism	64.7	69.625	574.5	0.030*
Perfectionism focused on others	50.125	61.75	363	0.000**
Socially prescribed perfectionism	52.3	59.175	534	0.010**
Integral scale	167.125	190.55	312	0.000**

Note: * - significance level $p < .05$; ** - significance level $p < .01$

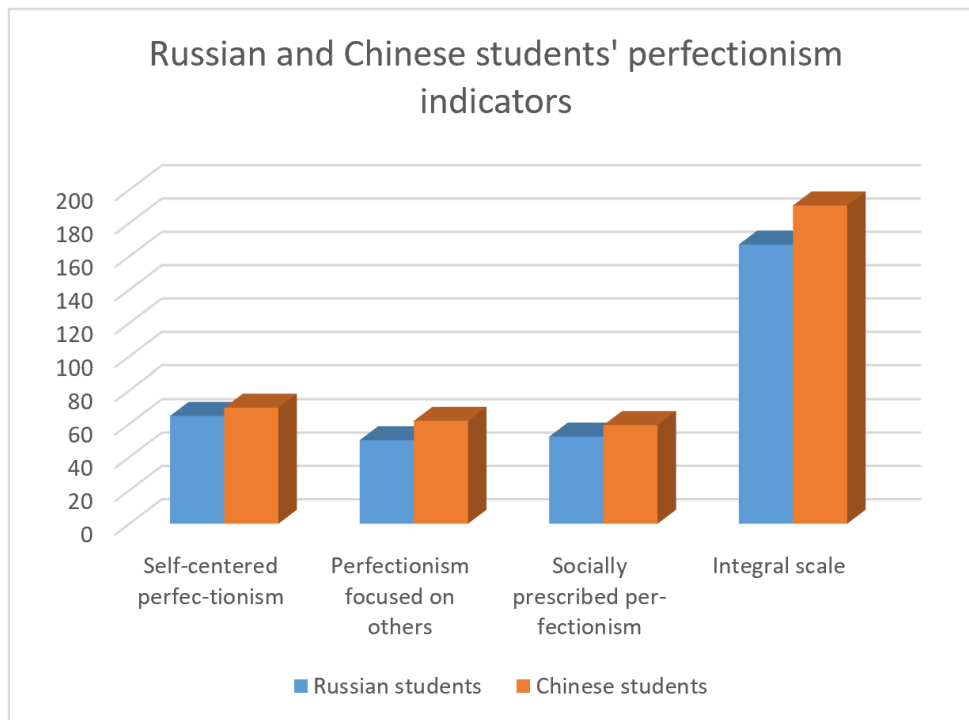


Figure 1. Comparison of perfectionism indicators in Russian and Chinese students (n = 80).

When analysing the results of the empirical study, it was revealed that the level of perfectionism in Chinese students in general and for each of its components is significantly higher than that of Russian students. The results obtained may indicate the specific features of Chinese culture representatives in relation to perfectionism phenomenon.

Unlike Chinese students, Russian students tend to be less demanding about themselves and their achievements, as well as about others. The lowest indicators on the scale of perfectionism focused on others were demonstrated by Russian students. Russian students are less inclined to expect the ideal performance of activities from others, including meaningful, close people.

Analysing the lower indicators of Chinese students on the scale of socially prescribed perfectionism, we can assume that in the conditions of studying in Russia, Chinese students experience less psychological pressure from parents and society. This is expressed in their reduced desire to meet the high requirements of Chinese society.

The results of the applied methodology for diagnosing the self-assessment of mental states by G. Aizenk are presented in Table 3 and Figure 2. Within the conducted comparative analysis using the

Mann-Whitney U-test, significant differences in indicators of anxiety, aggression and rigidity were found in Russian and Chinese students. Chinese students scored the lowest on the "aggression" scale compared to Russian students, which characterizes them as more restrained and patient. Russian students showed higher scores on the "anxiety" scale compared to Chinese students. Chinese students show a great degree of confidence in themselves and in their future. The study revealed some average indicators of rigidity in the both groups of respondents. Nevertheless, the level of rigidity in Russian students is higher than in Chinese (Table 3).

Table 3

Results of establishing the significance of differences in the level of indicators of psycho-emotional states in Russian and Chinese students (n = 80)

Methodics scale	Average value (Russian students)	Average value (Chinese students)	Mann-Whitney U-criterion	p-level
Anxiety	24.525	22.85	588.5	0.041*
Frustration	10.475	11.05	773.5	0.798
Aggression	28.675	26.9	527	0.008**
Rigidity	24.525	22.85	545	0.014*

Note: * - significance level $p < .05$; ** - significance level $p < .01$

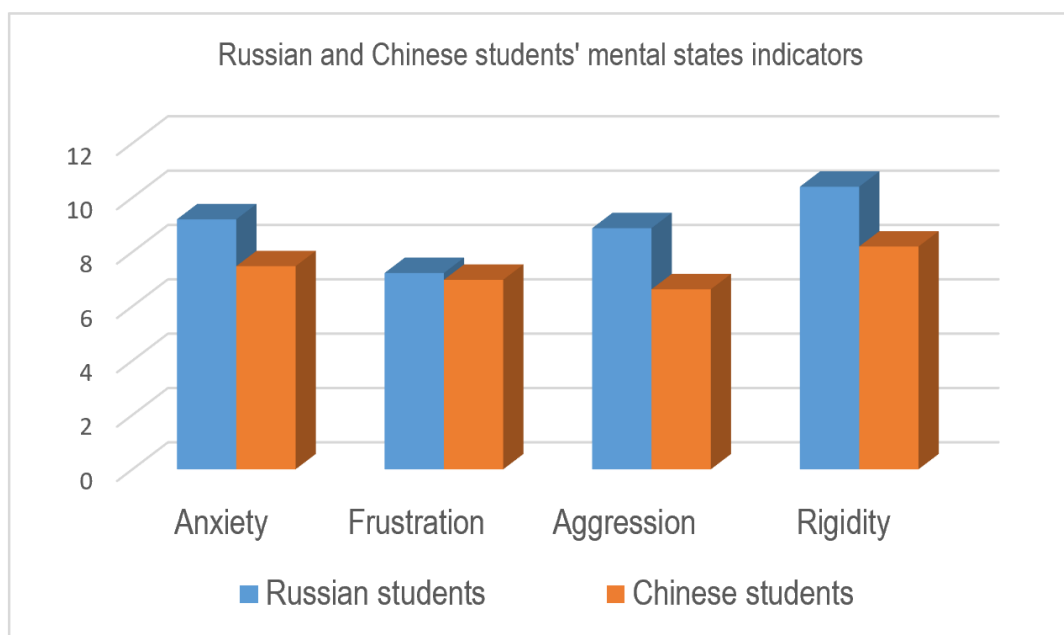


Figure 2. Comparison of psycho-emotional states indicators in Russian and Chinese students (n = 80).

The both groups of students demonstrated average performance on the rigidity scale. Nevertheless, the level of rigidity in Russian students is significantly higher than in Chinese. This suggests that Russian students are more difficult or unable to change their behavior, attitudes and activities when it is necessary. Russian students tend to experience discomfort when their usual routine is violated and deviations from their previous plans are combined with difficulties caused by the need to adapt to these changes. These results can tell us that Russian students take it hard to leave the comfort zone represented by the usual everyday situations in which they are accustomed to carry out their daily activities (Figure 2).

In the course of the correlation analysis, significant feedback was revealed between the indicators of the integral perfectionism scale and such a component of emotional burnout as depersonalization in

Chinese students. Probably, the indicators of Chinese students' perfectionism do not manifest themselves in the symptoms of emotional burnout (Table 4).

Table 4

The results of the correlation analysis of perfectionism and emotional burnout features in Chinese students (n = 40)

Methodics scale	Emotional exhaustion	Depersonalization	Reduction of academic progress	Anxiety	Frustration	Aggression	Rigidity
Integral Scale	-.281	-.331*	.102	.134	0.017	.050	.044
Emotional exhaustion	1.000	-	-	.491**	.516**	.428**	.581**
Depersonalization	-	1.000	-	.266	.410**	.462**	.437**
Reduction of academic progress	-	-	1.000	-.253	-.251	-.184	-.248

Note: * - significance level $p < .05$; ** - significance level $p < .01$

Characterizing the absence of significant links between perfectionism components and emotional burnout components in Russian students, provided that their perfectionism indicators are close to low and burnout indicators are high, we can assume the presence of other objective factors that have increased their burnout.

Probably, the leading factors in the development of emotional burnout in both groups of students were stress factors related to educational activities. It was revealed that the higher the level of emotional exhaustion among Russian and Chinese students, the higher the indicators of their frustration and anxiety and vice versa. Chinese students have less pronounced emotional exhaustion in these indicators. The reduced level of frustration among Russian students may indicate a reduced level of importance of educational activities for them due to the presence of urgent needs in other spheres of life.

The results of the study revealed the connection between emotional exhaustion in Chinese students with such mental states as aggression and rigidity. Despite the fact that Chinese students tend to show emotional detachment towards people around them, they express this in aggression to a lesser extent, compared to Russian students. In addition, the correlation analysis revealed the connection of such a component of burnout as the reduction of academic progress with indicators of frustration and rigidity among Russian students.

Conclusions

Summarizing the results of our research, we can note that the indicators of perfectionism in Chinese students are close to high, while the indicators of perfectionism in Russian students are close to low.

The results obtained may indicate the specific features of representatives of Chinese culture in the context of the phenomenon of perfectionism. Unlike Chinese students, Russian students tend to be less demanding about themselves and their achievements, as well as about other people.

Characterizing the emotional burnout in Russian and Chinese students, we noted the absence of significant differences in its indicators in these groups. Thus, both groups of respondents demonstrated close to high rates of emotional burnout. It was also revealed that the indicators of anxiety, aggression and rigidity in Russian students are significantly higher than those in Chinese students. In this regard, we can note the need for preventive work in order to reduce the level of burnout, anxiety, aggression and rigidity in students.

Based on the results of the study, we will formulate the following recommendations for working with students:

1. Minimizing the level of students' emotional burnout. To implement this task, we can recommend psychologists to conduct regular trainings, the purpose of which is to develop the students' self-regulation skills. It is necessary to develop the students' skill of building a balance between academic activities and other areas of life (communication, hobbies, etc.), which will not only reduce the level of burnout, but also prevent its development in general.

2. Reducing the level of anxiety, frustration, aggression and rigidity of students, since high rates of these mental states provoke the development of emotional burnout components.

3. The development of the students' learning motivation, which ensures not only the desire for the learning process, but also the meaningful performance of tasks.

4. Development and implementation of a mentoring system for foreign students in each individual study group.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

All authors contributed to the research design, data collection, data analysis, and write up. All authors contributed to the article and approved the submitted version.

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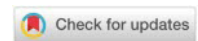
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On The Question of A Human's Personality Resources in a Changing World: Volitional Control, Trust, Anxiety

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Abstract: The article attempts to describe the features of a person's volitional regulation regarding the aspect of the implementation and realization of his intention in action in a challenging situation of the modern world: complexity, uncertainty, stress. The approaches to the study of will in psychology and philosophy have been analyzed. The role of trust in the implementation of a person's choice and the realization of intention in action has been shown. The following empirical methods were used: the psychometric technique "Self-confidence" by T.P. Skripkina, the Scale of interpersonal trust by J. Rotter in the adaptation of S.G. Dostovalov, the methodology of "Life orientations, SOHO" D. A. Leontiev, express diagnostics of propensity to unmotivated anxiety (V.V. Boyko), "Control in action" by Yu. Kull in S.A. Shapkin's adaptation. According to the results of our study, we can conclude that there are differences in the realization of the intention to act, depending on the different ratio of the level of trust in oneself and in the world. Self-trust can be a component and an important resource of self-regulation.

Keywords: self-regulation, volitional control, trust, trusting relationships, anxiety.

Introduction

The issue of volitional regulation and the mechanisms of volitional action is one of the central problems for psychology. The complexity of the experimental study of the will as well as methodological discussions about the nature of volitional behavior actualize the formulation of new research tasks and place the need to study the will, the implementation of actions and the implementation of human choice in a separate significant layer of research. Instability and complexity of the world, on the one hand, creates conditions for the development of anxiety, a number of other negative states; on the other hand, today we can observe a situation of developing new opportunities and new psychological resources of the volitional process. Being associated with a special cognitive practice, the situation of uncertainty allows, in the absence of specified algorithms, to experience a new experience, to see and rethink reality in a new way, to form a new culture of experiences through an emotional attitude to phenomena and objects of reality, to structure a new picture of the World and oneself in it. Self-regulation in this case unfolds not on an intellectual, but rather on a personal and semantic level. Moreover, the removal of uncertainty becomes a more significant goal in decision-making than the realization of choice (Kornilova, 2014). Thus, in situations where intellectual orientation is difficult (which is typical of the modern world challenges), a decisive role is assigned to personal effort, that unfolds at the level of volitional action. In existential psychology and philosophy this phenomenon is described in terms of resilience, existential courage (Maadi, 2004); courage (Tillich, 1995; Kierkegaard, 1993), effort in time (Mamardashvili, 2018), etc.

Moreover, speaking about the psychological resources of self-regulation (resilience Maadi, 2004), willingness to take risks, flexibility, orientation to action/state (Kuhl, 2000), we should understand that the shortage of resources is no less important. In one of his articles D.A. Leontiev designated such resources as universal, "based on the system restructuring connections in interaction with the world and thereby capable of turning into advantages even what at first glance looks like an obvious disadvantage." (Leontiev, 2016). So, the situation of trauma, despair, deprivation of opportunities and high stress – all this

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can turn out to be a resource for growth and “mobilize a person to change the structure and compensatory increase in the quality of self-regulation of their life activity.” (Leontiev, 2016). Therefore, the modern world can also act as a mobilization factor, and in this regard, it is vital not only to study what obviously increases the resources of self-regulation, but also to talk about those obstacles that make us grow.

The modern world challenges (informational, stressful, uncertain) are increasingly actualizing a person's personality resources – goal setting and meanings search as a vector of movement, the possibility of free action and taking responsibility for one's own choice, the effects of understanding and resistance to manipulation. Turning to psychological researchers and philosophical views on the nature of thinking, we underline that it is the act of thought that sets the possibility for free action; gives rise to a new experience situation and, via the extraction of meaning, opens up new opportunities for changing the movement trajectory. The act of understanding is always a “shift of consciousness” and, in the view of ancient and modern philosophers, it is “switching to a structure where meaning is extracted once and for all and further (Mamardashvili, 1999). The act of thought is the comprehension of continuity, “extracting meaning and making decisions.” (Mamardashvili, 1999). It is the aspect that M.K. Mamardashvili reflects on the “bad infinity” we fall into without being able to extract meaning from our own experience. In a situation of instability of the world, unpredictability of life processes and events, a person more often faces the need to develop personal resources to cope with information overload, compression and the speed of change. Thus, the experience of slowing down and focusing attention, accepting events and recognizing symbols, trust and dealing with anxiety creates a powerful resource for the realization of intentions and the expansion of his life experience.

In our opinion, trust as the most important socio-psychological phenomenon, is one of the mechanisms of regulating human activity and can also influence the mechanisms of volitional action, manifesting itself at the level of different ratios of self-confidence and trust in the world and thereby regulating the implementation of humans' actions and the implementation of their intentions in different ways. Our research is aimed at studying the features of volitional regulation (in this case, we understand volitional regulation as the retention of intent in action) and describing the differences in the implementation of actions depending on different types of trust relationships.

Despite the terminological ambiguity of the concept of will, as well as the complexity of the empirical study of this phenomenon in the view of philosophers and psychologists, will is primarily “a reasonable action accepted for execution, but insufficiently motivationally secured” (Aristotle); it is a concept that has become an affect (L.S. Vygotsky); a psychic force that transforms understanding and knowledge into action; a kind of bridge between desire and action (I. Yalom); the psychic organ of the future (Arendt); the ability to spontaneously begin a series of sequential actions, and finally, will is the decisive factor in the transfer of equilibrium into states of change; the act occurring between insight and action and experienced as an effort or determination (Velis); acceptance of responsibility as opposed to awareness of responsibility; the ability to make and embody choices; power consisting of energy and desire. Thus, the will expresses determination and commitment; directs us into the future, creates new opportunities in finding ourselves.

In the psychological tradition all theories of will can be conditionally divided into three approaches. The first one is motivational: will is considered through motivation and affects, aspirations, desires, determining actions become the subject of study. Motivational will theories also include D. N. Uznadze's views. He emphasized that the basis of volitional action is an attitude that controls the decision-making process and is formed in the process of imagination or thinking. In the theories of free choice the will is an independent force that mostly determines all other mental processes functioning. The same tradition is widely represented in philosophy. For instance, we find the idea of free will in I. Kant's reflections on the freedom of action. The will becomes free when it obeys its inner imperative, the inner law which determines the boundaries of volitional action. In psychological research the theory of free choice is also reflected in the P. Ya. Galperin's works: (will as a way of making a conscious decision in a situation of moral choice and volitional actions as a special type of mental actions requiring internal effort, in the concept of A. N. Leontiev (as characteristics of volitional actions, the author of the concept identifies: arbitrariness, the presence of choice, decision-making, overcoming obstacles (Leontiev, 2000)). Thus, within the framework of the approach the will of free choice is represented either as an autonomous unit or as one of the significant functions of cognitive processes.

The second concept suggested by Y. Kull's will is the basis for the construction and implementation of our research task, It is also close to the approach described above. In Yu. Kull's view, volitional regulation initially implies some difficulties in the implementation of personal intentions and is reflected at the level of retaining intentions in action. Reflecting on the obstacles in the realization of the intention and the implementation of the action, Yu. Kull introduces two basic concepts: state orientation (susceptibility

to the formation of inferior intentions, excessive concentration on thoughts about the experiences of their states resulting in difficulties with the action itself) and action orientation (the transition from intention to action occurs involuntarily). The author identifies the mechanisms that provide control in action: emotional (emotions regulation and thus the action continuation when face an obstacle), motivational (motivation support and intent actualization in achieving the goal); attention control is the most important mechanism manifested as focusing on information that is significant for the intent realization and distraction from interfering factors; perceptual control, failure control and behavioral control.

And finally, the third one – regulatory approach – is represented by the research of I.M. Sechenov, M.Ya. Basov, L.S. Vygotsky. In this approach the emphasis is shifted from the study of the will as a situation of generating special actions to the area of “mastering oneself” and one’s behavior. Within the framework of this very approach the problem of self-regulation arises as a private area of will research. Regardless of the difference in concepts, the volitional process includes: the motivational side as an incentive to action and setting a goal, motivational conflict and the problem of internal choice, decision-making based on the personal meaning of the action, expressed in intention and the action implementation (committing an act). At this exact stage volitional regulation acts as control over the execution of an action, and in a situation of obstacles – as a continuation of the action when meeting them.

Materials and Methods

The purpose of the study is to analyze the possibilities of volitional regulation in the situation of modern word challenges and to identify differences in the implementation of intentions in action, depending on different types of trusting relationships. As a working hypothesis we put forward a few points. Firstly, the assumption that the trusting relationships system is interconnected with the peculiarities of implementing implementation in action. Secondly, the suggestion that there are differences in the implementation of intentions among respondents with different types of trusting relationships. 210 people of 27-55 years old participated in the study: 28% were men, 72% – women. The research methods were focused on the study of the individuals’ features of the volitional regulation at various stages of the action implementation, highlighted by Yu. Kull. Distinguishing between action orientation (transition from intention to action) and state orientation (delay in the motivational phase), the author captures personality traits operationalized to three different situations. Firstly, orientation to active action versus orientation to reflection in a situation of failure, the ability to flexibly switch from one situation to another, the ability to dive deeply into the implementation selected activities while being distracted from others, in the realization of the intention to act (“Scale of control over action” by Yu. Kull, adaptation by S.A. Shapkin). Secondly, the severity of anxiety as an indicator of emotional state (express diagnostics of the propensity to unmotivated anxiety V.V. Boyko). Thirdly, trust in oneself and others and the study of the trusting relationships system (methodology for the study of interpersonal trust J.V. Boyko). Rotter’s “Interpersonal Trust Scale”, ITS, adapted by S.A.Dostovalov; psychometric technique “Self-confidence” by T.P. Skripkina). Fourthly, meaning of life orientations: the subject’s experience of the meaningfulness of his own life as an integral adaptation indicator and psychological well-being, including such components as satisfaction with the process of life and the result of self-realization in the past, the presence of clear goals and readiness for their implementation (methodology “Meaning of Life orientations”, SOHO, D.A. Leontiev).

Results

At the first stage of the study, the system of trusting relationships among respondents (self-confidence and trust in the world) was studied and the groups of trusting relationships were identified depending on the severity of self-confidence and trust in the world.

Table 1

Distribution of the sample by the severity of self-confidence and trust in the world. Groups of trust relationships

Group	Trust Level	% of the respondents
A	average self-trust level and the level of trust in the World	20
B	self-trust level is higher than the level of trust in the World	53
C	the self-trust level is lower than the level of trust in the World	10
D	high self-trust level and the level of trust in the World	16
E	low self-trust level and the level of trust in the World	0

These techniques allowed us to assess the severity level of two parameters – the level of self-trust, which ranges from high to low – and the trust level in others (in the World). As can be seen from the table, the most numerous group turned out to be group “B” – the self-trust level is higher than the trust level in the World. In our opinion, this result correlates with the idea of a transitive World, the person’s need and often their ability to find support mainly relying on themselves. Based on theoretical propositions about the essence of trust presented research on the trust system relations (Skripkina and Selezneva, 2014; Dostovalov, 2013), we proceeded from the fact that the balance of trusting attitudes allows a person to exercise activity more fully.

For the subsequent analysis of the trusting relationships group (“A” the average level of self-trust and the average trust level in the World and “D” the high self-trust level and the high trust level in the World), where the balance of trusting attitudes was recorded, we combined into one group – group “A” the harmonious ratio of the trust level to oneself and to the World.”

Further in the text:

Group “A” is a harmonious ratio of the self-trust level and the level of trust in the World.

Group “B” – the self-trust level is higher than the level of trust in the World.

Group “C” – the self-trust level is lower than the level of trust in the World.

At the next stage of the study, based on the tasks set, we analyzed the features of life-meaning orientations in each of the three groups, as well as the features of the implementing intention in action.

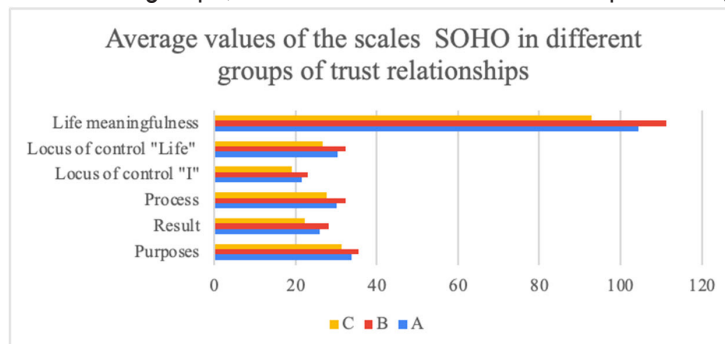


Figure 1. Symbols: A – a harmonious system of trusting relationships; B – self-trust is higher than trust in the world, C -self-trust is lower than trust in the World.

The obtained results suggest that self-trust is one of the conditions for a person’s ability to build a life perspective, perceive life as a value and fill it with meaning. As can be seen from the graph, the respondents in group “B” are more inclined to perceive themselves as having freedom of choice and being able to control their lives (scale “locus of control life (32,4); locus of control I (23)). On the contrary, in group “C” (self-trust is lower than trust in the World). The decrease in these indicators shows that, perhaps, excessive trust in the World limits, narrows the scope of what is possible for a person, thereby causing difficulties in setting goals, in feeling able to change the current life situation. It is interesting to note that in the harmonious group of trusting relationships there is also a decrease in values on all scales

of the SOE (in comparison with group “B”).

