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Original research paper

THE EFFECTS OF DISCOVERY-BASED LEARNING OF DIFFERENTIATED ALGEBRA CONTENT ON THE LONG-TERM KNOWLEDGE OF STUDENTS IN EARLY MATHEMATICS EDUCATION

UDC 371.3::51; 371.3:512-028.31; 37.037-057.874; 159.954/956-057.874

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Abstract. *One of the essential characteristics of knowledge that determines its quality is its durability. The durability of students' knowledge depends, among other things, on the quality of organization and implementation of teaching in the process of acquiring new knowledge, as well as reviewing and repeating old knowledge. More specifically, the durability of students' knowledge depends on the applied methodological approach and the students' activities in the classroom. The aim of this study was to examine the effects of discovery-based learning on differentiated algebra content on the long-term knowledge of students in early mathematics education. To achieve this goal, an experiment was conducted with parallel groups consisting of a sample of 261 fourth-grade students from primary schools. The experiment aimed to investigate whether the methodological approach to algebra instruction based on the principles of discovery learning and content differentiation yields better effects on the durability of students' knowledge compared to traditional learning methods. The results of the research showed that discovery-based learning on differentiated algebra content contributes to better knowledge durability overall and at each of the three achievement levels (basic, intermediate, and advanced).*

Key words: *knowledge durability, algebra instruction, discovery-based learning, content differentiation*

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1. INTRODUCTION

The accelerated development of science and technology in the 21st century has led to the emergence of the concept of a "knowledge society" or a "learning society," which has further driven global changes in the educational system with the aim of transforming traditional teaching methods to equip students with the necessary skills and abilities to successfully face the challenges of modern society (Mirkov, 2011). In traditional education, frontal instruction is the prevalent one, with the focus on the teacher's lecturing role, which reduces interaction between the teacher and students and leaves little room for independent student activities. This mode of instruction inadequately stimulates students to participate in problem-solving and is not effective in preparing students for lifelong learning (Bognar and Matijević, 2002). Another shortcoming of traditional instruction today is its uniformity. This means that "regardless of individual differences, students of the same age should master the same curriculum objectives, acquire knowledge of the same extent and intensity, engage in tasks of equal difficulty, and reason and conclude in the same way. In other words, they should progress at the same or approximately the same pace" (Milovanović, 2008, p. 470). "As a consequence of such a methodological approach, students who are below or above average are left aside because their active participation in teaching is hindered by instruction that is not adapted to their needs" (Janković, 2016, pp. 269-270).

On the other hand, there is an emphasis on the importance of active learning in education today, viewing the student as an active participant in the learning and teaching process. In such circumstances, "the student is a carrier, initiator, critic, researcher, interpreter. However, the student is not only the carrier of teaching but also its goal, which is why teaching is adapted to the needs and abilities of students in order to achieve their self-realization" (Stevanović, 2002, p. 25).

"Throughout the history of education, various types, teaching strategies, organizational models, and conceptual solutions have emerged in an effort to create conditions in which teaching would be more aligned with the needs, interests, possibilities, and abilities of students" (Maričić and Milinković, 2015, p. 63). Didactic literature emphasizes that different forms of active learning (teaching), including discovery-based learning, support different learning styles and students' abilities. In these forms of learning, differentiation is achieved by allowing students to access content at different levels.

When it comes to mathematics instruction, researchers worldwide (Kieran, 1981, 2004; Filloy & Rojano, 1989; Sfard & Linchevski, 1994; Knuth, Stephens, McNeil, and Alibali, 2006; Vergnaud, 1988, cited in Carraher, Schliemann, Brizuela & Earnest, 2006, and others) have confirmed that young students face numerous difficulties in learning algebra. These difficulties arise from the abstract nature of the content itself and the limited cognitive abilities of younger students. This implies the necessity of changing the approach to teaching these contents and finding suitable instructional methods for successful learning of basic algebraic concepts. Considering that students acquire the highest quality knowledge through independent activities, where the content and learning requirements are adapted to their individual capabilities, we have devised a methodological approach based on functional connection through discovery learning and content differentiation in the early algebra instruction. Differentiation of program content has been performed at three levels of complexity.

Since the durability of students' knowledge significantly determines the quality of acquired knowledge, the aim of this study is to evaluate, through experimental means, the

effects of the aforementioned methodological approach on the durability of students' knowledge in the early algebra instruction. This research represents a part of a comprehensive empirical study in which various effects of discovery-based instruction with differentiated content were examined.

The research should demonstrate whether the implementation of this methodological instructional organization in algebra teaching can make acquired knowledge more durable compared to knowledge acquired through conventional instructional methods. This can provide a positive impetus for teachers to increasingly engage in instruction organized in this manner.

1.1. Discovery-based learning with differentiated content used in algebra instruction in elementary mathematics education

The content in the field of algebra constitutes an important part of the curriculum in the teaching and learning of elementary school mathematics. At this age, special attention should be given to the proper formation of early algebraic concepts. However, it is important to consider the limitations associated with algebraic content, arising from its abstract nature on the one hand, and the cognitive limitations of young students in terms of symbolic thinking, representation, and acquisition of algebraic content on the other hand. Researchers worldwide have identified numerous difficulties that students face in understanding and mastering algebraic content at a younger age. Some of the most common problems include: misunderstanding the meaning of letters representing unknowns or variables, limited interpretation of the equals sign, difficulties in understanding equations and inequalities and comprehending the procedures for solving them, and challenges in developing the idea of functions.

The aforementioned points lead us to the conclusion that besides introducing algebraic content into the curriculum, it is necessary to find adequate approaches for students to acquire this content. Therefore, there has been increased interest among researchers and theorists in studying the problem of methodological approaches to aligning algebraic content with children's cognitive abilities.

The passivity of students in the process of learning algebraic content, which involves mere memorization of formulas without a genuine understanding of the concepts being learned, prevents students from applying what they have learned and significantly diminishes their interest in mathematics. Since one of the primary intentions of mathematics education is to enable and encourage students to actively participate in the learning process, to explore independently, discover, mentally grasp content, and apply what they have learned in practice and everyday life, discovery-based learning should hold a significant place in mathematics education, particularly in the learning of algebra.

Discovery learning is commonly understood as a form of learning in which students independently discover the content they need to acquire. The process of discovery is typically not completely independent but guided by the teacher through "Socratic questioning" or other techniques because it is not expected for the student to fully discover scientific concepts that would require years of scientific work (Hammer, 1997). Discovery learning involves teachers creating instructional situations that allow students to assume the role of scientist-researchers and satisfy their (natural) curiosity by actively constructing mental models that adequately explain their experiences (Driver et al., 2000, as cited in Kalathaki, 2015). This form of learning stems from constructivist learning theories and is defined as

an interactive process in which the student, as a subject, learns with understanding, aiming to enhance and transform existing knowledge, feelings, attitudes, and meaning (Gazibara, 2018).

During discovery learning, students are fully engaged in the instruction process, motivated to explore and present their ideas. The role of the teacher in discovery-based instruction is to create problem situations for students and familiarize them with facts, conditions, and examples that illustrate the concepts and principles to be discovered. The teacher guides students to independently generate ideas and concepts within the instructional content and apply them to problem-solving. "The activities of students in discovery-based instruction resemble the research activities undertaken by experts in science" (Kistian et al., 2017, p. 9). In this way, the student is in a position to independently perceive the connections between elements of the problem situation, between known and unknown quantities, gradually transferring them to the realm of symbolism, all the while understanding them. Throughout the process of discovery, the dominant aspect is the student's activity and their creative and exploratory act, as opposed to passive reception of information, receiving ready-made rules, symbolic generalizations, and so on. The student can grasp rules and generalizations only if they have integrated all the parts into a whole, firmly connected them, and understood them well.

The role of the teacher in the process of discovery learning in mathematics instruction is significant. Among other things, the teacher is expected to possess the ability to create instructional situations that encourage students to be active and creative, increasing their motivation for learning (Kistian et al., 2017). The teacher's role as a source of information is considerably reduced compared to the role of a teacher who guides and directs students on the path of discovery of new knowledge.

Discovery learning in algebra instruction must be well-prepared and tailored to the current abilities and capacities of the students. Simply presenting mathematical problems and encouraging students to independently seek solutions will not necessarily lead to learning (Garelick, 2009). Garelick emphasizes that problem tasks that are not adapted to the students' abilities do not lead to the acquisition of active and applicable knowledge. The author emphasizes that in mathematics instruction based on discovery, tasks must be well-formulated, not confusing to students, and selected in a way that gradually increases their difficulty, allowing students to use their knowledge from simpler tasks to solve more complex ones. According to this author's understanding, this structured discovery-based instruction plays a significant role in development and education as it provides the necessary support to the student (Garelick, 2009).

The studies conducted by author Malešević has shown that discovery-based learning in primary mathematics education has the following positive effects: "this form of learning is stimulating because it emphasizes the learning goal at the beginning, thus activating students' motivation; students grasp the meaning of the content; knowledge is more lasting, of higher quality, and transferable; it develops proper reasoning; students become capable of self-education and develop according to their individual abilities; learning becomes part of internal motivation, learning for its own sake rather than for grades; students develop self-awareness of their abilities" (Malešević, 2011, p. 10).

On the other hand, it is known that in practice there are numerous individual differences among students in terms of prior knowledge, mathematical abilities, motivation for learning, interests, and so on. Therefore, it is believed that optimal results in mathematics education,

including learning algebra, can be achieved through discovery-based learning that is differentiated according to students' level of knowledge, abilities, and interests.

Furthermore, the generality, abstractness, and symbolism characteristic of algebraic content create the need for differentiated approaches, where content and learning requirements are adapted to students' individual capabilities. Differentiating algebraic content allows these contents to be presented at different levels of complexity to different categories of students. This creates conditions for active student participation in tailored instruction, where they explore independently, mentally master the content, and actively apply discovered solutions. Hence, the concept of teaching based on respecting individual characteristics and differences among students, as well as activating students in the learning process through discovery, provides a good foundation for more effective acquisition of algebraic content.

The differentiation of program content for the purposes of this research was performed at three levels of complexity, based on prescribed educational achievement standards for the end of the first cycle of compulsory education for the subject Mathematics (*General Achievement Standards - Educational Standards for the End of the First Cycle of Compulsory Education - Mathematics, 2011*). Through analysis of these standards, it was determined that they do not define outcomes for all three cognitive levels for certain algebraic contents. Therefore, operationalization of requirements was carried out, and minimum, optimal, and maximum demands for algebraic content specified in the curriculum for teaching and learning mathematics in the fourth grade of primary school were precisely determined for the following areas: *Dependency of results of arithmetic operations on component changes, Equations, Inequalities, Expressions with variables*. Thus, for each of the mentioned algebraic contents, outcomes were precisely operationalized at three levels of achievement.

Differentiated instruction, as well as discovery-based learning, have their foundation in the constructivist theory of learning, in which the student is seen as an active creator of their knowledge. Respect for the prior knowledge and experiences of the student, as well as the understanding of the teacher's role as a facilitator in the learning process, are common characteristics of differentiation and discovery-based learning. Discovery-based learning provides a good context for the differentiation and individualization of teaching and learning. Educational literature emphasizes that different forms of active learning, including discovery-based learning, support different learning styles and student abilities. In these forms of learning, differentiation is achieved by enabling students to access content at different levels.

Advocates of discovery-based learning believe that students fully understand only those contents that they have discovered themselves, and that the essential characteristic of this type of learning is the mental mastery of educational content. The early mathematics instruction should be organized in such a way that the student acquires knowledge through constant discovery of concepts, rules, properties, etc. "Therefore, discovery-based learning should be present in the implementation of the entire mathematics curriculum (at all levels of mathematical education), regardless of the form of teaching used and regardless of the type of class applied" (Vuković, 1998, p. 206).

However, as already emphasized, in teaching practice, not all students can solve all tasks simultaneously. In such conditions, individual characteristics of students, their prior knowledge, and pace of work come to the forefront. Therefore, it is advisable to create learning material based on levels of complexity and difficulty so that each student can respond to part of the requirements. In this regard, discovery-based learning is most

productive in individualized and differentiated teaching through prepared written materials where the requirements are differentiated according to levels of complexity. Despite the fact that in this type of teaching the student learns on their own, they are guided by the teacher throughout the entire learning process, using specially prepared written materials (programmed, semi-programmed, problem-based workbooks, etc.) and orally, following a secure path. This way, students gain a clear insight into the structure of the content and acquire knowledge characterized by functionality, applicability, and operability (Vuković, 1998).

Considering all of this, discovery-based learning should have a dominant role in the implementation of the model of differentiated mathematics instruction. Considering that independent student activity in the learning process is crucial for acquiring the highest quality knowledge, and that the effects of this learning are significantly better when the content and learning requirements are adapted to individual student capabilities, the basis of this work is a methodical approach based on the idea of functionally connecting discovery-based learning and three-level content differentiation in the acquisition of algebraic content.

2. METHODOLOGICAL FRAMEWORK OF RESEARCH

It is a well-known fact that along with the process of learning a subject, there is also a process of forgetting it. Among the numerous factors influencing the speed of forgetting learned content is the methodological approach applied during the learning process (Vučić, 1991). Therefore, students will be more motivated and interested in the content they learn, and consequently, their knowledge will be more enduring if teachers provide optimal conditions in which students are mentally engaged, create teaching situations that require a certain intellectual effort from students, and enable them to discover connections between given data coherently. On the other hand, the primary indicator of the effectiveness and success of teaching is the permanence of acquired knowledge, skills, and habits, and one of the primary teaching principles is the principle of knowledge, skills, and habits' permanence.

Since the basis of this study is a methodical procedure based on a differentiated approach that allows all students to actively acquire knowledge through the process of independent discovery, we were interested in whether such organization of teaching and activities in the process of learning algebraic content contributes to the acquisition of student knowledge that withstands the process of forgetting for a longer period.

The main objective of the research is to examine the impact of discovery-based learning of differentiated algebraic content on the permanence of students' knowledge in the early mathematics education. Additionally, we wanted to investigate whether the applied methodological approach in learning algebraic content contributes to better knowledge permanence at each level of learning achievement (basic, intermediate, and advanced).

The general hypothesis from which we proceeded in this research is that discovery-based learning of differentiated algebraic content contributes to an increase in the permanence of students' knowledge in the early mathematics education.

The research used the experimental method. We employed the experimental method in the form of an experiment with parallel groups. By introducing the experimental variable, discovery-based learning of differentiated content, into the experimental group, we aimed to determine its effects on the permanence of students' knowledge in algebra instruction. For this purpose, we formed two groups: the experimental group, in which

algebraic content was taught with the created experimental lesson models, and the control group, in which the mentioned instructional content was implemented in the usual manner. The experimental program was implemented over the course of 30 regular mathematics classes. Students in the experimental group actively learned algebraic content through the process of independent discovery using teaching worksheets with differentiated requirements at three levels of complexity. Due to the impossibility of equalizing the examined groups by transferring students from one class to another, the dependent variable was statistically controlled using the analysis of covariance.

Data collection was conducted using the testing technique, with knowledge tests as instruments for students (initial, final, and retest) created by the researchers for the purposes of this research. The participants individually solved assignments on the test. The initial knowledge test was administered to both groups of participants before the start of the experimental program to determine students' prior knowledge of algebra. The final knowledge test was conducted after the implementation of the experimental program in both groups of participants to determine the effects of learning through discovery on differentiated algebraic content in algebra instruction. The repeated test or retest to assess the effects of the experimental program on knowledge permanence was conducted three months after the final testing. The tests consisted of three subtests (for each level of achievement), with six tasks each, totaling 18 tasks. The tasks were scored based on their difficulty (with 4, 5, or 6 points, depending on the task's complexity level), and the maximum number of points that could be obtained by correctly solving the tasks was 90.

A mini-pilot study preceded the final version of the knowledge tests to determine the appropriate metric characteristics. The metric characteristics of the tests were examined on a sample of 102 fourth-grade students from the "Jovan Jovanović Zmaj" Elementary School in Vranje. The calculated values of the Cronbach's alpha coefficient for each task (on all three tests) ranged from 0.72 to 0.86, indicating the reliability of the constructed tests. All tasks (on all three tests) were sufficiently discriminative, as confirmed by the task discriminative values greater than 0.12, ranging from 0.17 to 0.25.

The research sample was selected from the population of fourth-grade students in elementary schools in the Pčinja District, consisting of 261 students from the "Radoje Domanović" and "Jovan Jovanović Zmaj" Elementary Schools in Vranje. The sample structure is presented in Table 1.

Table 1 The sample structure according to the group affiliation of the participants

Experimental group				Control group			
School	Class	N	%	School	Class	N	%
“Radoje Domanović”	IV/1	24	9.2	“Radoje Domanović”	IV/3	25	9.6
	IV/2	27	10.3		IV/4	27	10.3
“Vuk Karadžić”	IV/3	26	10	“Vuk Karadžić”	IV/1	25	9.6
	IV/5	26	10		IV/2	26	10
	IV/6	29	11.1		IV/4	26	10
Total		132	50.6	Total		129	49.4

The data obtained in the research were statistically analyzed using the IBM SPSS Statistics 21 software package.

3. THE RESEARCH RESULTS AND DISCUSSION

Before the start of the experimental program, an initial testing was conducted, which determined that there were no differences in prior knowledge of algebraic content between the students in the experimental and control groups. Immediately after the implementation of the experimental program, a final testing was conducted, followed by a retesting of the students from both groups three months after the completion of the experimental program in order to determine the effects of the experimental model on the durability of students' knowledge. These effects were initially observed through the overall score of the students on the retest.

Table 2 provides an overview of the composite score on the final test and retest for the experimental and control groups, as well as for all participants together. It can be observed that students in the experimental group achieved significantly higher average scores (M = 51.42, SD = 22.87) on the final measurement compared to the students in the control group (M = 41.87, SD = 19.16). The retesting of the students from both groups shows a decline in performance compared to the final testing, which is expected given that the retesting was conducted three months after the completion of the experimental program, resulting in some forgetting of the learned material. However, when comparing the results between the groups, the experimental group outperforms the control group.

Table 2 The performance of students in the experimental (E) and control (C) groups on the final test and retest - descriptive statistics

		N	M	SD	Std. Error	95% Confidence interval	
						Lower bound	Upper bound
Final test	E-group	132	51.42	22.87	1.99	47.49	55.36
	K- group	129	41.87	19.16	1.69	38.53	45.21
	Total	261	46.70	21.62	1.34	44.07	49.34
Retest	E- group	132	49.848	22.597	1.967	45.958	53.739
	K- group	129	38.938	18.899	1.664	35.646	42.230
	Total	261	44.456	21.517	1.332	41.833	47.079

The determined value of variance (F (1.259) = 17.862; p = 0.000) indicates that there is a statistically significant difference between the students in the experimental and control groups in the average achievement on the retest as a whole (Table 3). More specifically, the students in the experimental group achieved significantly better results compared to the students in the control group even three months after the implementation of the experimental program, which supports the confirmation of the initial assumption

Table 3 The difference in overall achievement between the experimental and control groups on the final test and retest (ANOVA)

		Sum of Squares	df	Mean Square	F	p
Final test	Between groups	5 957.688	1	5 957.688		
	Within a group	115 535.002	259	446.081	13.356	0.000
	Total	121 492.690	260			
Retest	Between groups	7 766.270	1	7 766.270		
	Within a group	112 608.474	259	434.782	17.862	0.000
	Total	120 374.743	260			

regarding the durability of knowledge among students in the experimental group under the influence of the experimental factor.

In order to confirm that the statistical significance between the experimental and control groups on the retest is a result of the implemented experimental program and not a result of group differences, we conducted an analysis of covariance (ANCOVA). The results of the initial testing were used as a covariate in both groups. The covariate was measured before the implementation of the experimental program, and the value of the Cronbach's alpha coefficient of 0.79 (Table 4) indicates sufficient reliability.

Table 4 Cronbach's alpha coefficient for the initial test

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.79	0.77	18

Table 5 The difference between the experimental and control groups on the retest (ANCOVA test)

Source	Type III Sum of Squares	df	Mean Square	F	p	Partial Eta Squared
Corrected Model	112 209.405[a]	2	56 104.703	1 772.739	0.000	0.932
Intercept	259.500	1	259.500	8.199	0.005	0.031
Inici_total	104 443.136	1	104 443.136	3 300.087	0.000	0.927
Group	8 073.332	1	8 073.332	255.093	0.000	0.497
Error	8 165.338	258	31.649			
Total	636 197.000	261				
Corrected Total	120 374.743	260				

a. R Squared = 0.932 (Adjusted R Squared = 0.931)

The calculated value of covariance ($F(1.258) = 255.093$; $p = 0.000$) confirms that the difference between the experimental and control groups on the retest is statistically significant (Table 5). This indicates that the observed difference between the groups is a result of the applied methodological model rather than group disparities. The value of partial eta squared (0.497) confirms a substantial impact of discovery-based learning on differentiated content. This means that even three months after the implementation of the experimental program, 49.7% of the variance in the retest scores can be explained by the independent variable's influence.

Previous research studies examining the effects of discovery-based learning (Minner, Levy & Century, 2010; Balim, 2009; Malesević, 2003) and differentiation in teaching (Vulović, 2011) on student achievement have highlighted the durability of knowledge as one of the main advantages of such instructional approaches. Our findings are in line with these results. This outcome can be explained by the fact that in this approach, concepts that need to be learned are not presented in their final form; instead, students discover and apply them independently in new situations. Therefore, the acquired knowledge is based on construction, making it more meaningful and enduring for students.

To examine the effects of the experimental program on the durability of student knowledge, we also analyzed the results on individual subtests of the retest. These subtests were structured into three levels of complexity, corresponding to different levels of students' educational achievements: basic, intermediate, and advanced.

Descriptive indicators of student success in solving tasks at the three levels of achievement on the retest are presented in Table 6.

Table 6 The results of the students in the experimental and control groups on the retest at each of the three levels of achievement (descriptive indicators)

		N	M	SD	Std. Error	95% Confidence interval		Min	Max
						Lower bound	Upper bound		
Basic level	Experimental	132	20.67	4.74	0.41	19.85	21.48	8.00	24.00
	Control	129	18.45	4.98	0.44	17.58	19.32	0.00	24.00
	Total	261	19.57	4.98	0.31	18.96	20.18	0.00	24.00
Intermediate level	Experimental	132	19.81	9.34	0.81	18.20	21.42	0.00	30.00
	Control	129	16.40	10.04	0.88	14.65	18.14	0.00	30.00
	Total	261	18.12	9.82	0.61	16.93	19.32	0.00	30.00
Advanced level	Experimental	132	9.36	11.66	1.01	7.36	11.37	0.00	36.00
	Control	129	4.09	6.67	0.59	2.93	5.25	0.00	24.00
	Total	261	6.76	9.86	0.61	5.56	7.96	0.00	36.00

The average achievement of students in the control group at the basic level of the retest is M = 18.45; SD = 4.98, while the average achievement of students in the experimental group is higher, with M = 20.67; SD = 4.74. At the intermediate level of the retest, students in the control group achieved an average of M = 16.40; SD = 10.04, while students in the experimental group achieved an average of M = 19.81; SD = 9.34 points. The average achievement of students in the control group at the advanced level of the retest is M = 4.09; SD = 6.67, while students in the experimental group achieved a higher average score of M = 9.36; SD = 11.66. Looking at the differences in the average number of points achieved between the E and K groups on the three levels of achievement, we can conclude that the mentioned difference is largest at the advanced level of achievement.

By conducting an analysis of variance on different groups, the effect of the implemented instructional approach on the durability of students' knowledge at the three levels of achievement was examined.

Table 7 The difference between the experimental and control groups at the three levels of achievement (*ANOVA test)*

		Sum of Squares	df	Mean Square	F	p
Basic level	Between Groups	320.683	1	320.683	13.555	***0.000***
	Within Groups	6 127.256	259	23.657		
	Total	6 447.939	260			
Intermediate level	Between Groups	760.974	1	760.974	8.104	***0.005***
	Within Groups	24 319.102	259	93.896		
	Total	25 080.077	260			
Advanced level	Between Groups	1 812.364	1	1 812.364	19.984	***0.000***
	Within Groups	23 489.429	259	90.693		
	Total	25 301.793	260			

The experimental and control groups significantly differ in achievement at the basic level of the retest ($F(1.259) = 13.555$, $p = 0.000$), with the experimental group outperforming the control group. Statistically better performance of the experimental group compared to the control group was also observed at the intermediate level of the retest ($F(1.259) = 8.104$, $p = 0.005$). The experimental group achieved better results even at the advanced level of the retest compared to the control group ($F(1.259) = 19.984$, $p = 0.000$).

Summarizing the effects of discovery learning on the long-term knowledge retention of students, it can be concluded that there are differences between the experimental and control groups at all levels of the retest, three months after the implementation of the experimental program. The difference lies in the longer retention of acquired knowledge in the experimental group. The long-term knowledge retention of the experimental group was achieved through their independent discovery activities during the processing of algebraic content, where they actively reached understanding through their own effort. Additionally, well-designed practice and reinforcement activities, including tasks beyond their achievement level, contributed to the long-term retention of knowledge in the experimental group. Furthermore, the tasks within the experimental program that required the application of acquired knowledge in real-life situations also contributed to the longevity of knowledge retention in the experimental group. These findings align with literature indicating that "the longevity of acquired knowledge depends not only on the organization of the lesson but also on the type of knowledge that the student acquires" (Trnavac and Đorđević, 1998, p. 64).

4. CONCLUSIONS

The previously presented and analyzed research results indicate that the teaching of algebraic content through discovery learning using differentiated materials in the experimental group has an impact on better student achievement even after a certain period of time. In other words, the results suggest that the experimental model contributes to the acquisition of more enduring knowledge at all three levels of achievement compared to the traditional model of learning. This means that if the methodological approach to acquiring algebraic content is based on receptive acquisition of content, i.e., the teacher's direct instruction and memorization by students with or without understanding, such acquired knowledge is not resistant to the process of forgetting. On the other hand, independent discovery of concepts, rules, etc., accompanied by intensive mental activation, contributes to all students, even those with the weakest performance, acquiring more enduring knowledge.

Considering the long-term effects of this methodological model, it is necessary to apply it more frequently in the implementation of elementary mathematics content. For this purpose, teachers need to be continuously informed and equipped with ways to conceptualize this didactic instruction model. In doing so, they will not only become implementers of education but also successful creators and organizers. Teachers who participated in this research willingly embraced and positively evaluated the new approach to work, thereby assuming a new role in the instructional process, which implies replacing the teacher's lecturing function with an instructional one.

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EFEKTI UČENJA PUTEM OTKRIĆA NA DIFERENCIRANIM SADRŽAJIMA ALGEBRE NA TRAJNOST ZNANJA UČENIKA U POČETNOJ NASTAVI MATEMATIKE

Jedno od bitnih svojstava znanja koje određuje wegov kvalitet jeste njegova trajnost. Trajnost učeničkog znanja, između ostalog, zavisi od kvaliteta organizacije i izvođenja nastavnog rada u procesu usvajanja novog, ali i utvrđivanja i ponavljanja starog znanja. Tačnije, trajnost znanja učenika zavisi od primenjenog metodičkog pristupa i od aktivnosti učenika na času. Cilj ovog rada bio je da se ispitaju efekti učenja putem otkrića na diferenciranim sadržajima algebre na trajnost znanja učenika u početnoj nastavi matemaatike. U tom cilju sproveden je eksperiment sa paralelnim grupama na uzorku od 261 učenika četvrtog razreda osnovne škole, kako bi se ispitalo da li metodički pristup nastavi algebre zasnovan na principima učenja putem otkrića i diferencijacije sadržaja daje bolje efekte na trajnost znanja učenika u odnosu na tradicionalni način učenja. Rezultati istraživanja pokazali su da učenje putem otkrića na diferenciranim sadržajima doprinosi boljoj trajnosti znanja ukupno i na svakom od tri nivoa postignuća (osnovni, srednji i napredni).

Ključne reči: *trajnost znanja, nastava algebre, učenje putem otkrića, diferencijacija sadržaja.*

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Original research paper

ASSESSMENT OF EMPLOYABILITY SKILLS ACQUISITION NEED FOR SELF-RELIANCE IN BUSINESS STUDIES AMONG GOVERNMENT JUNIOR SECONDARY SCHOOLS STUDENTS IN NIGER STATE

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Abstract. *This study was conducted to assess the employability skills acquisition need for self-reliance in business studies among government junior secondary schools students in Niger State. The researchers raised two research questions for the study. In line with the research question, two null hypotheses were formulated and tested at 0.05 level if significant. A survey research design was used for the study. The area of this study consists of one government junior secondary schools from each local government in the state which comprise of twenty-five local government. A random sampling technique was used and the sample size for the study was two hundred and ten (210). A 4-point Likert scale used for the and the questionnaire was tagged as "Business Studies Skill Acquisition Questionnaire (BSSAQ)" containing twenty (20) statement items were used to collect data. To obtain the reliability coefficient of the measuring instrument, the instrument was pilot tested using some fifteen (15) selected junior secondary schools in Ilorin. The result obtained from the pilot study were then analyzed using Cranach alpha reliability coefficient statistical and the reliability index obtained was 0.88. The data collected on the twenty (20) statement items of the questionnaire were analyzed using mean and standard deviation to answer the research questions and t-test was used to test the null hypotheses formulated for the study. The study revealed among others, that a significant difference existed in the employability skills acquisition need for self-reliance in government junior secondary schools in Niger State. Based on the findings of this study, it was recommended that at junior secondary schools business studies contents should be well taught in other to encourage the acquisition of employability skills among the students of junior secondary schools in Niger state. Also, Business studies at the government junior secondary level should be encouraged through proper funding, and the provision of equipment for better acquisition of computer skills.*

Key words: *Skill Acquisition, Self-Reliance, Business Studies, Employability*

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1. INTRODUCTION

Employability skills are the fundamental abilities required for landing, keeping, and succeeding in a work. These are the abilities, dispositions, and behaviors that workers need in order to get along with coworkers and managers and make wise judgments. Employability skills, in contrast to occupational or technical skills, are generic in nature rather than job specific and apply to all industry kinds, business sizes, and employment levels, from entry-level employees to the most senior positions. What particularly are those abilities, dispositions, and behaviors, often known as employability skills, needed to land, stay, and perform successfully in a job.

Employability Skills needed for job placement as an employee or employer are known as employability skills. According to Okute (2013), employable abilities are the ones that allow a person to find and hold a job in a certain industry. According to Ezeani and Ogundola (2016), employability is the state or circumstance of being prepared for employment or ready to be hired after acquiring the required knowledge and resources for such job. employability skills are those that can be learned by education and training and that make it simple to find relevant employment, keep it, and advance in it. While there are many various methods to classify employability abilities, they are typically broken down into three skill sets: (a) fundamental academic skills, (b) higher-order thinking skills, and (c) personal attributes (Ezeani, & Ogundola, 2016).

A person can learn knowledge, develop skills and abilities, solve issues, and develop the business-like attitudes necessary for success in a business environment with the aid of business education. According to Ndineche and Ementa (2018), one of the fundamental goals of business education is to equip its students with the skills, knowledge, and values they need to carry out certain tasks and become independent. The junior secondary school business education curriculum differs slightly from the senior secondary school curriculum. Business studies, a three-year program in junior secondary school, consists of six disciplines, including commerce, bookkeeping, office skills, and typing, shorthand, and computer studies.

Business studies is a crucial component of prevocational classes in secondary schools in Nigeria, particularly specifically Niger State. The study of business gives students the knowledge and abilities necessary for successful entrepreneurship and company practice. Business studies, according to Kilby (1971), are courses designed to help students learn practical business skills and knowledge that will help them integrate in with post-secondary working contexts. In agreement, Odike and Menkiti (2019) highlighted the goals of business studies as including giving people who may not have the opportunity for further training the orientation and basic skills with which to start an occupation, giving people basic business skills for personal use now and in the future, giving students the opportunity for further training in business studies, and giving people the opportunity to develop basic skills in office occupation. This means that business studies courses must provide their students with the fundamental business information and abilities necessary for them to evaluate their potential as businesspeople. In circumstances when they find it challenging, graduate students can choose to get into entrepreneurship and venture development with the skills and competencies obtained in business studies classes.

With five distinct subject areas, including office practice, bookkeeping/accounting, typewriting, shorthand, and commerce, business studies were created in 1981 as a result of the introduction of Junior Secondary School (JSS) in the 6-3-3-4 system of education. The FRN through NERDC made Typewriting an elective course while Insurance and

Store management were introduced to Business Studies in 2008. These changes were made in response to the requirement to restructure our secondary school system to be in line with global and national demands. According to N.P.E. (1981 updated 2014), business studies serve as a means of setting the groundwork for economic, technological, and national development as well as for higher education (FRN, 2018). It provides its recipients with personal skills, consumer skills, and expertise for administrative and managerial tasks, claim researchers (Okay-Somerville et al., 2015),

According to Huga (2015), the main goal of including business studies in secondary school curricula was to give pupils the knowledge, abilities, and attitudes required for success in secondary school, the workplace, post-secondary education or training, and daily life. According to Eze (2011), The goals of business studies are to help students develop the skills, including critical thinking skills, and strategies necessary for self-employment; gain an understanding of business concepts through the study of subjects like commerce, shorthand, office practice, bookkeeping, and computers; apply the knowledge, skills, and attitudes they have learned through the study of business to a variety of learning tasks and relate them to business; and use the knowledge, skills, and attitudes they have learned through the study of business to relate their learning to other subjects (Eze, 2011).

How to provide graduates in particular and youngsters in general with the necessary skills and competencies for self-employment and self-reliance is the nation's biggest concern. Self-reliance is the full utilization of a society's own resources and autonomy in decision-making. Additionally, it refers to self-assurance, dependence on one's natural and human resources, and the ability to determine one's own goals. An individual who depends more on themselves or their own abilities and resources, and less on others, to manage their human and material resources is said to be self-reliant. Ofoye (2010) contends that people become independent when they are able to obtain and make use of the necessities of life, such as wholesome food, appropriate clothing, a safe place to live, medication, transportation, and useful education. The program's objectives for business studies are; to link expertise and expertise to the national economy, prepare students for additional business studies training, acquire fundamental office skills, acquire fundamental office skills, give those who don't want to pursue further training the orientation and fundamental abilities they need to begin working in the field, and to offer fundamental business knowledge that individuals can utilize today and in the future.

In order for a nation like Nigeria to be economically independent, it is necessary to diversify the economy and to inspire young people to pursue self-employment through favorable policy environments that would promote skill development, entrepreneurship, and independence. It is impossible to overstate the importance of skill development in the rapidly expanding other economic areas. A skill can be thought of as a talent or aptitude that an individual possesses and can be learned via practice, training, observation, and deliberate personal experiences. On the other hand, skill acquisition refers to the creation of a new technique, skill, or method of doing things that is typically acquired through instruction or experience. Many have claimed that learning new skills is the key to ending severe poverty and hunger since it opens doors for work, which leads to the creation of jobs and money while fostering independence and reliance (Isaac, 2011). Self-reliance has been thought of as being effectively treated through skill acquisition. The overall concept is that in addition to their usual academic program or curriculum, students should receive skill training in the vital sectors that are required by business. According to

Gambari (2011), effective youth engagement is essential to the fight against hunger and poverty, the reduction or elimination of unemployment in society, and the reduction of crime. The acquisition of skills by young people should be handled as a matter of urgent national concern, he added, given that our basic education has failed to produce the desired results and has been associated with negative outcomes like armed robbery, militancy, kidnapping, and a host of others.

A capacity to perform successfully is known as a skill and is developed via practice and expectation. A skill is a practical knowledge and the capacity to carry out a task that can be learned or acquired in a learning environment such as a school or training facility. According to Olowu and Aliyu (2015), skills are the capacity to carry out intentional motions required to finish or master a specific task. A person's capacity to complete a given activity and accomplish a specific goal is made possible by their skill, which is a learned response that is frequently the product of specific training. Agomuo (2014) also provided a list of some of the abilities that secretaries need possess in order to succeed in a business setting, including discretion, good time management, and organizing skills. confidence in computer software and information technology (IT), Accuracy and keen detail-orientation, the capacity to remain composed and diplomatic under pressure, and self-motivation. When possessed, these abilities make a secretary employable (Agomuo, 2014). The abilities and knowledge gained from typing on a typewriter translate to computer keyboarding. Keyboarding proficiency is now required in practically every element of our culture. For our educational system to evolve sustainably through computer training aimed at preparing students for some specific abilities that will make them relevant in today's office and for self-reliance, we continually experience a demand for keyboard instruction. Mbah and Umurhurhu (2016), all students, especially those studying business, should be familiar with computers and typing because they have automated many secretarial tasks and made them simpler. This study evaluated the impact of a skill acquisition program for self-reliance in business studies among government junior secondary schools in Niger State in the areas of keyboarding (Typewriting) and shorthand abilities, taking into account the significance of necessary skills and self-employment.

2. Statement of the Problem

The main goal of implementing a business studies curriculum at the junior secondary school level is to provide students with the knowledge, abilities, attitudes, and values necessary for self-reliance. These include knowledge of keyboarding (typewriting), computers, accounting, shorthand, office procedures, and commerce. It is important to note that giving young people the necessary skills for independence has a big impact on reducing unemployment in the nation, especially among secondary school graduates. Business Studies has seen an increase in enrollment at the secondary school level in Niger State over the years, but problems with unemployment and self-reliance, along with their associated effects like a rise in crime, insurgency, unfulfilled dreams, suicide bombings, and other problems, are posing significant challenges to many people in Niger State.

Business instructors are also concerned about the issue of business studies students' lack of independence skills. Due to the absence of self-reliance abilities, this circumstance has not only created significant challenges for students but also had an impact on the economy and slowed down national economic growth. It is an understatement to say that the 6-3-3-

4 system's emphasis on providing students with skills has degraded. Due to this circumstance, fewer graduates from high school have the necessary skills for independence (Adamu & Yakubu, 2012). Currently, children are taught at government Junior Secondary Schools (JSS) in an abstract manner without obtaining the fundamental skills that the National Policy on Education calls for. The majority of the business laboratories found in most schools in Niger State are empty aside from the chairs and tables used by the teachers. This lack of qualified business education teachers, who are the most crucial "tools" for teaching and learning business studies, demonstrates that students do not benefit significantly from these pre-vocational subjects. In the majority of schools, National Youth Service Corps members who have studied one aspect of business, such as accounting, marketing, business administration, banking, and finance, are assigned to teach business studies. However, this practice frequently lacks adequate infrastructure, and as a result, the impact is often subpar. Nobody who isn't proficient in shorthand and typing can instruct business subjects in junior high schools. When looking at the private sector, it was found that private business outlets had a high rate of failure. There is no evidence to support the claim that business studies students in Niger State have the necessary abilities to launch their own business outlets. Therefore, this study is designed to assess the employability skills acquisition need for self-reliance in business studies among government junior secondary schools students in Niger State.

2.1. Research Questions

The following research questions guided:

1. What are the keyboarding skills acquisition of male and female business studies students for self-reliance in government junior secondary schools in Niger State?
2. What are the computer skills acquisition of male and female students' business studies students for self-reliance in government junior secondary schools in Niger State?

2.2. Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

H_{01}: There is no significant difference in mean response of male and female business studies students on the keyboarding skills acquisition for self-reliance in government junior secondary schools in Niger State.

H_{02}: There is no significant difference in the mean response of male and female students on the computer skills acquisition for self-reliance in government junior secondary schools in Niger State.

3. Employability Skills

The terminology used to refer to employability skills is overflowing. According to Yorke (2018), employability is seen as generic, transferable, intellectual, cognitive and interpersonal skills. Employability denotes to an individual's ability to obtain a job, retain suitable employment, and man oeuvre within the labour market to realize his or her potential through sustainable employment (Brown, Hesketh, & Williams, 2003). Clarke (2008) employability as "the minimum generic skills or competencies needed by school leavers and graduates to enter the labour market". At an individual level, Clarke (2008)

defines employability as "the skills, abilities, attitudes, and behaviours, as a current state, a process of a future outcome, an individual characteristic made up of the sum of an individual's job related skills, or as a reflection of the individual's position within the labour market". Nilsson (2010) remarks, that for graduates, employability is associated with the ability to find a job and to be employed. Moreau and Leathwood (2016) employability "Employability Skills Development skills" such as understanding concepts and personal attributes that make graduates preferred and successful in their careers, along with the ability to benefit the workforce, community and economy in which they serve. Employability has different meanings depending on the context of the jobs researchers refer to. However, there are several general similarities and common criteria. Based on this literature review, the definition of employability can be summarized as "an individual's ability to find a job that is appropriate with his/her qualifications, remain relevant in the labour market, and the ability to make a transition between his/her job within the same organization or his/her ability to find a new job within the independent labour market". The literature suggests two types of employability skills: subject-specific skills and non-subject specific skills (Yorke, 2018). A subject-specific skill refers to specific skills or knowledge required to perform a specific job (i.e., doctor, lawyer, accountant, etc.), while non-subject specific skills are non-technical skills and knowledge. Cox and King (2006) contend that the concept of employability has two aspects, namely, subject skills and transferable skills. Transferable skills refer to knowledge, skills, abilities and personal characteristics that can be transferred or used within any profession and at any stage of a career, while subject skills are relevant only to a single profession. Dench (1997) extends the concept of employability skills to include personal attributes, namely, honesty, reliability and integrity. According to Clarke (2008), organisations that are able to hire employees with highly developed soft skills are able to compete more successfully than employers who focus on the retention of employees with only subject-specific skills. Hii (2017) states that a study of Fortune 500 chief executive officers (CEO) found that 75% of long-term business success depends on soft skills, and only 25% depends on technical skills. Therefore, the development and assessment of the soft skills of graduates is essential for ensuring a successful transition from the university setting to the employment market. According to Nilsson (2010), the key components of employability include "formal competence, social contacts and networks, literacy, and oral and written communication skills".

4. THEORETICAL FRAMEWORK

Self-determination theory is a metatheory of human motivation and personality development (Ryan & Deci, 2000). It is regarded as a metatheory in that it is composed of various "mini-theories" that come together to provide a thorough explanation of human motivation and behavior. Self-determination is founded on the fundamental humanistic tenet that people naturally and consciously direct their energies toward self-organization and growth. In other words, by integrating new experiences, cultivating their wants, desires, and interests, and interacting with others and the outside world, people seek to broaden and understand themselves. Self-determination, however, also contends that this tendency toward natural progress should not be taken for granted and that individuals might become manipulated, dispersed, and alienated if their fundamental psychological requirements for autonomy, competence, and connectedness are not met by an adequate

social context. Self-determination is based on the idea that an individual is constantly engaged in a dynamic engagement with the social world, simultaneously working to satisfy needs and reacting to environmental factors that either support or obstruct needs. People either become interested, curious, connected, and whole as a result of this person-environment interaction, or they become demotivated, ineffectual, and alienated.

The basic components of Self-determination – namely, its six mini-theories – combine to provide an account of human behavior across life domains, including work (Fernet, 2013), relationships (La Guardia & Patrick, 2008), education (Reeve & Lee, 2014), religion (Soenens et al., 2016), health (Russell & Bray, 2016), sports (Pelletier et al., 2017), and even stereotyping and prejudice (Legault et al., 2017). At the heart of each mini- theory is the idea of basic psychological needs; all individuals strive for and need autonomy (the need to feel free and self-directed), competence (the need to feel effective), and relatedness (the need to connect closely with others) in order to flourish and grow. The first mini-theory, cognitive evaluation theory, centers on the factors that shape intrinsic motivation by affecting perceived autonomy and competence. All people strive for and require autonomy (the desire to feel free and self-directed), competence (the need to feel effective), and relatedness (the need to connect deeply with others) in order to develop and grow. This principle lies at the core of each mini-theory. The second mini-theory, known as organismic integration theory, talks about how extrinsic motivation might be internalized. The causal orientations theory explains personality traits, such as whether people are typically impersonal, autonomous, or under control. The significance of fundamental psychological needs in health and well-being is covered in the fourth mini-theory, "Basic Psychological Need Theory", which also, crucially, describes how social settings can ignore, impede, or meet people's basic psychological needs. The goal content theory looks at how both intrinsic and extrinsic objectives affect one's health and well-being. Last but not least, connection motivation theory emphasizes the necessity of forming and maintaining intimate bonds and explains how the best bonds are those that enable people to meet their fundamental psychological requirements for autonomy, competence, and relatedness.

4.1. Motivation Theory

The additional of motivation theory for our study because of its application to interactive simulations which is one of the graduates' attributes factors of the study. According to Mincer (1962), there are two types of motivation related to interactive simulation. Extrinsic motivation and intrinsic motivation. The later one applies to our study. It is described as the type of activity or behaviour which the student engaged with to reach the required accomplishment (Mincer, 1962). Therefore, intrinsic motivation encourages learning and accomplishment as the students involve themselves in interactive educational simulations activities. Adult adapt motivational learning transitions (Kalfa, & Taksa, 2015). Other studies of interactive simulations found them to provide cognitive and essential skills, besides the motivational benefits due to the simulation activities (Boyd, 2017; Tennyson & Jorczak, 2018). Another important finding is noted by Moore and Morton (2017). He expressed that motivation is accomplished when students successfully reached the objectives of the current learning goal and are motivated to select and engage into additional learning activities. Therefore, correctly created interactive simulations activities are created to motivate students to progress and set new objectives or learning outcomes as they engage through the simulation procedures (Moore & Morton, 2017).

5. METHODOLOGY

A survey research design was used for the study. The area of this study consists of one government junior secondary schools from each local government in the state which comprise of twenty-five local government. The population is two thousand two hundred and fifty (2250) JSS III business studies students, in the twenty-five local government area of Niger State for the 2021/2022 academic session. A random sampling technique was used and the sample size for the study was two hundred and ten (210). A 4-point Likert scale used for the study as "Strongly Agree" (SA) = 5 points, "Agree" (A) = 4 points, "Neither Agree or Disagree" (NAD) = 3 points, "Disagree" (D) = 2 points and "Strongly Disagree" (SD) = 1 and the questionnaire was tagged as "Business Studies Skill Acquisition Questionnaire (BSSAQ)" containing twenty (20) statement items were used to collect data. The instrument was subjected to validation by two research experts from Business Education Unit, Faculty of Education, Al-Hikmah University, Ilorin, their suggestions and corrections were used to arrive at the final draft of the measuring instrument. To obtain the reliability coefficient of the measuring instrument, the instrument was pilot tested using some fifteen (15) selected junior secondary schools in ilrorin. From each of this selected junior secondary schools, two (2) business studies students each were selected from each school making up of thirty (30) participants. The result obtained from the pilot study were then analyzed using Cranach alpha reliability coefficient statistical and the reliability index obtained was 0.88. The data collected on the twenty (20) statement items of the questionnaire were analyzed using mean and standard deviation to answer the research questions, where any mean that is equal to or greater than 2.50 was accepted and any mean scores less than 2.50 was rejected. More also, t-test was used to test the null hypotheses formulated for the study, and where if the t-critical is greater than or equal to the t-calculated, the null hypothesis was accepted, and if otherwise, the null hypothesis is rejected.

6. RESULTS

A survey research design was used for the study. The area of this study consists of one government junior secondary schools from each local government in the state which comprise of twenty-five local government. The population is two thousand two hundred and fifty (2250) JSS III business studies students, in the twenty-five local government area of Niger State for the 2021/2022 academic session. A random sampling technique

6.1. Research Question One

What are the keyboarding skills acquisition of male and female business studies students for self-reliance in government junior secondary schools in Niger State?

The information in Table 1 shows that all the statement items have mean scores above 3.70. The response shows that Business Studies has to a great extent influenced students' acquisition of keyboarding skills for self-reliance in government junior secondary schools in Niger state.

Table 1 Response mean and standard deviation on male and female Business Studies students on the acquisition of keyboarding skills for self-reliance

S/N	Statement items	Mean	SD	Remark
1.	Keyboarding speed and accuracy is measured through Business studies	3.86	0.96	Agree
2.	Correct keyboarding is all about the enhancement of skills	4.06	0.84	Agree
3.	Business studies equip its graduates with skills for managing a Business Centers	3.66	0.66	Agree
4.	Business studies provide students with basic skills in keyboarding for entry into the world of work	3.89	0.79	Agree
5.	A good typing skill where letters are professionally typed without errors is a potential hot cake for entry into the world of work.	3.56	0.62	Agree
6.	Keyboarding skill enhances efficiency between school and Job performance.	3.78	0.98	Agree
7.	Students hired in Business Centers and Cyber Cafés update their knowledge and competencies	3.00	0.89	Agree
8.	Keyboarding skill acquired by Business studies graduate is able to establish a business center	3.65	0.65	Agree
9.	Correct keyboarding is all about the enhancement of skills in and outside the classroom.	3.99	0.66	Agree
10.	Keyboarding is a skill that improves only with practice	3.62	0.79	Agree
	Grand Mean	3.71	0.78	Agree

Source: Field Study 2021

6.2. Research Question Two

What are the computer skills acquisition of male and female students' business studies students for self-reliance in government junior secondary schools in Niger State?

Table 2 Response mean and standard deviation of influence of male and female business studies students on acquiring computer skills for self-reliance

S/N	Statement items	Mean	SD	Remark
1.	Business studies students' competence in fixing computer faults has an effect on self-reliance in computer data processing.	3.82	0.96	Agree
2.	Business studies students' acquisition of computer troubleshooting skills	3.79	0.84	Agree
3.	Business studies equip its graduates with skills for managing a Business Centers	3.86	0.66	Agree
4	Business studies programs afford students the opportunity to acquire competence in computer	3.90	0.79	Agree
5.	Business studies students learn about Windows, Software, and Hardware components of a computer system.	3.77	0.62	Agree
6.	Business studies students' acquisition of computing skills and their application makes the computer system trouble-free.	3.96	0.98	Agree
7.	Business studies troubleshooting is an integral necessity in the use of computer systems, which has made it a unique skill	3.88	0.89	Agree
8.	Business Studies program enables students to know about several possible causes of a network error in computing	3.79	0.62	Agree
9	Business studies students learn computer troubleshooting skill is a mixture of standard Procedure and personal creativity	3.90	0.68	Agree
10.	Business studies students learn to send and receive mail via computer	3.99	0.72	Agree
	Grand Mean	3.87	0.78	Agree

Source: Field Study 2021

The information in Table 2, it shows that all the statement items have mean scores above 3.87. The response shows that computer skills influence business studies students on acquiring skills for self-reliance in government junior secondary schools in Niger State.

Table 3 t-test statistics on Business Studies on students' acquisition of keyboarding skills for self-reliance

Students	N	Mean	SD	t-cal	t-crit	df	Sig
Male	425	3.71	1.45	1.88	1.96	623	.619
Female	200	3.23	1.65				

Source: Field Study 2021

From the t-test in Table 3, the t-calculated value is 3.88 while the t-critical value is 1.966 at 0.05 level of significance and 623 degrees of freedom. This means that there is a significant difference in the opinion of respondents on the extent to which Business Studies students' acquisition of keyboarding skills for self-reliance in government junior secondary schools in Niger State. Since the t-calculated value is more than the t-critical value the null hypothesis is therefore accepted.

Table 4 t-test statistic on male and female students on the influence of Business Studies on students acquiring of computer skills for self-reliance

Students	N	Mean	SD	t-cal	t-crit	df	Sig
Male	425	3.75	1.09	1.88	1.96	623	.619
Female	200	3.74	1.38				

Source: Field Study 2021

The result presented in Table 4 shows that the t-calculated value of 1.88 is less than 1.96 t-critical value at 0.05 level of significance and 623 degrees of freedom. This indicated that there is no significant difference in the mean rating of male and female students on the of Business Studies students on acquiring of computer skills for self-reliance in government junior secondary schools in Niger state. Since the t-calculated value is less than the t-critical value, the null hypothesis is therefore accepted.

7. DISCUSSION

The study's conclusions addressing the first research question suggested that junior secondary students in government schools in Niger State studying business should focus on developing keyboarding skills for independence. This is consistent with Umo's (2015) research, which recommended that junior secondary schools in Niger State focus their business studies instruction on producing high-caliber students. The development of skills both within and outside the classroom is the key to proper keyboarding. The knowledge and abilities gained from typing on a typewriter were transferred to computer keyboarding. The first null hypothesis demonstrated that there is a substantial difference in respondents' perceptions of how business studies affect students' development of keyboarding abilities for independence in government junior secondary schools in Niger State. According to the results of the second study question, both male and female business studies students in government junior secondary schools in Niger State had an impact on their ability to develop computer skills for independence. This is in line with Yakubu's (2016) opinion,

according to which word-processing and computer abilities are necessary for all business studies students and secretaries most crucially since computer skills have made all functions and secretarial chores simpler through automation. There are word processing features on every computer. The null hypothesis further demonstrated that business studies have no appreciable influence on students' acquisition of independent computer abilities. Because shorthand is beneficial in practically all professions and has the potential to create young entrepreneurs in many areas of business for independence, effective shorthand students have a better future ahead of them.

8. CONCLUSION

According to the study's findings, fields or areas of education that give students the tools they need to support themselves are essential for the growth and development of a growing country like Nigeria. The study came to the additional conclusion that business studies can give students the computer and keyboarding abilities they need to be independent. Therefore, the purpose of such education is to either find gainful job to ensure the survival of oneself and one's family or to become an entrepreneur who can also hire labor. The advantages of these two options are available to participants in the Business Studies skill acquisition program. For the purpose of empowering families, they are free to start any kind of business. This translates to self-reliance through self-employment and relieves the government of a significant amount of the burden associated with unemployment.

Based on the study's findings, the following suggestions have been made:

1. Business Studies curriculum material has to be taught correctly to promote skill acquisition in junior schools in Niger State.
2. To improve computer skill acquisition, junior secondary business studies and vocational training should be supported with adequate funds and cutting-edge equipment.
3. How accurate should the Business Studies curriculum content be presented to students in order to help them reach their goals? Acquiring shorthand proficiency for independence in junior secondary schools in Niger State.

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PROCENA POTREBA ZA STICANJE VEŠTINA ZAPOŠLJAVANJA I SAMOPOUZDANJA U OKVIRU POSLOVNIH STUDIJA MEĐU UČENICIMA DRŽAVNIH SREDNJIH ŠKOLA U NIGERIJI

Studija je sprovedena sa ciljem da se proceni potreba za sticanjem veština zapošljivosti i samopouzdanja u okviru poslovnih studija među učenicima državnih nižih srednjih škola u Nigeriji. Postavljena su dva istraživačka zadatka. U skladu sa tim, formulisane su i dve hipoteze koje su testirane na nivou značajnosti 0.05. Oblast ove studije predstavljala je po jedna državna niža srednja škola iz svake lokalne samouprave u državi koju čini dvadeset pet lokalnih samouprava. Korišćena je tehnika slučajnog uzorkovanja, a istraživanje je sprovedeno na uzorku od dvesta deset učenika. Za prikupljanje podataka korišćena je petostepena Likertova skala, a upitnik, koji je označen kao „Upitnik za sticanje veština iz poslovnih studija (BSSAK)" je sadržao 20 stavki. U cilju dobijanja koeficijenta pouzdanosti mernog instrumenta, izvršeno je pilot testiranje instrumenta u 15 odabranih nižih srednjih škola u Ilorinu, Nigerija. Rezultati dobijeni iz pilot studije su zatim analizirani korišćenjem statističkog koeficijenta pouzdanosti Cranach alfa, a dobijeni indeks pouzdanosti iznosio je 0.88. Podaci prikupljeni na dvadeset (20) stavki upitnika analizirani su korišćenjem srednje vrednosti i standardne devijacije, a korišćen je i t-test za testiranje formulisnih hipoteza. Dobijeni rezultati ukazuju na to da postoji značajna razlika u potrebi sticanja veština za zapošljivost i samopouzdanje u državnim nižim srednjim školama u Nigeriji. S obzirom na dobijene rezultate, preporuka je da se u nižim srednjim školama sadržaji poslovnih studija dobro podučavaju, kako bi se podstaklo sticanje veština zapošljivosti među učenicima nižih srednjih škola u Nigeriji. Takođe, zaključeno je da je potrebno podsticati poslovne studije na državnom nižem srednjem nivou kroz odgovarajuće finansiranje i obezbeđivanje opreme za bolje sticanje računarskih veština.

Ključne reči: *sticanje veština, samopouzdanje, poslovne studije, zapošljivost*

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Original research paper

SERBIAN AND ENGLISH BACHELOR STUDENTS' ATTITUDES TOWARDS ONLINE TEACHING: FUTURE TEACHERS' PERSPECTIVE

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Abstract. *This research investigates the attitudes of future teachers of Serbian as the mother tongue and English as a foreign language (EFL) regarding online teaching during the coronavirus pandemic. Although teaching has continued in virtual classrooms, university teachers have encountered numerous challenges related to teaching the invisible generations: motivation, interaction, and the role of students in online classes, as well as the functionality of methods, techniques, and online tools. The conducted research shows that future teachers of Serbian as the mother tongue and future EFL teachers perceive online teaching as an alternative or a supplement to traditional teaching applied in specific social circumstances. During the period of a year and a half, their attitudes towards online teaching have changed, ranging from acceptance to indecisiveness, and including an inclination to return to traditional classrooms. It should be stated that the bachelor students studying Serbian accepted this way of teaching to a higher degree than the EFL bachelor students. A statistically significant difference is evident in the respondents' replies with respect to their field of study, but not with respect to the respondents' gender or the current year of study.*

Key words: *online teaching, Serbian as the mother tongue, EFL, students' attitudes*

1. INTRODUCTION

The historical development of education so far has shown that changes in the teaching process have always been in compliance with the objective circumstances of a society. Sometimes these changes were slow, and sometimes relatively rapid, which was directly determined by the needs and goals of the educational system. Rapid changes often occurred at

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regular intervals, such as one month, three months, six months, twelve months, etc. These changes were usually visible only to experts in pedagogical, didactic and methodological fields, and they involved conducting detailed preparations and following pre-established procedures. In recent times, most changes have been caused by the implementation of modern information and communication technologies, which are recognized as an opportunity to modernize teaching and adapt it to the current moment in civilization development. The coronavirus pandemic has significantly changed the manner of teaching and learning across the entire world – traditional classroom lessons have been substituted with online teaching overnight. With the purpose of contributing to the global prevention of coronavirus transmission, all institutions of education, including universities, have adopted this (modern) mode of teaching (Ali, 2020), which has in turn altered teachers' and students' perception of online teaching. Online teaching was defined as conventional learning in a novel (virtual) environment at the end of the twentieth century (Mioduser et al., 1999; Dehoney & Reeves, 1999). However, today it implies not only the use of the internet, but also the application of advanced information and communication technology (ICT) to adapt teaching materials and methods to each individual student, the simultaneous participation of a large number of students, the efficient use of the allotted time (Suresh et al., 2018; Kim, 2020), asynchronous and synchronous communication through e-mails, forums, audio and video conferences (Anwar & Adnan, 2020; Kim, 2020), as well as the use of electronic interactive platforms and tools for creating a virtual learning environment (Novaković & Božić, 2020; Nash, 2020; Novaković, 2021). The main components that determine the character of online teaching are the following: 1) content (goals); 2) tools and resources; 3) particular tasks; and 4) the interconnectedness and reciprocal influence of the aforementioned elements (Rapanta et al., 2020).