Table 2

The results of comparing the average values of the CSR scales of respondents with different types of trust relationships. Variance analysis table

The Variable	F (df:2;200)	p	ω^2	Lower bound 95% CI	Upper bound 95% CI
Purposes	4,09	0,018	0,03	0	0,08
Process	5,93	0,003	0,05	0,003	0,11
Result	11,6	<0,001	0,09	0,03	0,17
Locus of control «I»	7,38	0,001	0,06	0,01	0,13
Locus of control «Life»	6,04	0,003	0,05	0,004	0,11
Life meaningfulness	8,87	<0,001	0,07	0,01	0,15

We conducted a one-factor analysis of variance (ANOVA) of differences between subjects with various types of trust relationships according to the scales of the SOE methodology. The values of Fischer’s statistical F-test and its significance level, as well as indicators of the magnitude of the ω^2 effect (omega-squared) and their 95% confidence intervals are shown in the table (the values are rounded to 2-3 decimal places). The differences on all scales are statistically significant, while the magnitude of the effect on the scales “Goals”, “Process” and “Locus of control – life” is small, and on the scales “Result”, “Locus of control – I” and the overall indicator is average (according to Mangiafico, 2016; Ben-Shachar Lüdecke and Makowski, 2020).

At the final stage of the study we analyzed respondents with different types of trusting relationships and their features of the realization of intention in action.

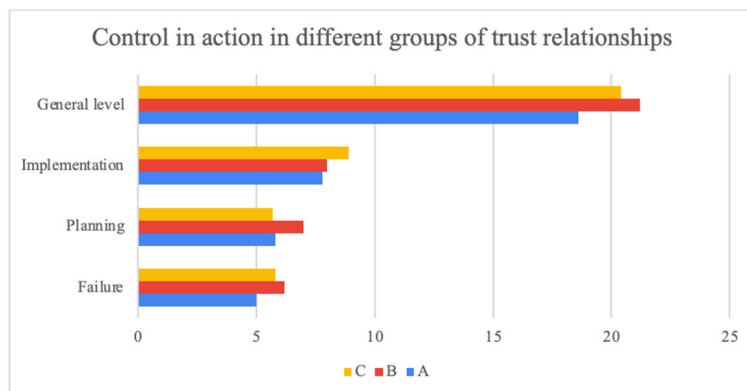


Figure 2. Symbols: A – a harmonious system of trusting relationships; B – self-trust is higher than trust in the World, C -self-trust is lower than trust in the World

As can be seen from the graph, in group “A” a harmonious system of trust relations, the values on the scales of the “Control in action” methodology are reduced, and the orientation to the state is expressed on the “Failure” scale (5) and on the “Planning” scale (5,8). Whereas in case of a violation of the trust attitudes balance (group “B” and group “C”) we observe differences in the implementation of intention in action (differences are significant at the level of $p=0.014$ at $p<0.05$ according to the Mann-Whitney U-criterion). It should be noted that for group “C” (self-trust is lower than trust in the World) there is a tendency to focus on the state in the situation of setting goals and gradually moving towards them (the “Planning” scale (5,7) and in the ability to focus on the goal in stressful conditions, overcoming anxiety (the “Failure” scale – 5,8). In group “B” (self-trust is higher than trust in the World), on the contrary, we observe high values on the scales of “Failure” (6,2), “Planning” (7), “OU” (21.2) with an action orientation. Thus, the cognitive and affective component of self-control in this group is the better formed and, unlike state orientation, assumes overall high abilities to plan and focus on goals without anxiety, as well as flexible choice of strategies in a situation of unfavorable conditions that complicate the action.

Therefore, self-trust can become a powerful condition that allows a person to act in an unpredictable, rapidly changing world. When there is no support in the outside world due to its unpredictability and uncertainty a person with a “fatalistic attitude” may form obstacles in implementing intention in action – a

delay in the motivational phase with a focus on reflection in a situation of failure and planning, as opposed to orientation to action (transition from intention to action). It can be assumed that self-trust (as a certain sensitivity to desires, experiences, needs) provides control in action: at the emotion regulation level, maintaining motivation in the state necessary for action, attention control, failure control and, to a lesser extent (in comparison with other types of trusting relationships) contributes to the formation of inferior intentions (excessive concentration on thoughts about the experiences of their states, as a result of which the action itself is difficult).

Let us consider the results of correlation analysis.

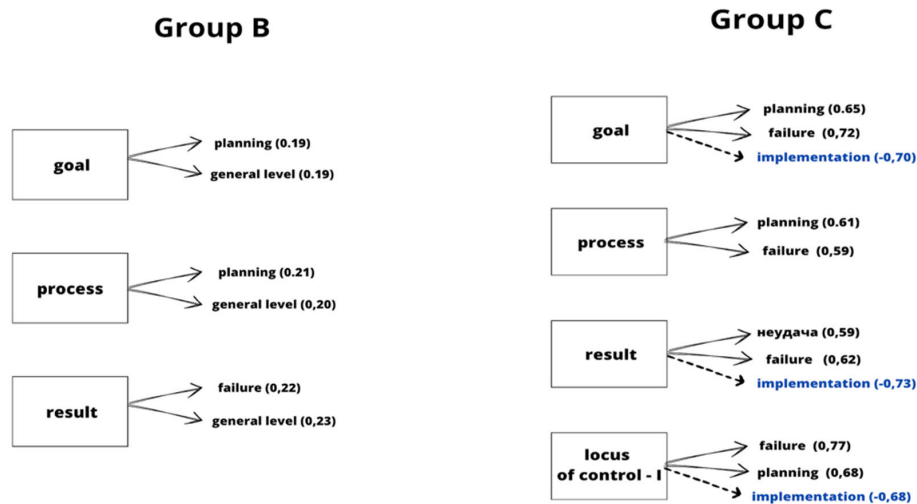


Figure 3. Results of correlation analysis (scales of the SOE methodology (D.A. Leontiev) and "Control in action" (Yu. Kull))

Symbols: B – self-trust is higher than trust in the world, C -self-trust is lower than trust in the world
The results of the correlation analysis allowed us to formulate the following conclusions:

In group "B" (self-trust is higher than trust in the world):

- positive connections are noted between the scales of the "Result" method and the scales of the "Control in action" Failure" method (0.22) The overall level (0.23). Speaking of this type of trust relationship, it should be noted that the more a person is able to evaluate their life as productive, the more they are ready to act in case of failures, overcoming anxiety and the higher the overall level of control in action is;
- positive relationships between the "Process" scale and the "Planning" scale (0.21); Overall level (0.2). This connection is quite interesting and reflects our general idea – the more a person is involved in their life and perceives it as emotionally saturated and filled with meaning, the more they will be ready to set new goals and move towards them, anticipate difficulties, and generally realize intentions in action;
- negative connections were found between the anxiety scale (V.V. Boyko's express diagnosis; the scale of propensity to unmotivated anxiety) and the scales "Failure" (-0.33), Realization (- 0,19), General level (-0.35). Thus, the higher the anxiety level, the less a person is capable of realizing the intention of action. Considering that these connections are common for the respondents in group "B" (self-trust is higher than trust in the World), it can be assumed that trust in the World provides contact with the World and creates the basis for safe activity in it. With a marked decrease in confidence in the World, the higher the propensity to experience anxiety in a person, the more this situation can lead to changes in the level of realization of intention in action for people, making it difficult to implement it. Recall that anxiety is a phenomenon that hides interest in an object and involvement as an emotional experience. The source of anxiety always consists in avoiding experience (past, current, future) and in this sense (with a high level of self-trust), because of anxiety, obstacles may arise in the way of implementing an action;

In group "B" (self-trust is lower than trust in the World):

- If the balance of trusting attitudes is disturbed in the direction of reducing the self-trust level, changes in the level of implementation of intentions in action may be observed, making motivational, emotional and behavioral control more difficult. This is evidenced by a large number of negative connections between the SOE scales and the "Implementation" scale of the "Control in Action" methodology. Goals and implementation (-0.70); Result and implementation (-0.71), Locus of control I and implementation (-0.68). For this reason, in case of disharmony of trusting attitudes (towards increasing the level of trust in the World and reducing self-trust), a person may have difficulties in realizing intentions in action, delaying

action in the motivational phase even if he or she is capable of experiencing the meaningfulness of life, is satisfied with the process of life and the results of self-realization, having clear goals.

Thus, we see variations in the identified relationships in different (based on the severity of self-trust and trust in the World) groups of trusting relationships. Self-trust actually creates the basis when value-semantic resources (meaningfulness of life, life satisfaction) begin to act as a support and give the subject self-confidence and the right to be active and make decisions).

Discussions

Thus, according to the results of our research, it was shown that the implementing intention in action (volitional control) can be interconnected with expressed confidence attitudes. Moreover, that exactly self-trust that mostly determines a person's willingness to act. In our opinion, this is the point of sensitivity to oneself that creates the basis for volitional action through the integration and processing of one's own emotional experiences, a more subtle awareness of one's needs and coordination with goals considered personally significant. In this case, trusting oneself, a person is more able to integrate contradictory feelings, accept their own contradictory experience as part of a single reality related to values, internal imperatives, meanings.

Another important conclusion that we made based on the results of the study concerns the function, the essence of a harmonious and disharmonious trusting relationships system. In a number of studies (Skripkina and Selezneva, 2014; Dostovalov, 2013), regarding various phenomena not directly related to volitional regulation, there was the thesis that the harmony of trusting attitudes sets a more complete way of human existence in the world. Indeed, trust as a phenomenon that allows a person to take a certain value position in relation to themselves and the world and, based on it, to build a life strategy largely determines the choice of a particular behavior model. Using the example of these studies, we proved that the trust predominance in the world underlies adaptive forms of behavior, the self-trust predominance is the basis of non-adaptive activity forms associated with risk and creative activity. In a situation of balance between self-trust and trust in the World a person finds themselves in a more harmonious situation and the balance of trust in the World and in themselves gives an opportunity to a fuller self-expression in the world. The present study shows that in a situation of a violation of the balance between trusting attitudes a person is more ready to realize their intentions. This is quite an interesting moment that allows, on the one hand, to take a fresh glance at the trust category, on the other hand, to raise even more questions and outline new research tasks in the study of the relationship between trust and free action.

Turning to modern foreign research in the field of will, it should be noted that most of them were carried out within the framework of research and study of the brain (Slors, 2019; Liljenstrom, 2021), while there are practically no completed studies on the relationship between trust and volitional regulation. Foreign studies are more focused on the exploring will in the aspect of studying decision-making and actions based on brain potentials. These studies are also focused on highlighting important aspects creating the conscious and unconscious in making volitional choices and concretizing the very concept of volitional regulation as irreducible only to motivation or to cognitive mechanisms, presenting an independent construct that is interconnected with personal, cultural, cognitive differences (Slors, 2019).

However, an interesting study by Jumana Yahua, who attempted to describe the factors influencing self-Control and suggested that self-control as the ability to regulate one's thoughts, emotions and behavior in order to achieve a certain goal (goals), especially in the presence of motivational counteraction, depended on three situational factors: bodily condition (muscle tone), signals of the surrounding world (soothing or alarming) and social trust (Yahua, 2021). Despite some differences in conclusions, this study is quite alluring for us. Thus, the author proves in a number of experiments that successful self-control is significantly increased in the case of muscle tension and a special bodily state (when, instead of modulating the cognitive state, which then mediates the success or failure of self-control, the bodily state has an unconscious and direct effect on self-control and is "inherently associated with strengthening or calling for willpower". This is the first situational factor. Social trust is the second factor that improves self-control indicators. And here a fairly simple explanation is expressed by Jumana Yahua: the situation related to the safety and reliability of objects (in other words, the situation of trust in someone or something) positively affects our ability to self-regulation in achieving goals when we also have to overcome obstacles.

Despite the controversial aspects of the presented judgments and some disagreements with the author, this study is of great interest to us and shifts the emphasis in the field of will studies to the plane of situational cognition, which in terms of the prospects for the study of volitional regulation, in our opinion, creates great opportunities and a research interest.

Conclusions

The challenges of our time are primarily existential, covering issues of free will, responsibility, personal decision, and human choice. Following V.A. Ivannikov, we note that “the ability to Choose taking into account the consequences “for Other equals” and taking responsibility for their own decisions” characterizes a Person as an individuality (Ivannikov, 2016). Awareness and decision-making in a situation of Choice, taking responsibility for the consequences of one’s decisions, committing an act and, finally, choosing one’s way of life forms a picture of the Personality and subsequently leads to the formulation of a task that is possible only for a Person – the task of changing oneself. This level of personal self-regulation cannot be considered outside of the question of a person regulating their intentions and his actions. As already noted earlier, the aspect of action regulation presented in the “Rubicon model” by H. Heckhausen, Yu. Kulya is primarily associated with a certain subject’s attitude to risk taking uncertainty. In a decision-making situation the moment when intention transits to the action implementation can often be associated with an act of internal responsibility acceptance for it. However, as we have seen, there are differences in determination and willingness to accept this responsibility, which depends on the severity of trust in the world and in oneself. This severity will determine a person’s attitude to uncertainty. Revealing the resources of self-regulation, D.A. Leontiev in addition to sustainability resources (features of the value-semantic sphere), motivational, instrumental and psychological resources (causal orientations, locus of control, orientation to action/state, self-efficacy, tolerance to uncertainty, risk tolerance, self-dependence, reflection, time perspective parameters, etc.) allocates so-called universal self-regulation resources, the function of which is to compensate the lack of sustainability resources in extreme life circumstances (Leontiev, 2016). These resources, which allegedly limit the subject’s capabilities, often become a resource for growth. Thus, the author formulates a general existential law: the scarcity of any resource increases the efficiency of its use (Leontiev, 2016).

The loss of stability today is a factor that leads a person to a crisis and, therefore, to action. These are the same universal resources D.A. Leontiev wrote about – resources that reflect the lack of opportunities and thereby increase the strength of the action potential. Analyzing the results, we saw what a significant proportion of respondents demonstrate a high level of self-trust, which causes the action. Acting with a clearly expressed trust in the world, feeling its security and the possibility of control, is becoming almost impossible today. The world leaves no choice and its complexity, unpredictability and sometimes unbearable creates the basis for free action only when you can rely on something inside yourself. This attitude (trust in the world as opposed to self-trust, the illusion of controlling the world) is increasingly changing to a desire of taking risks, to the perceiving the failures not as a factor reducing the ability to act, but rather as an experience needed to extract meaning from and shifting the trajectory of movement. This is a special state of “sensitivity to the impossible” that allows a person to be “mobile in a mobile environment” (Asmolov, 2018).

In our opinion, self-regulation resources can be supplemented with self-trust as the basis of self-regulation. This thesis in no way detracts from the importance of the opposite attitude (trust in the world), which forms the human activity basis. Of course, a person does not explore themselves in their deficits, they learn about their capabilities from the information that comes from the World and this also allows a person to design goals, correlate their needs, etc. However, the measure, the ratio of trusting attitudes means a lot for self-regulation. Our study convincingly proves that self-trust is exactly the thing that allows you to create support and move in the chosen direction.

The idea of a multidimensional space of life, a multidimensional psychological reality that has a value-semantic dimension, the idea of self-organization as the ability to complicate elements and arrange structures (Klochko and Klochko, 2015) turns us back to a Person, to their emotions, meanings as “guides to the consciousness of those objects that correspond to the current state of a person” and creates the basis for action (Klochko and Klochko, 2015). Thanks to the semantic dimension, the World is capable of expansion, but also of collapse, “compression, when external regulations limit the space of free movement.” Perhaps it is self-trust as a source of a certain measure of self-sensitivity, reflecting a willingness to work with emotions (including negative ones, but which also carry information about meanings and are in many ways the sources of our movement) that lies (paradoxically) at the heart of readiness for changing and at the heart of efforts to retain and implement goals. Where there is a sense, there will inevitably be a feeling, wrote V.P. Zinchenko (Zinchenko, 2007). And trust, as an irrational attitude in many ways, is also primarily a feeling. Often, when talking about volitional regulation, we think about the unity of “thinking and acting”, making a meaningful decision which leads to free action. Undoubtedly, it is vital to take this into account when studying volitional action. However, less often they talk about the feeling, about the emotions that underlie any action. Through the awareness of desires as special experiences, the intention

acquires meaning and significance; and at the stage of the volitional process (as the retention of intention in action), in conditions of involvement and high sensitivity to oneself, these conscious desires acquire the character of active intentions that guide a person's activity and form an action plan. Finally, decision-making and action takes us to the plane of interaction with the world in terms of taking responsibility for the consequences and results of our decisions. Thus, the intentionality itself (as a special position in relation to something) presented at the level of trust creates a powerful resource in the intentions realization and the committing a conscious act by a person.

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Conflict of interests

The authors declare no conflict of interest.

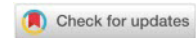
Author Contributions

Conceptualization, S. Y., A. I.; methodology, S. Y., A. I.; formal analysis, K. I. and S. Y.; writing—original draft preparation, S. Y., A. I. All authors have read and agreed to the published version of the manuscript.

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Student Motivation and Learning: The Impact of Collaborative Learning in English as Foreign Language Classes

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Abstract: Teaching approaches and techniques shape classroom practices and ultimately contribute to students' learning and achievement. While abundant research exists on how such practices impact student learning in EFL classes around the world, this research still remains scarce in Kosovo. Therefore, the current research addresses this existing gap by exploring the link between teacher classroom practices and student learning. Participants of this study included 10th and 11th grade students across six municipalities in Kosovo (N=237). The respondents were asked to complete a questionnaire inquiring about practices adopted by teachers to teach EFL. The results reveal disparate teaching practices adopted by teachers to teach the material. To that end, female students report enhances participatory and collaborative approaches used by teachers and in the meantime an overall higher perception of the chances given by teachers to express opinions and ideas in class, compared to male students. Similarly, 10th grade students reported higher opportunities provided by the teacher in class to express opinions as well as collaborate with other students to complete tasks. Finally, significant positive correlations are evident between certain collaborative and participatory approaches utilized by teachers in class as well as students' motivation. Evidently, students enjoy problem solving tasks and are much more active in cases when they collaborate with other students. In conclusion, this study sheds light on how students perceive teacher techniques and teaching methods used in EFL classes.

Keywords: motivation and learning, collaborative learning, English as Foreign Language teaching approaches and techniques.

Introduction

The intention of this research is to study the degree of interaction, cooperation and collaboration as strands of CLT of high school students in Kosovo as well as to measure the impact of interaction, cooperation and collaboration in students' motivation. These CLT teaching strands are with the same line with (Dörnyei, 1994) group components of motivation relating to dynamics of learning group which are: increase group goal orientation, promoting the incorporation of class norms, assistance in maintaining class norms, minimize the detrimental effect of intrinsic motivation assessment, promoting the development of group cohesion and strengthening ties between students and use of cooperative-collaborative learning techniques.

This research article explores the use of Communicative Language Teaching (CLT), Project Based Language Teaching (PBLT), Task Based Language Teaching (TBLT) and Engage Study Activate (ESA) as English teaching methods by emphasizing the use of communication and students' interaction (cooperation, collaboration, pair and group work) in achieving the goal of learning English as a Foreign Language (EFL). Furthermore, we want to see if there is a link between students' interactivity and (Dörnyei, 1994) group components of motivation relating to dynamics of learning group.

When it comes to dynamics of learning in groups, students have opportunity to take risks, translation opportunities as well as multilevel feedback (Vosburg, 2017). They also have possibility to promote language interaction via collaborative tasks, improve confidence, reduce foreign language anxiety, and have willingness to communicate in a target language (Vosburg, 2017). Kosovo Curriculum Framework for Pre-University Education states some of the elements where students need to communicate through

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foreign languages, they need to solve problems, they also need to find and use learning instruments and methods, they need to lean in teams and exchange their positive experiences, students need to work independently and as part of working teams, they need to proof their self-confidence and they need to have competencies of interpersonal and intercultural relations.

The CLT puts at the center the student. The students are very engaging, their creativity as well as their activity is significant which is directed by the teacher. The work of the students is the center of different tasks, students' feelings, their understanding and curiosity. Furthermore, Students mostly discuss about their life problems and their interests, and boring topics from the text books (Urinboyeva, 2020).

In order to achieve learning competences, especially in communicating in a foreign language, Kosovo Curriculum emphasizes that students need the interrelationship between conceptual aspects and practical dimensions, such as the implementation practical and everyday life real problems in a class situation.

Constructivist learning involves collaboration through different learning activities such as: exploring, searching, analyzing, planning as well as sharing information (Yeh, 2019).

Literature Review

Contemporary teaching methods enhancing cooperative and collaborative learning

According to Constructivist approach, the learning process happens when students build knowledge by engaging themselves in pairs and groups by experimenting through different learning tasks and activities in order to come to a solution of different problems (Moloney, 2013). Students' interaction, their cooperation as well as collaboration are crucial components in their ability to learn, discuss, explain, interpret, practice, solve problems and communicate in EFL. These components cannot be found in all teaching methods especially in traditional methods derived by behavior theory. The author (Zoghi, Mustapha and Maasum, 2010) makes emphases to social theories, Constructive theory as well as Humanistic theory when they elaborate students' cooperative and collaborative learning, found in teaching methods which achieve higher result with their students and they are: CLT, TBLT, PBLT, and ESA. Another author such as (Anderson, 2020) emphasizes the creation of students' good relationship through their group and pair work. He puts great emphasis on Text-based Teaching by stating that it enhances learners' use of language during different class activities while performing and they have less fear while using the language. At the same time students are more motivated while using the foreign language.

A special role of CLT, the authors (Toro et al., 2019) give to the development of activities in the pair work, role play, group activities, work through projects, seminars, quizzes and the Internet. Student activities in CLT is more complex and it is based on collaborations where students talk, exchange ideas, listen, and do not rely too much on the teacher. In this student-centered vision, the teachers are facilitators and do not carry sole responsibility for the manner in which the material is conveyed. In other words, students take on more responsibility in learning and become more independent where the teacher is just a facilitator or manager in a learning process. CLT method as more diverse incorporating other methods within itself such as: Task-Based Learning, Content Based Learning, Cooperative Learning, Interactive Learning, Collaborative Learning etc.

The different denominations suggest differences in their aim and objectives when in reality what ties these methods together is teaching by involving students to use target language. So, the main objective of each of them is communication, or rather how to get to communication as soon as possible (Richards, 2005). To achieve this goal, themes and topics concern everyday practices and examples taken from real life. For instance, what people do on weekends and holidays as well as learning about the interests, activities, preferences and opinions of classmates by sharing them with others. It can also include explaining daily routines, discussing current events, writing an email, telling a book, an article, or an interesting video clip (Celce-Murcia, Brinton and Snow, 2014).

CLT has numerous techniques such as: 1. Presenting authentic language through articles, news, movies, telephone conversations, etc. 2. Using games, problem-solving tasks, roles play, and discussions to help students experience real-life interactions. 3. Encouraging cooperative learning through interactions among learners. 4. Acting as a facilitator and advisor on the part of the teacher while students are engaged in group activities. 5. Emphasizing suitable application of a language by physical contexture and co-text (Farhian and Rezaee, 2015).

Motivation in class situations

There are different theories about motivation such as: behavioral, cognitive, humanistic Constructivist etc. Humanistic theories place special emphasis on the role of need (Musai, 1999). According to constructivism in the learning settings, students should reflect on their previous learning experience, they

should gain knowledge in order to analyze real matters, problems and affairs, know to research, how to debate as well as gain students' collaborative learning (Cetin-Dindar, 2015).