The sudden switch to online teaching has created completely new conditions at universities and led to a change in the way university teachers work, bearing in mind their important role in the development and stability of society (Kulikowski, 2021). Although teaching has continued almost unimpeded by the Covid-19 pandemic, since it has shifted to virtual classrooms and internet platforms, university teachers have encountered various challenges, the most important being low student attendance and interaction with teachers and colleagues online (Coman et al., 2020). This same challenge has been noticed at the Department of Serbian Language and the Department of English Language and Literature at the Faculty of Philosophy in Niš. Namely, the university teachers have been experiencing the same problems daily: students' low motivation, their reluctance to participate actively in online classes and restrictions in testing students' understanding of the acquired knowledge. What is questioned is whether the students attend lectures as active participants or as merely passive visitors without being motivated to join in. This is the crucial issue this paper aims to resolve. The established research problem involved interconnected questions related to the quality of online teaching: 1) How to motivate students to be more active in class? 2) How to test students' active listening and understanding in class? 3) How large of an impact do the integrated functions of virtual classrooms (class recording, digital whiteboard, breakout rooms, etc.) have on students' behaviour and active participation?

The paper is composed of five sections. After introductory considerations, an overview of the previous research on the issue of students' attitudes towards online teaching in the time of the pandemic is given. The research methodology is explained in detail in the third section, while the obtained results are analysed quantitatively in the fourth section. The fifth section presents the most important conclusions and recommendations for improving online teaching.

2. PREVIOUS RESEARCH

Virtual or online teaching, which is considered to be the main mode of teaching today due to the coronavirus pandemic, has posed numerous challenges and opened many questions of technological, pedagogical and social nature (Ferri et al., 2020). These include the functionality of electronic interactive platforms and integrated tools, decreased interaction between teachers and students (Yusuf & Al-Banawi, 2013; Sintema, 2021), insufficient experience in online teaching (Hasan & Han, 2020), long hours in front of the computer, internet access, requirement of a reliable computer (Lockee, 2021), economic and social issues related to student life, insufficient social contact with peers and insufficient knowledge necessary for virtual learning (Colman et al., 2020). Both teachers and students have been forced to adapt to the new conditions (Lassoued et al., 2020; Peters et al., 2020). Teachers have started designing and teaching online courses, no matter if they supported computer-assisted teaching and learning before the virus outbreak or opposed it bitterly. Teachers with some previous knowledge, i.e., with digital competences, have coped with the new situation more easily than teachers belonging to the so-called digital immigrants (Prensky, 2001), who were never willing to accept computer-assisted teaching and learning as effective, believing that better instruction could not be achieved by the use of the modern ICT (Novaković, 2021). Despite belonging to the generation of digital natives, students themselves have had difficulties in transitioning from conventional learning to online learning (Coman et al., 2020). The rapid transformation of online teaching from an alternative mode of teaching into the main one has forced educational institutions to provide training for their teaching staff to help them acquire skills and competences necessary for designing teaching curricula for online learning and teaching. Moreover, numerous scholars and educators have secured further assistance from diverse teachers' associations on social networks in publicly distributing large amounts of information related to the organisation of online teaching and the use of online tools and teaching material. These resources provide additional support to teachers when adapting to a new manner of teaching, learning, and developing digital competences in the online environment (Maksimović & Dinić, 2016).

Although online learning has been already implemented into the curricula of almost all educational institutions, it should be emphasised that a single unique pedagogical approach to this manner of instruction does not exist (Pokrel & Chhetri, 2021). A large number of education levels and academic courses requires the application of various teaching methods (Doucet et al, 2020). Numerous investigations have found a positive impact of online learning on the quality of teaching and on academic achievement (Baby & Sridevi, 2018; Lapitan et al., 2020). However, certain studies have shown that online learning does not actually contribute to the same or better academic results in comparison to conventional classroom teaching and learning (Galy et al., 2011; Thomas & Rogers, 2020; Omodan, 2020; Hodges et al., 2020; Kulikowski, 2021), particularly due to reduced motivation and interaction, as well as increased frustration during online classes (Dhull & Sakshi, 2017; Yusuf & Ahmad, 2020). Certain authors frequently discuss the issue of either increased or decreased motivation in both teachers and students during the Covid-19 pandemic (Alawlameh et al., 2020; Mishra et al., 2020; Bojović et al., 2020) whereas others emphasise the difficulty in establishing adequate student interaction in classes (Kulikowski, 2021). Academic achievement has always depended on the relationship between teachers and their students (Zhou et al., 2018; Yao et al., 2020). The abrupt switch in the manner of teaching has imposed large changes on university teachers, who

have a significant influence on social progress and stability (Kulikowski, 2021). Therefore, this paper examines students' attitudes regarding motivation and the quality of interaction in university teaching at the Department of Serbian Language and the Department of English Language and Literature, Faculty of Philosophy, University of Niš (the Republic of Serbia) with the purpose of determining if there is a statistically significant difference in the responses of future teachers of Serbian as the mother tongue and future EFL teachers.

3. RESEARCH METHODOLOGY

3.1. Research aims and objectives

This paper examines the attitudes of bachelor students of Serbian language and bachelor EFL students in order to analyse online university teaching from the perspective of future teachers. Assuming that online teaching will have become the basic mode of teaching and instruction by 2025 (Shailendra et al., 2018), it is essential to resolve the aforementioned questions and offer viable solutions to university teachers at philological departments whose students demonstrate low motivation for active involvement in online classes. Therefore, this paper examines students' attitudes on the issues of motivation and quality of interaction in their Serbian and English studies at the Faculty of Philosophy, University of Niš (the Republic of Serbia), in order to determine whether there are statistically significant differences between the attitudes of these two groups of future teachers.

3.2. Research tasks

The established aims and objectives determined the following research tasks:

1) To examine the students' attitudes towards the quality of interaction in online classes,
2) To examine the students' motivation for active participation in classes,
3) To examine the students' attitudes towards the integrated functions of virtual classrooms (the quality of audio and video connection, class recording, digital whiteboard, breakout rooms, etc.) and their impact on the students' willingness to be active participants in classes,
4) To determine a possible statistically significant difference in the responses provided by the two groups of future teachers regarding online teaching.

To determine a potential statistically significant difference in the respondents' answers considering the year of study and gender.

3.3. Research methods, techniques, instruments and sample

The paper was based on the theoretical analysis method and the content analysis technique. The method used in the empirical part of the paper was the descriptive method together with the survey and scaling techniques. Detailed qualitative and quantitative empirical investigations were conducted with the purpose of examining the students' attitudes towards their motivation for active involvement in online teaching.

A questionnaire with an assessment scale (abr. QASOT – questionnaire, assessment scale, online teaching) was constructed for the purposes of this research. The instrument

was divided into three parts. The first part contained a questionnaire related to the basic social and demographic facts about the respondents – the study programme, the year of study and gender. The second part of the instrument contained a questionnaire comprising seven open-ended questions that examined interaction in online classes during the Covid-19 pandemic. The third part of the instrument was the Likert-type scale with twelve items (1 – strongly agree, 5 – strongly disagree), which was used to examine the level of motivation of the future teachers of Serbian and the future EFL teachers for online university teaching. The students expressed their opinions regarding the aforementioned issues by selecting a statement of their own choice. In order to determine if there was a statistically significant difference in the respondents' statements considering the independent research variables, the following parameters were taken into consideration: frequency (f), percentage (%), arithmetic mean (M), standard deviation (sd), parametric statistics (t-test and F-test). The obtained data were analysed by SPSS 21.0 and they were described, explained and presented in tables and graphs.

3.4. Data collection

The empirical research was conducted from May 20th to May 25th, 2021. The data were collected online. The Google questionnaire was emailed to the respondents. The time set for the responses was twenty minutes. The permission for conducting this research was obtained from the Ethical Committee of the Faculty of Philosophy, University of Niš. The sample consisted of ninety-seven students (eighteen males and seventy-nine females). Forty-six respondents were bachelor students of the Department of Serbian Language and fifty-one of them were bachelor students of the Department of English Language and Literature at the Faculty of Philosophy, University of Niš. The respondents had been attending university lectures online by means of the Google Meet virtual classroom since the virus outbreak. Also, the respondents were bachelor students of all four years of study (Table 1).

Table 1 Number of respondents

Bachelor Studies, Serbian Department				Bachelor Studies, English Department			
Year I	Year II	Year III	Year IV	Year I	Year II	Year III	Year IV
8	10	14	14	22	13	7	9

4. Analysis of Results and Discussion

Analysis of the obtained results shows that the future Serbian and EFL teachers perceive online teaching as an alternative to conventional teaching and not as its replacement, which is the reason why they experienced it merely as a "temporary mode of teaching". Even though students stated that they were eager to start attending online classes, what they actually faced was "the other side of the coin".[1] The following are the obstacles that influenced the majority of the respondents to change their opinions related to online teaching:

[1] The response of one student is particularly worth mentioning. Namely, this student stated that online teaching did not live up to his expectations upon enrolling in the bachelor studies.

1) inability to stay focused during online lectures (“Our focus lasts as long as an average YouTube video”);
2) exhaustion owing to sitting (or lying) for long hours (“We feel exhausted, and it seems like days have no end in sight”);
3) limited social interaction (“I can’t remember the last time I talked to my colleagues about important life issues”);
4) anxiety followed by a lack of motivation (“As time goes on, I feel more and more scared, and worried about my health and my results at the Faculty”);
5) technical problems occurring despite advanced digital equipment (“It is really frustrating sometimes that despite the latest technology, I have a problem establishing a normal relationship with my colleagues and professors”);
6) excessive workload (“You can't imagine how much material I get from my professors. And I attend six courses”);
7) insufficient time for revising content due to a tight schedule (“The online environment has influenced an increase in the dynamics with which we get acquainted with the content”);
8) lack of “face-to-face communication involving physical contact” (“Online teaching introduces avatars instead of people”);
9) lack of teacher-student and student-student interaction (“I still haven't gotten to know my colleagues”);
10) monotony and routine settling in (“Each class is like the previous one”).

The most striking were the responses provided by a number of the students who stated that online university lectures represented “an obnoxious substitute for real (mode of) studying”, “reflection of cruel reality”, “foolishness” and “an enforced mode of teaching” or “force majeure” that entailed taking exams and midterm tests in “inhuman conditions” and with “poor results”. In other words, after a year and a half of attending online classes, students began to experience them as a “video tutorial on YouTube”, losing the “feeling of studying” and “spiritual closeness with peers.” Six EFL students and two Serbian students emphasised their distress related to their future teaching profession because of the disturbed social interaction in online learning and teaching. Contrary to this, some students considered online teaching to be a “new experience” with a number of advantages, such as no additional living costs (paying rent and bills, as well as necessary textbooks), absence of peer pressure in the classroom and unlimited access to all teaching materials on various collaboration platforms. The last of the mentioned advantages influenced the responses of twenty-five students who regarded virtual teaching as a supplement to traditional teaching. Students with disabilities saw online teaching as an ideal means of overcoming their everyday difficulties related to coming to the faculty, whereas students who had to retake the courses they had failed described virtual teaching as an opportunity to continue their studies along with their other engagements (mostly family obligations).

The quality of interaction with university teachers, teaching associates and colleagues was described as rather poor by sixty-one respondents, who stated that online teaching impaired interaction since it was “strictly formal”, “restricted” and “enforced”. Moreover, the respondents carefully observed their teachers’ performance and differentiated between those who stimulated interaction in the virtual environment and those who did not make that effort. The students highlighted the following techniques for stimulating interaction in online classes:

1) attendance tracking (random or respecting the official list of students enrolled in the course);
2) posing (interesting) sub-questions;
3) presentation of students' term papers and homework;
4) bonus points for prerequisite activities;
5) practical assignments in classes.

As many as 80% of the respondents believed that various (and practical) tasks and activities would be essential for better interaction in online classes, while a negligibly small number of students regarded online PowerPoint presentations as efficient as those presented in a traditional classroom environment. One point appears to be particularly worth noticing. Namely, not one student mentioned the use of online teaching resources and modern multimedia teaching tools, which was a paradox since these means are expected in online teaching. The students recognised the interaction with their colleagues as an important segment of virtual teaching, emphasising that it was considerably limited to merely texting one another, which made them "feel very bad" and hope that "they would soon go back to lecture halls".

The quantitative analysis yielded a range of versatile responses provided by the future teachers regarding their attitudes towards online university teaching. The minimum and maximum numbers of the respondents' answers prove that their attitudes ranged from agreeing to disagreeing (Table 2).

Table 2 Descriptive statistics of the respondents' answers

	N	Minimum	Maximum	Mean (M)	Std. Dev. (SD)
I attend online classes regularly.	97	1.00	5.00	4.2474	1.07074
Online teaching is easier to follow than traditional classroom teaching.	97	1.00	5.00	2.6598	1.35313
I participate actively in online classes.	97	1.00	5.00	3.6598	1.26562
The teacher wants to hear my opinion in class.	97	1.00	5.00	3.5258	1.17343
I am given the opportunity to ask the teacher to explain something that I do not understand.	97	1.00	5.00	4.4124	1.03835
I understand the materials covered in online classes.	97	1.00	5.00	4.0722	1.03327
The teacher adapts teaching methods to the virtual environment.	97	1.00	5.00	4.2165	1.00236
I frequently turn on my microphone whenever I want to state my opinion or answer a question.	97	1.00	5.00	3.4742	1.37001
Turning on the microphone requires turning on the webcam.	97	1.00	5.00	1.4021	.70208
I prefer in-call messages to using the microphone.	97	1.00	5.00	3.2062	1.33805
The teacher uses breakout rooms to organise teaching in groups.	97	1.00	5.00	2.4536	1.45072
Digital whiteboard is more functional than the traditional classroom blackboard.	97	1.00	5.00	2.4021	1.26376
Total	97				

The results of the quantitative research showed that the bachelor students of both departments attended online classes regularly (M = 4.24). Yet, their responses related to the statement that attending online classes was easier than attending traditional classes ranged from disagreement to indecisiveness (M = 2.66), which indicates that the future teachers made a distinction between these two modes of teaching, endorsing the traditional one. Several studies conducted in the last fifteen years have proved that there are no significant differences between online teaching and conventional teaching in regards to efficiency (Schoenfeld-Tacher et al., 2001; Bernard et al., 2004; Tallent-Runnels et al., 2006; Driscoll et al., 2012). However, the students' opinions about their own participation and engagement in online classes ranged from indecisiveness to agreement (M = 3.66). The identical results were obtained by Conan et al. (2020). This finding indicates that not all students are prepared to participate actively in online classes. Students' participation partly depends on teachers' willingness to offer them the right opportunity, which is one of the crucial tasks that a teacher has in the virtual environment (Yengin et al., 2010; Rapanta et al., 2020). The students' responses related to this issue ranged from indecisiveness to agreement (M = 3.53). The students, though, strongly agreed with the statement that their teachers provided enough time for their questions (M = 4.41), as well as with the statement that their teachers adapted the teaching methods to the virtual environment (M = 4.22), which enabled them to understand the materials covered in online classes (M = 4.07).

In regards to the use of the microphone to engage in class discussions, the students' attitudes ranged from indecisiveness to agreement (M = 3.47). Contrary to this, the students strongly disagreed with the statement that turning on the microphone required turning on the webcam. This global phenomenon of the invisible presence might be explained by various reasons of social, psychological or personal nature. Studying the problem of the invisible generations, Gherhes et al. emphasise that this kind of student behaviour could be caused by anxiety, diffidence, securing privacy and personal space or the possibility of another person entering the student's room. (Gherhes et al., 2021). Bedenlier et al. assume that this behaviour is caused by the desire to retain the homogenous group (Bedenlier et al., 2020). Although the students stated in the open-ended questions that they preferred writing in-call messages to speaking using the microphone, the quantitative results showed fluctuations in their responses related to the use of these two integrated functions of virtual classrooms and online teaching platforms (M = 3.21), where in-call texting is characteristic of asynchronous (and not synchronous) communication (Fedynich, 2013). Also, the students disagreed with the use of breakout rooms (M = 2.45), whose functionality in teaching was analysed by Saltz and Heckman (2020), as well as with the statement that the digital whiteboard was more functional than the traditional blackboard (M = 2.40).

The attitudes towards online university teaching expressed by the bachelor students of Serbian and by the bachelor EFL students were analysed with the purpose of detecting statistically significant differences. All the items on the assessment scale were grouped into the dependent variable called "online teaching", where the students' general responses were examined regarding the study programme, gender and year of study.

Table 3 Differences in the participants' responses based on their study programme

	Study programme	N	Mean (M)	Standard Deviation (SD)	t-test	Degree of freedom (df)	Significance
Online teaching	Department of the English Language and Literature	51	38.0588	8.98980	-2.47	75.73	0.02
	Department of the Serbian Language	46	41.5870	4.55864			

A statistically significant difference in the participants' responses about online teaching depending on their study programme was identified by means of the t-test ($p < 0.05$; $p = 0.02$). The research results show that the future teachers of Serbian as the mother tongue ($M = 41.59$) valued online teaching more than the future EFL teachers ($M = 38.06$). Actually, teaching methods and instruction modes practiced at these two departments (Department of Serbian Language, educating teachers of Serbian as the mother tongue, and Department of English Language and Literature, educating teachers of English as a foreign language) differ considerably, which is the reason why the EFL students presumed that online teaching did not supply university teachers with the appropriate tools necessary to apply the traditional classroom model in the virtual environment.

However, the respondents' statements did not differ significantly with respect to gender, although female students valued online teaching more highly than their male counterparts (Table 4), which is also confirmed by the results of the research conducted by Cuadrado-Garcia et al. 2010.

Table 4 Differences in the participants' responses based on their gender

	Gender	N	Mean (M)	Std. Deviation (SD)	t-test	Degree of freedom (df)	Significance
Online teaching	Males	18	36.5556	10.86940	-1.47	19.63	0.16
	Females	79	40.4557	6.24869			

The ANOVA test was used to examine whether there was a statistically significant difference in the future teachers' responses with respect to the year of study (Table 5).

Table 5 Differences in the participants' responses based on the year of study

	N	Mean (M)	Standard Deviation (SD)	F-test	Degree of freedom (df)	Significance
First year	30	38.8333	6.30863			
Second year	23	38.9130	10.07658			
Third year	21	42.5714	4.85357	1.33	3	0.27
Fourth year	23	39.1304	7.38736			
Total	97	39.7320	7.41411			

The results showed that there was no statistically significant difference in the respondents' answers with respect to the year of study ($p>0.05$; $p=0.27$). It is worth

mentioning that the students of the third and fourth years of study were more appreciative of online teaching than their first- and second-year colleagues. The reason is obvious: the latter have never even entered the faculty building since the day they enrolled in their bachelor studies, nor have they attended a single in-person lecture. On the other hand, the students of the third and fourth years have already had this experience (still vivid in their memory), which influenced their appreciation of virtual teaching.

5. CONCLUSION

Teachers all over the world have encountered numerous challenges related to online teaching which requires systematic and continuous research with the purpose of improving teaching and its efficiency, as well as students' academic achievement. The conducted research shows the attitudes towards virtual teaching from the perspective of future teachers of Serbian as the mother tongue and future EFL teachers. The obtained results showed that the respondents perceived online teaching as an alternative or a supplement to traditional teaching, indispensable in the specific social circumstances ("Online teaching is an alternative to the traditional (classroom) type of teaching in specific social circumstances"; "It complements classroom teaching in normal life circumstances and replaces it in specific circumstances"). In the course of a year and a half, their attitude towards online teaching has evidently changed from agreement ("We are very satisfied because online teaching has proven to be a very successful way of learning") to indecisiveness ("In the given situation, I really don't know how we could organize courses in a better way, although there are a lot of good and bad sides") and eagerness to return to traditional classrooms ("Pure nonsense, we should start in-person classes as soon as possible"). Namely, students notice that this type of teaching goes towards a "monotonous repetition of classes", where "courses are very similar", despite the fact that they have a positive attitude towards interaction with their teachers and are adjusting to the online environment. A statistically significant difference is detected in the responses of the future teachers of Serbian and the future EFL teachers ($p<0.05$). The mother tongue students have a more positive attitude towards online teaching ("The nature of our courses allows us to conduct lectures and tutorials through online platforms"), while the EFL students believe that learning a foreign language requires direct contact with teachers and teaching associates ("Unless we hear and see the teachers and the teaching associate, we will not be able to master the foreign language completely"). However, there is no statistically significant difference between gender and year of study. Minor deviations in the responses provided by the students of the first and second years in comparison to the responses of the students of the third and fourth years of study are caused by the younger students' failed expectations and disillusionment with the current situation that conditioned the closure of the faculty building ("When I enrolled, I believed that I would listen to my teachers and teaching associates in the lecture halls. During online classes, I don't have a feeling that I'm attending a faculty, but a language course").

This is closely connected to the students' motivation to participate actively in classes. Namely, even though they attended online classes regularly, they stated that online teaching did not offer possibilities for interaction and that the teachers were solely responsible for encouraging and stimulating them to become engaged in class activities ("At the very beginning, it was interesting. However, over time, our motivation and

desire to participate in classes dropped. Now we only participate in classes where the teacher invests enormous amounts of energy"). According to the respondents, the most effective ways of encouraging interaction were attendance tracking, posing interesting questions, presenting students' term papers, a punishment and reward system and practical class assignments. The main paradox of university online teaching is the fact that the students did not recognise the function of online teaching resources and modern multimedia tools, which is very nicely summarised in one answer, "It seems to me that in (this) first phase of online teaching we did not understand its essence. Online teaching should be a hybrid form of learning, which means taking advantage of all the benefits that the application of ICT brings. Unfortunately, it seems to me that as a society we are not ready enough to use modern software tools and online resources in class. There are so many interactive materials available, especially in foreign language teaching, that we can use every day". Still, the analysis of the obtained results proves that the students, in general, had a positive attitude towards their teachers' engagement, appreciating their effort to adapt teaching materials and methods to the virtual environment. However, the students demonstrated reluctance towards the integrated functions of virtual classrooms, such as the microphone and webcam, and indecisiveness regarding the chat box, breakout rooms and digital whiteboards.

Online teaching has been incorporated into educational systems all over the world, which means that the research conducted on its merits and benefits should contribute to its better understanding and improvement. Given the objective circumstances in which we currently live, we believe that online teaching will continue to be the dominant form of teaching for a long period of time. For this reason, it is necessary to determine specific recommendations in order to improve its quality. By analysing the attitudes of future Serbian and EFL teachers and their recommendations, we have selected some useful tips that will help teachers in their efforts to make their classes more interactive: 1) Use an electronic interactive platform to create virtual classrooms in line with the needs of the course and its nature. 2) Monitor the development of a software that could be used in classes and assess its functionality in the implementation of specific teaching tasks. 3) Use a variety of online tools to promote a more purposeful presentation of content, including electronic interactive whiteboards. 4) Insist on visual contact via a webcam. In order to set a positive example for their students, teachers are expected to use their cameras in their classes, as well as explain all the benefits of face-to-face communication in terms of the quality of interaction and teaching in general. 5) Organise classes so that students can join the conversation at any time via microphones or text messages. Students share the view that having support during a class is extremely valuable for understanding the content better. 6) Prepare electronic materials and share them with students through asynchronous virtual classrooms. 7) Organise classes in small groups using integrated functions of e-platforms (breakout rooms). 8) Adapt methods and procedures to work in the virtual environment in a way that will lead to the achievement of the pre-set teaching goals. It is especially important for teachers to avoid "reading from the PowerPoint presentation" in any way, which students recognize as an extremely non-functional procedure. 9) Engage students directly by calling on them. 10) Keep records of students' engagement in classes and reward them for their timeliness and dedication. 11) Approach your classes as energetically as possible in order to neutralize the limitations inevitable to online teaching. Students expect their teacher to be in a good mood, which will make them forget for a moment the harsh reality of the coronavirus

pandemic. 12) Behave responsibly in terms of teaching tasks, respecting the class schedule and the time that students have at their disposal.

5.1. Research Limitations and Recommendations for Further Research

This paper presented information and statistical processing of data on important issues of online teaching. Since the attitudes of students at two departments at the Faculty of Philosophy of the University of Niš were considered, the limitation of our study is reflected in a small research sample. Namely, the specific nature of the teaching profession implies a small number of students of Serbian and EFL at the respective departments. Future research should include conducting the same or a similar investigation which would involve larger groups of future Serbian and EFL teachers, as well as: 1) considering the attitudes of teachers employed in primary and secondary schools, and universities towards online teaching; 2) comparing the effectiveness of online teaching at the beginning of the pandemic and after a certain period of time; 3) considering the functionality of the most used electronic interactive platforms in teaching; 4) developing an electronic interactive software for online education.

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STAVOVI BUDUĆIH NASTAVNIKA O ONLAJN NASTAVI NA OSNOVNIM AKADEMSKIM STUDIJAMA SRBISTIKE I ANGLISTIKE

U radu su predstavljeni rezultati istraživanja o stavovima budućih nastavnika srpskog kao maternjeg i engleskog jezika kao stranog prema važnim pitanjima nastave u onlajn okruženju tokom pandemije izazvane pojavom i širenjem virusa korona. Pandemija izazvana pojavom i širenjem virusa korona uticala je na promenu načina podučavanja i učenja u čitavom svetu – tradicionalni (učionički) vid nastave je preko noći zamenjen onlajn nastavom. Iako je korišćenje virtuelnih učionica omogućilo nesmetanu realizaciju nastavnog procesa, univerzitetski nastavnici su se suočili sa mnoštvom izazova i pitanja koja su postala aktuelna sa dolaskom nevidljive generacije (eng. invisible generations): pitanja motivacije, interakcije i uloge studenata tokom onlajn časova, kao i pitanja funkcionalnosti metoda, pristupa i onlajn alata. U radu je korišćena metoda teorijske analize sa tehnikom analize sadržaja. U empirijskom delu rada korišćena je deskriptivna metoda sa tehnikama anketiranja i skaliranja. Zahvaljujući pobrojanim metodama sproveli smo detaljna kvalitativna i kvantitativna istraživanja radi ispitivanja stavova studenata u vezi sa njihovom motivisanošću da aktivno učestvuju u nastavnom procesu. Sprovedeno istraživanje nam je pokazalo da budući nastavnici srpskog kao maternjeg i engleskog kao stranog jezika onlajn nastavu vide kao alternativu ili dopunu tradicionalnom vidu nastave u specifičnim društvenim okolnostima. Njihov stav o onlajn nastavi se tokom jednoipogodišnjeg pohađanja promenio od prihvatanja do neodlučnosti i želje za povratkom u učionice, pri čemu su studenti srbistike pokazali veći stepen prihvatanja ovog vida nastave. Zapaženo je da postoji statistički značajna razlika u odgovorima budućih nastavnika maternjeg i stranog jezika ($p<0.05$), dok takva razlika ne postoji između polova i godine studija.

Ključne reči: *onlajn nastava, srpski kao maternji jezik, engleski kao strani jezik, stavovi studenata*

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Original research paper

EVALUATION OF UNDERSTANDING AND ATTITUDE TOWARDS THE CONCEPT AND IMPLEMENTATION OF SUSTAINABLE DEVELOPMENT

UDC 37.017:502/504; 378:502/504; 502.131.1::37.014.5 (497.11); 502.131.1:37.01(497.6 RS)

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Abstract. *The paper focuses on the development of the concept of education for sustainable development in the regions where the research is conducted; with the presentation of respondents' opinions for all three observed areas. The author's contribution to this work is reflected in pointing out the basic factors and essential problems that arise when reforming the educational system in order to apply the concept of education for sustainable development. The paper offers solutions to these problems, providing established guidelines on how to reform the education system. In this case, it is about the perception of students of three regional centers - Niš and Kosovska Mitrovica in Serbia, and East Sarajevo - Pala in Bosnia and Herzegovina. The results of our research show that a very small number of students are familiar with the emergence of the idea of OR, which confirms the fact that awareness and especially knowledge of citizens about OR, both at the level of the EU and especially at the level of Serbia, is far from desirable and necessary. The results of the research can be useful for decision makers who participate in the creation of the educational system; and they would be particularly significant for the reform of the education system in Serbia, where education for sustainable development is still viewed as a theoretical rather than a practical issue.*

Key words: *university, education, education for sustainable development, environmental behavior, students*

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1. The Importance of Introducing Ideas of Sustainable Development into University Education

Education The path to training people to live and work in accordance with sustainable development (hereafter OR) is education. Education raises the quality of human capital, develops and increases the capacities of individuals, groups, communities, organizations and countries to participate in the development of a sustainable society. It promotes the change of people's attitudes, opinions and values and thus enables the world to be made safer, healthier and more promising, and thus to improve the quality of life. Education is a key factor in changes and development of environmental awareness, culture and responsibility. Through upbringing and education, we express what kind of society we want to be and what kind of person we want to raise and educate. It is therefore important to recognize common values that should support educational activities. In this sense, the University and all educational institutions are expected to think about values, but also to act in accordance with the common social-cultural and educational values[1].

"Education for OR is often referred to as the engine of the world human community. It is a dynamic concept of education that should last throughout life as a comprehensive, continuous, long-term and progressive cognitive process based on a holistic approach, unencumbered by any ideology or politics and directed towards universal values of life" (Maletaški, 2018, p. 40). Recently, we have witnessed numerous globalization processes that make education and training for OR an educational imperative. The need to preserve certain values (such as knowledge, solidarity, identity and responsibility, as components of the OR concept) and to create mechanisms to strengthen them is increasingly being recognized. Since the issue of environmental quality cannot be placed in the framework of only one scientific discipline, education for OR is based on the principle of interdisciplinarity (Maletaški, 2018). University education, which in our time has achieved a high level of specialization, demands holistic and integrative approaches that allow the complex problems of human and society's relationship with nature to be seen from the angles of all disciplines. Today, a high level of cooperation among all fields of science is necessary. No serious environmental problem can be successfully analyzed and explained, or solved, if it is not simultaneously viewed from the perspective of natural, technical, medical and social sciences. University education, which in recent times takes place in the sign of favoring the "know-how" model of knowledge, is at the expense of developing a critical and open mind that is capable of grappling with the serious and difficult problems that the human species is facing today in its relationship to natural environment and issues of survival of life on planet Earth.

Like any other process and education for OR has its strengths, weaknesses and opportunities. Weaknesses come from the fact that this type of education is often not institutionalized and does not represent a powerful political factor. The potential of education for OR is not sufficient by itself, but its quality implementation requires a good organization within numerous social institutions. Education for OR, namely, requires a multidisciplinary and interdisciplinary approach to work, which implies the abolition of strict division between subjects. The general goal of education for OR is the gradual development of attitudes that would be based on those forms of behavior and action that would create sustainability, prudence and balance at the systematic level of reproduction

[1] For more information on the conceptual-theoretical meaning of the concept of value and its understanding, see: Prodović Milojković, 2020; while on education in: Stanojević, Zdravković, 2013.

of social life, and that at the levels of behavior of individuals, social groups and institutions. From the mentioned characteristics, it is clear that it is not about learning in a shorter period of time, but about constant - lifelong learning. What is necessary to say is that education for OR cannot be separated from the concept of lifelong learning, given that lifelong learning is within the value framework of OR, and at the same time its premise.

The concept of responsibility is often linked to the concept of OR, because it is a key value from the aspect of sustainability. The code of ethics of the North American Indians emphasized precisely the notion of responsibility, which corresponds to today's concept of OR. Thus, they emphasize responsibility towards themselves, others and the Earth, at the same time emphasizing that "The Earth is our mother, and everything we put into it, it gives back to us." The responsibility here is also related to intergenerational connection because it depends on us what and to what extent future generations will enjoy with what we currently have. Therefore, "thinking about intergenerational relations and co-responsibility becomes an important pedagogical issue". (Vukobratović, 2017, p. 25)

In the development of society so far, the application of knowledge to different areas of human activity has led to revolutionary changes. In order to respond to major global challenges, each country (including ours) must define intervention packages of specific measures, which include, among other things, the education and training system (see more in: Prodović, 2014). In this context, the question arises, what is the role of education?! Its role is not to solve accumulated environmental, economic and political problems, but to offer possible solutions. A possible solution to such a problem is called OR, whose goal is to satisfy the needs of the present without fear that future generations will not be able to satisfy their needs (Prodović, 2014, p. 11). As things stand now, the foundations of the survival and future of our civilization are represented by the philosophy of OR and the educational system, which should adequately transfer that philosophy to all structures of society and thus ensure its functioning in accordance with the concept of OR.

Recently, OR has been constantly set as a goal to strive for, but the question arises: can we and do we really want to achieve it at the Faculties and what tools are available to us?![2] Uzelac points out that (lifelong) education for OR is the way to implement the concept of OR; and that it is a systematic practical activity and not a one-time action (Uzelac, 2008)[3]. OR is a global policy, i.e. the unity of all elements of state or international politics in an effort to establish a balance in the present between all systems of labor-created values and between them and all systems of natural values, and to ensure a stable co-evolution between them for the future (M. Decleris). The author points out that all existing discussions on this topic should (read: and must) be based on debates about the role of the Faculty as a social institution that operates within the social and cultural milieu of a certain culture, i.e. within a certain value framework. Such studies would try to contribute to the popularization of lifelong learning and lifelong education as a value that has undoubtedly become an imperative of today's time and which is linked to the concept of upbringing and education for OR.

[2] There are many different interpretations of what OR is and what it actually refers to (see: Marković, 2005, pp. 399-401; Đukić, 2011, pp. 3-25; Đukanović, 1996, pp. 171-172; Nadić i Šuvaković, 2011, pp. 161-167; Miltojević, 2005, 2015).

[3] The theoretical implications of the term OR and its concept, which has been particularly intensively developed over the last forty years and which is often taken as a superficially used term on a daily basis without deeper knowledge and the possibility of its application, are extensively given and shown in the theoretical part presented in the master's thesis in 2014. (for more details, see: Prodović, 2014).

The fact is that OR is not taught with sufficient quality, but it is also not treated adequately to the needs of today's Serbia at the universities. Since its appearance, the OR concept itself has gone through changes and extensions, which was accompanied by controversies, some of which have persisted to this day (Dragutinović, Filipović, i Cvetanović, 2005). It was the previously adopted strategies that mandated higher education to include education for OR in international agreements. Education about OR implies introducing students to the concept, policies, theoretical debates on sustainable development, while at the same time presenting other theories, approaches and concepts[4]. The emancipatory view of education emphasizes that the role of education is to contribute to the creation of a democratic and ecologically just world, so education is interpreted as a means by which self-actualized members of society are created, who strive for meaning, develop their potential and solve problems together (Jickling & Wals, 2002, pp. 224-225). Such a model also implies that education for OR cannot only deal with economic and technological issues, but must include concern for the creation of common values, personal integrity, a sense of social responsibility, freedom of choice, development of individuals as parts of society, etc. "In the document revising the first five years of the UN Decade of Education for OR, two pedagogical interpretations of education for OR are distinguished: 1) education for OR as a means of transferring appropriate knowledge, attitudes, values and behaviors and 2) as a means of developing human capacities and opportunities to deal with sustainability issues so that they can choose alternative ways of living for themselves" (Wals, 2009, p. 27). As it is obvious that not everyone has to agree with the moral and value concepts prescribed by OR policies, it is extremely important for students to be familiar with other approaches to the relationship between man and the environment. "Furthermore, if the goal of ecological thinking is to further its development, and if students are to participate in an ecological discourse that is not at all conceivable today, then we must resist the temptation to exclude a wide range of nascent ideas in favor of the theme of sustainability or OR" (Jickling & Walsh, 2002, p. 222). In this sense, only if higher education is understood as "creating opportunities, not defining or prescribing the future for students" and if "universities promote research, evaluation and criticism of developing ideas and creative contribution to their development" (Jickling & Wals, 2002, p. 230), education for OR can have fruitful effects on the development of future generations. In this light, the concept of OR, as a multidimensional concept, can be useful for bringing together different points of view from different spheres (natural, humanistic and social sciences).

It is well known that university education for OR in Serbia suffers from many weaknesses: some are the result of heritage, and others stem from confusion arising from technological and other changes and their (mis)understanding. That is why it is necessary to "improve the existing education system as soon as possible" (see: Official Gazette of RS, 2010). As sustainability, as a fundamental development direction, is aimed at continuous harmonization of decisions and solutions related to nature and the social environment, consensus at all levels and commitment of all social groups is necessary. An informed and well-educated population is a condition for achieving OR, and therefore a fundamental tool for good management, good decision-making and achieving a better quality of life. Hence, a greater effort is necessary in the area of education of young

[4] On the goals of education, see: Stelmack,; Sinclair, & Fitzpatrick, 2005, pp. 36-53; Jickling & Wals, 2002, pp. 221-232.

people about OR, so that they are better acquainted with the principles and processes of planning and decision-making about OR of the communities in which they live, as well as society as a whole. Such knowledge is needed to coordinate ideas that want to be launched in communities, in order to lead to OR. The development of a sustainable society is a process of constant learning, full research and analysis. Therefore, it is necessary to constantly increase the level of knowledge and understanding of the principles of OR, while at the same time strengthening the skills of action. Considerable changes are needed in all social groups and at all levels, including in the educational process, in which it is necessary to introduce new institutional relations and new sectors. The state should strongly encourage the creation of a framework for lifelong learning about OR through formal and non-formal education. Let us recall that UNESCO's education strategy for OR states that its purpose is to encourage UNESCO member states to develop and integrate education about OR into formal education systems, into all relevant subjects, but also into non-formal and IT education.

The author's desire is to show the basic features of education for OR, as well as the fundamental principles on which this concept was established. From all this comes the scientific importance of the research, which is reflected in the systematization of general theoretical considerations of the concept of education for OR, along with the determination of the goals, possibilities and direction of education for OR, and the establishment of the necessary reformation of the education system, so that it enables education for OR.

Through the conducted research, the author examines information and understanding of the OR concept, as well as the attitudes and behaviors of young people in accordance with this concept. With it, he tries to contribute to raising the awareness not only of young people in Serbia, about the need and possibilities of their contribution to OR, but also to emphasize the importance of their role in the social and economic development of the community. The idea of such a research was not only to obtain data on their perception and understanding of the OR concept, but on the contrary to involve as many people as possible in the whole process, to encourage them to act in their communities and initiate activities based on the principles of OR. The contribution and motive of this approach is reflected in the aspiration to operationalize this concept and enter into its essence, not only within the framework of political declarations, but also in terms of school and university education, and that education in general faces the understanding of integral OR. Only if the abilities of future generations to apply these principles are improved, only in this way will the sustainability of our civilization and way of life be created and realized.

2. RESEARCH METHOD

The aim of the research is to deal with the analysis of knowledge of the concept of OR, which is considered one of the basic values of society; and within that, educational tools are considered for the purpose of easier implementation of education and training for OR at faculties. The intention is to discover the training of students "to make decisions as future leaders, scientists or engineers and act in a professionally appropriate and locally relevant manner in solving various problems that pose a threat to our common future" (Prodović, 2014, p. 12).

The specific goals of this research were based on determining the influence of the value attitudes of the respondents on the acceptance of the OR concept. The author's

expectations are that the obtained research results show that the application of the concept of education for OR is a consequence of the value attitudes of society members (in this case, students).

The research sample consists of the Serbian population in three different regions of the same speaking area. In order for the sample to be generationally the same, students of the same year (3rd year of study), of the same type - all students, from all three areas of the state social faculties - the Faculty of Philosophy, and the same major - from the Department of Sociology, Psychology, Pedagogy, Communication were selected and history. The sample size is 100 students per Faculties. It was insisted that the sample be random. Most of the questionnaires were distributed in Serbian, given that the language of instruction in most courses is Serbian. However, in order to ensure a good understanding of the questions and ensure reliable answers, the questionnaire distributed to students in East Sarajevo (Pale) was translated into Bosnian.

The survey research was conducted using the PAPI (Paper and pencil interviewing) technique, and at the very beginning of the survey questionnaire, respondents were informed that the research is anonymous, on a volunteer/academic basis, and that the research results will be used exclusively for scientific purposes. The collected data were statistically processed using the statistical computer program SPSS (Statistical Package for the Social Sciences).

3. Research Results and Discussion

One of the key dimensions of OR is the social dimension, which refers to how the population understands its importance (Kalmar, Krekić, Major, 2021: 147). In several previous works (see: Prodović, 2014; Prodović, Milojković, Prodović, 2014a), the author's subject of interest is, in addition to the theoretical conceptualization of the concept of OR, the state of higher education in the field of environment in Serbia.

The following is a presentation of the opinions of the students of the three regional centers on the questions posed.

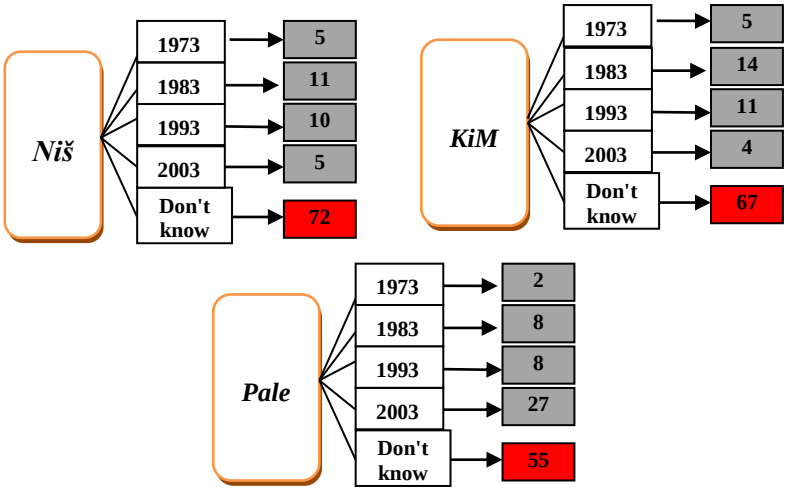


Chart 1 When did the idea of sustainable development first appear?

On the question "When did the idea of OR first appear" (graph 1), the largest number of respondents do not know the exact year (even 63.8%). A small number of students are actually familiar with the emergence of the idea of OR. Looking regionally, the majority of surveyed students (all three regional centers) do not know the exact year of its appearance. Female students are less familiar than male students (as many as 152 compared to 194 total respondents); which is contrary to some research according to which female students and students of higher years of study have a more positive attitude towards the issue of sustainability, that is, they more often accept and correctly define it than male respondents and students of the first year of study (see: Rončević, Rafajac, 2012).

In order to reveal a new dimension of understanding and knowledge of OR, the respondents were asked to answer, in their own words, what they consider the term OR or to describe their personal understanding and understanding of this term with an open question in a free form. Of the total number of respondents, even 76% do not have basic knowledge that would help in the definition. Only 17.8% gave a full definition of the term. The author cites several definitions of OR mentioned in the students' answers:

1) "... Smart exploitation of the natural system for humans, which means protecting the natural environment while enabling the longevity of the human species."

2) "Meeting today's needs without compromising the needs of future generations."

3) "Each step or act that makes the next one more efficient and better."

4) "My definition: OR is the light at the end of the tunnel...".

Among the definitions offered, an incomplete understanding of the OR concept is recognized, i.e. connecting the meaning of the term "sustainability" mainly with one of the dimensions, be it economic, social or environmental. In the description, the majority states that OR takes care of resources for the future, includes everything for the better development of the community, and points to economic growth and development. It is also equated with socially responsible management, education and transformation of consciousness and strategic and smart planning of the entire development. A part of the surveyed OR identifies with renewable energy sources, new ways of thinking and responsibility towards the community and nature. Synonyms that were often used were related to terms such as: ecological awareness (0.7%), environmental protection (1.6%), development(s) of society (2%), human needs (1.3%), upbringing and education (0.3%), and to the point that everything is considered OR (0.3%). One part of the comments shows the dissatisfaction of young people with the conditions and opportunities provided by the community and society. There are numerous negative considerations, but also those that require a more active commitment to integrate the concept of OR into the overall development of society and the communities in which they live. Everyone is still guided by those who say "it is important not to shoot" or "keep quiet, endure and suffer". An Indian proverb was also found in the descriptions of OR: "We do not inherit our land from our ancestors, but borrow it from our descendants." Below, the author cites a definition that emphasizes the economic and ecological dimensions of OR:

"OR is economic development that has no impact on ecology and natural systems, which is a challenge in today's world. Economic development refers to the development of the infrastructure network, schools, hospitals, healthcare and everything that would contribute to improving the standard of living, and OR means that with all this progress nature does not suffer any consequences. OR of a product/service can also concern the viability of a particular product/service in the market."

In the largest number of answers (over 70%), various wrong, one-sided, banal or too general formulations are recognized, which indicate a fundamental ignorance of the concept or its attachment to peripheral elements of OR. For example, in this group there are most of those who under OR mean continuous development, continuous development, development without interruption, regardless of the consequences of that development. This also includes those that connect OR with certain areas of personal or social life (preservation or development of culture, education, childcare, incentives for businesses or industry, acquisition of wealth and money, reduction of unemployment, etc.). Among them is a significant number of respondents whose citation of synonyms or some very general answers indicates a fundamental ignorance of the concept of OR (progress, progress, survival, balance, prevention, crisis...). Correct and relatively correct answers indicate the dominance of a fragmentary insight into the whole OR. The author points out that only one fifth of all respondents holistically and accurately perceives the term OR. Such a large percentage of ignorance of the very definition of what sustainable development is leads to the conclusion that ignorance is not only at the level of the meaning and content of this term, but also at the level of the very construction of this coin - "sustainable development".

This impression is also contributed to by the answers to the following question "Do you consider the concepts of OR and environmental protection to be the same?" (see chart 2).

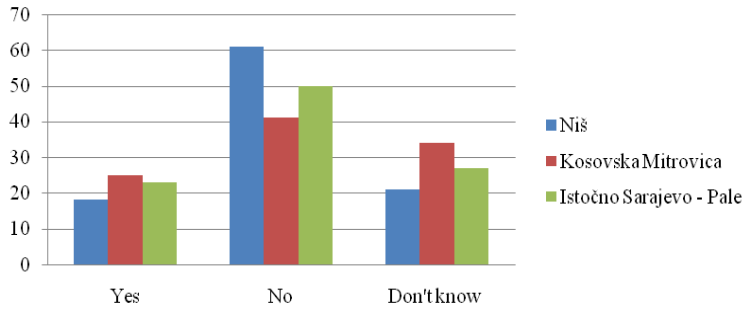


Chart 2 Do you consider the terms OR and environmental protection to be the same?

According to the survey, half of the respondents (50.7%) do not consider these concepts to be the same. This certainly blurs the picture of his knowledge, considering that the majority of the respondents freely associated this term with many synonyms, including environmental protection. It is worrying that the percentage of those who consider these terms synonymous is slightly lower than the respondents who are not sure or do not know how to accurately define the concept of this phenomenon (more than 28%). A somewhat larger and high percentage of young people who have heard of the term "OR" and at the same time less than half of those who do not know its basic goals speak in favor of insufficient information among young people about this development agenda, that is, they confirm the fact that the goals of OR are not sufficiently popularized and accepted among young people.

When asked which of the offered definitions best describes OR, the largest number of students (71.4%) correctly chose that OR "satisfies the needs of today without jeopardizing the ability of future generations to meet their needs" (graph 3).

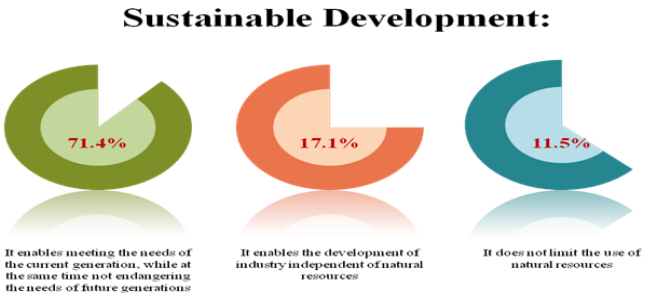
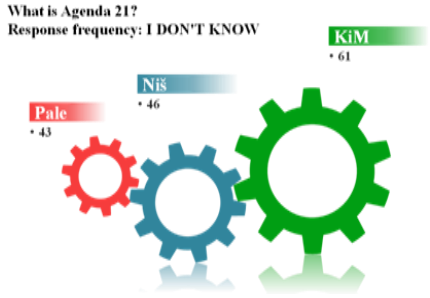


Chart 3 Which of the offered definitions best describes OR

The vast majority of all three examined university centers agree with this confident attitude.

In the continuation of the research, there was a question that asked the respondents to choose what is meant by "Agenda 21" in the answers already offered. Although the answers were offered, even half of the respondents clearly answered that they do not know what Agenda 21 is. Students from Kosovo and Metohija are leading in this (graph 4).



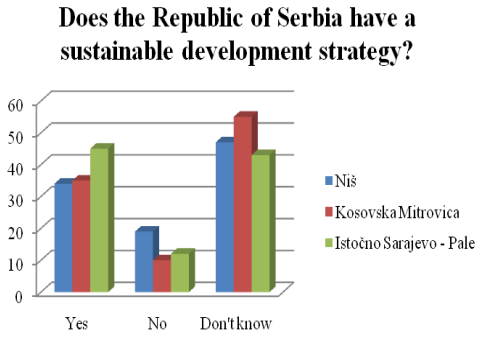


Chart 4 What is Agenda 21?

Chart 5 Does the RS have an OR strategy?

Knowledge about OR is based on a superficial recognition of what it is, without detailed knowledge of what its goals are. A third of respondents (34.5%) chose that Agenda 21 is "a plan of action at the global, national and local level, with the aim of OR", while only 16.1% linked it to "laws aimed at implementing OR". "Does the Republic of Serbia have an OR strategy?" almost half of the respondents (48.4%) answered that they did not know (students from Kosovo stand out). This additionally warns about the need to raise the awareness of young people to familiarize them with the goals of the OR. Slightly less than that (37.8%) clearly share the opinion that they have it, in which the students from Pale are leading. No less important is the fact that only 13.8% of the respondents believe that Serbia does not have the strategy in question (Chart 4).

The following group of questions asked in the form of a Likert scale (ranging from 1 - do not agree at all to 5 - completely agree) contributes to the students' perception of knowledge of OR. The conclusions reached by the author confirm the previous impressions - about the superficial recognition of the term OR - without a clear demarcation of its meaning and concept. Thus, to the following questions, the students of all three university centers clearly showed their ignorance of the term, their lack of interest and a passive attitude. The largest majority of answers were "I don't know/I'm not sure" to the questions: a) "OR must follow the logic of the previous model of industrial society development with rational use of natural resources" (43.8%); b) "The idea of OR is a vague, imprecise and contradictory phrase without concrete content (53.3%); c) "A way out of the current crisis is not possible if social energy is wasted on environmental protection and excessive social sensitivity" (39.5%); g) "OR seeks to balance the magic triangle: environmental protection, stable social development and fair distribution of social opportunities" (47%); d) "OR implies a radical break with the current economic concept of development" (63.8%); đ) "OR is a political syntagm and empty formula" (53%); e) "Implementation of the OR idea is possible only with a profound change in values and political concepts" (59.5%); h) "Protection of the environment should be in the first place regardless of slower economic development" (36.5%); z) "OR is the ability to use natural resources responsibly with the aim of meeting the needs of everyone in the present without jeopardizing the chances of future generations" (41.4%); i) "The current rights crisis is a consequence of a development pattern that does not respect the principle of sustainability" (59.5%).

The students also showed their passive attitude to the question "Which international organization monitors the progress of states in achieving the goals of the OR". More than half of respondents (51.6%) do not know/or are not sure which international organization they are talking about. The United Nations Organization (UN) was chosen by 33.6%, the United Nations Refugee Agency (UNHCR) by 8.2%, while the United Nations Protection Force (UNPROFOR) was chosen by 6.6%. Such data clearly indicate ignorance of the basic concept of OR, and lack of information about the organizations that are in charge of achieving its goals. See chart 5 on the frequency of responses confirming respondents' lack of information by region.

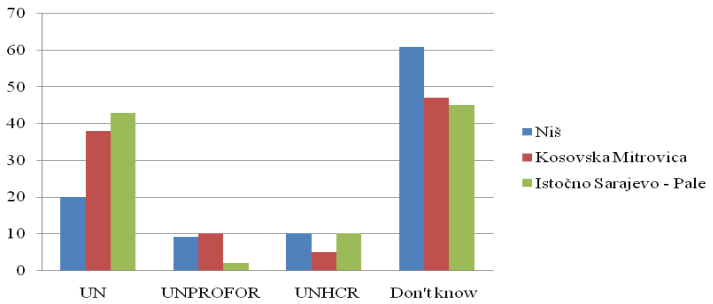


Chart 6 Which international organization monitors the progress of states in achieving the goals of the OR?

A set of questions examining the awareness of young people about the availability of information about the OR and the role of individual sectors in educating and informing young people about that topic points to the following conclusions (chart 7).

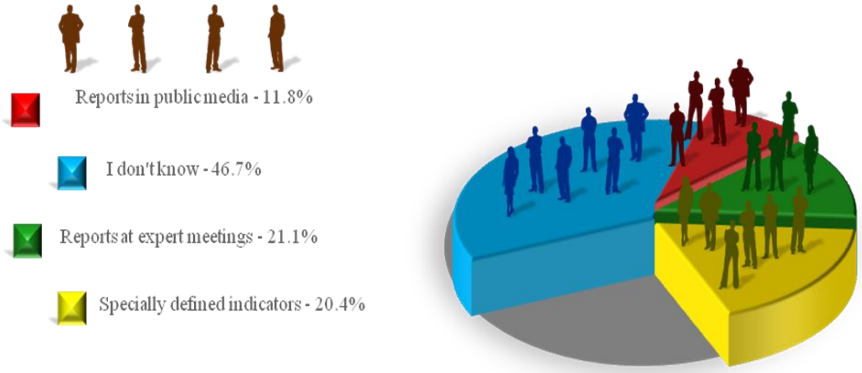


Chart 7 How is the achievement of the objectives of the OR monitored?

Students share the opinion that the achievement of OR goals should first be reported at expert meetings; then with specially defined indicators, and only then with reports in public media. The fact that the largest percentage of respondents do not have a clear opinion on this issue as well (as much as 46.7%) is worrying. Students from KiM are leading in this.

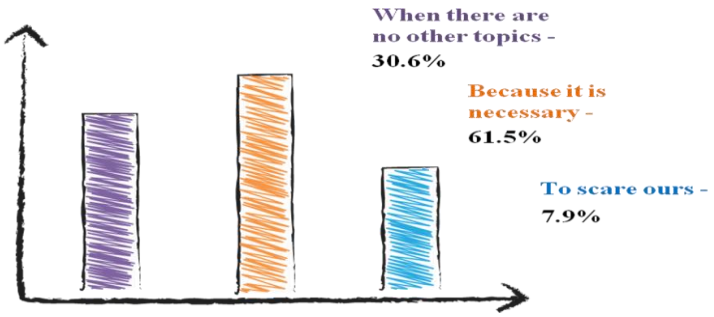


Chart 8 The issue of OR is discussed ....

What the students clearly agree with (chart 8) is the fact that the OR issue is always discussed - because it is necessary (61.5% of all three regional centers surveyed share this opinion). A third of respondents (30.6%) believe that it is talked about in moments of leisure - when there is no motivation for other and better (not to mention more important) topics; while a small number of students (only 7.9%) see the cause in an authoritarian approach - when this topic is approached for the purpose of scaring, warning and sobering up. According to estimates, young people receive the most information about OR (chart 9) in the media (as much as 78.6%), less at school/faculty (18.4%) and the least from family members (3%). This attitude is shared by the students of all three university centers.

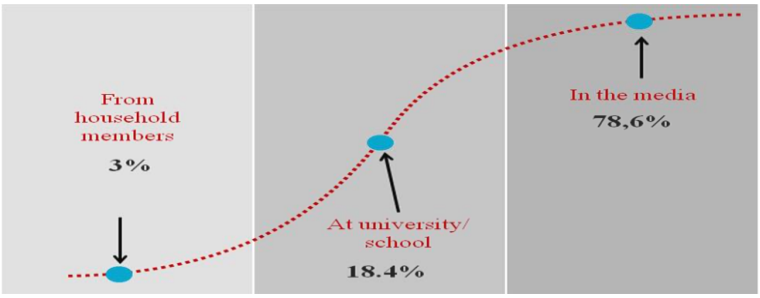


Chart 9 I hear the most about OR...

The role of certain sectors in educating and informing young people is evidenced by the following questions, where respondents prefer to answer that they are not sure/or that they do not know the answer, rather than agreeing with the options offered. The questions were related to: a) "Education and education for OR cannot be implemented in all subject areas" (43.8%); b) "Due to the lack of formal education in the field of education and training for OR, lecturers cannot acquire the skills to implement education and OR within their subject area" (51.6%); c) "While there are socially disadvantaged groups in society, upbringing and education for OR and lifelong learning programs are available only to the privileged" (43.8%); d) "Upbringing and education for OR should be a separate subject area" (39.8%); e) "Upbringing and education for OR can be implemented as a cross-curricular topic" (49%); f) "If the lecturer wants to implement the elements of upbringing and education for OR, he usually has to create the didactic material himself" (49%); g) "Implementation of cross-curricular topics that includes upbringing and education for OR requires additional involvement of lecturers and represents an additional burden" (48.2%); h) "In my subject area, it is not possible to deal with OR topics" (49.3%); z) "Out-of-classroom and project-based teaching are good ways to implement content from the field of upbringing and education for OR" (49.3%). Based on the insight into the existing data, we can notice that almost half of the respondents do not have an opinion at all on the issue of the implementation of OR in the educational system. The students only agreed that "Lecturers (teachers, professors) should include the contents of education for OR in their subject area" (47.4%) and that "It is necessary to introduce as many topics from the field of education as possible into the teaching programs for OR, because pupils/students should be encouraged to behave sustainably within the community" (44.7%). It is worrying that, despite the agreement, more than half of the respondents do not share such perceptions.