Similarly, our intention is to find out the motivation that occurs not only in a class situation but the motivation that students have while working together about a project, a task or activity outside of the class as well, which is learning and integration. This kind of motivating learners who acquire knowledge in EFL does not include only intrinsic and extrinsic motivation (Dörnyei, 1994). Students working together and cooperating direct them in developing intrinsic motivation and leads to improve their self-esteem, working in pairs, increases their pro-academic standards, as well as their sense of being part of particular group (Ning and Hornby, 2014).

Dörnyei (1994) uses about thirty strategies in terms of student motivation in the classroom that divides them into several levels / categories such as: level of language, level of students, level of learning situation which are part of specific motivation components in the course/subject as well as teachers' specific motivational components and groups' specific motivational components (Dörnyei, 1994).

According to Chang (2010), the connection of group has to do with to how well group members work together. By working together, the members the group are connected by sharing ideas, and taking part in different tasks and activities. This group identity then helps to create an affective individual students' motivation in a foreign language (Chang, 2010).

We are interested to know the students' motivation inside as well as outside the class situation, especially if students' interaction, their collaboration, cooperation, peer work and group work as strategies of different Contemporary teaching methods such as: CLT, TBL, PBL recommended by Kosovo Curriculum have effects on learners' motivation in EFL. So, (Dörnyei, 1994) specific motivational components of the group will help us in understanding and having a better view.

Furthermore, we are aware that there is a kind of correlation between the students' interaction, their cooperation, collaboration and (Dörnyei, 1994) specific motivational components of the group, so we want to see to what extent is this kind of correlation.

This research addresses a major gap in research by exploring teaching approaches in EFL in Kosovar schools. More specifically the study explores common approaches used by teachers and how these approaches impact achievement in English Language. The hypotheses of this study are:

H1. There are positive correlations between collaborative and participatory approaches.

H2. Female students perceive enhanced opportunities for collaboration and contribution in class compared to male students.

H3. There is a correlation between the students' collaboration and the enjoyment of learning and problem solving.

H4. There are differences in achievement according to teaching techniques and approaches used by teachers.

Materials and Methods

The nature of this research a quantitative research design. Therefore, it can be stated that quantitative method aims to show the degree of students' interaction (cooperation, collaboration, group and peer work) in EFL. Furthermore, we want to know if this interaction has any effect in students' motivation within the framework of contemporary teaching methods such as CLT, BPL and ESA of EFL learners. Since the design is a case study the sample was chosen purposely. The participants were tenth grade students of high school. Both groups were using the same syllabus as well as the same level of proficiency.

Participants

The subjects of this study were 237 tenth and eleventh grade high school students with the same level of proficiency in English language.

The table below presents the demographic data for the participants of this study. Most of the participants were male (N=125, 53%), while 112 participants of 47% of the sample were female students. In terms of grade distribution, 124 participants were in the 11th grade (52%) and 113 participants were attending the 10th grade when the research took place. Larger number of the participants reported that they had the highest grade in the English Language course (N=137, 58%), 61 participants (26%) reported that they had a grade higher than 3 and equal or lower than 4. Finally, 26 participants had a grade between 2-3 and 13 participants had the lowest grade 1-2.

When asked about the level of their mother's education, 100 participants (42%) reported that their mothers had a high school diploma, 64 participants (27%) reported that their mothers had a BA degree,

39 participants (17%) reported having mothers with a Master's degree or higher.

In terms of residence, 52 participants (22%) resided in Prishtina, 58 participants (24%) in Gjilan, 43 participants (18%), 37 participants in Gjakove (16%) and the remaining 47 participants or 20% of the total sample resided in Mitrovice.

Table 1
Sample description

	N	%
Gender		
Male	125	53
Female	112	47
Class		
10 th	113	48
11 th	124	52
Grade		
1-2	13	5
2.01-3	26	11
3.01-4	61	26
4.01-5	137	58
Education level mother		
High school diploma	100	42
BA	64	27
MA or PhD	39	17
Other	34	14
Education level father		
High school diploma	79	33
BA	80	34
MA or PhD	48	20
Other	30	13
Residence		
Prishtine	52	22
Gjilan	58	24
Prizren	43	18
Gjakove	37	16
Mitrovice	47	20

Instruments of data collection

Regarding the hypothesis, the instrument used was a questionnaire:

- A students' questionnaire was used to collect data about their interactivity (cooperation, collaboration, pair and group work as well as their motivation. The questionnaire included close ended questions where the students were asked to circle the possible answers according to Liker Scale from (Strongly Disagree – 1, Disagree – 2, Neutral – 3, Agree – 4, Strongly Agree – 5). It consists of 15 questions and it is divided in three parts the first parts are consisted of five questions which has to do with Language Skills in English Language, the second part is consisted of five questions which has to do with Learner Interaction/collaboration, and the third part is consisted from five questions which has to do with Students' Intrinsic Motivation.

Procedure

In order to prove the hypothesis, the quantitative research method was used. The data that was gathered from students were analyzed by using structured questionnaire by incorporated only close-ended questions The questionnaire was written in English; however, it was translated in Albanian in order to be better understood by the high school students and it was delivered to students in a hard copy where

the students could circle the answers. After the collection of all questionnaires the data were put into SPSS.

Results

The findings of t-test independent samples revealed that there are significant differences in gender, in their perceptions of teachers giving them the opportunity to discuss and share ideas in class $t(235) = -3.911, p < .05$. More specifically female students reported higher perceptions ($M=4.38, SD=1.09$) compared to male students ($M=3.84, SD=1.36$). There are also gender differences on student perceptions on teachers providing them with the opportunity to discuss and do practical exercises regarding texts $t(235) = -2.509, p < .05$. Female reported higher perceptions ($M=4.21, SD=1.09$) compared to male students ($M=3.83, SD=1.23$). Finally, the findings of a t-test reveal that there are also significant differences among genders within their perceptions of teachers providing students with the opportunity to collaborate in completing tasks $t(235) = -1.603, p < .001$. Similar to other questions, female students reported higher perceptions ($M=3.68, SD=1.05$) compared to male students ($M=3.43, SD=1.35$).

Table 2
Pearson correlation matrix for study variables

1. The teacher supports the learning through listening and practical activities	1																			
2. The teacher encourages students in asking questions and sharing ideas while discussing about Topics		2																		
3. After reading a text in the English Class the teacher initiates discussions and does practical exercises about it			3																	
4. The teacher gives tasks where I can use my writing skills				4																
5. The teacher provides motivating learning material to be used in the classroom					5															
6. I constantly cooperate with other students in the English language class						6														
7. There are not any possibilities for being active in learning English in a class							7													
8. The learning exercises develop interaction with other students								8												
9. I have a chance to cooperate to other students in the class in completing the tasks									9											
10. I often communicate with other students within the English language course										10										
11. We feel free to speak and give our opinions in English language classes											11									
12. I enjoy working together in solving a problem or working for a project												12								
13. The interactivity between students makes me more active													13							
14. The cooperation with friend makes me more curious														14						
15. Our collaboration in the class motivates us to finish the tasks															15					

In terms of differences between classes the findings of the independent t-test samples reveal that students' significant differences are shown on their perceptions on teachers supporting the learning of the material through listening and practical exercises $t(235) = 2.356, p < .05$, where students attending the 10th grade reported higher perceptions ($M = 3.78, SD = 1.06$) compared to students from the 11th grade ($M = 3.40, SD = 1.20$). Table 1, above presents the correlation between variables. It reveals that there is a significant positive correlation among teachers supporting learning through listening and practical exercises and teachers giving students opportunities to ask questions and share ideas ($r = .354, p < .01$), teachers doing practical exercises and initiating discussion after reading the text ($r = .315, p < .01$), teachers giving students tasks to practice writing skills ($r = .137, p < .01$), teachers providing effective materials to be used in the classroom ($r = .255, p < .01$), teachers promoting interaction between students ($r = .140, p < .05$), promoting student cooperation in completing in class tasks ($r = .145, p < .05$), enabling students to freely speak and give opinions in English ($r = .246, p < .01$), and motivating students through collaboration ($r = .134, p < .05$).

Data from a correlation analysis reveal that there are significant positive correlations between teachers giving students opportunities to ask questions and share ideas during in class discussions and teachers doing practical exercises and initiating discussion after reading the text ($r = .372, p < .01$), teachers giving students tasks to practice writing skills ($r = .425, p < .01$), teachers promoting interaction between students ($r = .221, p < .01$), promoting student cooperation in completing in class tasks ($r = .307, p < .01$), enabling students to freely speak and give opinions in English ($r = .458, p < .01$), and motivating students through collaboration ($r = .128, p < .05$). Finally, the results of the study reveal that collaborative work increases student activity during learning ($r = .289, p < .05$) while it also makes solving problems more enjoyable ($r = .292, p < .05$).

Discussion

According to students' answers regarding the approaches the teachers use in teaching EFL it is obvious that students were not satisfied with the teachers' support while learning listening skills. They claimed that the material used was not adequate and teacher do hardly any exercises regarding listening skills. On the other hand, results from t-test revealed that students' perceptions about their opportunity to discuss in the class as well as share their ideas while discussing about different topics was high. It is obvious that students were satisfied with learning of speaking skills in a class situation as well as their engagement in a class discussion. There were differences between how female perceive learning speaking skills male students' perception about speaking skills, however, both of them were satisfied with their engagement in learning speaking skills. The finding reveals that 10th grade students are more satisfied with their teachers regarding the teaching material as well as their participation in listening skills compared with 11th grade students. In addition, finding show that there is a link between teaching different skills. The positive correlations are usually between listening and speaking skills where students listen materials and then they do practical exercises, usually speaking and communicating between each other and with teacher as well. Another very important issue is the correlations between the reading, speaking as well as writing skill where students are engaged in reading and later, they are able to do practical exercises, initiate discussions and practice their writing.

The research data provided within the scope of this study reveal that there are gender differences in perception of opportunities to express ideas and collaborate in English language classes, with female students reporting more opportunities to collaborate in tasks and exercises compared to male students. Cooperative learning (CL) according to (Mahbib et al., 2017) found in literature is described as successful teaching strategy where working in small groups and pairs with diverse students, teachers can use different varieties of learning activities so that students improve their knowledge EFL. CL involves working in teams and pairs where students work together in accomplishing learning objective being helped by their teacher.

Almost the same aspect of teaching procedures and techniques are mentioned by (Khoshshima and Shokri, 2016) where is mentioned that, learners should be exposed, motivated and they should be given opportunities to use the language. Furthermore, they stated that most of the teaching activities should have features such as engaging, studying and activation. The main goal for English teacher is to wake learners' intention, their curiousness, as well as their interest by providing different tasks and activities which continuously engage students. Such activities and materials: games, interesting topics, visual aids, engaging activities, discussing themes as well as contemporary stories (Harmer, 2007).

Kosovo Subject Curriculum for tenth grade students for English language states that teachers should promote CLT, TBL as well as PBL in order to develop learners' creativity and autonomy as well as their collaboration, cooperation and interaction. As a matter of fact, teachers should promote learning

with the student in the center over the traditional way of teaching. Kosovo Curriculum also supports the students' extracurricular activities and encourages students' behavioral habits in order to enable them to survive in the world outside the class situation.

The main objective of English Language Curriculum is to promote students' communication in a successful way. The CLT aims to enable students' interaction between each other outside the classroom. Kosovo Subject Curriculum for tenth grade students for English language suggests that teachers should use the four language skills in order for students to be able to become a better communicator.

Another important finding of this research is that there are positive correlations between different practices of teachers. To that end, teachers who provide students with opportunities to ask questions and share ideas are the ones who also provide more support for student learning, as reported by students. On a similar note, there are positive correlations between teachers doing practical exercises with students and teachers promoting interaction and collaborative learning between students. Evidently, future research studies should explore the impact of specific teaching approaches and strategies utilized by teachers in teaching EFL in order to explore their impact on student learning.

Conclusions

While present research addresses a major gap in literature linked to student learning and motivation on one hand and teacher practices and approaches on the other, current research has a number of limitations. The study reveals gender differences in perceptions, with female students perceiving classrooms to foster collaboration and teachers to provide more opportunities for expression, discussion and working together, compared to male students who reported lower perceptions on all variables. To that end, future studies should explore these differences in perceptions in order to understand how students build perceptions regarding collaboration. Future studies should research the gender differences in student perceptions on the opportunities provided by teachers to share ideas and collaborate in class. Additionally, results of present research also reveal that students report being more active in learning when they have more opportunities to collaborate. In the meantime, students also tend to enjoy solving problems in cases when they collaborate with others. Building up on the results of the present research, future studies should research the link between collaborative learning and student achievement, in order to understand if and to what extent collaborative learning translates into higher achievement by impacting motivation and student activity.

Current research has a number of limitations. Firstly, this research study took place during the last phase of the pandemic and the results of this study may have been impacted by it. Secondly, current research gathered data only from students, and it would be interesting to explore the same topic from the perspective of the teachers.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, H.K.; methodology, H.K and M.XH; software, H.K.; formal analysis, H.K. and M.XH; writing—original draft preparation, H.K. and M.XH.; writing—review and editing H.K. and M.XH. All authors have read and agreed to the published version of the manuscript.

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Learning Through Games and Its Impact on the Development of Student's Knowledge During the Pandemic Period

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Abstract: Learning through play in the teaching process is a technique that has received a lot of attention since play itself increases the focus of students, and develops memory, creativity, and creative skills in students. However, the COVID-19 pandemic period was a very challenging period for every character included in the educational system, where many techniques used with physical presence were evaporated, or transformed in another form, as played through gamification. The objective of our research was to analyze the level and form of implementation of games as a teaching technique during COVID-19 in primary schools, among teachers N=120, students N=80 from I do 5th grade, and parents N=100 in Kosovo and North Macedonia. Results showed that there is a strong correlation of the implementation of games as a technique by parents and teachers in the implementation of the pandemic and the students learning and mental health, respectively their learning success has risen and their mental health was improved.

Keywords: play, strategy, knowledge, teaching, learning activities, parents, mental health.

Introduction

Starting from the fact that play is an inseparable part of children's lives, the way we can turn it into a technique for learning has shown and shows interest from many different authors who try to introduce innovations in the field of education and children's education (Stott and Neustaedter, 2013; Chang et al., 2017; Yu, 2019). Play is believed to be the most effective and motivating method for learning which can be applied in various forms. Therefore, we say that, when the game is well planned and oriented, we can influence in the incorporation of new concepts and students can develop and improve their skills without losing the motivation to learn (Mubaslat, 20120). The COVID-19 pandemic in North Macedonia and Kosovo affected the whole educational system, highlighting the lack of possibilities to use play as a teaching method (Kyriazis et al., 2021). Students were educated through an online form, which was a very unfamiliar form for teachers and students as well in North Macedonia and Kosovo. Even though children faced some emotional and social difficulties all over the world, a similar situation is described in the book of Lovatt (2021) "Paper rainbows began to appear in windows, painted as a token of hope by children kept indoors; but of children themselves, there was no sign" was happening in North Macedonia and Kosovo as well. It was evident that teachers and students were trying to find new alternatives of teaching and learning.

As professionals on the field, we were intrigued to analyze and research how much teachers and parents as well have collaborated among themselves during pandemic period in order to introduce different form of play/game as a technique of learning and teaching that can affect the overall success of students during the learning process (Rogers, 2022).

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The learning process and gaming/play

Learning through play is a continuum that brings together the spheres of children's lives such as: home, school and the wider world over time. Play is a natural activity of children which helps to understand the development and views of children. As children become mature they are able to represent their needs mentally and use the thinking process to create motivations for play (Vig, 2007). Children should have opportunities to explore with different materials and objects because this opportunity develops children's creativity. Children's play is connected to the objects and materials they play with. They contain the meaning, form and technique of the activity through the game. Therefore, the right choice of game affects the good education of children. In order to fulfill this multiple function, the game must fulfill a multitude of pedagogical requirements, must respond to the educational purpose with content and form, must be accessible to children, must stimulate children's interest, influence the development of creativity, personality etc (2010).

Through play, the child grows, develops, learns new habits. Play is the best way to put them on a good path in the difficult and long learning process. Gaming as form of play in general and game-based learning in particular have the potential to turn learning into a challenge. In the last decade there is a new term "gamification" which has been defined by some author (Nieto-Escamez and Roldan-Tapia, 2021) as the use of game elements in non-entertainment contexts to promote learning. Through play can be introduced concepts and students can develop and improve their skills without losing motivation. The game creates the foundation of reading and writing. Gamification pursues the use of game design elements to create engaging and motivating experiences (Lister, 2015). There are countless skills that students can develop through play such as critical thinking skills, creativity, teamwork and good sportsmanship. They can also create a positive memory and learning experience for students in the classroom. A game is one of the easiest ways to engage students, capturing their attention and making learning fun (Havziu, Memedi and Ameti, 2017).

Learning through play creates the possibility of a comprehensive approach to the learning process as the student seeks to learn independently and consciously (Glenn, Cousins and Helps, 2006). The game attracts even shy children, who in other situations would not participate in the tasks assigned by the teacher, because most of them prefer to use mobile devices such as smartphones and tablets (Krouska, Troussas and Sgouropoulou, 2021). Equally important for the learning process is the definition and clarification of rules of the game/play. They should be simple, clear, accepted by students and should not become an obstacle to the progress and flow of the game. We must be very careful to respect the age of the students and the level of skills in the selection of the game, because otherwise, the students would lose interest and the game would have no effect. The literature (Toda et al., 2019) show that there are three main concerns regarding this topic: (a) instructors and teachers does not have the resources to plan and develop gamification strategies into their classes; (b) gamification needs a systematic approach to achieve the desired positive results; (c) inexistence of systematic approaches that connect and help in the design of gamification and social network tasks within these contexts. The game focuses on solving problems. The search for a solution to the problem stimulates the diversity of teachers' perspectives and pushes the student towards productive, creative and not merely reproductive thinking (Adachi and Willoughby, 2013). According to Manzano-Leo et al. (2022) among the most used elements in educational gamifications are PBL (Points, Badges and Leaderboard), avatars and narratives.

The role of teachers in the process of gamification

COVID 19 pandemic era changed the carriers of educational system, the teachers. In developed countries the burden of online teaching cannot be compared with the burden of teachers from developing countries. During the first wave of the pandemic, the governments of the included countries (North Macedonia and Kosovo) supported the educational system in different ways, like broadcasting on national television or national education information network (Korez, et al., 2021). If in some developed

countries researches showed that the online teaching process with the process of gamification has elevated stress and anxiety in teaching staff, and made pressure to change approaches to teaching and assessment to achieve the highest score (Lakeman, et al., 2022), there are little evidence (Miftari, Dzogovic and Zdravkovska-Adamova, 2021; World Bank, 2020) how teachers in North Macedonia and Kosovo have experienced these, except for higher education (Krasniqi and Shabani, 2022; Leskova, 2021). In addition, even though social distancing has been accompanied by online interaction thanks to continuous advances in digital technologies, it requires educator to work to find ways of increasing students' motivation and engagements (Nieto-Escamez and Roldan-Tapia, 2021), which is why the teachers attitudes toward it is very important. There are some research (Marti-Parreno, Segui-Mas and Segui-Mas, 2016) that have shown a difference of attitudes between teachers from public settlements and private settlements, respectively they found that there is a significant more positive attitude towards gamification for teachers serving in private universities then in public universities. We can speculate from reviewing different literature that teachers negative attitude could be as a result of lack of recourses, and it has been underlined in several researchers (Asifayanti, Weda and Abduh, 2020).

The importance of implementing the strategy through the game lies in the fact that the information must be given in an appropriate way. Activities through play in order to be more effective in learning and teaching must be structured according to pedagogical rules and processes. Each activity must meet these criteria: activities through play should be well balanced with fun in learning, the activity must be planned with dedication and care in order to involve teachers and students in the activities, the content of the activity should be an integral part of the game, teachers must give the necessary instructions, ensure that the activity through the game develops according to the rules and that there is tolerance and cooperation among the students, also, the teacher must provide the conditions for all students to be an active part in the organized activity (Xhajkovska, 2016). There is some consideration that teachers should consider before presenting an activity through game, respectively the teacher must know the baggage of knowledge of the students choosing the game, they must decide the purpose of the game in order to make them useful. When choosing the game, a basic aspect that teachers should consider before explaining is that students must understand exactly how to play the game, because they may need to adapt it to the level and age of the students and this will be more difficult if the rules are not clear (Bodrova and Leong, 2003). Interruption of the game should be as rare as possible, so as not to reduce the interest of the students in the game.

The role of parents in the child's play/gaming

Parents play an important role in a child's life. Parents who play with their children form a stronger bond with them. These interactions provide positive life experiences that stimulate children's brain development. Happy, enjoyable moments are some of the most precious gifts parents can give their children. Therefore, it is important to prepare daily activities through play with children, get involved in family activities and create a corner for the child to play (Balaj, 2019). When parents are active in children's learning and development, the role of play will be more effective (Havziu and Rasimi, 2015). Primary caregivers are their children's first teachers. They should be an integral part of school because they can contribute and also learn and apply key strategies at home – so it is important to support parents and provide them with safe tools to implement learning through play at home.

There are many ways parents can stimulate children's development through nurturing care, conversation and storytelling, and by teaching life skills and providing time and materials for enriched play (UNICEF, 2018). Parents should provide a safe environment and plenty of opportunities for play and learning. The more play and learning activities that take place in the home environment - such as reading books, stories, singing, playing, learning letters and numbers and other activities - the more advanced the child's development and learning. Through play activities at home, parents help children develop self-confidence and life skills, encouraging their creativity through various games. It is better for the child to choose the game he wants to play, where through it he creates a sense of emotional security which enables growth and development (Kraja, 2012). As can be seen, parents have an important influence

on the growth and development of children, and yet when we talk about play, the role of the parent is somewhat more passive. We must not forget that the game is an activity created and that belongs only to children, so they are the only ones who will guide us in their game (Xhemali and Çeça, 2019). However, the pandemic period encountered many unprepared parents to meet the challenge of digitalization, and therefore gamification (Amzalog, 2021). There has been increase of researchers that have investigated the beliefs of parents towards these processes (Hanghoj and Brund, 2010; Bourgonjon et al., 2011; Hidayat, 2022), and according to Hidayat (2022), there is a contradictory attitudes of parents regarding the digitalization and gamification, respectively many parents allow their children to have screen time and even facilitate their children with gadgets but main concern for the children's game-time is the lack of social interaction, health issues, and digital addiction.

Materials and Methods

The literature review raised many questions towards the situation in North Macedonia and Kosovo, which intrigued us to carry a research were the main objective was analyze the level of cooperation of parents and teacher during the pandemic period while incorporating gamification as a technique that affects the overall success of students during the learning process and its correlation to students learning and their mental health. To answer this objective, we defined one general hypothesis: implementation of the game by parents and teachers in the period of the pandemic has had a positive impact on the students' learning and their mental health. The main variable was the use of gamification as predictor, and criterion variable were the involvement of teachers, of parents and students metal health related to their learning success.

To carry the research, it was used a different approach of research, starting with the theoretical analysis of literature review and comparative method, since the results were compared between Kosovo and North Macedonia, and statistical method with descriptive and inferential statistic, as Pearson correlation and t-test.

Techniques and instruments needed for this research included a questionnaire as a measuring instrument for teachers and parents, as well as an interview dedicated to students of the lower cycle in primary education.

Sample/population - The research was focused on eight primary schools in Kosovo and Macedonia, which comprise two groups of teachers, parents and students, overall N=300. This sample was comprised by 120 teachers (60 from RNM and 60 from Kosovo) and 100 parents from 16 schools, as well as 80 students. This research involved teachers who work with students from class I to class V and the parents of these students.