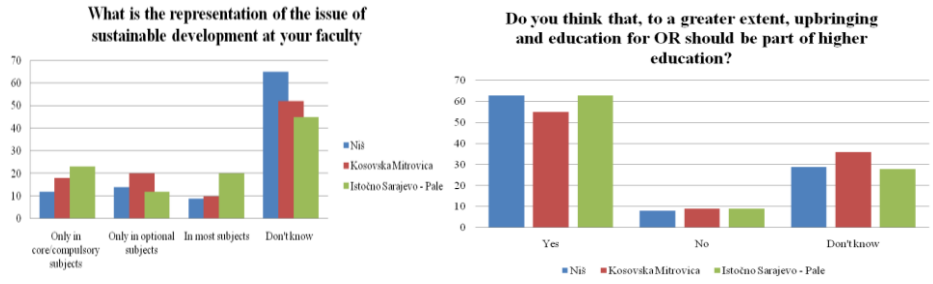


Chart 10 OR representation

On the slightly more detailed question "What is the representation of the OR issue at your faculty", more than half of the respondents are not interested in giving their opinion on this issue. They prefer not to have one/or to be unsure (54.6%), in which the students from Nis are leading the way. A smaller group shares the opinion that OR implementation at the Faculty is present only in basic/compulsory subjects (17.8%); while slightly less in optional subjects (15.1%). What they agree with, but still a smaller percentage of respondents, is that it is present in the majority of teaching subjects (12.5%) (graph 9). However, the respondents' answers to the question "Do you think that, to a greater extent, upbringing and education for OR should be introduced into the composition of higher education" provide optimism. As many as 60.2% of respondents believe that it should, in addition to an extremely small percentage of those who disagree (9.9%). The goal of those who are interested in this topic is to convince the third of the respondents (29.9%) who are not sure/or do not have their opinion on the correctness of the implementation of OR in all higher education levels (graph 9). In the end, those who answered the previous question positively share their agreement that the level of implementation of upbringing and education for OR should be graduate studies (as many as 46.1% - in which students from Pale are leading); then undergraduate studies (34.5%, led by students from KiM), then specialist/postgraduate studies (14.5%, led by students from KiM) and finally doctoral studies (with 4.9%, led by students from Niš) (graph 9).

4. Concluding Considerations

Very few students are familiar with the emergence of the idea of OR. By adding those who did not answer the question with those who gave wrong, general answers that cannot be connected in any way to the essence of OR - they lead to the conclusion that ignorance of this term is almost 80%. Similarly, the findings of some other research (Mihailović, Đukić, Mojsilović, 2019; EB 455, 2016) in which such indications about the awareness of citizens (EU and Serbia) about the OR, do not provide reasons for satisfaction, regardless of the fact that in the meantime positive changes. Namely, it can often be argued with great probability that citizens' awareness and especially knowledge about the OR, both at the EU level and especially at the level of Serbia, is far from desirable and necessary.

(Un)familiarity with the term OR is further contributed by the fact that despite the numerous synonyms used to define this term - when asked if they consider it the same as the usual synonym (environmental protection) - respondents answer no, or that they do not know or are not sure. Accepting data on partial or complete (un)informed and ignorance of students about OR and its goals as crucial challenges that call into question the realism of achieving the set goals by 2030, leads to the conclusions that maximum efforts must be made first at the level of systemic promotion and popularization of action for OR. Students overwhelmingly agree on OR - when some of the "sound" definitions are offered. Thus, as many as 3/4 of students firmly know that OR is tied to the definition: "meeting the needs of today without jeopardizing the ability of future generations to meet their needs." However, knowledge about OR is based on a superficial recognition of what it is, without detailed knowledge of what its goals are. In addition to not knowing the basic concept of OR, there is also a lack of information about the organizations that are in charge of achieving its goals. The importance should be given to emphasizing the social dimension of OR, with an emphasis on the involvement of young people. "OR is important for any society that seeks to improve its human resources, in this case young, educated people. In order for OR to be

productive, it is of crucial importance that the entire social community, together with state institutions, ensure all the conditions that will help young people to achieve and achieve all goals and acquire knowledge and skills with which they will become an essential factor of OR" (Collection, 2015).

The largest percentage of those surveyed do not have a clear opinion on the availability of information on OR and the role of individual sectors in educating and informing young people about that topic. This kind of lack of interest may indicate that there is basically not enough attention paid to OR and that young people are not given relevant information about the concept and principles of OR. Students clearly agree that the OR issue should always be discussed - because it is necessary. Young people receive the most information about OR in the media, less at school/college and the least from family members. With this, young people recognized the responsibility in promoting OR of all these sources, as well as the institutions and organizations that stand behind them (such as: schools, faculties, media, non-governmental organizations/associations, authorities and business organizations). At this point, it is necessary to get acquainted with the existing data of some other researches, which clearly indicate that the respondents still believe that the authorities are the most responsible for the promotion of OR, although the differences are small (Zbornik, 2015). When it comes to the responsibility for the implementation of the content of the OR in the composition of education, Vesna Nikolić notes that the role of ministries and the media is primarily emphasized, the role of schools is in third place, while the role of higher education was only in seventh place (Maletaški, 2018, p. 77). The question arises why the influence of educational institutions for the improvement and implementation of education for OR is so poorly evaluated?! According to the same author, the solution can be sought in understanding the non-independent position and strong centralist decision-making in the education system (Maletaški, 2018).

Based on the insight into the existing data, we can notice that almost half of the respondents do not have an opinion at all on the issue of the implementation of OR in the educational system. What they definitely agree with is that lecturers (teachers, professors) must include the contents of education and training for OR in their subject area; and that topics from the field of upbringing and education for OR must be introduced into the curriculum as much as possible, because this is the only way pupils/students should be encouraged to behave sustainably within the community. Students do not have their own opinion on the implementation of OR at the Faculty; except for a few respondents who share the opinion that it is present only in basic/compulsory subjects; slightly less in optional subjects, and least in most teaching subjects. Such data point to the conclusion that OR is not given enough attention and that young people are not given relevant information about the concept and principles of OR. What is encouraging is that the majority of respondents believe that, to a greater extent, upbringing and education for OR should be introduced into the composition of higher education, namely: first at graduate studies; then at undergraduate studies, then specialist/postgraduate studies and finally doctoral studies. In relation to students' attitudes, descriptive indicators of some other researches (Maletaški, 2018) indicate that students recognize that the implementation of the OR idea is possible only with a profound change in values and political concepts (59%); and that, in general, students do not have an opinion on the ways in which OR can be achieved, i.e. they are more inclined to look for solutions for development in the future within the existing model, more than they perceive that a completely different model of economic development is needed (Maletaški, 2018, p. 78).

All the obtained results must lead us to a unique conclusion - and that is that the primary task of the faculty is to educate students and that they should participate in the promotion of OR. That is why it is important to think that OR should and must be promoted at faculties. What we have to pay attention to is the attitude of some young people who are not very sure about the role and the need to promote the OR concept at colleges. The percentage of students who do not have enough information about OR is not small, which implies the inclusion of various aspects of non-formal and informal education in order to continue and support the development of competences for OR started within the formal education system. And according to other researches (Maletaški, 2018, p. 79), there is agreement that for better information, learning and promotion of OR, it is necessary to introduce a compulsory subject of OR in primary and secondary schools, which would enable future students to continue with permanent education for OR. Suggestions include organizing forums, lectures in schools and other institutions, educating young people through courses and workshops, introducing more subjects at all levels of education (primary, secondary and higher) that have OR in their contents (Maletaški, 2018).

What can be useful, as this research has shown, is that among young people there is an awareness of the importance of thinking and acting for OR. Young people need knowledge about OR in order to be able to use and apply it, both in their future professional engagement and in their private life. There is a clear attitude of young people in which they express the need for the inclusion and participation of citizens in decision-making processes and see the responsibility of citizens for the decisions made, especially those that concern life in local communities. Young people recognize the responsibility of all sectors and actors, as well as their own responsibility for the contribution of OR, whether it is the quality of life for everyone in the community or concern for ecology and the preservation of natural resources.

The system of upbringing and education bears a great responsibility, which consists in the integration of OR into the everyday life of beings. According to some authors (Rončević i Rafajac, 2012, p. 174), this can only be achieved when the awareness and sense of responsibility increases, when acquiring new knowledge and skills about the ways of practical realization of the concept in question. For such a more efficient and effective integration of sustainability in higher education, it is necessary to practice a holistic approach, as well as take responsibility for raising awareness among students, the academic and wider community about the consequences of (un)sustainable behavior, as well as "opening the door" for (interdisciplinary and intergenerational) cooperation with colleagues. In addition, a systemic approach, institutional support, creation of a generally favorable atmosphere - both at the level of the University and of all relevant instances in society, with connection to the international scientific and research community - is also necessary. And all with the aim, as some researchers say (Orlović, Lovren, 2015), of practicing what our society has also undertaken as an obligation "by signing international and designing national strategies, which, bearing in mind the new global development goals, will be imperative in the future".

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PROCENA RAZUMEVANJA I ODNOSA PREMA KONCEPTU I IMPLEMENTACIJI ODRŽIVOG RAZVOJA

U radu se fokus stavlja na prikaz razvijenosti koncepta obrazovanja za održivi razvoj u regionima u kojima se sprovodi istraživanje uz predstavljanje mišljenja ispitanika za sva tri posmatrana područja. Autorov doprinos ovim radom ogleda se u ukazivanju na osnovne faktore i suštinske probleme koji se javljaju prilikom reformisanja obrazovnog sistema u cilju primene koncepta obrazovanja za održivi razvoj. U radu se nude rešenja ovih problema, pružajući ustanovljene smernice na koji je način potrebno reformisati obrazovni sistem. U ovom slučaju reč je o percepciji studenata tri regionalna centra – Niša i Kosovske Mitrovice u Srbiji, i Istočnog Sarajeva - Pale u BiH. Rezultati istraživanja pokazuju da je veoma mali broj studenata upoznat sa pojavom ideje o OR, što potvrđuje činjenicu da je obaveštenost a pogotovo znanje građana o OR, i to kako na nivou EU, a pogotovo na nivou Srbije, daleko od poželjnog i potrebnog. Rezultati istraživanja mogu biti korisni za donosioce odluka koji učestvuju u kreiranju obrazovnog sistema; a posebno bi bili značajni za reformu obrazovnog sistema Srbije gde se obrazovanje za održivi razvoj još uvek posmatra kao teorijsko, a ne kao praktično pitanje.

Ključne reči: *univerzitet, obrazovanje, obrazovanje za održivi razvoj, ekološko ponašanje, studenti*

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Original research paper

PHYSICAL ACTIVITY AND HEALTH PROBLEMS OF STUDENTS IN SOUTHERN SERBIA DURING THE STATE OF EMERGENCY

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Abstract. *The COVID-19 pandemic affected practically every country in the world and changed how people lead their daily lives. The purpose of research was to ascertain the relationship between physical activity levels and the incidence of health issues among pupils. This research was conducted using an anonymous online survey that contained selected questions from the World Health Organization's health behavior in schoolchildren (HBSC questionnaire). The sample of participants consisted of 500 elementary and high school students from the territory of southern Serbia. It was observed that less than 1% of students reported having poor health, while 6% of participants said that they were dissatisfied with their health overall, compared to 94% of students who reported being satisfied with their health. Additionally, a total of 88% of students evaluated their lives with the highest marks, out of which 28% considered their lives to be the greatest they could possibly be. 90% of participants from this sample of students in southern Serbia reported engaging in physical activity three or more times per week, whereas only 3% of students reported engaging in physical activity only once a week or not at all. The key finding of this study proved that students who engaged in greater physical activity had fewer health issues than students who engaged in the least amount of physical activity. There are numerous benefits to being physically active, including how it influences the maintenance of human health and helps children grow and develop properly. Therefore, the importance of this work is reflected in the possibility of gaining knowledge about physical activity during the state of emergency and the connection between physical activity and health problems that emerged among students in southern Serbia during the COVID-19 pandemic.*

Key words: *COVID-19, physical health condition, elementary school, high school*

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1. INTRODUCTION

Nearly every nation in the world was affected by the COVID-19 pandemic, which significantly altered people's daily lives. As a result of the stringent measures established in order to stop the epidemic, people became encouraged to lead sedentary lifestyles and to ignore the daily recommendations for physical activity. In order to stop the transmission of this disease, it has become common practice to take social and physical isolation measures and close down companies, schools, kindergartens, and other facets of people's entire social lives. However, these restrictions have made it challenging for people to go about their daily lives regularly (Bass et al., 2020).

Physical activity is a very broad term; according to the World Health Organization, it is defined as any movement that results from the activity of the skeletal muscles and that involves the expenditure of energy. According to recommendations made by the World Health Organization (WHO 2020), adults should exercise 150 to 300 minutes per week at a moderate intensity, 75 minutes per week at a vigorous intensity, or at an appropriate combination of physical activity of varying intensity. Hypokinesia, the medical term for inactivity, is one of the most common disorders of the contemporary era and is sometimes referred to as the "pandemic of inactivity" (Castañeda-Babarro, Arbillaga-Etxarri, Gutiérrez-Santamaría, & Coca, 2020; Stanković, Nejić, & Stojiljković, 2020).

Training and all sporting events for kids and adults were outlawed during the time when restrictive measures were being implemented to combat the COVID-19 pandemic. People who wished to keep physically active during the "lockdown" opted most frequently for at-home workouts.

The most crucial external component for a child's growth and development is proper nutrition, paired with frequent physical activity. However, the public places a lot of emphasis on the type, quantity, and manner of eating while placing insufficient emphasis on physical exercise and lowering sedentary lifestyles (Ostojić et al., 2009). A sedentary person is one who is not physically active enough, spends their working hours sitting in an office without moving, and then exhibits the same pattern of behavior in their free time. On the other hand, a physically active person cleans their home, uses active transportation instead of passive means, and moves around in their free time (Thomas et al., 2008). Technology development influences the sedentary lifestyle, and new technological developments swiftly supplant children's play.

A healthy lifestyle is strongly dependent on the general populace engaging in adequate physical activity. The relationship between physical activity and health has been the subject of extensive investigation. A healthy lifestyle includes regular, well-balanced physical activity, which can reduce the risk of cardiovascular disease by up to 50%. Additionally, regular physical activity effectively controls body weight, which might be a risk factor for the development of certain diseases. Insufficient physical activity is frequently linked by researchers to an imbalance in a person's psychological health and the emergence of a variety of psychological issues (Maugeri et al., 2020).

Due to the aforementioned importance of physical activity and its connection with people's health, as well as the problems that restrictive measures brought about during the COVID-19 pandemic, it is necessary to focus our attention on people's health problems and their reduced physical activity. In this regard, the aim of this study is to examine the connection between the quantity of physical activity and the occurrence of health problems among students in southern Serbia during the state of emergency.

2. METHODS

This research was conducted using an anonymous online survey that contained selected questions from the World Health Organization's health behaviour in schoolchildren - HBSC questionnaire. The validity and reliability of the questionnaire used in this research was proven in the study Booth, Okely, Chey, & Bauman, (2001). Moreover, this research was conducted in 2021, when the COVID-19 pandemic caused a state of emergency.

2.1. The Sample of Participants

In this study, a total of 500 participants were recruited to examine the connection between the quantity of physical activity and the occurrence of health problems among students in southern Serbia during the state of emergency. The sample of participants consisted of elementary school students in the fifth grade, seventh grade, and the first grade of high school. Specifically, 30% (150 students) of the participants were from the fifth grade, 34% (170 students) from the seventh grade, and 36% (180 students) from the first grade of high school. The gender distribution of the participants revealed that 53% (265 individuals) were male, while 47% (235 individuals) were female. The age range of the participants spanned from 11 to 15 years. All participants were from urban areas in southern Serbia to ensure a diverse representation. Understanding the impact of the state of emergency on the health of students in this region is crucial, given the current context. By examining the quantity of physical activity and its relationship to health problems, this study aims to contribute valuable insights into promoting healthier lifestyles and well-being among school-going children during challenging times. In addition to having documented parental approval, the students willingly consented to take part in this study. Moreover, the students were informed in detail about the protocol of the entire study as well as its goal.

2.2. A sample of Measuring Instruments

Selected inquiries pertaining to the health issues experienced by students in southern Serbia during the state of emergency and their physical activity were used for the research's objectives. The questions regarding the health condition of the students were related to the frequency of stomach pains, headaches, nervousness, depression, irritability/being in a bad mood, difficulty falling asleep and dizziness that they experienced.

2.3. Data Processing Methods

We initially processed the data by calculating absolute and relative frequencies to gain insights into the distribution of the variables under investigation. Subsequently, we utilized the chi-square test to examine distributional differences between the variables. The chi-square test is a statistical method that allows us to assess whether there are significant associations or dependencies between categorical variables. By setting a statistical significance level of $p \leq 0.05$, we aimed to determine if any observed differences in distribution were likely to be meaningful or merely due to chance. The results of this test provided valuable information for understanding the relationships and patterns present within our dataset.

3. RESULTS

In a sample of 500 students from southern Serbia, it was observed that less than 1% of students gave their health a poor rating, and a total of 6% of participants reported that they were not satisfied with their health, while 94% of participants claimed that they were satisfied with their overall health. Additionally, in this sample of students from southern Serbia, a total of 88% of students evaluated their lives with the highest marks (grades from 7 to 10), out of which 28% considered their lives to be the greatest they could possibly be. Table 1 shows the frequency of participants' responses to questions related to health and life satisfaction.

Table 1 The frequencies and percentages of satisfaction with health and life (N=500)

Questions	Grade										
	Bad			Good			Very good			Excellent	
How would you rate your health?	4 (1%)			30 (6%)			113 (23%)			353 (71%)	
	Grade										
	0	1	2	3	4	5	6	7	8	9	10
How would you rate your life?	0 (0%)	4 (1%)	2 (0%)	4 (1%)	8 (2%)	15 (3%)	23 (5%)	86 (17%)	112 (22%)	106 (21%)	140 (28%)

The values are the frequencies (percentage) of the participants' responses

The majority of students in southern Serbia trained three or more times a week, i.e., 90% of participants from this sample, while only 3% of students trained only once a week or not at all (Table 2). A total of 5% of the pupils in the sample were at the lowest level of physical activity (level 1). Additionally, 23% were at the second level, and 30% trained between 5 and 6 days a week (level 2). Notably, 37% of the students in the sample indicated that they were physically active every day.

Table 2 Frequency of physical activity per week (N=500)

The number of days per week	f (%)
0	11 (2%)
1	7 (1%)
2	27 (5%)
3	52 (10%)
4	64 (13%)
5	97 (19%)
6	56 (11%)
7	186 (37%)

Table 3 shows the frequencies of the participants' responses to questions related to the frequency of health problems they experienced in the last month. The majority of students in southern Serbia reported that, in the previous month, they rarely or never experienced a stomach ache (54%), headache (67%), or dizziness (86%), compared to the entire sample of participants. Also, most participants did not feel depressed (74.3%) or have difficulty falling asleep (60%). At least once a week, between 12% and 14% of pupils had the

mentioned complaints, except for dizziness, which was less common (7%), and difficulty falling asleep, which was more common, reported by 25% of the sample. Up to 2% of the students in the sample experienced stomachaches, headaches, dizziness, and feelings of depression every day, while 5% of the students experienced difficulties falling asleep.

The majority of students in southern Serbia, however, were in a bad mood at least once a month (60%) and felt nervous (63%). Furthermore, 32% of the students reported being in a bad mood at least once a week, and even 41% reported feeling nervous. Additionally, 7% of students reported feeling nervous on a daily basis.

Table 3 Frequency of health complaints (N=500)

Symptoms	How often in the last month				
	Rarely or never	Once a month	Once a week	Several times a week	Every day
Stomach pain	270 (54%)	168 (34%)	32 (6%)	24 (5%)	6 (1%)
Headache	335 (67%)	96 (19%)	34 (7%)	27 (5%)	8 (2%)
Nervousness	183 (36%)	111 (22%)	114 (22%)	58 (11%)	34 (7%)
Depression	371 (74%)	66 (14%)	38 (7%)	16 (3%)	9 (2%)
Irritability/being in a bad mood	196 (39%)	141 (28%)	107 (22%)	45 (9%)	11 (2%)
Difficulty falling asleep	267 (60%)	81 (16%)	63 (12%)	34 (7%)	27 (5%)
Dizziness	430 (86%)	37 (7%)	15 (3%)	11 (3%)	6 (1%)

The values are the frequencies (percentage) of the participant's responses

Table 4 displays the findings of the Pearson Chi-square test, which was used to examine the significance of the relationship between the amount of physical activity and the frequency of health problems (contingency table individually for each health complaint). All observed frequencies in the contingency table are greater than 5, except for the tested relationship between the level of physical activity and life satisfaction, wherein more than 20% of the cells have less than 5 participants, which is why it was not taken into account for further analysis. At a significance threshold of $p \leq 0.05$, the chi-square test revealed that the obtained frequencies differ from the frequencies expected by chance in at least one cell of the contingency table. The alternative hypothesis, that there is a statistically significant correlation between the level of physical activity and health satisfaction and between the level of physical activity and health complaints, is therefore accepted as true, and it is concluded that they are not independent and that the observed frequencies are more likely to occur.

Therefore, Pearson's Chi-square test indicates a statistically significant relationship between the level of physical activity and satisfaction with health ($\chi^2(3) = 7.68$; $p = 0.05$), abdominal pain ($\chi^2(3) = 19.43$; $p < 0.001$), headaches ($\chi^2(3) = 16.14$; $p < 0.001$), nervousness ($\chi^2(3) = 32.10$; $p < 0.001$), depression ($\chi^2(3) = 22.95$; $p < 0.001$), irritability ($\chi^2(3) = 28.03$; $p < 0.001$), difficulty falling asleep ($\chi^2(3) = 18.78$; $p < 0.001$) and dizziness ($\chi^2(3) = 16.74$; $p < 0.001$).

By examining the values in the contingency table, we can discern that the students with the lowest level of physical activity (≤ 2/week) were mostly satisfied with their lives (84.4%); however, as the level of physical activity increased, this percentage of students rose until it reached 95.2% for those who engaged in physical activity every day. However, we discovered that the majority of students who engaged in physical activity twice a week or less (53.5%) reported experiencing abdominal pain, and this proportion of students did not change significantly as levels of physical activity increased—only 33.9% of students in this sample of participants reported experiencing pain at the highest level of physical activity. At all levels of

physical activity, the majority of students did not experience headaches; however, it is unclear whether there is an association between a person's physical activity levels and headaches. Nevertheless, the group that engaged in daily physical activity had the lowest percentage of participants experiencing headaches (21.7%), compared to those who engaged in other levels of physical activity (37.8%, 36.8%, and 40.5%). The majority of southern Serbian students in the sample who did not engage in daily physical activity reported feeling anxious, compared to the majority of those who did (52.4%). On the other hand, the majority of students across all levels did not experience depression, but the group who exercised fewer than three times per week (level 1) had the greatest percentage of responders (46.7%) who reported experiencing depression. With increased physical activity, the percentage of depressed individuals decreased, and in the sample of students who participated in daily physical exercise, the percentage was only 17.5%. Students who did not engage in daily physical exercise were more likely to report having a bad mood, mainly level 1 students (75.6%), and this proportion tended to decline over time; as a result, the percentage in the group with the highest level of physical activity was 46.6%. The majority of students in the south Serbia district who engaged in physical exercise fewer than five days per week reported having trouble falling asleep, but only 29.1% of those students who engaged in the highest level of physical activity reported having this problem. Dizziness was more common among students who engaged in daily physical activity (6.3%) than among those who engaged in other levels of physical activity (15.6%, 21.9%, and 16.6%). Thus, the connection between dizziness and the level of physical activity is unclear, despite the fact that they are interdependent. Finally, the majority of children did not feel lightheaded throughout all types of physical activities.

Table 4 Satisfaction with one's health, life and health problems depending on the level of one's physical activity

Questions		The level of physical activity				
		1	2	3	4	Pearson χ^2 test
Satisfaction with health	NO	7 (15.6%)	9 (7.9%)	8 (5.2%)	9 (4.8%)	$\chi^2_{(3)} = 7.68$;
	YES	38 (84.4%)	105 (92.1%)	145 (94.8%)	180 (95.2%)	$p = 0.05$
Satisfaction with life	1	2 (4.4%)	1 (0.9%)	3 (2%)	4 (2.1%)	$\chi^2_{(6)} = 4.41$;
	2	3 (6.7%)	14 (12.3%)	15 (9.8%)	14 (7.4%)	$p = 0.62$
	3	40 (88.9%)	99 (86.8%)	135 (88.2%)	171 (90.5%)	
HBSC life	NO	3 (6.7%)	9 (7.9%)	11 (7.2%)	10 (5.3%)	$\chi^2_{(3)} = 0.92$;
	YES	42 (93.3%)	105 (92.1%)	142 (92.8%)	179 (94.7%)	$p = 0.82$
Stomach pain	NO	21 (46.7%)	63 (55.3%)	66 (43.1%)	125 (66.1%)	$\chi^2_{(3)} = 19.43$;
	YES	24 (53.5%)	51 (44.7%)	87 (56.9%)	64 (33.9%)	$p < 0.001$
Headache	NO	28 (62.2%)	72 (63.2%)	91 (59.5%)	148 (78.3%)	$\chi^2_{(3)} = 16.14$;
	YES	17 (37.8%)	42 (36.8%)	62 (40.5%)	41 (21.7%)	$p < 0.001$
Nervousness	NO	12 (26.7%)	30 (26.3%)	43 (28.1%)	99 (52.4%)	$\chi^2_{(3)} = 32.10$;
	YES	33 (73.3%)	84 (73.7%)	110 (71.9%)	90 (47.6%)	$p < 0.001$
Depression	NO	24 (53.3%)	74 (64.9%)	118 (77.1%)	156 (82.5%)	$\chi^2_{(3)} = 22.95$;
	YES	21 (46.7%)	40 (35.1%)	35 (22.9%)	33 (17.5%)	$p < 0.001$
Irritability	NO	11 (24.4%)	31 (27.2%)	54 (35.3%)	101 (53.4%)	$\chi^2_{(3)} = 28.03$;
	YES	34 (75.6%)	83 (72.8%)	99 (64.7%)	88 (46.6%)	$p < 0.001$
Difficulty falling asleep	NO	21 (46.7%)	57 (50%)	84 (54.9%)	134 (70.9%)	$\chi^2_{(3)} = 18.78$;
	YES	24 (53.3%)	57 (50%)	69 (45.1%)	55 (29.1%)	$p < 0.001$
Dizziness	NO	38 (84.4%)	89 (78.1%)	126 (82.4%)	177 (93.7%)	$\chi^2_{(3)} = 16.74$;
	YES	7 (15.6%)	25 (21.9%)	27 (17.6%)	12 (6.3%)	$p < 0.001$

The values are frequencies (percentage).
Levels: 1., 0-2 days/week; 2nd, 3-4 days/week; 3rd, 5-6 days/week; 4., 7 days/week.

4. DISCUSSION

The aim of this study was to investigate the connection between the level of physical activity and the frequency of health problems among students in southern Serbia during the state of emergency caused by the COVID-19 pandemic. Our results align with several studies that have shown children being less physically active during the pandemic (Zhou et al., 2020; Bates et al., 2020). Social isolation and restrictions during the pandemic have significantly decreased the degree of physical activity among both male and female students (Zhou et al., 2020). A survey of Canadian children and adolescents revealed a substantial decline in meeting recommended guidelines for physical activity during the COVID-19 pandemic (Moore et al., 2020), further highlighting the challenges faced during such periods.

Despite the challenges, our findings demonstrated a statistically significant relationship between one's level of physical activity and satisfaction with health and health-related issues. While the relationship between physical activity levels and health satisfaction did not reach statistical significance ($p = 0.82$), our results show that an increase in physical activity is associated with a higher percentage of students reporting satisfaction with their health. These findings are consistent with earlier studies that have explored the relationship between physical activity levels and health-related outcomes (Chen, Ho, & Ahmed, 2020; Hawker, 2012). Notably, our study adds to the literature by examining this relationship during a state of emergency, providing valuable insights into students' health and well-being in challenging circumstances.

Moreover, our study aligns with research indicating that physical activity has a positive impact on children's and adolescents' moods during the COVID-19 epidemic (Zhang et al., 2020). Engaging in regular physical activity was associated with reduced symptoms of nervousness, depression, and difficulty falling asleep. This highlights the potential of physical activity as a protective factor for students' emotional well-being, even in the face of additional stressors during a pandemic.

Besides the effects of the COVID-19 pandemic, we also observed a relationship between physical activity levels and specific health issues. Students with higher levels of physical activity reported lower frequencies of abdominal pain, headaches, and dizziness compared to those with lower activity levels. These findings support previous research indicating that regular physical activity may contribute to reduced health complaints (Valois et al., 2004; Milde-Busch et al., 2010). However, it is essential to recognize that lifestyle factors, such as coffee and alcohol use, may also influence these health outcomes. Additionally, continuous high-intensity exercise may not always be advisable, as it may lead to discomfort in the locomotor apparatus (Kujala, Taimela, & Viljanen, 1999).