Results

In this mini chapter we present the results regarding the main hypothesis " The implementation of the game by parents and teachers in the period of the pandemic, has had a positive effect on the students' learning and their mental health " by using correlation analysis with Pearson's assess the correlation of use of gamification with student's success.

Table 1. *Pearson correlation*

	Kosovo		North Macedonia	
	1	2	1	2
1. Game strategy by teachers during the pandemic	-		-	
2. Student success during the pandemic	.695**	-	.528**	-

Based on the table nr.1, the results show that there is a significant positive strong relationship between "Teachers' Game Learning Strategy during the Pandemic" and "Students' Success during the Pandemic" ($r=.695^{**}$, $p<0.01$) for Kosovo, and there is a significant moderate positive relationship between "Learning strategy through play by teachers" and "Success of students during the pandemic" ($r=.528^{**}$, $p<0.01$) for Macedonia. This means that when teachers have used game strategies during the pandemic, student success has also increased in both states.

To see if there are differences of level of use of gamification related to the place of residence, we calculated the t-test for differences of means, and the results presented on table 2 show that there are significant differences on the level of use of gamification between teachers of North Macedonia and Kosovo, respectively the $t(58)=3.214$, $p=.000$, where M for Kosovian is 4,24 while North Macedonia M is 3.84. These results highlighted the higher level of gamification used among students by teachers in the teaching and learning process in Kosovo schools, compared to North Macedonia.

Table 2. t- test analysis

Settlement	Kosovo						North Macedonia					
	M	SD	M	SD	t	P	M	SD	M	SD	t	p
Learning through play during the pandemic	4.55	.34	4.24	.29	3.214	.000	4.59	.32	3.84	.24	2.316	.000

We continued with in-depth analysis for parent's involvement on gamification of teaching process correlated to student's success, and again we used Pearson correlation to assess the level of correlation between the two variables on table 3.

Table 3. Pearson correlation

	Kosovo		North Macedonia	
	1	2	1	2
1. Involvement of parents during the pandemic period	-		-	
2. Children's success during the pandemic period	.557**		.668**	-

Based on the table 3 above, the results show that there is a significant moderate positive relationship between " Parental engagement during the pandemic period" and "Children's success " ($r=.557^{**}$, $p<0.01$) for Kosovo and a strong positive relationship between " Parents' engagement during the pandemic period" and "Children's success " ($r=.668^{**}$, $p<0.01$) for Macedonia.

We continued with calculation of differences of level of parental involvement on gamification related to their settlement, respectively between North Macedonia and Kosovo, by using t-test for differences of means. The results presented on table 4 show that there are significant differences on parental involvement because $t(38)=3.595$, $p=.000$ is for Kosovo with M 3.21, while $t(38)=4.112$, $p=.000$ for North Macedonia with M 3.61. These results highlighted the higher level of gamification used among parents in North Macedonia compared to Kosovo.

Table 4. T-test analysis

Settlement	Kosovo						North Macedonia					
	M	SD	M	SD	t	P	M	SD	M	SD	t	p
Parent engagement during the pandemic	3.62	.24	3.21	.33	3.595	.000	4.28	.25	3.61	.52	4.112	.000

In the main hypothesis we underlined as well as the mental health of students related to gamification of the learning process. In order to test this variable as well, we calculated Pearson coefficient for correlation of level of gamification and student's mental health, which is presented in table 5.

Table 5. Pearson correlation

	Kosovo		Macedonia	
	1	2	1	2
1. Implementation of the game by students during the pandemic	-		-	
2. Mental health	.668**	-	.557**	-

Based on the table above, the results show that there is a strong positive significant relationship between "Implementation of the game by students during the pandemic" and "Mental health" ($r=.668^{**}$, $p<0.01$) for Kosovo and there is also a significant moderate positive relationship between "Implementation of the game by students during the pandemic" and "Mental health" ($r=.557^{**}$, $p<0.01$) for Macedonia.

Qualitative data

To ensure more subjective data of the research, we carried on an interview with students from Kosovo and North Macedonian schools, and to follow up the results we present most common statements, starting with the mental health of the students, where they were asked to discuss how the implementation of gamification had affected their wellbeing, and most of the respondents underlined that in general use game in their spare time, thus using games just made them very happy.

- During distance learning when teachers used activities through games such as quizzes, competitions between groups, imaginary games, etc. How did you feel about these activities?

- The most frequent statement was that during the pandemic period the activities and games that their teachers have prepared to facilitate distance learning have had a positive impact on their mental health as well as the development of knowledge and skills.

The second theme of the interview was regarding the learning process, and how much gamification have helped or hampered this process, and in general by using games during online classes increased their motivation and simplified the tasks for them, which enabled them to overcome learning difficulties.

- What games did your teachers organize with you during the pandemic period and did they help you overcome difficulties in learning?

- Most of them stated that their teachers have organized various games during the pandemic, such as quizzes, activities related to learning units, association games, and physical activities through the projector, and this has helped them a lot in overcoming any difficulties they had.

The third theme was regarding the involvement of parents in the process of gamification and how this collaboration has affected them, and the vast of the respondents addressed as positive points the involvement of parents and the biggest supporters. However, there were a considerable number of parents that were working online as well during the online classes, and they pointed out the mismanagement in that time with the parents.

- How much do you think the game has affected you and who has helped you during the pandemic?

- The answers received were that the game and the activities through it have had a positive effect on them and have helped them to remove stress and negative thoughts, and they emphasized the role of parents as well in this process and their collaboration with teachers.

The last theme was regarding the use of gamification during their leisure time, which was their favorite topic to talk about, since the whole world was using the pandemic time for online promotion. The majority have used different online educational games that have discovered during this period, and their attitudes were positive.

- Have you implemented any games at home?

- They have implemented various games with parents, sisters or brother, such as the bowling game where they have placed some bottles and a ball and through hitting the bottles they learned how to subtract numbers.

Conclusion

After extracting the results, we can confirm the raised hypothesis, that implementation of the game by parents and teachers in the period of the pandemic is strongly correlated with students' learning and their mental health, since there were two significant correlation with the process of gamification, teachers involvement and parents involvement. Even though, we must underline the difference among teacher's involvement, that were higher for Kosovian, in other side parents from North Macedonia showed higher preparedness for involving in the process of gamification. Nevertheless, both variables were strongly correlated to student's success like it has been documented in many other research (Adachi and Willoughby, 2013; Amzalog, 2021; Mubaslat, 2012; Ye et al., 2022), respectively as more teachers have used gamification in the teaching process, the learning success of students has risen. Most likely that through play, children connect more with parents, so the time spent with them brings positive effects both physical and psychological, as has been shown in some research (Calandri, Cattelino and Graziano, 2022). In addition, students spend 1/3 of the day in school, so by using gamification teachers contribute to students' wellbeing as well, which is why the qualitative data from the interview of our research with the students was positive regarding the gamification during the teaching process, and its positive effect on overcoming the learning difficulties, as well the involvement of parents in this process, which can be found in on other researches (Almusharraf, 2021; Mariano and Cordova, 2022). In North Macedonia and Kosovo the pandemic era was a changing era of digitalization of the educational system, even though teachers and parents weren't prepare, it has had highly positive effect on changing the mindset of teachers. By learning new techniques and apps they were able to be up to date with the western system of schooling. Thus, we strongly hope that these results will intrigue other researchers from North Macedonia and Kosovo to widen their scope of research in the bigger sample and draw recommendations that can make policymakers change the educational system, a system that will seek to apply research based techniques of teaching.

Conflict of interests

The authors declare no conflict of interest.

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Author Contributions

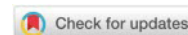
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The Problem of Peer Violence Among Deaf and Hard of Hearing Students

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Abstract: The work was created with the desire to point out the problem of peer violence among deaf and hard of hearing students. Due to their specific characteristics created under the influence of hearing impairment, deaf and hard of hearing students are exposed to a greater risk of peer violence compared to their hearing peers. The aim of the paper is to analyze the available literature from years 2002-2022 and determine whether deaf and hard-of-hearing students are exposed to peer violence and what its nature is. The following search engines were used to search the literature: Ebscohost, ScienceDirect., KoBSON, Google Scholar. The results of the literature review show that deaf and hard of hearing students are exposed to peer violence and that the frequency of peer violence is higher among deaf and hard of hearing students compared to their hearing peers. Deaf and hard of hearing students are more often exposed to traditional forms of violence than to cyberbullying. Research also shows that the frequency of peer violence is higher in special than in regular schools. As due to the nature of their communication and social functioning, deaf and hard of hearing students are actually not always able to recognize and report peer violence, the question arises of the actual level of frequency of peer violence among these students. The problem of peer violence among deaf and hard of hearing students indicates the need to develop programs for the prevention and stopping peer violence that will be adapted to deaf and hard of hearing students.

Keywords: peer violence, cyberbullying, deaf and hard of hearing students, programs to prevent peer violence.

Introduction

Peer violence implies a specific form of continuous intergenerational violence that arises from a certain relationship between peers in primary and secondary school, with the aim of causing harm to the victim (most often psychological), but primarily to portray the bully as dominant in the group (Miladinović and Petričević, 2013). The most common types of peer violence are physical, verbal and relational violence. Physical violence represents the infliction of any form of physical damage to the victim and their property, which is mainly manifested by hitting, slapping, breaking personal belongings. Verbal violence is expressed by insulting, humiliating, calling someone derogatory names, etc. Relational violence, or alternative or relational aggression, is an insidious type of violence that includes ignoring, social isolation or avoidance of an individual. Verbal and relational violence are also classified as psychological violence. Sexual violence among peers is also mentioned in the literature, which is characterized by different behaviors, from sexual comments to unwanted physical contact with the victim (Coloroso, 2004).

With the constant use of the Internet and the emerge of social networks, electronic peer violence (digital violence, cyberbullying, electronic violence) begins to develop. Cyberbullying represents any malicious and repeated use of information and communication technologies to harm a person who cannot easily defend themselves (Tokunaga, 2010). The main elements of this form of violence are the characteristics of traditional violence with a description or enumeration of the electronic device through which electronic violence occurs (Vandebosch and Van Cleemput, 2009). The activities that cyberbullying include are harassment, stalking, insulting, enco group hatred, impersonation, attacks on privacy, unauthorized communication, deception, exclusion, cyber stalking (Bilić, Bulan Flander and Hrpka, 2012; Hoover and Stenhjem, 2003). Recently, a new form of cyberbullying has been especially highlighted, the video recording of attacks. This form of violence implies that the perpetrator intentionally, in any way,

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abuses the victim and all the time records the event in order to send it or publish it publicly, all with the purpose of ridiculing the victim (Bilić, 2014).

Traditionally, peer violence, i.e. physical, verbal and social violence correlates highly with cyberbullying, therefore it is very difficult to separate them and observe them in isolation, considering that in most cases they follow each other (Yoon and Tairiol, 2009). Despite this correlation and the dominance of modern information technologies, which open up more space for encouraging peer and electronic violence, traditional peer violence still has a higher frequency than electronic violence (Hammad and Awed, 2020). The victim of peer violence is most often a person whose physical and social characteristics differ from the majority (Hoover and Stenhjem, 2003; Platero, Méndez and Ceto, 2007; O'Moore, 2010; Pinquart, 2017).

The specifics of deaf and hard-of-hearing students, which arose in conditions of deafness, make these students different from their hearing peers, and these specifics are reflected in their physical characteristics, speech-language expression and social functioning. Physical characteristics that distinguish deaf and hard of hearing students are visible, hearing aids. Speech and language expression of hard-of-hearing students with severe and very severe hearing impairment is characterized by large distortions in articulation, nasal tone of voice, reduced fluency, which contributes to making it difficult for the environment to understand them in communication. Deaf students, due to a complete loss of hearing, most often adopt and use dactylography and sign language. Hard of hearing students most often attend regular schools, and deaf students attend special schools. Special schools are adapted to the communication possibilities and abilities of deaf students, and in such conditions they acquire knowledge, reading and writing skills and develop language for further social functioning. The social functioning of deaf and hard-of-hearing students, which results from their speech and language characteristics, implies a constant focus on the face of the interlocutor in order to read speech from the mouth, expressed facial expressions, increased gesticulation (Đoković, 2004; Jolić and Isaković, 2008; Isaković and Kovačević, 2015; Kovačević and Isaković, 2019). In addition, the sphere of social functioning of deaf and hard of hearing students is threatened, they are often isolated, socially and emotionally unadjusted and immature. They have difficulty developing empathy, have difficulties with self-control and are prone to impulsive behavior (Dimoski, 2011). The mentioned specifics of deaf and hard of hearing students attract peer violence and the chances of deaf and hard of hearing students experiencing peer violence increase.

Methodology

In the light of our basic interest, which is: Is peer violence present and recognized among deaf and hard of hearing students? The main criterion for the selection of papers was that those papers include the problem of peer violence among students with hearing impairment. The aim of the paper is to analyze the available literature in the period from 2002 to 2022 to determine the extent to which deaf and hard of hearing students are exposed to peer violence, as well as to describe its nature. The following search engines were used for the literature search: Ebscohost, ScienceDirect, Wiley Inter Science and SpringerLink, KoBSON, Google Scholar. Papers were searched based on the following keywords: peer violence, deaf and hard of hearing students as victims of peer violence, peer violence among students with disabilities, peer violence among students with sensory impairments, prevention of peer violence. This paper includes over 60 studies, with ten state-of-the-art studies done in the last five years, which were analyzed in detail in accordance with the research questions. Other criteria for the selection of papers were based on research questions related to the frequency and forms of peer violence, the influence of gender, degree of hearing impairment, type of school and school age on peer violence, consequences and prevention of peer violence. Peer violence among students is spreading more and more, and it is especially difficult to detect it among deaf and hard of hearing students, both because of the sensitivity of this topic and because of the specificity of the functioning of these students who are born in conditions of hearing impairment. The consequences of peer violence affect the overall development of students, therefore it is necessary to focus more attention on the occurrence of peer violence within this population of students. In accordance with the above, this paper is of great importance because it directly points to the problem and specifically deals with the nature of peer violence among deaf and hard of hearing students.

Peer violence among deaf and hard of hearing students

People with disabilities are more at risk of becoming victims of peer violence compared to people from the typical population (Van Cleane and Davis, 2006; Young, Ne'eman and Gelser 2012; Schroeder et al., 2014; Fink et al., 2015; Huffman, 2015; Maiano et al., 2016) especially students with physical

impairments, hearing impairment and visual impairment (Rose, Monda-Amaya and Espelage 2011; Swearer et al., 2012). Peer violence among deaf and hard-of-hearing students represents a problem that is still not sufficiently researched and which, due to its sensitive nature, requires special attention (Weiner, Day and Galvan (2013)).

Between 17-32.5 % of deaf and hard of hearing students experience peer violence (Kvam and Loeb, 2010; Blake et al., 2012; Hadjidakou and Panayiotis, 2012). Compared to their hearing peers, deaf and hard of hearing students are more exposed to peer violence (Pinquart and Pfeiffer, 2015). It has been shown that deaf and hard of hearing students who have the support of their peers, the support of their parents and better grades are less exposed to peer violence.

Weiner, Day and Galvan (2013) indicate that deaf and hard-of-hearing students have experienced peer violence three times more than their hearing peers, as well as that they are more often exposed to traditional forms of violence than to cyberbullying. The opposite is true for their hearing peers, they are more often exposed to cyberbullying than traditional peer violence. The authors looked at these results with the fact that deaf and hard of hearing students are not in such a good socio-economic situation, i.e. that there are only a small number of them who own smart phones, that they do not fully understand how communication via the Internet works, as well as what the risks are when using the Internet and information technologies (Bauman and Pero, 2010). However, Aslan (2016) came to conflicting results indicating that deaf and hard of hearing students are more often victims of cyberbullying. The forms of peer violence that are most present in deaf and hard of hearing students are verbal violence, alternative or relational aggression and physical violence (Kouwenberg et al., 2012; Pinquart and Pfeiffer, 2015; Lund and Ross, 2016). Deaf and hard of hearing students are different because they wear hearing aids, use sign language, or have specific spoken language expression (Cheng, Chou and Lin, 2019). The very nature of hearing impairment, the poor and specific communication skills that develop in this condition lead to the fact that the deaf and hard of hearing primarily do not hear, and then do not recognize and understand the elements of peer violence that are directed towards them. It is considered that the victims of peer violence are those deaf and hard of hearing students who do not have sufficiently developed and adequate social skills, and due to inconsistencies in communication, they are deprived of certain social information that helps them understand the situation in which they found themselves and to deal with it (Tresh, 2004; Felinger et al., 2009; Bauman and Pero, 2010; Theunissen et al., 2014). Inadequate social skills further lead to social immaturity, which represents a great risk for committing various forms of peer violence against deaf and hard of hearing students (Hadjidakou and Panayiotis, 2012). McCrone (2004) believes that one of the most common reasons for peer violence and mistreatment of the deaf and hard of hearing lies in the fact that they are perceived by society as not as good or valuable as others who do not have hearing problems. Then it is understandable why there are situations in which some individuals tend to find the causes of unpleasant events within the framework of peer violence in their own limitations and shortcomings, such as deafness, and not in external factors. In that case, the victims blame themselves and believe that they are responsible for the fact that peer violence happened and that their damage, helplessness, limitations are the triggers for it (Bauman and Pero, 2010).

Students who have some kind of hearing impairment are often prone to marginalization and peer violence. Studies have shown that students with hearing aids are more susceptible to a higher degree of peer violence compared to their hearing peers. Traditional peer violence is more frequent, i.e. has a higher frequency compared to cyberbullying (Broekhof et al., 2018; Warner – Czyn et al., 2018; Feijoo et al., 2021). This has also been found with deaf students in Sweden, as well as with hard of hearing students in Taiwan (Brunnberg, Bostrom and Berlund, 2018; Cheng, Chou and Lin, 2019). On the other hand, in a Brazilian study, no statistically significant difference was found between hearing and deaf and hard of hearing adolescents in terms of peer violence, but it was found that the frequency of peer violence is increasing (Ernsen, 2016).

A review of the available literature shows that deaf and hard of hearing students are not only victims but also perpetrators of peer violence (Hadjidakou and Panayiotis, 2012). The percentage of perpetrators of peer violence among deaf and hard of hearing students is close to the percentage of victims (Lund and Ross, 2016). When groups of deaf and hard-of-hearing perpetrators are compared with groups of their hearing peers, no statistically significant difference is obtained in terms of peer violence (Pinquart and Pfeiffer, 2015). Like the previous group of authors, Aslan (2016) also points out that deaf and hard-of-hearing students are both perpetrators and victims of peer violence, that is, the percentage of students from both groups is approximately equal. According to the results of the latest research by Hammad and Awed (2020), it was found that the percentage of victims and perpetrators of peer violence among deaf and hard of hearing students is almost equal, which is in accordance with the results of the previously mentioned research.

Peer violence in relation to gender, degree of hearing impairment, type of school, school age and self-esteem of deaf and hard of hearing students

Research often raises the question of whether there is a gender difference in the frequency of peer violence. Are male or female students more susceptible to peer violence? Rather conflicting results are obtained. There is a larger number of studies that have shown that there is no statistically significant difference between male and female students in terms of peer violence (Calvete et al., 2010; Dembo et al., 2019; Feijoo et al., 2021). This number is followed by research that indicates that male respondents are more often victims of both traditional peer and cyberbullying (Huang and Chou, 2010; Twardowska - Staszek, Zych and Ortega - Ruiz, 2018; Hammad and Awed, 2020). However, in addition to these studies, there are also those whose results showed that female respondents are more exposed to peer violence (Cenat et al., 2014).

Degree of hearing impairment, communication model and type of hearing aid did not prove to be factors within which there are differences in peer violence, i.e. there are no statistically significant differences between groups within these variables in terms of frequency and severity of peer violence (Kouwenberg et al., 2012).

Research that dealt with differences in school age showed that peer violence is most common among students of older elementary school age (from fifth to eighth grade), and it continues in the middle school period with a tendency to decrease (Bilić, Buljan-Flander and Hrpka, 2012). According to parents' reports, we come across information that the percentage of peer violence in elementary schools, in grades one to four, is about 22%, in grades five to eight about 29%, and in high schools about 22.5%. It is assumed that this percentage is even higher, but it is not recorded because not all students report to their parents that they were victims of peer violence (Blake et al., 2012). But it should also be mentioned that there are different findings, where the decline of peer violence is already visible in the older grades of primary school (Olweus, 1998) or the increase during the middle school period (Hemphill, Tollit and Kotevski, 2012). This is supported by research that has shown that peer violence is more pronounced in adolescence, in high school students (Blake et al., 2012; Weiner Day and Galvan, 2013). Adolescents with hearing aids are more susceptible to a higher degree of peer violence compared to their hearing peers (Broekhof et al., 2018; Warner – Czyz et al., 2018; Feijoo et al., 2021). Despite the fact that deaf and hard of hearing students have more pleasant social experiences in special schools, research shows that peer violence occurs more often in special schools than in mainstream schools (Klewin, Stinson and Colarossi, 2002; Dixon, 2006; Arulogun et al., 2012; Kouwenberg et al., 2012; Marschark et al., 2012; Fumes and Oliveira, 2013; Weiner, Day and Galvan, 2013; Theunissen et al., 2014). In schools for the deaf, about 32.5% of students reported being victims of violence at least 2 to 3 times a month (Weiner, Day and Galvan, 2013). The most common types of violence among deaf and hard of hearing students that occur in special schools are verbal and physical violence (Arulogun et al., 2012). An explanation for these results can be found in the fact that deaf and hard of hearing students in special schools have similar speech and language characteristics and communication models and communicate better and recognize more easily if they have been victims of peer violence. As a prerequisite for traditional peer violence and cyberbullying, self-esteem is also starting to be investigated (Patchin and Hinduja, 2010). Research results most often show that victims of cyberbullying have a low level of self-esteem and that low self-esteem is a factor that contributes to students being exposed to a greater risk of any form of peer violence (Aslan, 2011; Sesar, Šimić and Barišić, 2011; Brito and Oliveira, 2013; Hesapcioglu, Yesilova Meraler and Ercan, 2018; Hammad and and Awed, 2020). On the other hand, research has shown that even in the group of perpetrators of peer violence, respondents had low self-esteem, which means that low self-esteem is certainly a risk factor when it comes to peer violence, regardless of whether it is about committing or experiencing it (Kowalski and Limber, 2013; Dadić, 2014; Hammad and and Awed, 2020).

Deaf and hard-of-hearing students who have problems accepting their impairment and functioning within it, become more vulnerable over time, their level of self-esteem decreases and they do not have enough emotional self-control, which contributes to them becoming easy targets for both perpetrators of traditional peer violence and perpetrators of cyberbullying (Hadjikakou and Panayiotis, 2012).

Exposure to peer violence affects the reduction of the quality of life of students, which manifests itself later in life. Among students who were victims of peer violence, weak social skills are impaired, problems with mental health, tendency to depression and anxiety disorders, and suicide occur. These students have impaired self-esteem and problems with alcoholism and smoking (Ybarra and Mitchell 2004; Høglund, 2007; Kowalski and Limber, 2013; Brunstein, Sourander and Gould, 2010; Swearer et al., 2012; Fedwa and Ahn, 2011; Sessa and Sutherland, 2013; McVie, 2014; Takizawa, Maughan and Arseneault, 2014).