Considering the collective findings, promoting physical activity among students remains crucial for enhancing their overall health and well-being. Encouraging regular physical activity, even during challenging circumstances like a state of emergency, can have positive effects on students' health satisfaction, mood regulation, and specific health complaints. By understanding the relationship between physical activity and health outcomes, schools and communities can design targeted interventions to support students' overall health and resilience, even amidst unforeseen disruptions.

Despite the contributions of this study, some limitations should be acknowledged. The use of self-reported questionnaires to assess physical activity may introduce biases and inaccuracies. Future research could benefit from incorporating objective measures, such as accelerometers, to provide more reliable data on students' physical activity levels.

Additionally, a larger and more diverse sample could further enhance the generalizability of the results.

In conclusion, this study sheds light on the importance of regular physical activity for students' health and well-being, especially during challenging periods like the COVID-19 pandemic. The findings emphasize the potential benefits of maintaining physical activity for students' overall health satisfaction, emotional well-being, and specific health complaints. By promoting physical activity even during adverse circumstances, we can strive to improve students' health outcomes and foster their resilience in the face of adversity.

5. CONCLUSION

Physical activity has proven to be vital for students' health and well-being, even during challenging periods such as the state of emergency caused by the COVID-19 pandemic. Our research, conducted on a sample of 500 students from southern Serbia, highlights the importance of regular physical activity for students' overall health satisfaction and the frequency of health problems they experience. Most students in the sample engaged in regular physical activity, and this was associated with higher satisfaction with their health and reduced reports of health issues.

The significance of our study lies in the insights gained about physical activity during the state of emergency and its relationship with health problems among students. These findings can aid in designing appropriate physical exercise programs for students, especially during challenging times. As future research unfolds, it will be valuable to explore physical activity patterns further, using objective measures like accelerometers to complement self-reported data. With continued efforts to promote physical activity among students, we can enhance their well-being and overall health, even amidst unforeseen circumstances.

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FIZIČKA AKTIVNOST I ZDRAVSTVENE TEGOBE UČENIKA JUŽNE SRBIJE U USLOVIMA VANREDNOG STANJA

Pandemija Covid 19 prisutna je u gotovo svim zemljama sveta i dovela je do promene svakodnevice čoveka. Cilj ovog rada bio je utvrditi povezanost nivoa fizičke aktivnosti i učestalosti zdravstvenih tegoba učenika južne Srbije u uslovima vanrednog stanja. Uzorak ispitanika u ovom istraživanju činilo je 500 učenika osnovne škole sa teritorije južne Srbije. Uočeno je da manje od 1% učenika ocenjuje svoje zdravlje kao loše, a ukupno 6% ispitanika nije zadovoljno svojim zdravljem, dok je 94% učenika zadovoljno svojim zdravljem. Takođe, ukupno 88% učenika ocenjuju svoje zdravlje najvišim ocenama od čega 28% smatra da je njihovo zdravlje najbolje moguće. Većina učenika južne Srbije je trenirala tri ili više puta nedeljno, tj. 90% ispitanika iz ovog uzorka, dok je svega 3% učenika treniralo samo jednom nedeljno ili nijednom. Rezultati istraživanja ukazuju na to da su učenici koji su bili fizički aktivni u većoj meri u manjoj meri imali zdravstvene tegobe nego učenici na najnižem nivou fizičke aktivnosti. Benefiti bavljenja fizičkom aktivnošću su brojni, fizička aktivnost utiče na očuvanje zdravlja čoveka i doprinosi pravilnom rastu i razvoju deteta. Značaj ovog rada ogleda se u mogućnosti dolaženja do saznanja o fizičkoj aktivnosti tokom vanrednog stanja, o povezanosti fizičke aktivnosti i zdravstvenih tegoba koje su se pojavljivale kod učenika južne Srbije tokom pandemije Covid 19.

Ključne reči: *Covid-19, zdravstveno stanje, osnovna škola*

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Review article

STUDENT PERFORMANCE ASSESSMENT IN ONLINE LEARNING ENVIRONMENT

UDC 371.26; 37.018.43; 371.213; 316.774:371.13

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Abstract. *The importance, traits, and methods of assessment in an online context are highlighted in this paper's discussion of assessment as an essential component of teaching. The paper aims to provide teachers with a comprehensive overview of the fundamentals, features, and methodologies of online assessment while also emphasizing the need for ongoing efforts to raise teachers' professional competence in order to ensure their successful integration into contemporary educational processes. The research sample comprises of pertinent literature that was gathered on the Google Academic and ResearchGate platforms, most of which is foreign due to the scarcity of studies on this topic in Serbia. Approximately 20 years' worth of publications have been chosen, taking into account the topic's current relevance. This paper was prepared largely with the aim of giving teachers more knowledge, influencing awareness-raising, and removing hurdles that teachers frequently have when it comes to online assessment. It was written utilizing the technique of content analysis. Since the past has demonstrated that the educational system is not immune to social difficulties, it is advised that teachers accept online assessment as a substitute for traditional methods of assessment and become familiar with its significance and potential implementation strategies.*

Key words: *student performance, online environment, online assessment, online assessment techniques, teacher*

1. INTRODUCTION

One of the five crucial steps in the teaching and learning process, student performance assessment, creates a connection between teachers, institutional policies, and disciplinary procedures and student needs (Hodgson & Watts, 2016). The assessment of the intended

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outcomes of the teaching process should be prepared and begun concurrently with the teaching, and preferably before that, even if it is typically anticipated that this will happen after the end of the implementation of instruction. Before the teaching process is put into action, the assessment process should start by evaluating the available materials as well as the students' prior knowledge and skills in relation to a particular teaching unit. The ability to create and carry out the teaching process using appropriate methods and approaches would be made possible by this insight into the student's prior knowledge. The assessment of student achievement, according to the authors (Saputra & Hidayani, 2021), is "an integral part of the teaching and learning process in both conventional and distance education contexts" and serves as a gauge of students' progress toward meeting predetermined educational goals (Ogange et al., 2018, p. 29). Education is no longer just restricted to the classroom; instead, online learning has emerged as the new pillar of education (Idrizi et al., 2021). Even though online learning which started to be used in 2020 represented a great challenge for both students and teachers, it turned out that learning in an online environment facilitates continuous evaluation, enables automatic and quick correction of shortcomings, and timely direction of the further course of the learning process (Almeida & Monteiro, 2021). The online learning environment provides tasks for written and spoken communication, cooperation, and teamwork with the option of employing various means of expression through visualization, multimedia presentation, audio, and video resources, in addition to real-world, everyday skills (McLoughlin, 2006). The online learning environment increases student engagement, promotes quick feedback, offers flexibility in terms of time and location, and cuts down on the amount of time needed for administrative and assessment duties (Baleni, 2015). Students are expected be self-disciplined and motivated to learn via discovery in order to take advantage of the ease and flexibility that the online environment offers (Robles & Braathen, 2002). To sustain the pedagogical potential of contemporary, online teaching, teachers, on the other hand, consider the advantages of the online environment for learning outcomes while using proper teaching methods and new technology. When comparing learning and teaching in an online setting to learning and teaching in a traditional context, there are differences in interaction, communication, learning paradigms, and assessment methodologies. According to Robles and Braathen (2002), altering how the teaching process was carried out also required altering how teaching efforts and student progress were evaluated.

Numerous studies confirm the lack of preparation and uncertainty among teachers when it comes to evaluating student achievement in an online setting (Musdulifah et al., 2022; Lopes & Soares, 2022; Rahman et al., 2022; Syam & Jumiaty, 2022; Sambell et al., 2019). We may also concur that the necessity for best practices for evaluation in the online context is clearly increasing (Baleni, 2015). Existing research demonstrates that teachers were very concerned when deciding how to assess student work. Although they frequently used the traditional method – paper and pencil – while securing and adhering to the established standards, there were times when it was preferable to evaluate students virtually, without having them present.

Online evaluation goes beyond testing and evaluation. The teacher must modify and enhance assessment methods and activities for the sake of efficient evaluation in the online environment in order to give students useful feedback (Robles & Braathen, 2002). All of the above leads to the idea that, in the event that the teaching staff once again has the opportunity to implement the teaching process using digital technologies, online assessment should be presented in one location with all of its features, potentials, as well

as recommendations for its successful implementation. Although we don't anticipate facing the same difficulties as in 2020, when classes were held entirely online due to the Covid-19 pandemic, it will be beneficial to be ready and have everything we discuss in this article on hand as a reference and a backup plan.

The basis for new types of assessment is found in constructivism, i.e., the constructivist approach to learning, according to which "knowledge is created by the activity of the learner and the learning process consists in the (re)organization of schemas with which the learner represents certain elements in his physical and social environment". In order for this learning model to be applied in practice, it is important to promote the formation of new concepts or constructs in students that are linked to previously assumed schemas and integrated into complex structures based on students' cognitive activity and their practical experiences and actions. As students acquire and "construct" their own knowledge, teachers should merely guide and direct them in this process. It is the teacher's task to provide students with the necessary sources of information and other materials with which they construct their knowledge through their own activity" (Glušac, 2012, p. 18).

A constructivist view of assessment can be applied to online assessment in particular, as it does not measure reproductive knowledge, which is often assessed in examination situations, but focuses on higher mental functions and writing portfolios, essays, making projects, models, and other independent work.

2. Evaluation of Student Performance: Importance and Definition

Assessment of student performance involves a systematic review of activities, regular assessment, and timely feedback with the goal of measuring and verifying student results in the educational process (Lopes & Soares, 2022; Ragupathi, 2020; Sambell et al., 2019). It indicates that both the student and the teacher, who is acting as the assessor, must take responsibility and put forth constant effort. The right evaluation method is essential for a student's learning, teaching, and overall personality development (Kharil & Mokshein, 2017). According to Sambell, Brown, and Race (2019), assessments for teachers should be appropriate, valid, trustworthy, inclusive, and manageable, while for students they should serve as a significant source of motivation and a catalyst for future learning (Mate & Weidenhofer, 2021). Assessment of student performance is a complex task that includes the approach and consideration of three key components: self-assessment of achievement by students; measuring learning objectives; and interaction and feedback between students and teachers (Musdulifah et al., 2022; Robles & Braathen, 2002).

Certain authors (Orsmond et al., 2002 according to Sambell, Brown & Race, 2019) advise specific tasks so that the teacher can successfully give feedback and assess the student's achievement:

1. Give the pupils spoken feedback during the lecture, pointing out any flaws or errors they are making right now. This would allow for an intervention and have an impact on error prevention and prompt correction. We may also add that it would be beneficial to record or note faults that occur inside a specific teaching unit. If we were to teach the same lesson online to a later generation of students, it would be a good idea to keep the notes and make them available so that any mistakes that were made might be avoided in the future.

2. Reporting on finished assignment and distributing it to the students electronically after class.
3. Utilize worksheets where it would be beneficial to include the evaluation criteria.

In order to prevent simple content reproduction, insufficient access to content, and uncritical use of knowledge and available data, assessment criteria should be constructively matched with prescribed learning objectives (Sambell, Brown & Race, 2019). The aforementioned can be accomplished by adhering to the standards of quality evaluation:

1. Assessment needs to be clearly connected to learning objectives.
2. Use of different evaluation methods.
3. To gauge student development in the course of learning, the teacher should use diagnostic, formative, and summative assessment procedures.
4. The learning objectives, evaluation criteria and scoring method should be transparent for students.
5. The teacher should provide continuous feedback based on formative assessment to help students fill learning gaps.
6. Students should be given the opportunity to reflect on their learning and self-assess their own progress (Orlando, 2011, p. 28).

In this section of the paper, the features of assessment are emphasized as a crucial step in the teaching process that not only offers insight into the efficacy of what has been done but also serves as a guide for creating new lesson plans. Due to the uniqueness of assessment in the online setting, we outline the features of online assessment in the sections that follow, beginning with the characteristics of traditional evaluation.

3. Features of Student Performance Evaluation in an Online Setting

While online assessments also use multimedia, audio, video, and animations, traditional assessments of student achievement primarily use paper and pencil (Westhuizen, 2016). For both traditional and online assessment, the objective, purpose, and components are essentially the same. Every component of traditional assessment is included in online assessment, and the use of contemporary technologies enhances the approaches and strategies that can be applied during online assessment. Online assessment is based on traditional assessment approaches for formative, summative, and diagnostic assessments, while it is facilitated with digital technologies that are employed in the development, storage, and dissemination of assignments to assess student accomplishment (Villiers et al., 2016). Therefore, online evaluation can be carried out using a variety of contemporary devices (computers, laptops, mobile phones) using text-based or multimedia documents as well as complex game simulations (Musdulifah et al., 2022; Kharil & Mokshein, 2017). It is evident that online assessment, quite expectedly, has a big role in the digitization of education (Kundu, 2021), regardless of the stated goal of online assessment, it should be primarily pedagogical, not technological, which means that digital technology should be put in the service of pedagogy in this case (Pedersen et al., 2012).

The requirements and tasks students are given online must be explained fully and clearly, and students must receive timely, accurate feedback (Diarsini et al., 2022; Mate & Weidenhofer, 2021; Gaytan & McEwen, 2007). Numerous methods can be used, including online tests, surveys, participation in online games, forum posts, multiple-choice questions, essay writing, and the capacity to connect different pieces of information and utilize them to address problems in the real world (Lopes & Soares, 2022). All forms of

assessment conducted online share the potential for increased student motivation and a certain amount of fun, which not only improves the assessment's outcome but also lessens the discomfort that students frequently experience when checking and evaluating their performance during the learning process.

Asynchronous and synchronous online assessment options are available, and synchronous online assessment requires less time for risk management than asynchronous online assessment does (Pedersen et al**.,** 2012). While asynchronous learning involves the sequential activities of teachers and students, synchronous learning in an online environment involves the simultaneous presence of teachers and students in an online classroom (Robles & Braathen, 2002).

Although we have already mentioned some of the positive features of online assessment, but the advantages that the author (Westhuizen, 2016) singles out can particularly facilitate assessment in an online setting:

1. Test items can be randomized, so that students do not receive tests with the same order of questions.
2. The provided answers to multiple-choice questions might be presented in a different order.
3. Test items can be ordered by difficulty level.
4. The distribution of different assignment groups to various students can be done using test sets.
5. Automatic evaluation of some of the assignments lessens the teacher's workload.
6. Online tools can provide instant feedback to students.
7. Item analysis can be done using online tools, which can aid the examiner in spotting badly written assignments and questions.

When developing assessment methods for each topic, online assessment offers flexibility. It enables students to take exams or answer questions when it is convenient for them, and it offers the chance for peer interaction and collaboration through online discussions, self-checking, and peer assessment of individual and group work (Ragupathi, 2020).

In contrast to traditional evaluation, online assessment uses contemporary, digital technologies. But regardless of digital technologies as a mediating tool, assessment in an online environment can be diagnostic, formative or summative. In addition to these benefits, using digital tools for evaluation gives teachers immediate access to student work and accomplishments, while also giving students quick and accurate feedback (Lopes & Soares, 2022). teaching process and student progress makes online assessment unique.

4. Online Assessment Techniques

Software platforms support techniques that can be employed in online assessment (Villiers et al., 2016). A teacher has a variety of alternatives and methods at their disposal to evaluate student performance online (Ragupathi, 2020). These assessment techniques must support the creation of realistic learning scenarios, the alignment of learning objectives with actual circumstances, the use of software for teaching, the accessibility of teachers, and the provision of support and assistance during learning if they are to be effective (Boyle et al., 2003).

Online evaluation methods abound in the related literature. By examining and differentiating each technique's traits, we can find that all of them share the use of digital technologies to mediate communication between instructors and students.

The use of multiple-choice questions that include identifying the problem and its solutions is the first method mentioned. Since this is the most typical form of online evaluation, it is crucial to create questions that will be simple to answer later. Writing abilities are not evaluated in this situation, which is a mitigating factor if one of the pupils writes in a different language. Because the teacher creates the questions and the suggested answers, there is a thread of subjectivity present that makes it difficult to consider this type of assessment to be completely objective. Only one of the possible answers to a question of this type, which should be brief and clearly phrased, is correct (Dominguez-Figaredo et al., 2022; Lopes & Soares, 2022; Ragupathi, 2020**;** Ogange et al., 2018; Stansfield et al., 2004; vd Westhuizen, 2016).

Questions that require the student to classify the provided response as either true or false. In this instance, the student has a 50% probability of accidentally guessing the right response. By requesting an additional justification for the selected response, this flaw can be fixed (Ragupathi, 2020; Ogange et al., 2018; vd Westhuizen, 2016; Benson, 2010).

The most typical short-answer questions are those with blanks to fill in. As an answer to a question, the student types in a word or phrase. This scoring method has the benefit that answers can be scored right away by comparing the received answer to a previously prepared answer. The shortage of this kind of question could be the result of a typographical or spelling error, in which case even the right response would be flagged as incorrect (Ragupathi, 2020; Ogange et al., 2018; vd Westhuizen, 2016).

The use of essay questions is indisputable when it comes to qualitative assessment. The student reflects on his beliefs while also demonstrating knowledge and expertise in the subject matter by responding to a given question. This method of assessment is useful when assessing higher-order learning skills, bearing in mind the greater likelihood of subjectivity when evaluating answers (Lopes & Soares, 2022; Ragupathi, 2020; Ogange et al., 2018; vd Westhuizen, 2016).

In an online setting, self- and peer-evaluation are related assessment techniques. Questions with brief and direct replies that foster a deeper approach to learning and encourage the student to reflect on what he has learned comprise self-assessment. It entails completing a self-evaluation diary and reflecting on whether and how well they were able to solve problems as a type of online assessment. Students in this situation must take initiative and autonomously track on their progress. Following the self-evaluation, it is possible to determine whether the student's individual contribution is important for the development of the group or team. In this case, the peer assessment is added to the student's self-evaluation score (Benson, 2010; Gaytan & McEwen, 2007; McLoughlin, 2006; Robles & Braathen, 2002). The authors (Robles & Braathen, 2002) stressed that, in addition to the teacher, students themselves play an extraordinary role in assessing accomplishment even twenty years ago. They considered self-assessment as a crucial part of the learning process in the online setting. With the help of this approach, pupils can determine if they have met the predetermined objectives or whether they need to revisit the material and carry out the same tasks again.

The use of evaluation tables, preferably in the form of a straightforward checklist. Although it takes the teacher more time and effort to prepare the questions, this method of assessment is quick and easy. It is advisable to familiarize the students with the structure of this grading technique and the process for assessing the submitted responses before implementing this strategy (Rahman et al., 2022; Villiers et al., 2016).

Students are accustomed to using digital devices and are comfortable posting to forums and blogs. This is one of the online assessment strategies that makes it possible to gauge students' interest in a certain subject. While working to complete a task or solve a problem, the student applies critical thinking by writing posts and blogs (Lopes & Soares, 2022; Ogange et al., 2018; Villiers et al., 2016; Westhuizen, 2016; Gikandi et al., 2011). In contrast to a face-to-face discussion, students can give more open-minded and truthful assessments and responses in this situation.

A student's work is arranged and presented in an electronic portfolio as part of an online evaluation strategy to show that the student has learned the material and has improved over time. Teachers can better understand student achievement while students can obtain a deeper comprehension of the topic thanks to portfolios. Images, audio, and video can be included. The ability to include diverse elements that give a more accurate image of the student's work is the electronic portfolio's key advantage (Dominguez-Figaredo et al., 2022; Ogange et al., 2018; Villiers, Scott-Kennel & Larke, 2016; vd Westhuizen, 2016; Gikandi et al., 2011; Benson, 2010; Gaytan & McEwen, 2007).

Activities structured on the basis of play, frequently with competitive qualities, are included in game-like activities as an online assessment tool. These activities are a good predictor of the true status of student achievement. They serve as both a stimulating opportunity for students to evaluate their progress and a secure, imaginative, and innovative setting where they can experiment, work together, and solve problems (Lopes & Soares, 2022; vd Westhuizen, 2016). The elimination of anxiety and assessment-related fear is a benefit of using this technique for online evaluation.

The presentation as a method of online evaluation entails seeing and evaluating the student's work and effort, comprehension of the material delivered by the student during the presentation, and creativity (Rahman et al., 2022; Villiers et al., 2016). The student exhibits a variety of abilities when giving a presentation, including the level of knowledge, his work experience with digital technologies, his creativity, originality, and independence.

When used as an assessment approach in an online setting, virtual or online conversation offers an advantage over face-to-face discussion in terms of removing the anxiety associated with public speaking. Online discussion's asynchrony feature allows students additional time to consider comments. Students may be requested to remark on a discussion of a particular topic, and those comments may then be assessed online using checklists, which would constitute formative evaluation in this instance. Students can then be given assignments to discuss online, and by keeping an eye on the level and quality of their discussions, it will be feasible to assess how well the students are understanding the material and how they think. The hardest task in this situation is coming up with meaningful discussion topics and assignments. The questions should be relevant to the material but also prompt further investigation and higher order thinking from the learner (Villiers et al., 2016; Orlando, 2011; Benson, 2010).

Based on the chosen online evaluation strategies, we may conclude that this type of evaluation is challenging and demanding for both the student and teachers themselves. Undoubtedly, there are numerous ways that the assessment of student performance in an online environment could be successfully completed. After gaining an understanding of the characteristics of the techniques being used, it is important to emphasize that, in addition to enhancing teachers' and students' abilities, it is important to support and influence the growth of their awareness of the role they can play in the process of evaluating both their performance and instructional methods

5. CONCLUSION

Information on accomplishments acquired in an online environment has a favourable impact on students' motivation for future learning, according to research on the impact of feedback in an online learning environment (Al-Darei & Ahmed, 2022). Additionally, it was discovered through the analysis of relevant resources that teachers require more support and information regarding the requirements of online assessment. This study attempts to analyze relevant theoretical and empirical studies concerning the evaluation of student performance in an online setting. We began by assuming there was a significant number of studies on this subject, which turned out to be correct (Kristiyanti, 2021).

Although it is on its way out, the Covid-19 pandemic has left evident consequences and traces when it comes to education. It broadened the horizons of all participants in the teaching process, and showed that the classroom is definitely not the only place for the realization of teaching, and for the effective implementation of all stages of the teaching process. The remaining advice is that the teaching personnel should always advance their skills and stay up-to-date with new developments in digital technology. Additionally, instructors should set up occasional online classes and ensure that students are comfortable working in an online setting. As a result, both teachers and students would be aware that working in an online setting is an option that might be used again.

Teacher has to know the students and their unique qualities, while the evaluation approach must be suited to the needs of the students as well as (Diarsin et al., 2022). There are numerous aspects that affect the quality of assessment and numerous components that should be taken into consideration during assessment, therefore evaluation of student accomplishment in any situation, whether traditional or online, should be considered as a systematic effort (Robles & Braathen, 2002). In an online setting, teachers ought to encourage discussion among students and give constructive comments in addition to teaching knowledge. The teacher should also share learning objectives with students and outline the standards to be followed during online learning (Wing & Sand, 2019). Before beginning with the presentation of content, which will be assessed later, after, and throughout the learning process, students should be able to complete activities in an online environment (Baleni, 2015). While the online setting requires teachers to work on technological and digital competencies in addition to regular professional activities (Gillet-Swan, 2017), we are witnessing that it is not enough for a teacher to only have initial education and training by participating in a certain number of seminars. The teacher, on the other hand, must work diligently to improve his professional position, conduct research, keep up with modern society's trends, and constantly seek to improve and innovate his own abilities in addition to these official forms of learning and training. Because it is anticipated that future education will take place online, this paper also has the implication that modern learning and assessment methods must be developed.

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PROCENA UČENIČKIH POSTIGNUĆA U KONTEKSTU ONLINE UČENJA

Kroz diskusiju o ocenjivanju kao suštinskoj komponenti nastave, u radu je ukazano na značaj, ocenjivanja u onlajn kontekstu, kao i sveobuhvatan pregled nastavnicima koji se odnosi na osnove, karakteristike i metodologiju onlajn ocenjivanja. S obzirom na potrebu za permanentnim podizanjem profesionalnih kompetencija nastavnika na ovaj način bi se obezbedila njihova uspešna integracija u savremene obrazovne procese. Kroz analizu relevantne literature koja je prikupljena na platformama Google Academic i ResearchGate cilj rada bio je da se nastavnicima pruži više znanja o onlajn ocenjivanju, da se utiče na podizanje njihove svesti i da se uklone prepreke za njegovu primenu od strane nastavnika koji često imaju predraude u odnosu na onlajn ocenjivanje. Izvršena analiza odnosila se na publikacije objavljene u prethodnih 20 godina, uzimajući u obzir trenutnu relevantnost teme. S obzirom na rezultate dobijene analizom, a imajući u vidu činjenicu da su ranija istraživanja pokazala da obrazovni sistem nije imun na društvene teškoće, savetuje se da nastavnici prihvate onlajn ocenjivanje kao zamenu za tradicionalne metode ocenjivanja i da se upoznaju sa njegovim značajem i potencijalnim strategijama implementacije.

Ključne reči: *učeničko izvođenje, onlajn okruženje, onlajn ocenjivanje, tehnike onlajn ocenjivanja, nastavnik*

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Review article

THE INFLUENCE OF DANCE CONTENTS ON THE PRESCHOOLERS MOTOR FITNESS AND THEIR POSSIBLE APPLICATION IN PRESCHOOL INSTITUTIONS CURRICULUM

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Abstract. *This paper presents a research focused on dance contents, specific dance programs and preschool children motor fitness. The main goal of this paper was to collect and analyze studies that as an experimental treatment had the contents of dance activities and their impact on the preschool children motor fitness. The necessary literature and papers were collected through the following databases: Google Scholar, PubMed, SCI index and the available professional literature at the Faculty of Sport and Physical Education in Niš, as well as other available literature. The following keywords were used: influence, effects, preschool age, preschoolers, exercise, dance, dance activities, motor skills, motor skills and their adequate translation into English. Twelve papers that met the set criteria were selected for the final analysis. The following conclusion was drawn: there is a positive impact of dance contents on the preschool children motor fitness, therefore, they can be recommended for use as the adequate contents of the PE curricula in preschool institutions.*

Key words: *influence, dance, fitness, preschoolers, program, teaching process, education*

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1. INTRODUCTION

Preschool age is an extremely sensitive period of an individual's development and has always been in the focus of scientific interest of the profession. Most motor abilities, and with it certain habits and motor skills, develop precisely in childhood. Therefore, it is possible to influence them in the preschool period, from the fourth to the seventh year of life and up to the early school age, from the seventh to the eleventh year (Bala, 1991). Motor behavior depends on the level of maturity of the central nervous system. It is influenced by genetic (Malina & Bouchard, 2004) and external factors (Bouchard & Malina, 1997 according to Chaves, et al., 2015). In this period, it is possible to influence the complete personality of children through physical exercise because children react to physical activity with their complete intellectual and cognitive capacity (Ismail & Gruber, 1971).

It is extremely important for certain motor skills of children to develop at the right time. The lack of timeliness can affect many of them to be underdeveloped. If that critical period of growth and development is missed, it is very difficult to make up for it later, and the level of adoption gets lower (Kelly, 1985; Humphrey, 1991; Hamga, 1999).

It is an indisputable fact that most motor tasks and thus the entire activity of children is based on play. Through play children learn about life, through play children also go through the stages of human evolution (Tadić, 1985). In preschool institutions, through play children learn and acquire certain hygiene habits (e.g. brushing their teeth), they learn life activities (the game "Crossing the street"), good behavior (the game "Bon Ton") and the like. To put it in a nutshell, it must certainly be a well-planned and expertly managed activity in order to provide a high-quality and long-term stimulus for the development of all traits and abilities (Pejčić & Malacko, 2005).

Motor abilities at this age are definitely not precisely differentiated and we can label them as children's motor skills. It was already pointed out that organized physical exercise in preschool institutions is very important, but it turned out that they are insufficient by themselves. Mandatory physical activity which is carried out in preschool and school institutions is not enough to influence the increase of the child's overall physical activity and the improvement of its motor fitness (Cleland, et al., 2008; Pate, et al., 2008). Programmed activities improved children's motor skills on tests of coordination, flexibility and strength (Hraski and Zivcic, 1996). The results of research carried out in the last twenty years show a motor benefit in almost all examined areas (Kostić, et al., 2002; Dobrila, Sporiš & Hraski, 2003, Deli, Bakle, & Zachopoulou, 2006; Živčić, Trajkovski - Višić , & Sentderdi, 2008).

Therefore, additional forms of exercise and different and special programs for the development of motor skills of preschool children have been organized (Uzunović et al.. 2017; De Privitellio, et al., 2007), especially dance contents as a form of activity were implemented and their effects monitored (Pantelić et al.. 2018). Children's dance programs have a positive effect on the motor fitness of preschool children (Uzunović, Veselinović, and Stojanović, 2006; 2011). That experience was also shown at the age of younger schoolchildren (Marković, 2011). By combining with elements of gymnastics (exercises on the apparatus and on the floor), dance activities turned out to be an excellent content of the alternative physical education program for younger school age (Marković, 2016).

Children's dances or dance games (Kostić and Uzunović, 2013) are a special type of dance. They are composed of technical elements of other dances (folk, social, modern), but they are modified in such a way that, in addition to being rich in movements, they exist in special dance forms, different rhythms and specific choreographic solutions. Their application affects

biological growth and development, but also has an educational role in physical education (Uzunović, Kostić, and Stojković, 2010). The Institute for the Improvement of Education and Training - ZUOV). Children's dances have a positive effect on the development of most motor skills: coordination, speed, strength, endurance. They also enable normal mobility of all joints (Zrnzević et al., 2010), correct body posture, correct function of internal organs, which is a priority for the normal growth and development of preschool children.

Motor abilities represent a general feature of an individual or capacities that are associated with the performance of various motor skills, and which at the same time represent a component of those skill structures (Magill, 2004). Their development leads to the balanced functioning of the movement system, which represents motor fitness. The term "fit" in the narrower sense is a term used to denote the coordinated action of various human abilities and physical characteristics during the execution of physical activities with a certain degree of neuromuscular strain (Kostić, 2009). Dance can be defined as a form of musical experience, which through rhythmically determined movements contributes to the artistic expression of the spiritual states of man. In dance, a person expresses himself or herself with his/her body, movements and motions, which he/she shapes spatially, dynamically and temporally (Kostić and Uzunović, 2013).

The subject of this paper is dance contents, specific dance programs and motor fitness of preschool children. In a narrower sense, it focuses on the application of various dance activities for the development of motor skills of the mentioned population in the previous twenty years, and the possibility of their application in the contents of work in preschool institutions.

2. METHODS

2.1. Search Strategy

The collection of necessary literature and papers was performed through the following databases: Google Scholar, PubMed, SCI index and the available professional literature at the Faculty of Sport and Physical Education in Niš, as well as utilizing other available literature. The following keywords were used: influence, effects, preschool age, preschoolers, exercise, dance, dance activities, motor skills and their adequate translation into English.

2.2. Inclusion Criteria

The systematization of the found research was carried out according to the criteria of the type and impact of dance activities on the motor fitness of the examined sample.
The experimental research had to meet following criteria in order to be accepted for the final analysis:

- subjects were tested to determine motor skills and motor skills in general;
- only the persons not suffering from any chronic diseases participated in the research;
- experimental research included children - preschoolers, male and female, with an average age ranging from four to six years;
- dance programs were used in the research studies.

2.3. Data Collection

The experimental studies that satisfied the requirements were then examined and presented using the criteria listed below: reference (author and year of publication of the research), sample of subjects (total number of subjects and subgroups), program contents, tests or tested abilities that were used to determine motor skills and research results. The oldest of these studies was published in 2002, while the latest was in 2020. The articles in this collection gathered information on the sample size, age, variables, experimental, program and results. In the end, the qualitative analysis comprised 12 studies.

2.4. Exclusion criteria

The criteria for excluding the research studies were:

- research was conducted on school-aged subjects;
- experimental research was conducted on the subjects who did not practice the dance program;
- subjects were disabled children;
- theses, dissertations, congress abstracts, and proceedings were not considered, nor were qualitative reviews, systematic reviews, or meta-analyses.

3. RESULTS

3.1. Description of the Studies

Table 1, displays all of the information about the publications that made up the review. The sample sizes for the studies ranged from 25 to 66, and they included both boys and girls between the ages of 4 and 6. In total, more than 554 participants were included. A minimum of eight weeks and a maximum of ten months were spent practicing various types of dance. Preschoolers practiced dance 2 to 4 times a week.

The results showed changes in the parameters of motor status in preschool children: strength, speed, flexibility, coordination, balance, kinesthetic differentiation, orientation in space, rhythmic ability, fine control of hands, agility, proprioception, and endurance. Regarding morphological status, changes were observed in physical development, and in the parameters of social status there were improvements in social development. And finally, in psychological status changes were monitored for executive function, working memory, and cognitive flexibility skill.

The aim of the study is to determine, based on the available research, the impact of different dance programs on the preschool children motor fitness. First of all, research on the mentioned sample was sought. In addition, we searched for research that had a dance program or intervention in the experimental procedure. In the following table, papers that meet the set criteria are highlighted. The discussion of the results refers to the benefits of the implemented programs and the analysis of the program contents.

Table 1 Information about the publications that made up the review

Authors	Subject sample	Variables	Experimental program	Results
Kostić et al. (2002)	30 boys and 30 girls preschoolers	strength speed flexibility coordination balance	folk dances standard social dances rhythmic games dance improvisations with different music patterns 4 months 3x a week total 48 hours of dance	strength + speed (boys del. girls -) flexibility + coordination + balance +
Venetsanou & Kambas (2004)	66 preschoolers (36 boys and 30 girls) 4-6 years	development of motor abilities	combination of music/movement elements, singing games and dances *introductory traditional Greek dances*	kinesthetic differentiation + balance ability + orientation in space + rhythmic ability response ability +
Uzunović, et al. (2006)	50 preschoolers girls 6 years	individual development of motor abilities	accredited dance program "play, sing, create through dance" 3 months 2 times a week 30 minutes	speed + coordination + expl. strength + balance + flexibility +
Biber (2008)	40 preschoolers E + K 5-6 years	physical and social development	folk dance 2 months 4 times a week 32 dance lessons	physical development + social development +
Uzunović, et al. (2011)	36 preschoolers 6 years	individual development of motor abilities	accredited dance program "play, sing, create through dance" 3 months 2 times a week 30 minutes	speed + coordination + expl. strength + balance + flexibility +
Gallota, at. all (2016)	25 preschoolers 4 and 6 years 10 - physical activity 6 - dance 9 - swimming	BOT-2	clasical dance 4 months	fine control of hands + coordination + running speed + agility +
Marković and Višnjić (2016)	There are no data on the number of preschoolers	Influence of dance and play on motor engagement	12 activities with dance contents 12 activities with movements games	total engagement: 725 sec. of dance 707 sec. of games there are no stat. significant differences

Authors	Subject sample	Variables	Experimental program	Results
Chatzopoulos et al. (2018)	62 32 preschoolers-E 30 preschooler-K	proprioception rhythm static balance	creative dance program 2 months 2 times a week 45 minutes	proprioception + rhythm + static balance -
Pantelić, et al. (2018)	65 preschoolers E-34 K-31 6 years	coordination BOT-2	accredited dance program "play, sing, create through dance" 3 months 2 times a week 30 minutes	fan + jumping in place unilaterally synchronized + foot and toe tapping synchronized from the opposite side +
Uscategui Ciendua (2019)	44 preschoolers 4 to 7 years folk - 25 urban -19	motor development	urban and folk-dance 8 weeks 90- min	50% increase in manipulative component, 31% increase in locomotor component
Shen et al. (2020)	60 preschoolers around 4 years	Executive function Working Memory Skill Cognitive Flexibility Skill	street dance 3 x a week 40–50 min 24 hours of dance	Executive function + Working memory + Cognitive flexibility skill +
Cheverda et al. (2020)	46 preschoolers 6 years	Pedagogical experiment	sports dance 10 months	coordination + flexibility+ endurance+

Looking at the overview of selected papers, it can be concluded that two thirds of the papers represent research conducted in the last five years. This indicates the author's interest in the current issue of motor skills of the observed sample.

The subject sample comprised preschoolers up to the age of six years. Some research studies were focused just on one age population Kostić et al. (2002); Uzunović, et al. (2006); Uzunović, et al. (2011); Pantelić, et al. (2018); Shen et al. (2020); Cheverda et al. (2020), while in other studies the subjects were preschoolers of a larger age range, four to six, or five and six years. The total number of subjects ranged from forty to sixty subjects of both sexes.

4. DISCUSSION

Considering the theoretical aspect of the problem, the importance of special program activities was pointed out. It indicates an extremely significant benefit on the motor skills of preschoolers, regardless of which program was applied. De Privitellio, Caput-Jogunica, Gulan, & Boschi (2007) investigated how an organized sports program affects the motor skills of preschool children on a sample of 136 children (four to six years). The children were tested at the beginning and at the end of the experimental cycle in the areas of coordination, explosive strength, repetitive strength, balance, flexibility and agility. The

experimental program that was implemented with children rendered positive results, the biggest changes were seen in the assessment of repetitive strength, and the smallest change was observed in the assessment of flexibility. As compared to boys, girls showed better results on the tests for balance, repetitive strength and flexibility, while boys achieved better results on the tests of coordination and explosive strength. The authors recommend programmed activities at this age. This assertion was supported by the results obtained in a study that was supposed to answer the question as to what extent and how the sports school program can affect the coordination of preschool children through the research of Uzunović et al. (2017) on a sample of 57 preschool children. The experimental group implemented the sports school program for a period of 8 weeks (2 x 45 minutes each week). The control group had only regular activities in the kindergarten. The level of children's bilateral coordination was determined using seven tests, and balance was determined using nine tests at the initial and final measurements. The tests used in the research are from the BOT-2 test battery, where coordination is assessed as a separate composite with the help of bilateral coordination and balance subtests. It is assumed that the experimental program influenced the improvement of the results between the two tests of bilateral coordination assessment (on the three tests) and balance assessment (on one test). The obtained results point to the need for wider application of similar programs while working with children.

The combination of fitness and dance programs is very interesting. Cheverda et al. (2020) investigated the effectiveness of a fitness program with elements of dance sports for older preschool children. The effectiveness of the implemented program was evaluated in a pedagogical experiment lasting for nine months. The research was conducted based on the program and resources of the sports dance club "Supadens" from Kyiv. 46 children of older preschool age participated in the research. During the research, the dynamics of indicators of the biogeometric profile of body posture was studied. The proposed means had the maximum effect on the indicators of the state of the biogeometric profile of posture, such as the angle of the head, the angle in the knee joint, the triangle around the waist and the position of the feet. Such changes led to a statistically significant increase in the overall assessment of the biogeometric posture profile of fitness children using dance sports. Positive changes occurred in the indicators of the respiratory system and physical fitness of children. This indicates the effectiveness of the proposed teaching program. Of particular concern is the decrease in the level of motor activity of preschool children, the drop in motivation to participate in physical education and health classes. It is possible to improve the situation by including children in health fitness classes. The implemented program included three periods: preparatory, basic and "supporting", and contained several blocks aimed at improving the posture of children of the older preschool age, improving physical fitness, motivating children to engage in regular physical activity, and adhering to recommendations for a healthy lifestyle.

Combinations of different dance structures gave positive results on the transformation of motor skills. Physical activity during preschool age promotes learning sports and the acquisition of basic and complex movement skills. Gallota et al. (2016) investigated the impact of three different four-month programs of physical and/or pre-sport activities on the motor skills of preschool children. Twenty-five girls, aged between four and six years were involved in the research, 10 practicing physical activity, six practicing dance (classical), nine practicing swimming. The state of the motor skills of the girls was assessed before and after the intervention period using the "BOT-2 Bruininks–Oseretsky Test of Motor Proficiency-Short Form (BOT-2 SF)". Different effects of the program appeared in fine hand control and coordination, as well as in running speed and agility. The playful and very

varied content of the physical activity conducted by the specialized teacher was more effective for the development of motor skills of the preschool girls.

From the defined subject of research, the focus was on research studies of the motor skills of preschoolers. Motor tests were applied, and there were other pedagogical experiments since not all research studies focused only on motor skills (Biber, 2008; Cheverda et al., 2020). Fine motor tests VOT-2 Bruininks-Oseretsky Test of Motor Proficiency-Short Form (BOT-2 SF) were applied - (Gallota at al. 2016; Pantelic, et al. 2018) as well as other motor tests Motoriktest fur vier -bis sechsjahrige Kinder, MOT 4–6, Zimmer & Volkamer, 1987, and TGMD-2 (Test of Gross Motor Development). Uscategui Ciendua (2019) conducted the last and a series of the above mentioned research studies. TGMD-2 (Test of Gross Motor Development) includes: 1- movement skills: running, galloping, jumping on one leg, jumping over obstacles, horizontal jump and sliding; 2- manipulative or visual-motor skills: hitting a static ball, stationary dribbling, catching the ball, kicking the ball, throwing the ball above the head, throwing the ball below the waist. The goal was to determine the effects of the modern and folklore dance program on the motor development of preschool children. The programs were conducted over eight weeks lasting 90 minutes on a sample of 44 children aged 4 to 7 years (mk 5.64; of 0.68) at the Pablo VI District Educational Institution in Bogotá. The study had a quantitative approach, a descriptive scope both before and after the test, with a comparison of the two experimental groups: E1 (folk dance, n = 25) - kumbia, currulao, guanena, pasillos and joropo and E2 (urban dance - modern dance, n = 19) - hiphop, house and dancehall. The obtained results indicate positive effects on motor skills after the implemented dance programs. An increase of about 50% was evident in the manipulative component, and 31% in the movement component. It is recommended to include dance in school academic programs as a means of stimulation and motor development of children.

The authors investigated the impact of dance contents on children's motor skills where they singled out motor skills (strength, speed, flexibility, coordination, balance, suppleness) Kostić et al. (2002); Uzunović, et al. (2006); Uzunović, et al. (2011); Chatzopoulos et al. (2018); Cheverda et al. (2020), or they assessed the overall development of motor skills Venetsanou & Kambas (2004); Uscategui Ciendua (2019). Furthermore, the authors combined the analysis of the impact of dance on motor skills and the ability to express rhythmically by Gallot, et al. (2016); Chatzopoulos et al. (2018); Venetsanou & Kambas (2004). Executive function + Working memory + Cognitive flexibility skills represent the subject of research of a combination of cognitive and motor abilities (Shen et al. 2020) as well as physical and social development (Biber, 2008). Biber (2008) analyzed the effects of folk dance training on the physical and social development of preschool children. An experimental setting in this research with an experimental and a control group was used in accordance with quantitative research methods. The research was conducted on a sample of 40 children. The research included a total of 32 hours of folk dance training over two months, with four training sessions per week. Control group students attended their daily preschool education program. As a result of the analysis, it was revealed that there is a significant difference between the experimental group that attended folk dance training and the one that did not, in terms of physical and social development.

It is evident that in almost half of the studies the authors investigated the area of coordination Kostić et al. (2002); Uzunović, et al. (2006); Uzunović, et al. (2011); Gallota, at. all (2016); Pantelić, et al. (2018); Cheverda et al. (2020). In addition, since movement in rhythm is the basic means of expression in dance, the authors investigated the influence

of dance programs on the ability of rhythmic expression of the children of the examined sample Venetsanou & Kambas (2004); Chatzopoulos et al. (2018).

Research conducted with the aim of determining to what extent and how the dance program affects the coordination of preschool children by Pantelić et al. (2018) included an experimental group (34) who performed dance activities over a period of 8 weeks (2x35 minutes each week) and a control group (31) who performed regular activities in a kindergarten. The level of children's coordination was determined using the BOT-2 battery of tests. The analysis of the obtained research results revealed a statistically significant difference between the dance and control groups in three variables: fan, jumping in place unilaterally synchronized and tapping with feet and fingers synchronized on the opposite side. Statistically significant differences between groups indicate a positive effect of the applied dance program on the development of coordination of preschool children using the experimental dance program. The results show that dance activity is recommendable in the work program of the preschool institutions.

The contents of the experimental programs were definitely different. In the studies, the authors applied programs of almost all types of dances, folk dance Kostic et al. (2002); Venetsanou & Kambas (2004); Uzunović, et al. (2006); Bieber (2008); Uzunović, et al. (2011); 9 Pantelić, et al. (2018); 10 Uscategui Ciendua (2019), sports dance Cheverda et al. (2020), classical dance Gallota, at. all (2016), modern dance by Uscategui Ciendu (2019); Shen et al. (2020).

The traditional dance program, in its own form, is an excellent tool for improving motor skills. Venetsanou & Kambas, (2004) conducted a study on a sample of 66 students (36 boys and 30 girls) attending a public kindergarten in Argolis (Greece), aged 4-6 years (Ks = 59.79 ± 6.40 months). The "Test for children aged 4 to 6 years" (Motoriktest fur vier-bis sechsjahrige Kinder, MOT 4-6, Zimmer & Volkamer, 1987) was used to assess motor skills. Children in the experimental group (n = 28) attended an experimental program lasting 20 weeks, participating in two sessions per week, while children in the control group (n = 38) did not regularly participate in any organized physical activity program. Two-factor ANOVA analysis for repeated measurements was used for data analysis. From the obtained results it was observed that the introductory program of the traditional Greek dances can significantly improve the motor skills of children. The contents of the programs are designed to improve: recognition, rhythmic abilities, body awareness, response to music, personal space, tempo training, balance, bilaterality. Dance Games: "Karakatsanis" Greek Singing Game (4/4) "John Says...", Tambourine Singing Enigma, "All Around" Greek Traditional Singing Game, "Flowers Growing" (Personal Space Exercise), Hokey-Pokey, Train, Singing game “fat cat” with tempo changes, Acrobats - bending and stretching game-like exercises, “Little Helen” (Greek singing game), “A-be-ba-blom” (Greek singing game),”Back to the house” (reaction to music-play), “Little Helen “, “A-be-ba-blom”, “The Smurfs do gymnastics”.

A modern dance program was applied by Shen et al. (2020) with the aim of investigating executive functions presented as the center of cognitive, emotional and social functions and which plays an important role in children's cognitive development. Street-Dance, as a comprehensive dance form that integrates the characteristics of movement, music, rhythm, etc., requires coordination of individual sensory systems and a sense of musical rhythm and action. These are the same elements of activity found in previous studies that can improve individual executive function in children. In order to examine the promotional effect of street dance training on children's executive function, the authors

designed a street dance training program integrating the characteristics of each component of executive function. Sixty preschool children aged around four years (M = 52.4, SD = 3.95) participated in the study, which used a pre-post test experimental design. The dance group performed street dance training three times a week, 40-50 minutes, a total of 24 hours of dance; the control group was not trained. The results showed that 8 weeks of street dance training can promote the development of the executive function of the preschool children, and the effects of street dance training through the implemented program are indicated. Uscategui Ciendua (2019) conducted a study to evaluate the effects of a modern and folklore dance program on the motor development of the preschool children. The effects of folk dance (kumbia, currulao, guanena, pasillos and joropo) and urban dance (modern dance, hiphop, house and dancehall) were compared.

However, there is also a specially designed program called creative dance by Chatzopoulos et al. (2018). A study was conducted to investigate the effects of creative dance on proprioception, rhythm and static balance of preschool children. The experimental group consisted of 32 preschool children who participated in a creative dance program lasting 2 months (twice a week for 45 minutes), while the control group (30 preschool children) participated in an unstructured setting of free play. Dance concepts included body parts (head, arms, etc.), shapes (straight, symmetrical, etc.), relationships (body parts to body parts, body parts to objects, etc.); space (self space/general space), size (large, medium, small), level (high, medium, low), direction (forward, back, right, left, up, down, path) and focus; rhythm and speed (slow, medium, fast); force (energy, weight and flow); balance (balanced, unbalanced). Before and after the dance program, proprioception (active reproduction test), rhythm (k-rhythm test) and balancing on one leg were assessed. The results showed that the treated group had significantly better results on post-test measures of proprioception and rhythm as compared to the control group. No significant differences were found for static balance. It can be concluded that creative dance can have a positive effect on the proprioception and rhythmic synchronization of the preschool children. Given the importance of these factors for children's motor development, it is suggested that creative dance be included in early childhood curricula.

The contents of the experimental programs includes the accredited program "Dancing, singing, creating through dance". The program is intended for the children of preschool age and can be implemented at preschool ages of four, five and six. There is a special selection of dance games for every age. The dance contents of all games comprise all types of dances. The authors of the program rightly called this type of dance a children's dance. Children's dances or dance games (Kostić and Uzunović, 2013) are a special type of dance. They are composed of technical elements of other dances (folk, social, modern, sports, artistic), but they are modified so that, in addition to being rich in movements, they exist in special dance forms, different rhythms and specific choreographic solutions. Each dance game has its own name, is played in a certain rhythm, has a special educational, motor and dance task. For example Waltz: at the age of four, the dance game Spinko waltz 1 is played. The tempo of the waltz is much slower, instead of the classic waltz three-step, a step is played with attraction without transferring weight. At the age of 5, we play Spinko waltz 2. At a slightly faster tempo, moving back and forth and left and right; with the same step technique with pull but with turning by a certain number of degrees. At the age of 6, we play a real waltz three-step, at a slightly faster pace, but not at the real waltz pace (Uzunović, Kostić and Stojković, 2010). The idea is to achieve the realization of a specific dance in this gradual way. The authors tried their best to ensure that children play a specific dance in its entirety (rhythm, step technique, movement in space) or at least learn the

rhythm of certain dances so that when "age permits" they can learn the right technique of a certain dance. The educational note is reflected in the connection with various educational tasks of work in kindergarten. This is how you learn Bon-Ton, a sports game, a zoo, an orchestra or, in a special way, to educate yourself in space and develop motor skills and tempo through games such as circle dance and the like.

The mentioned program is composed of several different dances, which is also the case with the experimental programs of other authors. Kostić et al. (2002) conducted research with the aim of transforming motor skills with different dance contents. The subject sample consisted of 30 boys and 30 girls of the preschool age. Motor skills were assessed based on nine variables (one for strength, two for speed, two for flexibility, two for balance, two for coordination). After four months of treatment, 48 hours of dancing, the results showed better results in almost all variables; Uscategui Ciendua (2019) who applied traditional and modern dance; Pantelić et al. (2018).

The application of children's dance affects biological growth and development, but it also has an educational role in physical education. In particular, the influences in each phase of the lesson can be analyzed, as well as the overall engagement in directed motor activities. The study by Marković and Višnjić (2016), which investigated the influence of the contents of dance and games on the motor engagement of preschoolers, was carried out in the first half of the school year. 12 activities with dance contents and 12 activities with moving games were monitored. The duration of the phases of directed motor activities was as follows: the first A phase (introductory) - five minutes, the first B phase (preparatory) - five minutes, the second phase (main) - fifteen minutes and the third phase (final) - five minutes. The time of activity (engagement) was measured by randomly choosing one of the children, who was followed during the directed activity. The observed child did not know that he was the subject of the measurement. Data processing included descriptive statistics and t-test for small independent samples. Descriptive statistics parameters indicate longer engagement of children in the first A phase, the third phase and complete engagement with dance contents. The content of the game influenced greater engagement in the first phase B and the second phase. The contents of the game had a statistically significant difference as compared to the contents of the dance in the third phase. Total engagement with dance contents was 725 seconds, with game contents 707 seconds. The t-test does not indicate a statistically significant difference between the contents of dance and play in terms of the overall engagement of the preschoolers. The results indicate that activities with dance and game contents are very useful in working with preschoolers.

The authors were looking for solutions that will enable proper growth and development of preschoolers in all aspects. The essence is that the outcome of the conducted activity should be the application of what was learned in everyday life. The development of natural forms of movement is inviolable. Deli, Bakle and Zachopoulou (2006) examined the effects of an intervention program on the effectiveness of locomotor skills in preschool children. A twenty-week program was implemented on a sample of 75 children aged 5-6 years. The first experimental group had programmed movement, the second experimental group applied music and movement tasks, and the control group had free play in the program. The test results clearly showed that the experimental groups significantly improved their performance as compared to the control group in running, jumping, horizontal jumping and skipping. The authors concluded that the effectiveness of basic locomotor skills can be improved through different types of organized exercise in preschool institutions.

Children's dances have a positive effect on the development of most motor skills: coordination, speed, strength, endurance, and they enable normal mobility of all joints (Zrnzević et al., 2010).

4. CONCLUSION

Investigating the impact of different dance programs on motor skills - motor fitness of preschool children as a systematic overview research is a consequence caused by the coronavirus pandemic. The results of the collected studies are of great importance since experimental programs of different types of dances, different motor tests, different pedagogical experiments were applied and they all contribute to the same conclusion: dance programs have a significant impact on children's motor skills and as such are recommended in the implementation of physical education and health tasks in preschool institutions. There was no difference in the impact of the implemented experimental programs according to the gender of the subjects. The number of subjects ranged from forty to sixty. The programs usually lasted about two months, with different frequency, but about 32 dance lessons.

Based on the collected research studies, their selection and careful analysis, it can be concluded that the hypothesis that there is a positive influence of dance content on the motor fitness of preschool children has been confirmed.

The conducted systematic overview research is one in a series that had as its subject the motor skills of preschool children. This study makes a contribution to that scientific opus in the sense that the results of recent scientific-research studies on the examined sample can be found in one place. In a scientific sense, it should also be recommended to analyze the effects of specially designed programs on the motor fitness of preschool children. Therefore, different programs and different measuring instruments for assessing the motor skills of preschoolers are advisable.

The practical importance is reflected in the fact that in almost all studies, the authors suggested that such and similar dance contents should be included in the physical and health education program in preschool institutions.

If we have proven that dance is beneficial for the motor skills of preschool children, for their cognitive and social development, let us invite those who raise children:

TEACH THE CHIDREN HOW TO DANCE!

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UTICAJ PLESNIH SADRŽAJA NA MOTORIČKI FITNE PREDŠKOLACA I MOGUĆNOST NJIHOVE PRIMENE U PREDŠKOLSKIM USTANOVAMA

U radu je prikazano istraživanje čiji su predmet činili plesni sadržaji, specifični plesni programi i motorički fitnes dece predškolskog uzrasta. Osnovni cilj rada je bio da se prikupe i analiziraju studije koje su kao eksperimentalni tretman imale sadržaje plesnih aktivnosti i njihov uticaj na motorički fitnes dece predškolskog uzrasta. Prikupljanje potrebne literature i radova urađeno je uz pomoć korišćenja sledećih baza podataka: Google Scholar, PubMed, SCI indeks i dostupne stručne literature na Fakultetu sporta i fizičkog vaspianja u Nišu, kao i druge dostupne literature. Korišćene su ključne reči: uticaj, efekti, predškolski uzrast, predškolci, vežbanje, ples, plesne aktivnosti, motorika, motoričke sposobnosti i njihov adekvatan prevod na engleski jezik. Za završnu analizu je izdvojeno dvanaest radova koji su zadovoljili postavljene kriterijume. Zaključak je da postoji pozitivan uticaj plesnih sadržaja na motorički fitnes dece predškolskog uzrasta, te se oni mogu preporučiti kao adekvatan sadržaj u nastavi fizičkog vaspitanja u predškolskim ustanovama.

Ključne reči: *uticaj, ples, fitnes, predškolci, program, nastava, obrazovanje*

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Scientific commentary

HOW TO TEACH SUBJECTIVE TRUTH? KIERKEGAARD'S DOCTRINE OF INDIRECT COMMUNICATION

UDC 141.4 Kjerkegor S.; 37.013.73; 371.33::1; 37::14

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Abstract *The main goal of the paper is to determine the structure, meaning, and origin of Kierkegaard's method of indirect communication. Since Kierkegaard claimed that subjective truth cannot be directly imparted, the question arises as to how this type of truth can be conveyed to a student in the teaching process. Kierkegaard's doctrine of indirect communication should provide the answer - the invention of poetic characters, irony, and dialectical knots in the speech should provoke the student and entice him to awaken existential interest and begin existential development. In order to explain this combination of aestheticism and the ethical value of indirect communication, the paper will first address the difference between a subjective and objective reflection, which establishes the difference between direct and indirect teaching methods. In the main part of the analysis, the paper will examine the structure of indirect communication and explain the difference between aesthetic and existential reduplication. In the concluding part, the paper will briefly refer to Socrates' maieutics to determine the significance and benefaction of indirect communication as a teaching method.*

Key words: *indirect communication, direct communication, subjective reflection, objective reflection, subjective truth*

1. INTRODUCTION

In the *Concluding Unscientific Postscript*, Climacus writes: "The difference between subjective and objective thinking must express itself in the form of the communication, that is, the subjective thinker has to be aware from the start that artistically the form must have as much reflection as he himself has when existing in his thinking." (Kierkegaard, 2009, p. 62)

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According to Climacus, indirect communication is a form of speech that serves to express subjective reflection and subjective truth. Kierkegaard believes that the student can awaken subjective reflection and begin the quest for subjective truth only if the teacher abandons the form of direct communication and employs an indirect method. Hence, the question inevitably arises: what is the difference between direct and indirect communication? In what way is it possible to apply indirectness in the teaching process?

However, before employing a detailed analysis of the importance and structure of indirect communication, the paper should address general questions. According to Climacus' writings, there is an "organic" connection between the form of speech and the type of reflection. Direct communication is a vehicle for objective reflection; indirect communication is a suitable medium for subjective reflection. This means that the examination of the concept of indirect communication should first grasp the meaning of subjective reflection and its opposite – objective reflection. Therefore, the first part of the paper will be devoted to considering the following problems: What is subjective reflection, and why is it important? Why does the teacher have to assume the position of a subjective thinker? What is the difference between objective and subjective reflection?

2. The Difference between Subjective and Objective Reflection

To understand the meaning of subjective and objective reflection, and their differences, the investigation will start with Pojman's interpretation, presented in the *Logic of Subjectivity*. According to Pojman's understanding, objectivity "stands for a composite of attitudes, including unemotionally, disinterested evaluation, neutrality, impartial judgment, which leaves the interested subject out of the scene, and consensus, based on the public's assessment of the situation" (Pojman, 1984, p. 57). Subjectivity is at the opposite pole. In contrast to the objective attitude, subjectivity requires strengthening interest, intensifying passion, and initiating introspection (see: Pojman, 1984, p. 58).