Research shows that there is a connection between school success and experiencing peer violence. Victims of bullying, whether at school or online, were more likely to have difficulties at school such as absenteeism, poor concentration, learning problems, poorer grades, and generally showed lower academic performance compared to non-bullied students (Beran and Li, 2007; Juvoven and Gross, 2008; Kowalski and Limber, 2013; Yang, Ne'eman and Gelser, 2013).

Anti-bullying programs, the prevention of peer violence and recommendations for future research

A large number of victims of peer violence are afraid to report the violence because they think that it will make the situation worse, that no one will react and take any measures or that their technical devices for communication (mobile phones, computers, tablets...) will be taken away from them (Bauman and Pero, 2010). The authors point out that when students are encouraged to anonymously report some form of peer violence they have suffered, they begin to feel liberated and better, which further motivates them to talk more about this topic (Jaffe et al., 2015). Peer violence is most often reported by students to their parents, and then to friends and teachers (Feijoo et al., 2021). Violence is most effectively stopped when it is reported to adults, who intervene as soon as possible to positively affect the victim's overall condition (Bjereld, Daneback and Mishna, 2021). Parents' reactions to peer violence are different, some parents provide children with emotional support and strategies that can help them deal with peer violence, others urge school counselors and teachers, some talk to the perpetrators of peer violence and their parents, all with the goal to protect their child (Harcourt, Green and Bowden, 2015). On the other hand, there are those parents who consider peer violence a normal experience in their child's development and do not take any steps (Sawyer et al., 2011).

One of the strategies for combating peer violence is the implementation of so-called anti-bullying programs, that is, programs for the prevention of peer violence. The programs that have been implemented so far have yielded positive results in reducing verbal violence by 20%, reducing physical violence by 27% and the percentage of social exclusion of individuals decreased by 28% (Limber, Olweus and Luxenberg, 2013).

Anti-bullying are not only used to reduce the frequency of peer violence, but also to work on its prevention. Such programs must be constantly improved because the dynamics of relationships between young people in today's society often change. Through programs for the prevention of peer violence, it is necessary to insist on spreading the story about peer violence and point out the problems and consequences it causes. The essence of these programs is to act on relationships among peers in the direction that will lead to supportive, tolerant, cooperative and friendly relationships (Hadzeldu Foundation, 2014). It is necessary to promote social skills such as empathy and cooperative action, as opposed to insisting on the development of a competitive spirit. By developing the aforementioned social skills, students would understand that it is necessary to defend and protect each other and that then the chances of inciting peer violence are minimal (Jenkis et al., 2016). In the processes of creating and implementing programs to prevent peer violence, in addition to appropriate experts, students, their parents, school employees and members of the community where students live and grow up must also be involved (Hadzeldu Foundation, 2014). With the help of the program for the prevention of peer violence, a safe environment is created in which deaf and hard of hearing students and their hearing peers can develop connections and social skills with the lowest possible risk of experiencing and committing peer violence.

Programs for the prevention of peer violence must be adapted to deaf and hard-of-hearing students so that they can understand them and gain the best possible insight into what peer violence entails. This is extremely important because only then will they be able to actually recognize and report peer violence (Raskauskas and Modell, 2011). When it comes to deaf and hard-of-hearing students, prevention contributes to information and familiarization with the phenomenon of deafness, Deaf culture, speech-language specifics of deaf and hard-of-hearing, their communication needs, sign language (Dixon, 2006).

One of the great advantages that can be derived from programs of this nature is that their existence and implementation can lead to a more substantial and essential implementation of social inclusion. As these programs promote the creation and maintenance of tolerant, cooperative, supportive and friendly relationships, opportunities are opened for getting to know the personal values of deaf and hard of hearing students, their acceptance and inclusion in society without looking back on their limitations and shortcomings.

Recommendations for future research

Research has shown that the problem of peer violence is present in the population of deaf and hard of hearing students and that these students are exposed to a greater risk of peer violence (Broekhof et al., 2018; Brunnenberg, Bostrom and Berlund, 2018; Warner - Czyz et al., 2018; Cheng, Chou and Lin, 2019; Feijoo et al., 2021; Hammad and Awed, 2020). Such findings point to the need to focus more attention on elucidating the problem and examining the factors of peer violence in more detail within the population of deaf and hard-of-hearing students. Given that no domestic research papers describing the nature of peer violence among deaf and hard of hearing students have been found, we believe that it is necessary to carry out research on this topic in the territory of the Republic of Serbia. Since it is about the population of deaf and hard of hearing students, in future research, it should be taken into account whether models of communication and expression that suit these students are used, which contributes to the validity of the results.

Conclusion

Looking at the available literature, we conclude that peer violence is a frequent phenomenon among deaf and hard of hearing students, but at the same time insufficiently researched in the territory of the Republic of Serbia. Due to the nature of their communication and social functioning, deaf and hard of hearing students are actually not always able to recognize and report peer violence, which makes it even more difficult to determine the level of frequency of peer violence among these students. Research also shows that the frequency of peer violence is higher in special schools than in regular schools. Such results are explained by the fact that in special schools, the communication models among students are similar, they communicate better and easier, so it is therefore easier for them to recognize peer violence in such an environment. We are of the opinion that it is necessary to create and develop programs for the prevention of peer violence, adapted to deaf and hard of hearing students, which will be part of the development and strengthening of social inclusion. The focus should be on strengthening peer relationships and creating a safe social environment. In addition to preventing peer violence, the advantage of these programs is a better introduction and understanding of the diversity of deaf and hard-of-hearing students. This approach reduces both the chances and the risk of creating peer violence among deaf and hard of hearing students.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, J.B.K. and M.B.K.; methodology, J.B.K.; software, M.B.K.; formal analysis, M.B.K. and J.B.K.; writing—original draft preparation, M.B.K. and J.B.K.; writing—review and editing, J.B.K. and M.B.K. All authors have read and agreed to the published version of the manuscript.

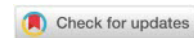
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Competences of Physical Education Teachers in Education Supported by Digital Technology

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Abstract: The application of digital technology in teaching physical education provides a basis for its improvement in the direction of promoting physical activity and student development. As one of the most important subjects of the teaching process, teachers have a fundamental role in achieving the goals and tasks of physical education. Physical education teachers are required to develop competences based on which they would implement digital technology in physical education classes in compliance with the imperatives of modern digital education. Therefore, this research is focused on the competences of physical education teachers in education supported by digital technology. The aim of this research is to determine the competences of physical education teachers necessary to fulfil their role in education supported by digital technology. The method used in this theoretical research is the method of theoretical analysis. The technique of content analysis was used. The research instrument consists of the relevant literature on this topic. The theoretical analysis points to a need to expand and improve the digital competences of physical education teachers, which can be achieved by joint action of formal and informal education systems in developing programs that would provide a basis for the professional development and empowerment of physical education teachers to use digital technology with more certainty and purpose in teaching physical education.

Keywords: physical education, digital technology, teacher, competences.

Introduction

The development of digital technology and its impact on all spheres of life has significantly changed the way people function on a daily basis. Advances in digital technology have influenced the way we comprehend knowledge and skills. They are inextricably linked to technological knowledge and skills, without which functioning in different areas would be difficult. Therefore, educational process is experiencing progress caused by the integration of digital technology into its flows, which affects the changes in the organization of teaching and learning when it comes to all subjects. Physical activity is the basis of a healthy lifestyle and its regular implementation contributes to the creation of healthy life habits, which is why it is important to promote greater physical activity of students. For that reason, it is necessary to use digital technology resources that can contribute to the implementation of changes in physical education as a compulsory subject, with the aim of its development and modernization. Changes are being implemented in educational practice and physical education teachers are in charge of their efficiency. The application of digital technology in education has influenced the change in the way physical education teachers act, which has made them encounter numerous challenges in the form of the necessary knowledge, skills and abilities. Teachers are the ones who shape and direct the teaching process, and it largely depends on them what outcomes will be achieved. As digital technology has become an indispensable part of the teaching process, physical education teachers are expected to possess competences that would enable them to use digital technology in teaching physical education successfully. Based on the developed competences, physical education teachers would effectively perform their role and thus achieve the set goals of teaching physical education in accordance with the concept of digital education. By modernizing teachers' competences, it is possible to make positive changes when it comes to teaching physical education. By implementing digital technology, education gains the opportunity to develop.

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Analysis

Under the influence of digital technology, the modern educational process has received support in the form of various technological platforms and resources that provide a chance for its progress. Like other subjects, physical education classes have the opportunity to be improved, and the physical education teacher has a significant role in that. The achievement of fundamental goals and tasks of physical education depends on the physical education teacher, which is why his role is complex and implies a planned and organized approach to the physical growth and development of students aimed at influencing other spheres of development of their personalities. Effective and adequate performance of the role of physical education teacher requires developed competences. The basic competences of physical education teachers represent the foundation of their work, which can be improved precisely by applying digital technology, i.e. by expanding and developing digital competences. Positive changes in the role and competences of physical education teachers are becoming more and more emphasized and in the near future they will be further shaped by the changing process of learning and teaching which is conditioned by the presence of digital technology.

Physical education as an indispensable part of institutional education occupies an important place in it. The basic tasks of physical education are to encourage growth, development and proper posture, develop motor skills and habits related to physical exercise with the inevitable development of the awareness of a healthy lifestyle (Kretschmann, 2010; Ristić, 2018b). The characteristics of physical education classes are reflected in the fact that they are carried out in a special environment with a lot of props and equipment, where the basic teaching tool is exercise. This reflects the increased responsibility of teachers in terms of protecting students from injury. Physical education differs from other school subjects because its teaching content and method of learning is physical activity, which is what also distinguishes the role of a physical education teacher from the role of the teacher of another subject. "Professional activity of physical education teachers differs from other pedagogical specialties and requires much more attention, concentration, responsibility. Thus, the physical education teacher must simultaneously control the state, movement and safety of all the students over large areas, be able to adjust and assist the students in adapting to situations that are changing dramatically (gaming, educational, weather, physical ones); protect the students from injuries, overload; constantly promote universal, cultural, pedagogical values, skillfully stimulate various aspects of student development due to physical exercises, games and exercises" (Maksymchuk et al., 2018: 814). The organization of physical education classes conditions increased interaction among students and between the teacher and his students, which provides an opportunity and a task for the teacher to get acquainted with the physical and psychological characteristics of the students in order to adapt the teaching to the characteristics and traits of each student effectively. His role in the adequate inclusion of students in physical education classes is also important. The results of the research conducted by Jeremić et al. (2018) show that students emphasize the role of partners in affective interaction as the most important role of physical education teachers, i.e. they emphasize the importance of respecting students, respecting their work and protecting their privacy. In addition, the objectivity of teachers in assessing the performance and progress of each student individually is highly valued. In the educational systems of developed countries, greater importance is given to the development of a positive attitude towards physical education and sports, which is why it is necessary for teachers to train students to apply knowledge, skills and habits acquired through teaching and recognize the connection between physical exercise and health (Momčilović and Momčilović, 2016). Therefore, one of the most important roles of a physical education teacher is to emphasize the importance and value of physical exercise constantly and to work on his students' creation of a habit to take care of their body and improve their abilities. In that sense, his task is to show to the students how to apply a certain program of physical exercises in their free time, beyond school hours, so that physical exercise becomes their need and desire over time. Good performance of the role of a physical education teacher requires, above all, good preparation, dedication and motivation of teachers together with the application of various contents and activities that would enable greater participation and an active role of students in the teaching process. This is also supported by the respect of their proposals and ideas, and the distribution of responsibilities in the execution of certain activities and tasks. In addition, it is important to provide support and cooperate with students before, during and after exercise. Students' subjective sense of the teacher's competence should not be left out in order to develop a sense of trust and security, which together contribute to a mutual sense of satisfaction during physical education classes, the ultimate goal being successful psychomotor development of students (Zrnzević and Zrnzević, 2018).

The implementation of digital technology in education is one of the leading imperatives of modern education and in this field, there are numerous studies and practical examples that have proven the

positive effects of the application of technology in the teaching process (Kretschmann, 2015a). Physical education is an area in which the application of digital technology is still not common due to limitations such as the lack of training, the availability of equipment, space, time, and hardware problems (Gibbone, Rukavina and Silveanu, 2010; Yaman, 2008). However, digital technology in physical education, as well as in other subjects, has great potential (Selvi, 2010). Based on the technological standards for teachers and students, the National Association for Sports and Physical Education (NASPE) has proposed four guidelines for the appropriate use of teaching technology in physical education (Baert, 2011: 17):

- The use of instructional technology in physical education is designed as a tool for increasing instructional effectiveness;
- The use of instructional technology in physical education is designed to supplement, not substitute for, effective instruction;
- The use of instructional technology in physical education should provide opportunities for all students, versus opportunities for few;
- The use of instructional technology in physical education can prove to be an effective tool for maintaining student data related to curriculum objectives based on standards.

Based on these guidelines, we realize that educational technology is not important in itself, it cannot replace the teacher, but as a supplement to his work, it becomes an effective tool for modernizing and improving physical education classes. Examples and possibilities of the efficient inclusion of digital technology in teaching physical education can be found in the literature. In that sense, the roles of physical education teachers have been expanded. They are related to the daily use of technology in the process of preparing and conducting classes, ways of communicating with students and colleagues, providing resources for learning, administration and reporting on student results. Their role is to follow the scientific achievements in their field and educational technology, to educate young people in a different technological and value milieu, to evaluate the work of students continuously and to encourage them constantly to achieve better results. In this new role, physical education teachers become organizers, programmers and teaching assistants, while students become more independent, creative and responsible (Selvi, 2010). It is necessary for a physical education teacher to create pedagogical situations that will encourage the students' desire for knowledge, skills development and success. This would increase the students' motivation to learn and progress and enable student participation as a basis for greater achievements (Barbieri, 2020). It is also important for the teacher to create a friendly relationship with the students, to be their advisor, a person of trust, to acquaint them with social and cultural values, to help them acquire these values and to promote the development of their personalities (Kretschmann, 2010; Zobenica and Stipančević, 2017). In addition, he is a guide and role model for students, which is why he needs to use educational technologies purposefully. The physical education teacher has a crucial role in encouraging the development of the students in the field of physical health, and is, therefore, responsible for providing effective education (Filiz, 2020). Action research is of great importance for teachers-practitioners in the integration of digital technologies into physical education in order to improve teaching and gain a better teaching experience. The history of action research in physical education is not long, but it offers great opportunities, because it implies that physical education teachers review their actions in order to improve their work. Teacher reflection deals with re-examining the values and procedures that they represent and use in physical activity and sports, with the purpose of solving problems and improving their practice (Bodsworth and Goodyear, 2017; Maksimović and Osmanović, 2018).

The diversity of roles of physical education teachers speaks of their importance in modern physical education. Based on the knowledge of the psycho-physical characteristics of students, their basic task is to promote the physical development of students and the development of physical exercise habits. In that sense, their role is reflected in the preparation and organization of physical education classes, where, through various forms of physical activities, they will try to achieve a positive influence on the growth and development of students, and encourage their motivation for progress, which is why it is important for teachers to follow modern achievements in physical education. Ensuring the safety and protection of students is an integral part of the role of physical education teachers, and so is objective reporting on the results achieved by students. Through counseling and supporting students, teachers promote pedagogical values and connect physical education with the development of a healthy lifestyle. The application of digital technology can contribute to the improvement of the role of physical education teachers in all aspects. As one of the key bearers of educational work in school, physical education teachers must possess competences that include specific knowledge, skills and attitudes acquired through education, as well as experience in educational work, which enable them to perform tasks and roles in complex situations of contemporary school (Karić et al., 2015). The very concept of competences refers to the abilities, knowledge, attitudes and skills of a person that he possesses or can develop. In the field

of education, competences are seen as potential actions based on personal abilities and willingness to take initiative. Competences are widely discussed in modern education and there are numerous analyzes that indicate that competences are certain abilities to perform a task, i.e. abilities to solve given problems based on competent knowledge (Hercigonja, 2018; Krumsvik, 2011).

The National Education Council of the Republic of Serbia has defined the Standards of Competences for the profession of teachers and their professional development by dividing them into four categories (Šafranĳ and Zivlak, 2018: 2):

- Competences for the teaching area, subject and teaching methodology;
- Competences for teaching and learning;
- Competences for supporting student personality development;
- Competences for communication and cooperation.

Considering the stated competences in the context of physical education teachers, competences for the teaching area, subject and teaching methodology refer to the subject knowledge, planning, implementation and evaluation of the teaching process, as well as training in the field of physical education. The first group of competences implies that the physical education teacher has knowledge in the field of physical education and related disciplines, in which digital technology, i.e. the Internet, provides him with opportunities, offering a wide range of professional knowledge. Based on this knowledge, by using digital technologies in the didactic-methodical organization of teaching, he strives to achieve the goals and tasks of physical education. These competences also refer to the skills of more creative planning, implementation and evaluation of physical education classes using digital teaching aids in order to improve them, whereby it is necessary to know at least one foreign language which can contribute to that (Pišot, 2017; Šafranĳ and Zivlak, 2018). Teaching and learning competences include the knowledge of student development and the nature of learning in physical education classes, planning skills, implementation and evaluation of the process of student progress and the ability to improve the pedagogical practice. Competences for supporting student personality development refer to the knowledge about the differences between students and adequate ways of motivating them. These competences include planning and implementation of various activities for the development of students' personalities, with the inevitable evaluation and improvement in these aspects of competences. Digital technology can be the basis for the improvement of these categories of competences through numerous programs and applications that facilitate the process of monitoring and measuring progress in the physical development of students, based on which the teaching of physical education would be implemented more fully and efficiently. In other words, digital technology provides a chance for the development of better communication and cooperation with students, because this type of communication is close to students who have grown up with technology. In this way, a positive relationship between teachers and students can be formed, and on that basis, students can be more motivated to engage in physical activity and realize its benefits. Communication and cooperation competences include the necessary knowledge, planning skills and implementation of cooperation activities with parents, guardians and other partners in physical education, in the improvement of which digital communication media have a significant share. Examples are applications and social networks that enable real-time communication outside the classroom, providing the exchange of the necessary information about students in order to monitor their physical activity outside of class. Therefore, the modernization of physical education in accordance with technological innovations is possible if the physical education teacher primarily understands the importance of digital technology in teaching, and in that sense seeks to develop these basic competences following the trends in digital technology (Šafranĳ and Zivlak, 2018).

Forming the attitudes of physical education teachers is an important segment of their competence. The success of a physical education teacher will depend not only on the skills he possesses, but also on the safe implementation of those skills, i.e. his self-confidence (Gibonne, Rukavina and Silverman, 2010). This is explained by the concept of self-efficacy, which represents an individual's judgment of himself and his ability to organize activities that require certain performance and quality. In this sense, self-efficacy is the belief in one's own abilities. The attitude of teachers about their competence is of great importance for their practice, which is reflected in the results of research conducted by Yaman (2008), which show a positive connection between self-efficacy and the use of computers in teaching. Namely, if the faith of physical education teachers in their self-efficacy is low, they will not be considered competent enough to use computers in teaching and will tend to use them less, and vice versa. This means that teachers must have the confidence to use digital technology in order to be able to integrate it into their work. In the context of teachers' attitudes towards technology, younger teachers have been shown to have more positive attitudes towards the use of technology in teaching than older colleagues (Woods et al., 2008). Therefore, younger teachers use digital technology more and believe that the application of technology

increases students' achievement in physical education (Osmanović, Maksimović and Dimitrijević, 2020). The reason for that can be found in the fact that technology is closer to younger teachers. In that sense, technological trainings can improve the technological competences of older teachers, which will have a positive impact on their attitude towards the use of technology (Woods et al., 2008). For this reason, it is important to work on teachers forming positive attitudes towards the use of digital technology, because this affects how much it will be applied in teaching physical education (Filiz, 2020; Semiz and Levent Ince, 2012).

Developed competences of physical education teachers are the basis of quality physical education classes. By applying numerous technological resources, from traditional to modern, such as computers, tablets, mobile phones, the competences of modern physical education teachers can be improved. In this way, teachers have significantly more opportunities in the field of planning, organization and evaluation of physical education, making the process more creative and interesting, which will certainly increase the motivation of students to engage in physical activity, which is one of the goals of physical education, and improve the knowledge, skills and abilities of teachers in these areas. Also, through the use of various applications, programs, platforms and the Internet, they improve their skills of monitoring the development and progress of each student, as well as communication skills and types of cooperation with students and parents. The availability of content, seminars and courses on the Internet allows teachers to improve, or continuously expand their professional knowledge and skills in the field of physical education. The physical education teacher is the main carrier of the application of innovations in teaching physical education, and, therefore, it is necessary for him to have self-confidence built on the competences necessary for innovative teaching. Based on this, we can conclude that the application of digital technology in physical education is a way to expand and modernize the basic competences of physical education teachers. Therefore, it is necessary for physical education teachers to strive to improve their basic competences by using digital technology in teaching physical education. In the context of the inclusion of digital technology in the process of teaching physical education, digital competences have stood out as a special type of competences of physical education teachers.

The presence of information and communication technology in schools and everyday life has conditioned the need for the development of digital competences of physical education teachers (Momčilović and Petrović, 2019). In order for the integration of information and communication technology in teaching to be effective, we need professional teachers who develop their competences through continuous professional development. The digital age requires digitally skilled teachers. Digital competences are one of the basic competences for lifelong learning which are determined by the documents of the European Union education policy (Balbieri, 2020; Momčilović and Petrović, 2019). Presented in this way, digital competences can be included among the basic needs of a person for life, work and learning in the digital society in which we live (Dragutinović and Mitrović, 2020). It is possible to find various terms in the literature that refer to the ability to use digital technology, such as digital literacy, computer literacy, information literacy, media literacy or e-competences. Digital literacy is a broader term that encompasses all of the above (Cantabrana, Rodriguez and Cervera, 2019). Digital competences are closest to digital literacy because they refer not only to skills but also to the social and emotional aspects of using digital technology. Digital competences can be defined as the critical and creative use of digital technology in order to achieve different goals (Hercigonja, 2018). The definition of digital competences was given by Ferrari (2012: 87): "Digital Competence is the set of knowledge, skills, attitudes, abilities and strategies that are required when using ICT and digital media, with the aim of a thoughtful, flexible and safe process of teaching and learning." It follows that digital competences refer to the ability to use information and communication technologies safely and critically for work in personal, social and professional life. The key elements are the basic information and communication skills and abilities: the use of computers to find, evaluate, create, display and exchange information, and develop collaborative networks via the Internet. A digitally competent teacher is one who has mastered the ability to use the media, search for information and select them critically, as well as the ability to communicate with other people and groups through digital tools and applications, i.e. who is willing to make decisions about what digital tools he can use in a particular teaching situation, how they should be used and what the reason for their use is (Duh, Bratina and Krašna, 2012; Ottestad, Kelentrić and Guðmundsdóttir, 2014). Digital competences of physical education teachers are defined on the basis of general digital competences which are directed towards the use of digital resources in teaching physical education with the awareness of the pedagogical possibilities of using technology (Divjak, 2017; Lakkala, Lomaki and Kantosalu, 2011). Thus, in addition to everything mentioned above, digital competences of physical education teachers include a critical understanding of the social use of technology in the context of the formation of young people. Consequently, competences for quality and effective use of digital media include not only skills for their application in teaching, but

also a critical attitude towards these media in the teaching environment (Duh, Bratina and Krašna, 2013; Johannesen, Ogrim and Gjaever, 2014).

The question is which technologies enhance the digital competence of physical education teachers. Such traditional technologies include television and video cameras that enable recording physical exercises and movements and their display in class for a more successful analysis and application, which in modern teaching can be improved by using LCD projectors since they are larger and clearer than television (Baert, 2011; Kretschmann, 2010; Semiz and Levent Ince, 2012). Among modern technologies, the computer is certainly the most important representative, because it provides the use of numerous programs, applications and the Internet, which are the basis for improving the work of physical education teachers (Osmanović, Maksimović and Dimitrijević, 2020), i.e. their digital competences, including developing skills and abilities to integrate technologies effectively in different ways. With respect to the analysis and presentation of complex movements, the teacher can record video clips of certain physical skills, or the best players in the world and share them with students on the Internet, so that the content is preserved permanently and students can return to it, which would undoubtedly increase their motivation to play sports (Yaman, 2008). In addition, the use of a specific software and simulation in physical education classes is recommended (Kalemoglu Varol, 2014). Digital technology can also be used for preparation and administration, through the presentation of fitness results or through the assessment of students' motor abilities in a more efficient way. Monitoring the heart rate on the monitor is a great way of assessing cardiovascular speed, providing more specific information about the physical health of students. In this sense, physical education teachers can use digital technology in assessing fitness through more comprehensive databases (Gibonne, Rukavina and Silverman, 2010; Kalemoglu Varol, 2014). In addition, digital competences are reflected in the planning, programming and preparation of the training process with the aim of monitoring the competition for statistical data processing and student evaluation (Gibonne, Rukavina and Silverman, 2010; Jeremić et al., 2018). The nature of physical education classes can be further developed by using the Internet, i.e. sites dedicated to physical education or those where such content can be found such as YouTube, educational softwares and emails or social networks for exchanging ideas with other teachers, for example, in the field of lesson preparation and organization of teaching materials (Gibonne, Rukavina and Silverman, 2010; Jeremić et al., 2018; Osmanović, Maksimović and Dimitrijević, 2020). Furthermore, numerous Internet contents provide a chance for teachers to enrich and update physical education contents and connect them with subjects related to physical education and sports (Filiz, 2020; Yaman, 2008). Important educational tools for a digitally competent physical education teacher are multimedia systems and presentations, computers and web application programs, and search tools. One way to use these tools is to maintain websites dedicated to the promotion of physical activity that are mostly intended for their students in order to promote a healthy lifestyle (Gibonne, Rukavina and Silverman, 2010; Kalemoglu Varol, 2014). An indispensable type of modern technology that can serve to improve the work of physical education teachers very successfully are mobile phones, which are inseparable from the functioning of a modern man and children. Therefore, in the context of spreading awareness about the importance and benefits of physical activity, physical education teachers can use a number of mobile phone applications that contribute to their innovative work. Some of them are Physical Education, Nike Training Club, RunKeeper, Workout Trainer, Step Counter, Heart Rate Plus, Water Reminder (Osmanović, Maksimović and Dimitrijević, 2020). It is very important to emphasize the ability of teachers to critically evaluate the mentioned technologies and tools, i.e. the critical use when teaching physical education, based on the analysis of their safety, security, purposefulness and significance. Certainly, as shown by the results of numerous authors, it was found that the use of technology in physical education as a tool benefits teacher with the aim of developing digital competences, as well as students by helping them achieve the goals of physical education efficiently (Yaman, 2008).

In order for teaching in physical education with the help of technology to be effective, it is necessary to connect three elements: technological knowledge (TK), pedagogical knowledge (PK) and content knowledge (CK), which form a theoretical framework called Technological Pedagogical Content Knowledge or TPACK (Divjak, 2017; Semiz and Levent Ince, 2012). Technological knowledge (TC) includes knowledge of digital technologies, such as computers, the Internet, and digital video. This knowledge includes the skills of using a certain technology in physical education activities. Next, content knowledge (CK) includes mastering the basic facts and concepts in a certain field, i.e. in physical education. This means that physical education teachers should have the knowledge in the field of motor learning and control, anatomy, exercise physiology, sports, exercise psychology and the like. Pedagogical knowledge (PK) includes teaching methods and strategies, which in the context of a physical education teacher refer to his ability to adapt physical movement to the development and needs of a child. Pedagogical content knowledge (PCK) is a combination of knowledge about teaching strategies and concepts, and

physical education content. For example, a basketball lesson will not be conducted in the same way with second and seventh grade students. It follows that technological pedagogical knowledge or TPK includes the ability to use different technologies in physical education based on pedagogical knowledge. In that sense, a teacher who has a high TPK can easily choose the appropriate tool to use in teaching, taking into account the level of readiness of a child. Technological content knowledge (TCC) implies the ability to use and understand the purpose of a particular technology in the subject content, i.e. the content of physical education. In physical education, choosing the right technology can be crucial for teaching a particular sport (Semiz and Levent Ince, 2012). The cross-section of these parts of the model shows the necessary knowledge and skills that a physical education teacher should possess in order to integrate technology into the teaching process of physical education. These are competences in the use of technology, professional competences, pedagogical-didactic and methodological competences (Dias-Trinidad and Moreira, 2020). By applying this model, the teacher demonstrates his skills in the application of digital technology in teaching physical education (Ristić, 2018a). Thus, the basis of effective technology teaching is an understanding that arises from the interaction between content, pedagogy, and technological knowledge. The level of TPACK of a physical education teacher is a decisive factor that reflects his digital competences (Semiz and Levent Ince, 2012). Therefore, it is important to work on the development of digital competences of teachers, because when a teacher feels competent and has a greater level of self-confidence, he will introduce innovations in the teaching process of physical education (Fraile, Penalva-Velez and Mendioros Lacambra, 2018; Kučina Softić, 2020). Different programs, applications, digital tools and media are presented and they serve the development of technological skills and knowledge of physical education teachers in different ways and in different areas, which is why it is recommended to use them in physical education, because they contribute to the development of digital competences of teachers and, therefore, improve the teaching process of physical education. In addition to technological skills and abilities, it is important that teachers acquire pedagogical and professional knowledge in the field of physical education, because their skillful combination is a demonstration and practical application of digital competences of physical education teachers.

Discussion

The efficiency of the education system significantly depends on the readiness of teachers for continuous development (Bakhmat et al., 2019). Since competences are a dynamic concept that depends on specific conditions and time, it is necessary to constantly study their effectiveness and the need for change. Changes in the social functioning conditioned by the progress of digital technology affect the change of the education system, i.e. the process of teaching and learning in all subjects and, accordingly, the necessary expansion of teaching competences in the direction of digital literacy (Yaman, 2008). With the development of digital competences, physical education teachers have the opportunity to change their role, to present a different learning environment, increase cooperation and interaction with students and to implement digital technology in accordance with the modern ideas of pedagogy, which will encourage the development of technological literacy (Kučina Softić, 2020; Rokones and Krumsvik, 2014; Vogt, Reghlonghaus and Klein, 2019).

The findings of the research conducted by Liang et al. (2006), as well as the review of numerous studies provided by Liu et al., 2018, show that physical education teachers lack the appropriate knowledge to apply technology in physical education effectively. Other authors present similar results. Namely, most physical education teachers have basic ICT skills and a positive attitude towards the integration of ICT in education before starting university. However, teacher education programs do not provide adequate competences for teaching using technology. Teachers most often learn about traditional methods of ICT integration in education, while innovative models of ICT integration such as cooperative learning or synchronous and asynchronous online-based learning are not represented (Gibonne, Rukavina and Silverman, 2010). The way physical education teachers are prepared and educated directly affects the way in which they will organize physical education classes (Liu et al., 2018). Therefore, there is a need to pay more attention to the preparation and development of digital competences of future physical education teachers during formal higher education, which would be continued through various teacher training programs. This view is also shared by Maksymchuk (2018), who believes that it is necessary to create pedagogical conditions for training physical education teachers in the form of a series of organizational measures aimed at pedagogical innovations, modern trends in higher education, physical culture and sports. The framework for the development of digital competences of physical education teachers was presented by UNESCO, which includes three phases in the development of digital

competences of teachers. The first phase involves the acquisition of technological literacy with the aim of better learning with the application of digital technology. The second phase refers to the opportunity to acquire knowledge and the ability to apply that knowledge in solving problems. The third phase focuses on creating knowledge through which teachers as citizens contribute to society through participation. The analysis of study programs for teacher education at the Faculties of Sport and Physical Education of the Universities of Belgrade, Niš and Kosovska Mitrovica shows that the emphasis is on acquiring basic information and communication competences, while the core courses do not include competences for designing innovative digital teaching environments and learning management systems. Therefore, in order to enable physical education teachers to acquire digital competences, it is necessary to provide them with basic knowledge in the field of information and communication technologies and to innovate curricula with content for creating digital teaching environments and learning management systems (Ristić, 2018a). The need to reorient educational strategies and introduce new educational models for teaching through the integration of technology into physical education includes the development of the teacher's TPACK model, which has already been described. Since physical education is usually taught in a gym or outdoors, it is important that teachers develop their skills in a context as similar as possible to that expected in their work (Liu et al., 2018).

In the context of training future physical education teachers at universities and improving the content and overall organization of the educational process, one of the examples of innovating courses used in practice is mastering the use of SkyDrive as one of Microsoft's cloud services. SkyDrive provides users with a wide range of services such as a customized calendar with scheduling and reminders, task management, the ability to perform stand-alone or group tasks, access from different devices and the like. The training involves the lecturers publishing the tasks on SkyCloud the day before the lecture. The students then receive a reminder in their email inbox, so that they can read the tasks and think about them. The goal of this approach is to intensify the educational and cognitive activities of students as well as their interest in future self-development and learning. An organizational and methodological solution that would also be effective in the systematic development of digital competences of physical education teachers is reflected in the introduction of a special course in the curriculum that would include mastering the best tools to increase the interactivity of the educational process that can be used in physical education, and which was reviewed in the previous section. In addition, future physical education teachers are expected to master the use of applications for the analysis of sports skills, as well as the assessment of progress and physical readiness of students (Gibonne, Rukavina and Silverman, 2010). In that sense, it has been shown that the diversity of the offers of digital technologies and tools influences the motivation of future physical education teachers in a positive way and it accelerates the process of acquiring personal pedagogical techniques (Bakhmat et al., 2019). The more positive the attitudes of teachers and the greater the competence in the use of technology in education, the greater the probability that they will use appropriate technology more often and more optimistically, as well as apply more innovative methods in physical education, because when future physical education teachers are trained to use technology, they feel comfortable and productive using digital technology, due to a strong connection between the feeling of readiness and developed competences (Filiz, 2020; Gibonne, Rukavina and Silverman, 2010; Kretschmann, 2015b; Ristić, 2018b).

The basis for the advancement of the education system supported by digital technology is represented by well-educated and digitally competent teachers. As the results of the research showed that physical education teachers have only basic skills in the application of information and communication technology, it is necessary to enable physical education teachers to acquire modern knowledge and skills in the field of information and communication technology, to be trained to use digital media in teaching and to develop their digital competences based on adequate professional and pedagogical education. Therefore, we believe that it is important to develop the awareness of teachers about the need to develop digital competences, which can be achieved by pointing out the advantages and importance that they have in the overall work of physical education teachers. Demonstrating the way some of the programs work can also contribute to this, which would increase the interest and motivation of teachers to acquire digital competences. One of the recommendations of our research is to introduce special courses at faculties where future physical education teachers would acquire these competences, including technological knowledge and training for the implementation of modern technology in physical education. In addition, it is necessary to have courses where current teachers could acquire digital competences, i.e. improve them, and which can be organized remotely so that teachers can learn from their colleagues from countries with more developed education systems. Conducting action research is another way of training teachers who need more attention, because in that way teachers can understand the level of development of their digital competences and continue to study accordingly. Therefore, the key to

promoting the development of digital competences of physical education teachers lies in the cooperation of formal and non-formal education. University professors, professional associates in schools, as well as organizers of non-formal education programs, and above all physical education teachers themselves, play a significant role in initiating the introduction of digital technology in the field of physical education. As practitioners directly affected by this topic, the suggestions and attitudes of physical education teachers should be the starting point for improving the teaching process of physical education through digital technology. It is also important to support these initiatives at higher levels of decision-making, in order to develop programs for the development of digital competences of physical education teachers. Developed digital competences will have a positive impact on the overall personality and role of physical education teachers, expanding and enriching their knowledge, skills and abilities in the use of digital technology based on which they will be able to improve basic competences. The self-confidence that results from the formed digital competences will be reflected in the overall work of physical education teachers, and that is why it is important that teachers become aware of the importance of digital competences, i.e. open to innovation and improvement. The constant increase of information and technological innovations are the cause of the need for constant improvement of physical education teachers. The constantly increasing amount of information and technological innovations are the cause of the need for constant improvement of physical education teachers. Due to this research, which highlights the basic roles and competences of physical education teachers, we conclude that it is necessary to provide support to teachers and work on increasing their digital competences in order to achieve and improve the role of teachers in modern physical education supported by digital technology. The scope of this paper did not provide an opportunity to explore in more detail the basics, information and procedures that would enable the creation of programs through which physical education teachers would develop their digital competences, so this may be a recommendation to other researchers in order to strengthen teachers' digital competences for their application in physical education classes.

Conclusion

As a social and humanistic science, pedagogy must follow and research contemporary social tendencies in order to strive to enable adequate development and growth of personality in accordance with the characteristics of the modern digital society. It is more than clear that education in the twenty-first century cannot be separated from information and communication technology. The innovations brought by the digital media have created a chance to improve the teaching process of physical education, which cannot be possible without competent physical education teachers. Based on this theoretical research, we can conclude that the application of digital technology in physical education can significantly improve the professional knowledge of teachers, skills related to planning, organizing and evaluating the teaching process, the ability to monitor the physical development of students and their progress, as well as communication skills with all the actors in the educational process. Therefore, it is necessary to expand and modernize the basic competences of physical education teachers, which would be achieved by encouraging teachers to apply digital technologies in teaching physical education. However, an adequate use of digital technology in teaching physical education primarily requires developed digital competences as a special aspect of the expertise of physical education teachers. Digital competences of physical education teachers imply safe and critical use of information and communication technology in teaching physical education. They represent a means of modernizing their work. A digitally competent physical education teacher will use digital technology to increase the efficiency of teaching, as a supplement to his work, and not a substitute for it, as a means of equal inclusion of all students and for monitoring student data better. Technological literacy and multimedia abilities enable him to achieve the tasks of teaching physical education in a more creative and efficient way through various tools, applications, programs, softwares and simulations. When it comes to digital competences, the emphasis is on the skills of combining professional, technological and pedagogical knowledge in order to apply digital technology in physical education purposefully. Achieving the goals and tasks of physical education largely depends on understanding the social use of technology in the context of forming young people and, therefore, it is very important that modern physical education teachers have competences that will influence the physical development as well as healthy physical habits and lifestyles of students.

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Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization, J.M. and N.L.; methodology, J.M. and N.L.; software, J.M. and N.L.; formal analysis, J.M. and N.L.; writing—original draft preparation, J.M. and N.L.; writing—review and editing, J.M. and N.L. All authors have read and agreed to the published version of the manuscript.

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Ethical Aspects of Science and Technological Innovations

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Abstract: The progress of civilization depends on both science and ethics, on two different ideas. Unlike ethics, which deals with moral principles and ideals that guide human behavior, science is based on logical argumentation, empirical data, and methodical testing. However, as science develops, it often raises ethical questions that must be addressed. As a result, science and ethics are intertwined and both are essential for the moral and long-term advancement of science. This research examines the results of two interconnected processes: the quick development of science and technology and its moral ramifications, or the harm it does to people’s lives all around the world. The writers highlight the need for a qualitative shift in attitudes toward nature and society as a whole in order to address environmental challenges and remove the threat of a global ecological disaster by analyzing the substance and impact of these processes.

Keywords: Science, technological development, ethics, sustainable development.

Introduction

Similar to other sectors of contemporary life in growth, ethics are prevalent in science and technology. It is essentially an informal (normative) science that examines social norms of human conduct. In addition, because it examines what is good or wrong, it is regarded as a subfield of philosophy that deals with the nature of moral judgment. On the other hand, ethics has a close relationship with morality, and although it has the same essence, it is different. On the other hand, ethics is a set of norms that come from within, they are personal norms, while morality represents those that come from outside, that is, from society. Science and technology are not exempt from ethics. Although it is true that both fields have contributed greatly to the benefit of society, it is true that many times they end up being unethical.

In the past, it was believed that the ethics of science only applied to those aspects of the scientific method, such as the justification of knowledge with empirical and logical evidence, the way in which scientists respond to new empirical data, and how they are willing to accept review and criticism of their scientific hypotheses. Apart from these operational guidelines, however, the ethics of science must also be assessed in terms of the methods it uses to conduct its research and the degree to which it participates in discussions and decisions regarding the application of its knowledge based on ethical standards.

However, environmental degradation is a constant byproduct of rapid economic growth and population expansion. The most difficult contributors to environmental health issues include industrialization, increased agriculture, and rising energy use. The advancement of the technical-technological foundation of human work was associated with both advantages and a certain risk of endangering and disrupting man’s integrity at work and the ecological balance in the natural environment, which is the biological context of his life. Because industrial risk is a companion to industrial civilisation, it is often described as a civilization of peril. Globalization was made feasible by high-tech industries like computers and electronics, which were formerly seen as relatively clean due to their safer workplaces and less environmental effect. „However, the perception of the effects of these technologies today is negative. From the perspective of preserving the integrity of workers and preserving the ecological balance of the environment, work in these industries is also not safe“ (Marković, 2002).

The topic of biotechnology is one of the main places where science and ethics meet. The development of genetic engineering and synthetic biology has the potential to greatly benefit society

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by improving the food supply and treating disease, but it also presents ethical questions. Is it moral to genetically modify human embryos, for example? Should artificial life forms be patentable? These are questions that require rigorous ethical investigation and reflection.

Animal research is another arena where moral and scientific issues coexist. Animal studies are often used to test new medical procedures, but they also raise concerns about the ethics and welfare of the animals involved. When conducting experiments, scientists must keep in mind the welfare of the animals used in the study and take precautions to prevent undue harm. The scientific community must strike a balance between the benefits of using animals in research and moral concerns for their welfare and respect for living creatures.

Science in the function of the development of society

Since the beginning of mankind, science and art have been considered intelligent creations, and the first systematic knowledge appeared in Greece around 600 BC. Even then, it was considered that every individual is homo moralis by essence, simply because he is homo sapiens. Modern science, above all psychiatry, psychology, anthropology, sociological sciences, cannot define homo sapiens completely and comprehensively. At that time, the medical profession of Ancient Greece was absolutely separated from religion and doctors were trained according to the most rigorous system. The ruling principle was that everyone has the right to medical help, and the doctor, in addition to medical knowledge, also had to strictly ethically apply his skills to the sick. The Medical Consilium was introduced in the Hippocratic School for the seriously ill. Hippocrates' students and collaborators collected 53 of his works and published them in 72 books under the name "Hippocrates Collection" and handed them over to the Library of Alexandria for safekeeping.

There are many periods of discovery in science that have been crucial in shaping modern science, and they can be categorized into three significant scientific revolutions that have taken place over the centuries. These are the Scientific Revolution, the Industrial Revolution, and the Digital Revolution. The Scientific Revolution of the 16th and 17th centuries was one of the most important periods of discovery in science. During this time, scientific inquiry began to shift from medieval ways of thinking to a more empirical approach. The Industrial Revolution of the 18th and 19th centuries was another critical period of discovery in science. During this time, there was significant progress in the fields of mechanics, chemistry, and electricity. Innovations such as the steam engine and the telegraph transformed society and allowed for unprecedented levels of productivity and communication (Ho, 2023). The Industrial Revolution also stimulated scientific inquiry, with researchers focusing on ways to improve manufacturing processes and develop new technologies that could further advance society. Finally, in the 20th and 21st centuries, we have seen the emergence of the Digital Revolution, which has opened up new possibilities in areas such as artificial intelligence, robotics, and medicine. Breakthroughs in computer technology have transformed the way we live, communicate, and conduct scientific research. Researchers today are exploring concepts such as virtual reality, quantum computing, and gene editing to unlock new horizons in science. The largest-selling newspaper in Europe, the German tabloid Bild, has told workers that it expects to make more editorial cuts as a result of "the opportunities of artificial intelligence" and has planned a €100 million cost-cutting initiative that would result in 200 layoffs. ChatGPT is an example of an AI tool that can produce very complex text from basic user prompts. It can produce anything from essays and job applications to poetry and works of fiction, although occasionally the results are incorrect or even made up (Henley, 2023).

The history of science is marked by numerous periods of discovery that have greatly transformed our understanding of the world. These periods, characterized by astonishing breakthroughs and scientific advancements, have laid the foundation for the modern scientific inquiry we rely on today. One such period of discovery occurred during the Scientific Revolution in the 16th and 17th centuries, where scientific giants like Galileo Galilei and Isaac Newton revolutionized our understanding of the natural world. Another significant period was the Atomic Age in the mid-20th century, characterized by groundbreaking discoveries in nuclear physics and the development of atomic weapons, along with the birth of quantum mechanics. These periods of discovery have shaped the course of human history and led to remarkable scientific and technological advancements. Today, "periods from discovery to their application are getting shorter" (Dobrov, 1969; Sarić, 2002). After a month, word of the British colonies' unilateral proclamation of independence in the New World (USA) reached Europe. The assassination of United States President Abraham Lincoln in April 1865 "travelled" to Europe for 12 days, making it the greatest and most significant news of the 19th century. The American president was killed in Dallas, Texas, in November 1963. At 1:00

p.m., he passed away. The news was first reported to 68% of Americans simultaneously, followed by 92% at 2 PM and 98.8% at 6 PM. Consequently, the entire nation learned pretty rapidly (Kapferer, 2016).

The advancement of science is seen everywhere in the world. More people than ever before are enrolled in universities thanks to advancements in society, science, living conditions, etc. Organized study is becoming more and more important for gaining new information, whereas accidental and haphazard discoveries are becoming less and less common. By integrating science in education, learners are exposed to new and innovative ideas that challenge their understanding of the world around them. They are equipped to think critically and analytically about problems and develop practical solutions. Science education also encourages curiosity, creativity, collaboration (Parker and Kingori, 2016), and communication. These skills are essential in both academic and professional settings and contribute to the overall development of learners. Furthermore, science education plays a significant role in preparing future generations for a world that is increasingly dependent on technology and scientific advancements. It helps students to understand and appreciate the impact of science on various aspects of society, including health, agriculture, environment, and energy. In order to create knowledgeable citizens who can make decisions that benefit their communities and the wider globe, a solid foundation in scientific education is essential. Overall, the growth of people, society, and the globe depends on science as an educational tool.

For the general development of the economy and society as a whole, encouraging innovation is crucial, as is raising awareness of its significance. Only by combining three markets—the market for ideas, the market for cash, and the market for talent—could Silicon Valley claim success (Dašić, 2023). Many innovative and business-minded individuals melded into the Valley and introduced fresh concepts. As a parallel to Silicon Valley, which was envisioned as a hub of global scientific thinking, the new Russian innovation center “Skolkovo” is the product of collaboration between the government, business, and scientific communities.

Science and technology have been and still are the cornerstones of human progress. Man has increased his power, material wealth, and skills over time by using discoveries and technology. Thus, the expansion of science and technology contributed directly to the expansion of the human race, as well as to improvements in living standards and overall quality of life. “The major aspect of development in the future should guarantee the greatest standards of living, assure the long-term advancement of human civilization, and also allow for the growth of human colonies outside the planet. Given these facts, it is clear that science and technology are an essential component of quality of life” (Milivojević, et al., 2012)

More efficient utilization of natural resources is now achievable thanks to the use of science, technique, and technology. Only in the last thirty years have targeted measures to stop environmental degradation been put into practice. Thanks to technical improvements, recycled materials may now be used to generate newspapers for much less money, while glass manufacturers may use up to 90% recycled resources. With 85% recycled material, Toyota and Honda produce vehicle parts. Garbage is no longer considered waste at these companies; instead, it serves as a resource for business and a driver of innovation.

However, in order to reach the knowledge that will lead to a better life on earth, we must take into account the ethical dimension. Dr. Franz Heimlich received the greatest scientific honor - the Nobel Prize - while working at the Hudson Institute, a private college in New York State. The real Hans Stein, who worked with Dr. Josef Mengele during the Holocaust and is regarded by many as being responsible for 400.000 Jewish fatalities, was identified after his persona became more well known. Stein helped Mengele, dubbed the “Angel of Death” or the “Butcher,” conduct medical experiments on thousands of Jews that left the patients permanently paralyzed. „His medical advancements were therefore made feasible by information gathered from cruel tests performed on Holocaust victims“ (Dej, 2008).

Nevertheless, the application of technological solutions (rapid development of industry, energy, transport, urbanization, and military technologies) has extremely negative effects on the environment and a sharp increase in risk to the human community, in addition to the extremely positive effects of science and technology on the human community and its quality of life. There are numerous and diverse ways that science and technology harm the environment and human existence. Lastly, the misuse or unethical utilization of scientific knowledge has resulted in harmful consequences. Science can be manipulated and used to deceive people or for unethical purposes. An example is the rise of fake news and misinformation, where scientific studies can be misinterpreted or misused to spread false information and ideologies. Additionally, advancements in biotechnology have raised ethical concerns regarding genetic engineering, cloning, and manipulating the human genome. The potential misuse of such knowledge could have severe consequences, both on an individual and societal level (Dašić, Kostadinović and Kostadinović, 2022).

“The global Internet and other new media, in such circumstances, bring new ethical challenges as well. It is a fact that technological breakthroughs also introduce new approaches to unethical behavior

and that one of the biggest concerns from that level is the ease with which personal information can be collected and shared over the Internet” (Bjelajac, Filipović and Stošić, 2022). The ethics of new media are inseparable from the state of moral communities in which these media operate; the “moral chaos” on the Internet has less to do with this technology, and more with the state of morality in the societies that use it (Bajić, 2020).

Baudrillard calls this new human environment postmodern reality. Reality is replaced by its signs, and the function of media images in the system of the death of reality is to leave reality without the opportunity to ever be produced again. “The surreal is now already protected from the imaginary, leaving only room for the orbital return of the model and the simulated creation of risk” (Bodrijar, 1991, 6-7): Baudrillard is aware of the role of the development of technology, and above all information technology, in the loss of man’s contact with reality: “The image itself can no longer represent the real, because it is the real itself.” He can no longer even dream of it, because it is his virtual reality. As if things swallowed their own mirror and became transparent to themselves...” (Bodrijar, 1998, 14). Instead of disappearing from themselves due to the illusion, according to Baudrillard, those pictures are compelled to be “printed on millions of screens on whose horizons not only reality, but the image itself, disappears. According to Baudrillard, “Reality is exiled from Reality,” and rather than seeing technology as a factor that isolates people from reality, he believes that it may be the only thing that still unites reality’s fragmented components.

Multidisciplinary and interdisciplinary research methods have become increasingly popular in recent years. Modern, very dangerous forms of warfare, rapacious resource extraction, environmental degradation, technological acts of brutality, undiscovered genetic alterations, and numerous other unsettling occurrences are the results of the aforementioned. By building atomic power plants, man has created many comforts for himself. However, we have witnessed catastrophic failures at two such nuclear power plants, at Three Mile Island in the US and at Chernobyl.

Science played a crucial role in the creation of the atomic bomb. The development of the atomic bomb was a multidisciplinary endeavor that required the coordination of different scientific fields such as physics, chemistry, and engineering. Scientists worked tirelessly to unravel the mysteries of the atom, with the aim of harnessing its energy for destructive purposes. The Manhattan Project was the codename for the secret military project that produced the first atomic bombs during World War II. It involved the collaboration of renowned scientists such as Robert Oppenheimer, Enrico Fermi, and Albert Einstein, who provided critical insights into the scientific principles underlying the atomic bomb’s creation. Scientists developed various technical procedures that helped refine the atomic bomb’s design, reducing its weight while increasing its destructive power.

Science played a key role in the atomic bomb’s development, raising ethical questions about the possible consequences of its use. The bombing of Hiroshima and Nagasaki resulted in the death of many people and caused long-term effects such as radiation poisoning, cancer, and environmental damage. The development of the atomic bomb highlights the power of science to both create and destroy, emphasizing the need to use science responsibly in advancing human civilization (Temkov, 2020).

Ethics as an indispensable part of science

After World War II, several codes of ethics were established to regulate scientific research. The Nuremberg Code, adopted in 1947, was a set of guidelines for conducting medical experiments on human subjects. The Declaration of Helsinki, adopted in 1964, expanded on the Nuremberg Code and set guidelines for medical research on human subjects. The Belmont Report, adopted in 1979, established guidelines for research involving human subjects in the United States. These codes have helped to ensure that scientific research is conducted ethically and with the aim of improving the lives of people.

When talking about social values, researchers first and foremost lay a strong focus on ethical standards, which highlight moral responsibility for one’s own conduct as well as for the behavior of other study participants. The majority of researchers uphold fundamental ethical standards in science, and unethical behavior is not typical of scientists (or at least it shouldn’t be), yet there are certain people who are simple to deceive.

Today’s improvements in worldwide social development, especially in the most economically advanced countries, are primarily due to developments in science and technology. In addition to the positive effects that technology has had on the expansion of all aspects of social life, it has also had severe effects, notably on the environment. “Man created scientific technology to enhance productivity and volume of output, but he didn’t anticipate that using it would have such negative effects on the environment and its ecological systems as well as on the resources consumed” (Vićentijević, Aćimović

and Stevanović, 2011). The question is rightly raised whether the progress of science leads to progress or regression of humanity. The first scientific-technological revolution led to a decrease in the number of employees, because they were replaced by machines, while the current scientific-technological revolution, almost certainly, will deprive people of the ability to think.

One of the most famous Serbian writers of the 20th century, Borislav Pekić, has long warned about the problematic nature of artificial intelligence, more precisely about the problem of developing its emotionality. He divided science into black and white - permissible and impermissible science. White science refers to everything exact and true in science, which does not engage in dangerous, uncertain and staged experiments, aimed primarily at the well-being of man.

Corporate scientism, which has abandoned the aim of service to man and mankind and has put itself at the service of profit without regard for means or methods, is what we refer to as "black science." Today, unethical and unscrupulous lobbying permeates practically everything. The Nobel Prize has become worthless to many, and several Scandinavian activists filed a criminal investigation against committee members for disrespecting its founder's legacy after the peace prizes were awarded to Obama, Chinese dissident Liu Xiaobo and the European Union. After only nine months in office as US president, at a time when the US was engaged in two wars - in Afghanistan and Iraq, as well as during increased drone attacks in Pakistan and Yemen, Obama was awarded the world peace prize "for outstanding efforts" in order to strengthen international diplomacy and cooperation between nations. Recently, huge amounts of money have poured into American institutes, whose "unbiased studies" increasingly coincide with the interests of foreign donors. One such example is the Center for Global Development, which received a large sum of money from Norway to influence the US to double foreign aid, praise its prime minister and nominate him as the next head of the NATO alliance. Another example is the Japanese, who also donated over 1.1 million euros to publish studies concluding that the US should negotiate a free trade agreement with Japan. These are academic groups that present themselves to US officials as "objective" organizations, "untainted" by interests, and often their studies carry more weight than the persuasion of proven lobbyists, interest groups or lawyers.

Scientists frequently run into issues that are brought on by "various power centers, important people, politicians, strong social institutions, and the like" (Vučković, 2022). We may use the dominant worldwide pharmaceutical industry as an example, which invests much in science, research, and the development of new drugs but is also the target of countless rumors of unethical behavior and immoral acts (Dašić, Tošić and Deletić, 2020). Investment experts anticipate that the American biotech company Moderna, the German biotech company Biontech, and their joint venture partner, the American pharmaceutical behemoth Pfizer, will generate billions of dollars in revenue in 2019. The Moderna vaccine's development is said to have cost roughly \$ 2.5 billion in total, with the consensus being that "American taxpayers funded for 100% of that development. Support for the Moderna vaccine, which according to testing is 94.5% effective, comes from a number of organizations, including Emory University, Vanderbilt University Medical Center, and the Dolly Parton Research Fund. "All vaccine-related transactions are covered in secrecy, and businesses and government agencies are protecting their right to privacy" (Clouse, 2021). Drug companies have been reluctant to discuss the price of a single dosage of a vaccine, despite the fact that the government has committed billions of dollars in its development.

Military innovations significantly lower people's quality of life. The majority of them are instruments for mass destruction of both people and objects. Biological weapons have been developed using bacteria that cause diseases including anthrax, smallpox, and biotoxins. Additionally, brand-new biological weapons are being created, principally using the most recent genetic engineering and genetics expertise. Many scientists' consciences were deeply affected by the development of the atomic bomb because of the suffering that resulted from its deployment at the conclusion of the Second World War. Following that, a number of ideas for the peaceful use of atomic energy emerged, which caused millions of people to become wealthy and, as a result, feel less guilty. This method is still utilized today, thus space exploration is done in conjunction with military objectives by installing strong military satellites that, aside from being used for more effective and faster global communication, are primarily used to wage war and commit murder.

The link between man and nature, or their life interconnectivity and conditioning, has been a continuous companion of human history since human life is a part of the natural cycle of life and production is the taking and processing of natural materials to fulfill human needs. "Man's impact on environment, however, takes on a distinct character in pre-industrial civilization, which is dominated by agriculture, cattle, and crafts" (Marinković, Marinković and Stefanović, 2013). With his manufacturing and other actions, man has an impact on and modifies nature. But these modifications are only made locally, just in the areas where people construct their homes or harvest natural resources for their personal purposes.

This interaction between man and his surroundings does not call into doubt the natural equilibrium.

Preservation of the environment has become an increasingly pressing issue in recent years. With the rapid expansion of human activities and the subsequent rise in pollution levels, it is imperative that immediate action is taken to protect our planet. The preservation of the environment is crucial because it directly impacts the health and well-being of all living organisms, including humans. Our planet provides us with essential resources such as clean air, water, and food, and it is our duty to conserve and protect these resources for the benefit of all. Moreover, a healthy environment promotes biodiversity and ecological balance, contributing to the overall sustainability of our ecosystems. By preserving the environment, we can ensure the continuity of life and avoid irreversible damage from pollution, deforestation, and global warming. The consequences of neglecting the preservation of the environment are severe and far-reaching. Continued degradation of the environment will lead to an increase in air and water pollution, which can have detrimental effects on human health and the natural world. Climate change, resulting from excessive carbon emissions, will bring about more frequent and severe natural disasters, such as hurricanes and droughts. Furthermore, the loss of biodiversity due to habitat destruction threatens the delicate balance of ecosystems, impacting agricultural productivity, food security, and ultimately human survival. Neglecting environmental preservation would jeopardize not only our own future but also the well-being of all other species with whom we share this planet. To ensure a sustainable future, Scientific workers and researchers. must take action and promote environmental preservation in their daily lives. This can be achieved through simple measures such as reducing waste, conserving energy, and supporting sustainable practices in our consumption patterns. Additionally, spreading awareness about the importance of environmental preservation through education and social activism can create a positive ripple effect, inspiring others to join in the cause. By participating in environmental organizations or engaging in research related to environmental issues, college students can drive meaningful change and contribute to the preservation of our planet for generations to come.

Scientists are expected to make a significant contribution, to listen to predictions and align their intended big undertakings with them and to respect the dangers caused by industrialization, excessive burning of petroleum derivatives in the automotive industry and in factory plants because all of this can have catastrophic consequences for the overall life on planet Earth. In the last decade, it has been proven that the stratosphere has been introduced into the phenomenon of the so-called greenhouse due to the excessive production of carbon dioxide and the reduction of ozone, resulting in ozone holes. The ozone layer protects against excessive penetration of infrared rays from the solar spectrum on the earth's surface. The depletion of the ozone layer in the stratosphere is caused by the excessive use of chlorofluorocarbons and the burning of petroleum products. Chlorofluorocarbon was used in the industry of refrigerators and sprays and, following the warnings of scientists, it was banned by a UN decision made in 1995 to stop the greenhouse effect (Nenadović, 2007).

The debate over the socio-ethical boundaries of science is centered on the tension between the legitimate right to freedom of inquiry and the need for outside controls to mitigate the risks of inquiry—which, for instance, could endanger the right to life, the quality of life, or the preservation of the environment. „The participation of the scientific community in defining the risks associated with modern technology cannot be replaced, but decisions concerning their management require discussions beyond disciplinary boundaries, as well as the exchange of data and arguments from different scientific and non-scientific perspectives“ (Develaki, 2008; Doemeny and Knerr, 2017).

Conclusion

Science has greatly influenced the progress of civilization over time, always increasing its material and spiritual possibilities. This affected and helped to establish modern civilization and the conditions for a secure and satisfying existence. Every country in the globe is still growing, mostly because of science and emerging technology. However, because changes occur so fast and dramatically, it is challenging to keep up with them. It is also challenging to recognize how changes affect us all on a daily basis. Even worse, a lot of scientific advancements and technology are kept a secret in order to retain economic and military superiority.

It is believed that the development of, say, moral principles in science is significantly influenced by the scientist's sense of personal responsibility as well as the sensitivity he developed during his education for moral issues related to the choice of research subjects and the dissemination of his knowledge for practical application. Another, equally important factor is the willingness and commitment of the scientific community to expose cases of risky research, misuse of scientific knowledge by certain groups, or to raise

public awareness of the possible costs to society of the risks associated with technological applications. Of course, it can be countered that there are always positive and bad outcomes in research and that any attempt to completely separate them would probably result in the stagnation of scientific progress.

Science undoubtedly opens new doors and provides people with inspiration and tools to build and progress, but it also poses a threat to all life on Earth. This, however, is not a direct moral output of scientific thinking and activity, or even very seldom a direct consequence thereof; rather, it results from people's negligent exploitation of scientific knowledge. The ethical conduct of research is crucial for many types of undertakings, not only those involving scientists. In order to meet new health, environmental, and technological concerns and consequently enhance quality of life, society as a whole depends on innovation across many fields. Due to speedier advancements in science, medicine, a more enjoyable way of life, and economic success, or an improvement in the general quality of people's lives, the average lifespan has grown during the previous two centuries. Despite this change's undeniable significance and importance, which may seem contradictory, it has nonetheless led to a rapid rise in the world's population, and this change has had numerous negative direct and indirect effects on the environment and ecosystems that are harmful to people.

Ethics and science are crucial for the development of human society. Ethics guarantees that our scientific discoveries remain sustainable and responsible even when science provides us with information and tools for progress. For humanity to progress without harming itself and other living beings, these two sectors must be recognized as interconnected and mutually influencing.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

Conceptualization: D.D., Formal Analysis: D.D., M.S., G.K., Investigation: M.S., Methodology: D.D., M.S., Project administration: D.D., Resources: G.K., Writing – original draft: D.D., Writing – review & editing: D.D., M.S., G.K. All authors have read and agreed to the published version of the manuscript.

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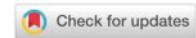
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Designing a Multimodal Environment for Cognitive and Creative Activity in Pre-School Education – Competence of the Teacher

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Abstract: This article focuses on the formation of pedagogical competence for the design of multimodal educational environment, the functionality of which is the foundation of the cognitive and creative activity of the child in pre-school age. It problematizes the need for adequate professional reflection of the teacher in the context of the transgressive approach and highlights the parameters of organizing pedagogical interactions that utilize multimodality as a communication phenomenon. The understanding that the competence of the teacher for designing a multimodal environment as well as cognitive and creative activities develops as transgressive and is continuously created in the cultivation of new knowledge and skills, while expanding the cognitive and practical limits of the subject, is affirmed. Based on this affirmation, the thesis that if a child has entered the “communicative state” and has engaged in multimodal educational interactions, the child appropriates the social experience by forming a transgressive attitude of behavioral response.

Keywords: pedagogical competence, transgressive behavior, multimodal educational environment, cognitive and creative activity of the child in pre-school age.

Introduction

Nowadays, the channels for storing and passing on information are technologically-changed, which is why modern communication is defined as multimodal. The “transition from paper to screen/monitor/display” (Kress, 2003: 190) has been pointed to as emblematic of this transformation. This transformation reveals the peculiarities of the media practices and their cultural resonance reflects a new understanding of literacy in contemporary society.

The term multiliteracy is introduced and meaningfully represented as “including multimodal textual practices, such as linguistic, visual, audio, gestural, and spatial modes, as well as the existing culturally grounded literacies” (Cope and Kalantzis, 2000: 207). In defining the purpose for the introduction of this term, the need to capture the “increasingly complex range of multimodal practices required to understand, manage, create and transmit knowledge” (Taylor et al., 2008: 274) is prioritized.

In the context of a stable research perspective of multimodality as a communication phenomenon, the new idea of literacy determines concepts such as visual and multimodal literacy (Kress, 2003), digital literacy, digital-and-information literacy (Bawden, 2001: 218-259), technological literacy, spatial literacy, historical literacy, political literacy, media literacy, information literacy and multicultural literacy (Abilock, 2008: 7-14) as well as digital-and-media literacy (Hobbs, 2010: 3-63). Given the category-determined autonomy of information, visual, multicultural, and media literacies, Sean Cordes describes them as “a group that can be thought of as a competent if not thorough description of some features of multimodal literacy in both theory and practice”. However, he specifies that “although these literacies are not new, the idea of their interaction creates an object that is more than the sum of its parts and has a different perspective from the traditionally divided notions of literacy” (Cordes, 2009: 3).

Prerequisites with potential for the development of multiliteracy are contained in the theories of social semiotics, communication, and the concepts of social and pedagogical facilitation. It is established that the formation of multiliteracy is a consequence of: ‘situatedness based on the specificity of individual

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experience with information, of flexible instructions contributing to finding a form of self-expression in the process of communication, of a critical view that allows information to be related to the social context and individual needs, of the practice of transforming the system of meanings and meanings from one context to another' (Kolesnikova, 2013: 7). At the same time, within the scope of more recent theoretical levels of problematisation, the use of a term that denotes the specific internal structural dynamic of an emerging literacy is also registered - transliteracy as "the ability to read, write and interact using a variety of platforms, tools and media, from signs and oral signals, including hand-written text, printed text, television, radio and film, and culminating in digital social networks" (Wilkinson, 2016: 34).

The idea that the agents of socialisation in the present are the practical skills of orientation, power and influence in the multimedia environment is increasingly asserted, because the person (the child) of the new time transcends the strict confines of a national subject, of a professional, a specialist or representative of a particular community limited within state borders and enters a new identity - one in which the social subject becomes a citizen of the global society. It is this specific contextuality that requires an attitude of transgressive behaviour in the subject (including the group subject) to actively engage, initiate and implement change.

When analysing the changes in the social situation of development, Sir Ken Robinson notes that "we are still preparing children for the world that is fast disappearing, not the world that is fast emerging" (Robinson, 2015). Respectfully accurate is another observation that 'the potential in the pre-school age remains unused and there seems to be reason to suspect that even on a more global scale the main concern of pedagogy is how to contain the development (of the child) in order to bring it within the rapidly ageing notions of the previous generation or, alternatively, within its own canons' (Dimitrov, 2012: 48). The warning that a lack of multimodal literacy is "a prerequisite for a debilitating inferiority with respect to the future" is also alarming (Danov, 2020: 37).

These propositions provoke a revision (revision) of the pedagogical interactions in the kindergarten as an environment that is called upon to further develop, to build upon not only the experience of 'living with others' within the context of a personal perspective, but also the activity of constant extension of the cognitive boundaries.

The debate on transgressive behaviour as metacognition (metaknowledge) in continuum

There is a body of research that explores the relationship between transgressive behavior and the dynamics of the learners' creative behavior (creative resources). In a study conducted by Wróblewska (2015) the following question is asked: which subjective creative traits, supported by a predisposition to transgressive behaviour, constitute the correlations determining success? In the search of hypothetical determinants of success, an attempt is made to empirically test the relationship between creative competencies (as subjective creative characteristics) and the willingness to engage in transgressive behaviours. The personal positive activation (subjective-caused activity) is understood as a specific activity and set of nonconformist traits stimulating a person's potential creativity in the cognitive and behavioral spheres. It is claimed that creative subjective resources (the level of creative attitude) and personal positive activation favor transgressive activities. According to the author, subjective creative traits, supported by a predisposition to transgressive behavior, represent correlates that determine success.

The creativity-oriented person functions in relation to a specific mechanism, the essence of which is an interaction reflecting the feedback principle of the following elements: (1) potential cognitive creative talents or gifts; (2) activation of the personality - stopping or stimulating the activity of the emotional and motivational sphere in the development of creativity in the cognitive sphere and its manifestation in behavior; (3) evaluation of the effects on one's own activity - creative or adaptive. As a result, creative characteristics expressed in the creative attitude coexist with transgressive behavior: pro-creative motivation in seeking changes, non-conformism, focus on activity and overcoming problems, openness and courage to take on new tasks, innovation and acceptance of novelty.

M. Wróblewska's study shows that "non-conformism is associated with transgressive behaviour as it includes: prevalence, activity, courage, spontaneity, consistency, originality and high self-esteem. The higher the level of creative attitude and its elements in the cognitive (heuristic behaviours) and characterological (non-conformist orientation) spheres, the stronger the links with various manifestations of transgression: attitude of dominance over others, motivation to enhance competences, innovation in designing new solutions and courage to take on new tasks" (Wróblewska, 2015: 248).

The way in which M. Wróblewska describes creative competencies puts them in the perspective of

the transgressive concept of man, focused on the description of behaviours reflecting not only active and deliberate participation in changes, but their initiation and creation. In terms of the individual, the most important thing in applying transgressive behaviors is to go beyond personal capabilities (limits) in every dimension of the individual's functioning. Thus, the person simultaneously builds his/her potential for implementing the resulting transgressive behaviors. Central to motivating the individual to act beyond his or her capabilities are the mechanisms of self-presentation, self-valorization (self-promotion of one's own value), and enhancement of one's own competencies to serve as confirmation of one's own value and its growth. The individual must have an appropriate level of self-awareness to be able to understand his own possibilities to act and how to implement them. J. Kozielcki's thesis is relevant here as he affirms, "You cannot go beyond material or social limits, you cannot go 'one step further' without knowing the structure of the world, especially without knowing where the limits of human abilities and achievements are" (Kozielcki, 2004: 59). For the author, "every modern person has, to a greater or lesser extent, the intellectual and praxeological capacity to create transgressions, if not in historical manner, then at least in psychological one. Those who have never used the power of their generative mind have lost the chance they have received from nature, society and culture" (Kozielcki, 2004: 71).

On the basis of this study, M. Wróblewska comes to the conclusion that creative competences, considered from the transgressive perspective, similarly to the creative approach, are determining for the active person who creatively transforms the environment and her/himself. He is an active agent, able to think and act transgressively, focused on change and development. The factors distinguishing the specificity of transgressive behaviour identified in the analysis of the study may favour practical actions directed towards the physical world (transgression towards things); actions and behaviours directed towards other people (transgression towards others); creative actions that enhance knowledge about the world (symbolic transgression) or self-creative activities leading to self-development (transgression towards oneself).

The latter are particularly important because they arouse cognitive curiosity, increase motivation to act and develop abilities and creative skills. According to Wróblewska (2015), this may imply that subjective creative traits supported by a predisposition to transgressive behaviour (and vice versa) represent important personal resources, and undertaking transgressive actions indicates the individual's active participation in the deliberate transformation of the way of achieving goals to one that is successful. The author emphasizes that in the contemporary conditions, and especially within the context of the development of self-awareness, the urge for transgressive behavioral response in adolescents is becoming a necessity, especially with an accent on the awareness of personal resources and the motivation to apply them.

Cognitive and creative activity in a multimodal learning environment

Children have a need to form their own identity and it is in the course of mutually oriented communication, through the continuous presentation of the self, that they discover themselves and explore the world they inhabit. In the field of postmodern pedagogy, Cl. Sapundzhieva interprets the understanding that "the relationship Self - Other(s) is defined by a conscious binding, this bind is taught (learned) and is the subject to collective rules" (Sapundzhieva, 2005: 93). Taking into account and conforming to this course of natural developmental, directs the teacher towards stabilizing the child's active life position, i.e. - towards his/her development as a subject of activity. From the point of view of subjectivity, activity is primarily related to previous experience, needs, attitudes, goals and motives, to personal meaning and to the manners of carrying out the activity.

Psycho-pedagogical theories of early childhood development emphatically stress that "over time, children's literacy moves from unconventional to conventional practices" (Yaden, Rowe and MacGillivray, 1999: 25). In line with the understanding that learning in preschool is not a leading activity, the validation of this principle finds expression in the need to organise a multimodal learning environment in the kindergarten: an environment oriented as much as possible towards children's communicative modes, in which children use their own semiotic resources/signs to create an image of themselves (Kress, 2009) and construct their own theories of the world (Gardner, 1993).

The multimodal learning environment is based on the simultaneous activation of specific sensory functions: visual, auditory, tactile and motor. This means that the educational content is structured as a composition of speech, facial expression, gesture, images, music, and movement to support each child in the cognitive process by activating his or her leading representational system. Neil Fleming deploys this approach in the design of the VARK model, which incorporates the four sensory modalities: visual, auditory,

theoretical, and kinesthetic. By incorporating a variety of activities and offering multiple communicative modes (including digital), the teacher in effect works with the individual cognitive style of the children (visual, auditory, theoretical and practical) and achieves readiness and interest for new cognitive activity. As Neil Fleming himself notes, “I sometimes believe that children and teachers invest more trust in VARK than it deserves. You can like something and be good at it or not. VARK simply informs how you prefer to communicate. It tells you nothing about the quality of that communication” (Fleming and Baume, 2006: 7).

The modes of communication used and their various resources are an implicit component of forming cognition because in the process of mediated interaction meanings are specified or actualized in the minds of the communication partners. These meanings are interpreted in the different contexts of communication (linguistic, situational-and-psychological, social, historical) and contribute to the embedding of a meaning in an information exchange. By extending the range of interaction with peers and adults, children enrich the repertoire of activities (games and expressive, constructive, musical, verbal-and-performance activities) and thus internalize new meanings and senses. Any intense-communication learning environment (speech, mimics, gestures, texts, images, moving images, animation, sound, intonation, music, dance, texture, etc. - in real and digital environments) is a prerequisite for dynamic learning about others and the world. This is extremely important in the education and communication of children with specific communication needs, because the resources of Facilitated Communication, are widely used as one of the alternative methods of communication and interaction for children with multiple disorders. (Georgieva, 2021). The combination of different communicative modes and resources is also a basis for designing a stimulating learning environment and a condition for the implementation of innovative pedagogical practices, such as in STEM learning settings, where learners are encouraged to explore, and their activity is stimulated by building their motivation through manipulative handson activity to reach the final product and experience satisfaction from the engineering work (Temnikova, 2023: 70).

So organized, pedagogical interactions in kindergarten exploit the transgressive functionality of multimodality as a communication phenomenon because they fully operationalize the “reflection-in-action” effect, defined as “the child’s ability, with the teacher’s help, to move back and forth between reflecting experience and contemplating experience” (Schön and Bambrger, 1991: 52).

Following the logic of the established educational strands and cores for preschool education, the proposed multimodal paradigm affirms the understanding that child development is approached holistically.

Table 1.
Meaning-centered field “Cognitive activity”

Field of indication	Subjective expression of pedagogical specialists
Promoting cognitive activity through support	<ul style="list-style-type: none"> • Responds to children’s signals, actions and comments through a multifaceted (multimodal) two-way communication exchange; • Integrates the child’s previous experiences by encouraging exploration, experimentation and creation and supports the child’s relationships with significant others (adults and peers); • Facilitates the acquisition of new concepts and skills through questions, descriptions, prompts, stories, images, audio/visual messages and multimodal ensembles; • Supports children’s tasks through the use of external mediators (verbal, visual, physical) to facilitate and support the child’s autonomous development.
Utilizing the resources of artistic and creative activities (in real and digital environments) in the context of multimodal environmental design	<ul style="list-style-type: none"> • Stimulates children individually and collaboratively to use audio, verbal, visual and digital messages while drawing information from a variety of sources; • Provides resources and materials that prompt children to present ideas from the perspective of the building of shared understanding; • Encourages children to actively engage as listeners, viewers, authors and performers of multimodal designs; • Motivates children to experiment with the modal resources of different communicative modes and realize children’s combinative thinking and imagination; • Supports the child’s self-expression (performance, expression, competition, representation of situations, meanings, states, etc.) through involvement in artistic and creative activities; • Creates a primal base of “navigational” skills for learning in a global culture that is increasingly connected through powerful multimedia messages.

<p>Providing propaedeutic cognitive development</p>	<ul style="list-style-type: none"> • Creates prerequisites for the search and detection of signals and their determination as essential characteristics, features, properties and signs for the (re-)cognition of objects, processes and phenomena; the identification, generalization and systematization of information from multimodal environments and its subsequent transformation and encoding into mental images and representations, whose subsequent interpretation and use leads to the recoding and placement of information in and through different models. • Creates conditions for interpretation of the received array of information through: abstraction from specific multisensory information, visual representation of multisensory information, information encoding, recoding and decoding in and through models; indirect recreation of multisensory perceptions of real objects and phenomena through the development of various models. • Suggest sign-and-symbolic encoding and representation of the created cognitive product - model.
<p>Tracking, filing and analysing of child development feedback for short-term and long-term planning of pedagogical interaction</p>	<ul style="list-style-type: none"> • Monitors children's behaviour, tracks their specific interests (in cognitive, artistic, sporting and play activities) in order to transform the elements of the educational environment for their development and progress; • Organise the educational environment in accordance with the social and cultural context in order to achieve the best understanding of the conditions that enable children to develop creative and critical thinking skills; • Motivates cognitive activity by encouraging children's experience through using social and material resources to express meaning (oral speech, pauses, mimicry, gestural and spatial relations, verbal improvisations, instrumental, vocal and pictorial interpretations, mimetic or technological and visual modes: drawings, images, illustrations, videos and music, animation).

In its functionality, the multimodal kindergarten environment is oriented to the child's specific and unique world, which reflects the child's sociocultural belonging and also the child's acquired and inherent ways of sharing and successfully communicating with others. This allows the educational process "to focus on the trinity of the psychosocial self: knowledge, skills and values of children in pre-school age, and on the conditions in which they master them" (Dermendzhieva, Tasevska and Dyankova, 2022: 55).

Multimodal interactions create a heuristic and productive space for the early development of multimodal literacy by identifying core meaning-centred fields with the corresponding underlying concepts and indicators. Because of their specifics and autonomy, each meaning-centered field of interaction, given its underlying concepts, realizes its own added value in the formation of the psychosocial self in preschool age. The thesis that if the child has entered the "communicative state" and engages in multimodal educational interactions, s/he appropriates the social experience by forming a transgressive attitude of behavioral response, gains relevance. The meaning-centered field "Cognitive activity" stands out as a priority, whose basic concepts and indicators are described in Table 1.

Transgressive nature of pedagogical competence for designing multimodal environment for cognitive and creative activity

Within the context of the transgressive approach, each competence is designed as an internal self-consistency of elements and/or domains of such. A dynamic network is created whose boundaries are fluid enough. Clarifying the properties of the parts (competences integrating knowledge and skills in a specific context) is only possible by clarifying their relations in the dynamics of the whole (competence). It is an accepted view that no matter how well we describe the constituent elements of competence, only their integrity ensures effective behaviour (Delibaltova, 2004).

This understanding of the structural and functional unity and interconnectedness of the parts, as well as their derivability from the whole and vice versa, traces the way to a change in the understanding of competence (understood at its highest level of achieved expertise) as a framed concept and its formation and development in an educational context in compliance with a certain linear scheme, ensuring finiteness of dimension or strict hierarchy in the arrangement of the elements.

This new way lies in the search for opportunities for this to happen through the creation of transgressive zones of synergistic concentration of elements/spheres of the whole, in which elements simultaneously develop and create new ones in terms of networkedness, multilayeredness, complexity and spiraling growth.

The formation of competence in the teacher for designing a multimodal environment for cognitive

and creative activity opens up possibilities for overcoming the finiteness in definition, linearity in formation and liminality in the development of a competence through the continuous creation of transversal zones of cross-sections, generating new such zones and building on the basic ones.

This understanding of competence is analogous to the understanding of the human being as a system whose "theoretical universal commensurability with all other systems makes of itself an extremely complex system with multiple functional structures that are actualized under certain internal and external conditions". Under the conditions of the functioning of the human self, however much it may be "decomposed" into a "present self," a "dynamic self," a "fantastic self," a "possible self," an "idealized self," an "imaginable self," or an "ideal self," a person, according to A. Deikov, possesses a particularly characteristic quality - the quality of being aware of the boundary, of constructing boundaries, of crossing boundaries" (Dejkov, 2004: 154).

Multimodal as well as digital environments with their plasticity and fluidity, with the created sense of boundlessness and dynamic stability foster opportunities for creating and for crossing and/or pushing boundaries in personal development, but in the context of professional growth, the formation and development of competence to design multimodal environments for cognitive and creative activity, establishes the teacher as a transgressive person who is "expansive and creative, free and responsible, whose behavior is defined by his/her intentions and the will to achieve them by transgressing the boundaries of formed types of activities" (Kozielecki, 1987: 210).

This reframing of the understanding of the approach to the development of the teachers' competence to design multimodal environments for cognitive and creative activity (and it may be necessary for all transversal competences) is in line with Yana Merdzhanova's vision of the "individual in the XXI century and the following centuries", who "only by giving autonomy, is autonomous; only by balancing between metamorphoses, remains constant and stable; only by taking into account changes and following the direction, changes the Direction; only by living his many biographies, creates his unique biography; only by being, in this sense, an embryo at each moment of something new, does self-emerge and self-renew with his/her authentic root forces; ceasing to have a beginning, thus becoming a beginning; there are always reserves, because the open and included organism "charges" continuously, as it charges the environment; only by giving, it does continue" (Rasheva-Merdzhanova, 2014: 22). This, according to Yana Rasheva-Merdzhanova, happens not only when uniting: analytical-and-synthetic/logical-and-abstract thinking (which is deterministic, cause-effect-bound, hierarchizing and discriminating - dissecting things); creative (lateral, divergent, networked) thinking (seeing things in different positions and modes, from different perspectives - as a complex and within its context, but not always with a guarantee of its metamorphoses and evolution); artistic (associative, metaphorical, analogy-driven) thinking (which connects through the simultaneous use and classification of things), but also with the perspective of the genealogical vision, the depth is (dis-)covered; a sight is beheld, a picture taken, not just a snapshot, but one of a life path of a thing" (Rasheva-Merdzhanova, 2014: 73).

Naturally, this approach also requires a new type of thinking, which Rasheva-Merdzhanova calls "genealogical", the same being essentially transgressive, and the "genealogical person" she speaks of is also transgressive, because "s/he has a chance of bringing value the environment by integrating into it, which is also the result (product) of his/her interdisciplinary competence based on his/her interdisciplinary genealogical thinking", as "this type of thinking is specifically human, it continues to makes sense of all kinds of technological information and other kinds of logically powerful structures, and by hyperstructuring the information, but not only by logical mechanisms, but by the value-evaluative of the human complex critical attitude, the living human intelligence is a structuring, necessary partner of the artificial intelligence, as two complementary halves of the whole, and only then the computer-human system will become a social system in which the personality is the leading one, and not vice versa - a technical system in which the machine is the leading one" (Rasheva-Merdzhanova, 2014: 74).

Applying this type of thinking to the teacher's competence to design a multimodal environment for cognitive and creative activity, it should be seen as: "alive" (unframed), having a vital path (deep with many levels) that is embossed (growing along a fluid dynamic-resistant spiral) and has important points (base segments/spheres); there are centres (as transgressive zones with dynamic resilience) of metamorphoses, as starting points and transitions to other levels (emergent spheres), as well as critical points seen as potential new spheres. In the liminal spheres of the essentially deep structure, multiple beginnings are synergized as sources rather than starting/primary points, and multiple possible outcomes as continuations (aspects of transgressiveness - boundary offsets) rather than endpoints. Thus, there is a continuous dynamic of interdependencies with the environment and with constituent (disappearing and emerging) components, in which the teacher's competence to design a multimodal environment for cognitive and creative activity develops as transgressive, being continuously created in the cultivation of

new knowledge and new skills, expanding the subject's cognitive and practical limits.

Conclusion

It is the insight, the awareness of this relativization that conceptualizes the idea of forming competence in the teacher to design a multimodal environment whose functionality presupposes the cognitive and creative activity of the child in preschool age, taking into account and utilizing in synergy:

- The multifaceted forms of children's expression as the main element in social interactions;
- the multifaceted signification of language as a communicative entity in real and digital environments;
- the dynamic connectivity of information media as expressors of meanings and prerequisite for understanding;
- dialogical communication with the child to build on his/her visual, informational, multicultural, media and digital experiences in preschool.

Conflict of interests

The authors declare no conflict of interest.

Author Contributions

In accordance with the authorship criteria, S. Dermendzhieva and N. Tsankov certify that they participated with an equal degree of activity in developing the content and design of the submitted manuscript. The authors certify that they take public responsibility for the methodology of the present study: the concepts of multi-modality and multiliteracy - S.D., the concepts of transgressive personality behavior – N.Ts. Their analysis, their interdisciplinary interpretation is the result of the equal participation of the authors S. D. and N. Ts. in developing the concept of the transgressive essence of a multimodal educational environment. All authors have read and agreed to the published version of the manuscript.

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Past research (Gogel, 1984, 1990) ...

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Several studies (Gogel, 1984, 1990a, 1990b) ...

- When several authors cite in the same bracket, or when we point to the consent of the author, references detach semicolon and listed them in alphabetical order.

Several studies (Balda 1980, Kamil 1988, Pepperberg & Funk, 1990) ...

- If with some of the references cite a source that confirms what is specific to this reference, then the source listed below see also, but that goes with the source of reference, but not alphabetically.

Several studies (Minor 2001; see also Adams, 1999; Storandt, 1997) ...

- When quoting hearsay, cite the author's name and year of the original work, followed by a semicolon and then cited code, then last name, year and foreign labor from which he quoted original work. The first definition of intrinsic motivation gave Decy (1975; see Suzić 2005, p. 108) ...

- If we know the year of the first publication of the work, then it is to be connected age translation by first listed year of first publication, a slash and then year translation.

(James, 1890/1983)

- For an Internet source that does not have a bookmarked Web page, use a pair of ¶ and paragraph number on the page where it was published.

(Myers, 2000, ¶ 5)

- Personal communication or publicly spoken words in a lecture to quote only in plain text, but not in the list of references, but does mention the date of actual communication.

Decy (personal communication, April 18, 2001) ...

REFERENCES

- Form Guidance papers in the journal is as follows:

The author's name [comma], initial / names [point], [open small brackets] year of publication [close little brackets] [point] title of the paper [point], the name of the magazine - in italics [comma] the number or volume - in italics [comma] page starting work [line] Page completing work [point].

Dennis, TA, Cole, PM, Wiggins, CN, Cohen, LH & Zalewsky, M. (2009). The functional organization of preschool-age children's emotion expressions and actions in challenging situations. *Emotion, 9*, 520-530.

- Form quoting the works of authors of books is as follows:

The author's name [comma], initial / names [point], [open small brackets] year of publication [close little brackets] [point] title deeds - in italics [point], the city (and state) [two counts], the publisher [Point].

Hirsch, Jr., E. D. (1996). *The schools we need and why we do not have them*. New York: Doubleday.

- When you mention a paper published in a journal or as part of a book as a chapter, then applies the following form:

The author's name [comma], initial / names [point], [open small brackets] year of publication [close little brackets] [point] title of the paper [point], In Proceedings ... (note that the work was published in a journal or book ...) The name of the publisher [open small brackets] Issue. (Note that this is a publisher) [Close little brackets] [comma] title of the collection - in italics [open small brackets] page starting work [line] Page completing work [point], the city (and state) [two counts], publisher [point].

Barrett, KC, & Campos, JJ (1987). Perspectives on emotional development: II. A functionalist approaches to emotions. In Osofsky JD (Ed.), *Handbook of Infant Development* (2nd ed., Pp. 555-578). Oxford, England: Wiley.

- If seven or more authors, then we will list the names of the six authors, and the seventh and the rest fall into the category of " and associates " .

Adam, JJ, Paas, F. Teeken, JC van Loon, EM, Van Boxtel, MPJ, Houx, PJ, et al. (1998). Effects of age on performance and a finger-precuing task. *Journal of Experimental Psychology: Human Perception and Performance, 24*, pp. 870-883.

Second and last author in a list of references are always stating afterward conjunctions & English.

- In magazines published articles cite the following form:

the author's name [comma], initial / names [point], [open small brackets] day, month and year of publication [close little brackets] and the title [point], the name of the magazine or newspaper - italics [comma], number of journals or Newspapers - italics [comma], page beginning of the text [line] Page completing the text [point].

Henry, W. A., III. (1990, April 9). Beyond the Melting Pot. *Time*, 135, 28-31.

- When we need to with the title of the article mention what kind of material it is then enclosed in square brackets after the title of the paper is printed by it is a brochure, video recording and the like.

Research and Training Center on Independent Living. (1993). Guidelines for reporting and writing about people with disabilities (4th ed.) [Brochure]. Lawrence, KS: Author.

- The work of famous authors downloaded electronically applies the following form:

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taken (note that work will take) the day, month and year, with (internet address).

Schwarzer, R. (1989). Statistics software for meta-analysis [Computer software and manual]. Retrieved March 23, 2001, http://www.yorku.ca/faculty/academic/schwarze/meta_e.htm

- When the list reference is made to the work that is being prepared for the press, after the authors' names, in parentheses, listed in the press in English.

Zuckerman, M. Kieffer, SC (in press). Race differences in faceism: Does facial prominence imply dominance? *Journal of Personality and Social Psychology*.

- When the list of references cites a newspaper article without the author prints the name of the article, then the time of publication, then the title and number - in italics, and at the end of the page on which the article was published. If the title is long, we can shorten the optimum number of words by taking the first few words.

The new health-care lexicon. (1983, August / September). Copy Editor, 4, 1-2.

- If within the journal as publisher publishes a special issue as a monograph, it is necessary after heading indicate that it is a monograph.

Ganster, DC, Schaubroeck, J. Sime, WE, & Myers, BT (1991). The nomological validity of the Type A personality among employed adults [Monograph]. *Journal of Applied Psychology*, 76, 143-168.

- When an abstract or summary of the quote as the original source, after the title should be in parentheses to indicate that it is abstract.

Wolf, NJ, Young, SL, Famselow, MS, & Butcher, LL (1991). Map-2 expression in cholinceptive pyramidal cells of rodent cortex and hippocampus is altered by Pavlovian conditioning [Abstract]. *Society for Neuroscience Abstracts*, 17, 480 harvesters.

- Titles that are not in English, and we want them to be published in the journal in English, listed in their native language, and then in the square brackets give the title translation into English. In addition to the title, everything else remains the mother tongue.

Ising, M. (2000). Intensitätsabhängigkeit evozierter Potenzial their EEG: Sindh impulsive persons Augmenter stage Reducer? [Intensuty dependence and event related EEG potentials: Are impulsive individuals augmenters or reducers?]. *Zeitschrift für Differentiel und diagnostisch Psychology*, 21, 208-217.

- In the list of literature translated work following a text that we have a year of the original edition listed in parentheses at the end behind the publisher. When we quote in plain text, year of first publication and translation writing along with a slash between (eg. Laplace, 1814/1951).

Laplace, P. S. (1951). A philosophical essay on probabilities (FW Troscott & FL Emory, Trans.). New York: Dover. (Original work published 1814)

- When the list of references cites a paper published in the Proceedings of the translated, italics will print the name of the collection at the end to add when it published the original.

Freud, S. (1961). The ego and the id. In J. Strachey (Ed. & Trans.), The standard edition of the complete psychological works of Sigmund Freud (Vol. 19, pp. 3-66). London: Hogarth Press. (Original work published 1923).

- When you cite articles published on the university or one of the official institutions, universities, publishers listed as the first name of the university and then university.

Broadhurst, RG, & Maller, RA (1991). Sex offending and recidivism (Tech. Rep. No. 3). Nedlands: University of Western Australia, Crime Research Center.

- When the list of sources cites a report of an organization or institution that has no author, it is best to nominate as the author of this organization, which is also the publisher.

Employee Benefit Research Institute. (1992, February). Sources of health insurance and characteristics of the uninsured (Issue Brief No. 123). Washington, DC: Author.

- When the work was published on the Internet as a photocopy, it should cite the original source noting that this is the electronic version.

Vandenbos, G. Knapp, S., & Doe, J. (2001). The role of reference elements in the selection of resources by psychology undergraduates [Electronic version]. *Journal of Bibliographic Research*, 5, 117-123.

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Vandenbos, G. Knapp, S., & Doe, J. (2001). The role of reference elements in the selection of resources by psychology undergraduates [Electronic version]. *Journal of Bibliographic Research*, 5, 117-123. Retrieved October 13, 2001, from <http://jbr.org/articles.html>

- When you download from the Internet a document which has no date or author, then the document name takes the place of the author or the first place.

8th GVU's WWW User Survey. (Od). Retrieved August 8, 2000, from http://www.cc.gatech.edu/gvu/user_surveys/survey-1997-10/

- Material from the symposium or a scientific paper which was only exposed, but not published, listed with the note on which the scientific or professional meeting is material exposed. If the author has presented on the site, it is desirable to name and web page.

Cuter, LD, Frölich, B., & Hanrahan, P. (1997, January 16). Twohanded direct manipulation on the responsive workbench. Paper presented at the 1997 Symposium on Interactive 3D Graphics. Abstract retrieved June 12, 2000, from <http://www.graphics.standard.edu/papers/twohanded/>

- Computer software listed noting computer software. Name of the software we write italics.

Miller, M. E. (1993). *The Interactive Tester (Version 4.0)* [Computer software]. Weastminster, CA: Psytek Service.

- Data downloaded from the website of the government or other official organization listed noting data file. The filename of the data listed in italics.

Department of Health and Human Services, National Center for Health Statistics. (1991). *National Health Provider Inventory: Home health agencies and hospices, 1991*. [Data file]. Available from the National Technical Information Service Web site, <http://www.ntis.gov>

Standards take according to Suzic, N. (2010). *Pravila pisanja naučnog rada APA i drugi standardi* [Rules scientific APA work and other standards]. XBS Banja Luka.

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EndNote (<http://www.endnote.com/support/enstyles.asp>) and

Reference Manager (<http://refman.com/support/rmstyles.asp>).

Above management software have plug-ins to word processing where authors only need to select the appropriate journal template when preparing their article and the list of references and citations to these will be formatted according to the journal style as described in this Guide. If you cannot find an available template, see the list of sample references and citations provided in this Guide to help you format these according to the journal style.

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Thank you Reviewers!

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