Following this general difference, Pojman will introduce the difference between the subjective and objective relation to the truth. In this regard, Pojman finds that "juxtaposing objectivity and subjectivity may be outlined as follows: Subjective reflection yields subjective understanding; that is, deep introspection produces self-knowledge whereas objective reflection yields objective knowledge" (Pojman, 1984, p. 58).

Before embarking on a detailed consideration of the concepts of subjective and objective reflection, and subjective and objective knowledge, the analysis should take into account another general thesis on which Pojman's interpretation is based. In the section *The Failure of Objectivity*, Pojman opens the problem of the difference between subjective and objective approaches, and notes that these two types of cognitive acts are in an exclusively disjunctive relationship: "One asks about the truth either objectively or subjectively, but he cannot do both at the same time" (Pojman, 1984, p. 36). This conclusion is well founded. In the *Concluding Unscientific Postscript*, Climacus writes that "precisely because (the individual human being) exists, he will not be able to walk both paths at the same time" (Kierkegaard, 1996, p. 213). In addition, Pojman adds another assumption, which outlines that "one cannot be both interested and disinterested in the same object in the same respect at the same time" (Pojman, 1984, p. 37). Following these insights, Pojman formulates his Cognitive Disjunct theses, which establishes the relation between subjective and objective thinking: "*There is an exclusive disjunctive relationship between a subjective inquiry and objective inquiry*" (Pojman, 1984, p. 37).

At first glance, Pojman's thesis on cognitive disjunction seems to claim nothing more and nothing different than what Climacus himself states in the *Concluding Unscientific Postscript*. The situation of an existing individual does require the positing of a cognitive *either-or*: the subject will either initiate objective reflection and focus on the object to discover the truth about it, or he will turn to himself through subjective reflection and start searching for the truth that would bring about his existential transformation. However, Pojman's thesis on cognitive disjunction becomes problematic upon further investigation.

Starting from the cognitive disjunction thesis (CD), Pojman first states that "Kierkegaard lacks sufficient distinctions with regard to possible attitudes toward truth" (Pojman, 1984: 48), and that, when considering the problem of truth, Kierkegaard excessively and unnecessarily insists on positing the "either-or". In addition, Pojman claims that "the implications of Climacus's thesis (CD) seem disturbing" (Pojman, 1984: 37), and that Kierkegaard's conveniently formulated "either-or" "seems to falsify what most of us believe to be the case" (Pojman, 1984, p. 37). What does this mean?

Pojman answers: "I think there is a fundamental confusion here. Disinterestedness or impartiality is not necessarily opposed to subjectivity. The opposite of interestedness is the spirit of neutrality" (Pojman, 1984, p. 48). On the one hand, the position of a neutral observer implies an objective assessment of the situation, consideration of conflicting propositions, and weighing the evidence, but not the conclusion about their truth value. On the other hand, impartiality, in addition to implying an objective assessment of the state of affairs, consideration of the evidence, and suspension of subjective moments, also involves accepting one of the opposing positions. Of course, the decision regarding the opposing views results from an objective assessment of the situation.

So, contrary to Kierkegaard's teaching, which is based on the thesis of cognitive disjunction, Pojman wants to establish two positions:

1. First, that objectivity can precede and condition a subjective attitude, and that objective research and questioning of the truth of beliefs can awaken existential interest.
2. Subjectivity does not exclude objectivity, i.e., rational questioning of beliefs does not diminish the passion and interest with which the individual relates to them.

Both positions are based on an inadequate interpretation of the difference between subjective and objective positions, namely, the subjective and objective interests that constitute them. Here's what Climacus notes: "When the truth is asked about objectively, reflection is directed objectively at truth as an object to which the knower relates. (...) If the truth is asked about subjectively, reflection is directed subjectively on the individual's relation" (Kierkegaard, 1996, p. 217-218). In other words, "the objective accent falls on *what* is said, the subjective on *how* it is said" (Kierkegaard, 1996, p. 220). It should be noted that Pojman is fully aware of this. According to Pojman's interpretation, the problem of Kierkegaard's teaching lies in the relationship of exclusive disjunction, the incompatibility between these two attitudes. Pojman asks the following: why is it not possible for an individual to be guided by the same passion and existential interest in the objective examination of the truth? Why would existential interest exclude or at least diminish interest in the truth value of a proposition?

The problem with Pojman's interpretation is that he fails to detect the difference between the two types of interests that respectively constitute these two attitudes toward truth. First, Pojman understands both types of interests in the light of objectivity, and then he explores the difference between these two interests under the category of quantity. The analysis will first address the problem of Pojman's objectification of interest.

This is how Pojman understands the difference between a subjective and an objective thinker: "The objective inquirer is basically disinterested in the results of the inquiry; interest might be a relative, motivating factor, but the inquiry must be impartial, disinterested (…) For the subjective thinker, on the other hand, interested in the results, the inquiry is more than an intellectual exercise" (Pojman, 1984, pp. 36-37). Here, it can be seen that Pojman reconstructs both types of understanding according to the model of objective research. Both types of research have the same structure - a thinker who focuses exclusively on a given object in the research process. The difference between these two types of thinkers lies in their attitude toward the result of the research: while the subjective thinker is interested in advance in the proposition that has yet to be determined, the objective thinker can suspend interest in the outcome of the research and remain impartial. Following this understanding, Pojman develops a critique of the thesis of cognitive disjunction and introduces the difference between impartiality and neutrality. Since interest is defined as an interest in the result of research, Pojman concludes that a thinker can be driven by complex motivation, while remaining disinterested in the outcome and managing to conduct research objectively.

Another problem in Pojman's interpretation is the quantification of interest. This means that the difference between subjective and objective interest becomes a question of the extent or degree to which the thinker is interested in the results and the research itself. This is precisely why Pojman believes that one of the key positions for understanding the difference between subjectivity and objectivity is expressed through the following principle: "Minute subjectivity for things of minute value, absolute subjectivity for that which is of absolute value" (Pojman, 1984, p. 62).

It should be noted that Kierkegaard is largely responsible for creating this confusion by introducing the notions of finite and infinite interest. Namely, to set forth the demarcation between subjective truth and subjective madness, Climacus explores the nature of the object to which the subjective thinker is related. If an individual invests infinite interest in an idea of finite importance, we have a case of subjective madness. On the other hand, if an individual treats an idea of infinite value neutrally, freed from infinite passion and interest, the process results in objective madness. Therefore, Climacus concludes that ideas of infinite importance should be treated adequately – "otherwise subjectivity becomes a final stage, and objectivity disappears" (Kierkegaard, 1996, p. 215).

It is important to note that the difference between subjective and objective attitudes parallels the distinction between finite and infinite interest. However, this distinction should not be the main criterion for differentiating subjective and objective attitudes. So what should be the key determinant? Here's what Climacus states: "Subjective reflection turns in towards subjectivity, wanting in this inner absorption to be truth's reflection" (Kierkegaard, 1996, p. 215) and also: "Subjective thought invests everything in becoming" (Kierkegaard, 2009, p. 62). The first movement in the constitution of a subjective attitude is the suspension of self-forgetfulness and the awakening of interest in existence. The constitution of a subjective position begins with the question - Who is seeking the truth and why? - to which Climacus answers, "I guess so that he could exist in it" (Kierkegaard, 1996, p. 211). What drives the subjective thinker to search for the truth is not interest in the result of research, but the need to transform his existence. On the other hand, the main assumption of an objective attitude is the state of self-forgetfulness. To initiate an objective inquiry, the thinker must focus on the object and completely devote himself to the examination. Subjective interest is thus suspended not because research requires the scientist to exclude emotion and interest, but because he must ignore the question "How should I

live?" to answer the question "How should the object of research be understood?". Self-forgetfulness is inherent in objective research - as long as he is devoted to the problem of the object, the thinker cannot consider the problem of his existence. Objective inquiry renders fundamentally important topics existentially irrelevant – "Yes, Hegel is right; and yet we have not come a single step further. The good, the beautiful, the ideas are in themselves so abstract as to be indifferent to existence, and indifferent to anything except thought-existence? (...) Am I the Good because I think it, or am I good because I think the Good?" (Kierkegaard, 2009, p. 276). What does Climacus want to say? As long as the thinker remains committed to theoretical questioning and is interested in finding the correct definitions of moral values, he fails to see his existence under ethical determinations.

Therefore, the difference between a subjective and an objective attitude is not a question of the degree of interest in the object of research. What is crucial in the constitution of the subjective attitude is the awakening of interest in existence, which implies the suspension of self-forgetfulness. The main condition for adopting an objective attitude is the state of self-forgetfulness and the intensification of (theoretical) interest in the object. However, this is only the first moment in the constitution of the subjective attitude. Namely, in this part of the research, Climacus realizes that he has to introduce a further distinction between subjective truth and subjective madness. Hence the need to distinguish between finite and infinite interest and to introduce another constitutive moment of the subjective attitude - transformation (which implies eternalization) of interest. Aside from awakening awareness of the importance of self-development and transformation of existence, the constitution of a subjective attitude also demands the awareness of the importance of the idea according to which existence is to be transformed. Otherwise, the process would end with a case of disturbed interiority, i.e., subjective madness, which is recognized by the fact that "this something, which is of such infinite concern to the unfortunate, is some fixated particular that is of no concern to anyone" (Kierkegaard, 1996, p. 215).

In conclusion, it should be noted that the subjective relationship to the truth, and subjective reflections, is constituted through abolishing self-forgetfulness, and awakening interest in (one's) existence. On the other hand, objective reflection demands the state of self-forgetfulness, suspension of questions about existence, and interest in the object of research. How, then, is the difference between the two types of reflection reflected in the difference between direct and indirect communication? Why is it necessary to apply indirect communication in the process of teaching ethical truths?

3. The Need for Indirect Communiction

The meaning and necessity of direct communication arise from the need to transmit and receive information. Hence, the prerequisite for this type of speech is a lack of knowledge, which induces a question, places the individual in the role of a student, and posits the need for a teacher. When the relationship between two individuals is thus established, the speaker must find a suitable expression for his thought to convey it without interference. In order to communicate a factual situation or theoretical knowledge, the speaker requires unambiguity and precision of speech, and the learner - openness to new content. The ambiguous speech would only create confusion and omit the goal of communication. This is always the case when it comes to objective knowledge. The student asks because he needs information, and the teacher answers to convey it to him. If the student is unaware of a lack or error in his

cognitive structure, the teacher removes the wrong content and replaces it with the truth. So why not use the wisdom of the direct method? Why can't we inform the individual about his state, and directly communicate the content of essential knowledge?

To answer this question, Kierkegaard refers to the phenomenon of the illusion of Christendom. According to Kierkegaard's understanding, the essence of this illusion is that the members of the Christian Church mistakenly believe that they are Christians, while they exist under different categories. They fulfill their religious obligations, gather in the church once a week, take communion, listen to the sermon, and regularly confess their sins. This external practice of religion creates and maintains the illusion that the individual is a believer. If the priest were to try to question their commitment to the faith (in a direct way), he would only be met with resentment and resistance. So how could this illusion be removed?

Judge Wilhelm advises as follows: "Fairy tales portray people who were enchanted by mermaids and water spirits. In order to get rid of the spell, the fairy tale teaches, it was necessary for the bewitched to walk the same path backward without making a single mistake. It is very well thought out but very difficult to implement, yet that is how things are. The delusion that has taken over the individual must be eradicated just like that, and every time a mistake is made, he must start from the beginning" (Kierkegaard, 1990, p. 577). What does the fairy tale have to teach us? To remove the illusion, the individual must go back to the start. Before making further progress, the individual must make a decisive turn – he must return to himself and eliminate self-forgetfulness. But that is not the only message of the fairy tale. The Enchanted Hero must perform this movement alone. This is where the fairy tale discloses the problem of the beginning of the movement. The individual is required to rely on his strength to awaken existential interest; at the same time, self-forgetfulness prevents the individual from looking backward and returning to himself. The endurance of self-forgetfulness requires a teacher's presence, while awakening the existential interest requires solitude. The teaching situation both demands and undermines the role of the teacher. This is one of the key problems of teaching subjective truth. Kierkegaard's answer to this paradox would be the doctrine of indirect communication.

If the paradoxical teaching situation generates the need for indirect communication, then it could be assumed that the nature of this form of speech would reflect its paradoxical origin. But before answering the question about the structure of indirect communication, the analysis should first introduce the general definition. Anti-Climacus states the following: "Indirect communication is shaped through the art of duplicating speech. The secret of art consists in the skill of combining qualitative opposites into a unity...If an individual wants to use this kind of speech, he must be able to untie the dialectical knot" (Kierkegaard, 1944, p. 132). What does the skill of combining qualitative opposites represent? What does the reduplication skill refer to?

4. THE STURCTURE OF INDIRECT COMMUNICATION – TWO REDUPLICATIONS

The investigation should start with some general remarks. Following Pool's and Lübcke's research, the analysis will first introduce the difference between two indirections or reduplications that constitute the phenomenon of indirect communication. The next step will be a detailed examination of each structural moment. In addition, the analysis will address the problem of the difference, or incommensurability, between direct and indirect forms of speech and expose the reasons for the inadequacy of direct method in teaching subjective truth.

It is widely known that indirect communication is a method that Kierkegaard used in his aesthetic writings. However, Kierkegaard's doctrine of indirect communication is complex and cannot be reduced to communication skills or writing style. In this regard, Roger Pool finds that it is necessary to distinguish between two indirections, two (re)duplications, or two dimensions of indirect communication - aesthetic and existential (see: Pool, 1993, pp. 158-159). The aesthetic dimension refers to the author's characteristic style, which requires a duplication skill (first duplication). Hence, the aesthetic dimension refers to Kierkegaard's practice of an *incognito* mode of communication, combining opposites such as earnestness and humor, using parables, etc. On the other hand, Pool finds that the existential dimension, the second indirection, refers to the phenomenon of double reflection, which is realized at the level of "the relationship between the author and what is said" (Pool, 1993, p. 159). While the first indirection discloses (re)duplication as a tool of aesthetics, a clever deception that allows the author to hide his intentions, the second indirectness refers to an authentic, existential double reflection. Namely, double reflection requires the subjective thinker "to exist in a way that dictates thinking" (Kierkegaard, 2009, p. 104). The secret of double reflection is that it is a "reflection of the inwardness, a reflection of possession" (Kierkegaard, 2009, p. 161), which means that the thought, contemplated on the reflective level, is repeated and actualized on the level of existence. Therefore, Pool concludes that the authentic meaning of reduplication can only be recognized within the second indirectness because it refers to the reduplication "between written text and lived expression" (Pool, 1993, p. 159). First, it should be noted that the essential function of indirect communication is to provoke the listener (reader). Encrypted content and confusion about the speaker's identity should prompt the listener to take action. In what way?

The true meaning of indirect communication is not to help the author find his expression but to motivate the reader to existential development. This is when Pool concludes that "what is true for the author must also be true for the reader" (Pool, 1993, p. 160). What does this mean? At this moment of analysis, Lübcke's research should be introduced. Namely, Lübcke tries to discover why Kierkegaard insists on the inadequacy of direct communication and the necessity of the indirect method. His thesis, presented in his work *Kierkegaard and Indirect Communication*, is that "this shift is not provoked by problems within *semantics* but has to do with the *pragmatic* aspect of language" (Lübcke, 1990, p. 32). Lübcke finds that the misunderstanding of Kierkegaard's indirect communication is mainly based on the traditional interpretation that relies on Wittgenstein's *Tractatus*. However, unlike Wittgenstein, Kierkegaard does not consider ethical and religious problems inexpressible. Therefore, the need for indirect communication is not constituted at the semantic level. The problem of ethical concepts is not related to their unspeakable or semantically problematic content, but to how this content should be adopted. In fact, Lübcke believes that, according to Kierkegaard, moral principles, imperatives, and the difference between good and evil, are already universally known. Therefore, communication of the ethical can "abolish the object of speech" because "there is simply nothing left to teach" (Lübcke, 1990, p. 34). However, it is necessary to motivate the reader to practice what he has always known: "we ought to take the object and the message about it as a given and pass from the *semantic* to the *pragmatic* level of speech, so as to concentrate on the pragmatic task of motivating the listener to do what he knows to be his duty" (Lübcke, 1990, p. 34). Combined with Pool's remark that "what is true for the author must also be true for the reader" (Pool, 1993, p. 160), it can be concluded that the use of indirect communication is based on the need to awaken the reader's double reflection.

4.1. The Aesthetic Dimension of Indirect Communication

The investigation should first open the question of the meaning of the first indirectness. As already stated, the first sense of reduplication refers to the style of speech used by the teacher. Practicing indirect communication implies, first of all, the dialectic of humor and seriousness, the introduction of allegories and parables, poetic expression, etc. Aesthetic reduplication has two main goals: hiding the speaker's identity (and his "teaching" function) and then creating the vagueness of the content of the speech. Since the main function of the aesthetic dimension is to create confusion on every level of speech, the question follows – How is it possible to teach anything at all by employing the indirect method? How do the secret identity of the speaker and the uncertainty of the content of the communication result in the student's subjective (existential) progress?

It was already stated that the need for indirect communication derives from a paradoxical teaching situation. On the one hand, it was stated that the individual must choose to abolish self-forgetfulness and awaken existential interest, but also that he is unaware of the necessity of such a choice. On the other hand, the investigation revealed the need for a teacher, but also exposed the negative aspects of his function. Indirect communication now shows a way of combining these opposites. This masked speech simultaneously posits the teacher and forces the student to rely on his strength and capabilities. How is this possible?

In the *Point of View for My Work As an Author*, Kierkegaard writes about indirect communication as follows: "I can absolutely never impose one opinion, conviction, belief on someone; but I can do one thing, in a certain sense the first (because it conditions the following, the adoption of opinions, convictions, beliefs) and in another sense the last: I can force him to become attentive" (Kjerkegor, 1981, p. 31). The true origin of indirect communication is the teacher's endless care and respect for the student. First, it should be noted that the teacher is completely aware of the student's state of self-forgetfulness and illusion. Hence the impossibility of direct communication. But even if he could speak directly, the teacher would decide against it. Preaching to the individual about his condition, and forcing him to make a choice, would be the most severe violation of his autonomy. The only thing the teacher can do is to become provocative enough to attract the student's attention and force him to make a judgment. That is why awakening attention is, in a sense, the first and the last thing a teacher can do for his student. Becoming attentive can be the first movement of subjectivity that heralds the movement of becoming. But awakening attention can also be the last instance of the teacher's activity. Teaching does not necessarily result in accepting the task of existence.

Due to the awareness of the student's freedom, the teacher must teach through presence and absence, approach and withdrawal. He must recognize the student's need for self-development and existential progress. However, the teacher must always keep in mind the limits of his activity. That is why it is necessary to acknowledge the moment that requires the withdrawal of the teacher. Cultivating the self, making choices, and making life-critical decisions are processes that take place in the deepest solitude because "confession can be salutary only when one gives it to oneself, alone, and in silence" (Kjerkegor, 1981, p. 24).

4.2. The Existential Dimension of Indirect Communication

The second level of reduplication problematizes the very content of what is conveyed. It has already been said that indirect communication requires a dialectical doubling of the spoken content and the vagueness, openness, and ambiguity of the content of indirect

speech. What does this instability of the semantic dimension imply? Lübcke's research has already partially answered this question. However, it is now necessary to carry out a detailed analysis of his understanding.

One of the contemporary authors, Jamie Turnbull, recognized the difficulties that arise when analyzing indirect communication and the contradiction that emerges when considering Kierkegaard's different definitions of this problematic concept. First, through the character of Johannes Climacus, Kierkegaard states that the content of indirect speech is always determined: "the tirelessly active irony; the parody of speculation in the entire plan, the satire in so much effort being made as though something (...) new should come out of it, while what constantly emerges is old-fashioned orthodoxy in fitting severity" (Kierkegaard, 2009, p. 230). Although it seems that Kierkegaard is communicating something new by using highly stylized speech, Turnbull finds that, behind the creative rhetorical devices, there is well-known content. On the other hand, by exploring different definitions of the indirect method, Turnbull concludes to the ambiguity of the content of indirect communication, and the instability of semantics. How can this tension be resolved? How is it possible, at the same time, to demand definiteness and vagueness of content?

The problem can be solved by appealing to the definition of subjective reflection. Previously, the analysis of the structure of subjective reflection discovered that it unites two moments: intensification and transformation of inwardness. The transformation of inwardness is, in fact, the movement of eternalization through which the subjective thinker focuses on the sphere of eternal values. The first task of subjective reflection is to consider and understand principles and ideals with eternal validity, which means that subjective reflection includes a moment of objective reflection. Nevertheless, the result of subjective reflection is not an obsession with the object, but the application of the idea in the domain of practice, enforcing value into existence and translating eternity into finitude. Hence, it turns out that the key goal of subjective reflection is the existential appropriation of ethical-religious knowledge.

Therefore, while the direct method stems from the need to communicate scientific results, necessary truths, or historical data, indirect communication serves to "teach" essential, ethico-religious knowledge. However, the goal of indirect communication is not a simple transfer of knowledge: "Neither the Church nor the doctrine should be reformed. If there's something that can be done - it is the reformation of all of us. This is what my existence is trying to express" (Kierkegaard, 2003, p. 223). This means that the need for indirect communication arises at the level of the pragmatic dimension of speech. The goal of indirect communication is to awaken subjectivity, build a special relationship with ethico-religious propositions, and translate truth into existence. However, the issue of semantic instability remains. Is semantics abolished by insisting on the pragmatic dimension of speech? Kierkegaard answers: "In life, is not important what is said, but how it is said. Because the same thing has been said countless times - the old saying is right: there is nothing new under the sun" (Kierkegaard, 2003, p. 269). The pragmatic dimension of speech presupposes the semantic one. Indirect communication purports that the listener is informed about the content (the "what") of essential knowledge that has been communicated countless times. However, while the individual has given his cognitive assent to essential knowledge, he has never existentially acceded to it. Indirect communication has to achieve the balance between the objective and subjective aspects of reflection, the *incognito* way of communicating and the cognitive dimension of speech. What does this mean?

In the *Postscript*, Johannes Climacus provides the most important definition of indirect communication: "The communication's form is something other than its expression. When the thought has found its suitable expression in the word, which is achieved by means of the first reflection, there follows the second reflection which concerns the relation between the matter to be imparted and the imparter, and reflects the imparter's own relation to the idea" (Kierkegaard, 2009, p. 65).

Here we can clearly see that indirect communication combines both types of reflection. The reference to the first, objective reflection is given in the first part of the definition: to convey the meaning of an idea, the speaker has to articulate it through words/concepts. But what about the second reflection? The second reflection seems to bring about an additional doubling. On the one hand, the teacher has to motivate his student to grasp ethico-religious knowledge existentially and to transform his existence according to the content of the idea thus conveyed. This aspect of indirect communication has already been recognized as the goal of the indirect way of teaching. However, apart from awakening the inwardness of his student, the teacher must also express his own relationship to the idea, and testify to the truth with his existence. Indirect communication is the conveyance of inwardness for the sake of inwardness – this is its function and, simultaneously, its reason for existence (*raison d'être*). Direct communication is not a suitable method for teaching subjective truth and enticing the existential development of a student. Why?

To answer this question, the analysis should take into account Kierkegaard's understanding of knowledge and language. Namely, in *The Concept of Irony*, Climacus finds that "if the concept is not in the phenomenon (...) and if the phenomenon is not in the concept (...), then knowledge would be impossible." In the first case, we would lose truth, in the second case – actuality" (Kierkegaard, 1989, pp. 241-242). Therefore, if the conceptualization of the phenomenon weren't possible, that is, if the constitution and revision of concepts weren't based on the development of the phenomenon itself, the truth (which implies a certain degree of agreement of being and thinking) would not be possible either. On the other hand, if the term did not reflect the phenomenon, i.e., if it weren't possible to grasp at least the general characteristics of the phenomenon or group of phenomena through the term (because concreteness always escapes conceptualization), then it would not refer to actuality at all. However, it should be noted here that, even though the concept and the phenomenon refer to each other, they are mutually irreducible. There will always be a gap between conceptual reality and concrete, empirical existence. This is the main reason for the inadequacy of direct communication and the problem of language in general. Teaching subjective truth aims at achieving a synthesis between the universal and the concrete, the eternal and the temporal. The main requirement for a student is the existential appropriation of knowledge and application of acquired knowledge at the level of existence. However, just as the consideration of empirical knowledge discovers a gap between the conceptualization of reality and concrete empirical existence, in the same way, analysis reveals a disproportion between the generality of ethical concepts and the concreteness of the individual. This is precisely why Climacus claims that "existence-actuality [*Existents-Virkelighed*] cannot be communicated" (Kierkegaard, 2009, p. 300), at least not directly. This is exactly what Socrates understood. According to Kierkegaard's understanding, Socrates' maieutics was a form of indirect communication and teaching of the truth: "It has been argued that Socrates' own conception of maieutics was overly intellectualist; that although he did not consider it possible to teach by straightforward instruction, he did see teaching as a means for making the student acquire knowledge of the essence of ethical concepts" (Kierkegaard, 2009, p. 60). In what way?

First, Climacus refers to the aesthetic dimension of Socrates' maieutics: "He did not have quite so favorable an appearance as that described; he was very ugly, had clumsy feet, and, above all, a number of growths on the forehead and elsewhere, which would suffice to persuade anyone that he was a demoralized subject. This was what Socrates understood by his favorable appearance… Why was this old teacher so happy over his favorable appearance, unless it was because he understood that it must help to keep the learner at a distance, so that the latter might not stick fast in a direct relationship to the teacher, perhaps admire him, perhaps have his clothes cut in the same manner. Through the repellent effect exerted by the contrast, which on a higher plane was also the role played by his irony, the learner would be compelled to understand that he had essentially to do with himself, and that the inwardness of the truth is not the comradely inwardness with which two bosom friends walk arm in arm, but the separation with which each for himself exists in the truth" (Kierkegaard, 2009, p. 208). The first level of Socrates' maieutics, that indirect teaching method, refers to the contrast and balance between his unpleasant appearance and the seductiveness, the allure of his speech. Although his questioning and philosophical discussions attracted the attention of the youth, Socrates' appearance maintained a distance between him and his students. Socrates knew how to teach through attraction and repulsion; he was aware that he should provoke the student, and make him interested in learning essential knowledge. At the same time, he knew that the teacher must work on his student's emancipation, keep him at a distance so that the student could awaken his subjectivity and see his existence in the light of ethical categories. This is the second dimension of Socrates' maieutics, which builds on its aesthetic form. It is known that maieutics is a midwifery method, a type of teaching through which the teacher, as a questioner, compels the student to discover the truth independently. Kierkegaard's method of indirect communication works in the same way – Kierkegaard's invention of pseudonyms, his poetic expression, irony, and ambiguity of content aim to provoke students. It is necessary for the student to become interested enough to start listening - first to Kierkegaard's speech, and then to his own inwardness. In the end, the main goal of indirect communication is the emancipation and independence of students. In contrast to direct communication, where the teacher is the source of knowledge, and the student is the *tabula rasa* on which the teacher writes the content, through indirect communication, the student himself comes to the understanding of knowledge (which has always been known) and decides to transform his existence according to it. Here's how Climacus describes the benefaction and the true meaning of indirect communication: "What, then, is the greatest benefaction? … the lover knows to make himself unnoticed, so that the recipient does not become dependent on him – by crediting him with the greatest benefaction. This means that the greatest benefaction is precisely the mode in which the only true benefaction is accomplished … Let us get this clear. When I say 'This man, by my help, stands on his own' and what I say is true, have I done the best [for] him? … What do I mean by this? I say 'He stands by himself, independent, by my help'. But then, of course, he does not stand by himself: then he has in fact not become his own, then he is indebted to my help for all this – and he is aware of this. To help a person in this way is really to deceive him … Consequently, the greatest benefaction cannot be accomplished in any way whereby the recipient gets to know that he is indebted. … On the other hand, if one says 'This man stands alone – by my help,' and what he says is true – then he has done for the other person the highest that one man can do for another: he has made him free, independent, unto himself, unto his own, and simply by hiding his help helped him to stand alone" (Kierkegaard, 1998, p. 255).

The teacher, therefore, makes the student free - free from tutelage and idols, independent enough to make decisions about his existence. The greatest gift a teacher can bequeath to his student is the ability to "stand on his own" (Kierkegaard, 1998, p. 255) – to independently search for the answers, take upon himself the task of existence, and embark on the quest for subjective truth.

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KAKO PODUČAVATI SUBJEKTIVNU ISTINU? KJERKEGOROVO SHVATANJE INDIREKTNE METODE SAOPŠTAVANJA

Cilj ovog istraživanja jeste da razotkrije smisao, strukturu i potrebu za Kjerkegorovom metodom indirektnog saopštavanja. Budući da je Kjerkegor smatrao da se subjektivna istina ne može direktno preneti učeniku, postavlja se pitanje kako je uoošte moguće učenje i podučavanje ove vrste istine. Odgovor donosi Kjerkegorovo shvatanje indirektnog opštenja sa učenikom - kreiranje pseudonima, ironija, dijalektičke smicalice u govoru treba da isprovociraju učenika i navedu ga da probudi egzistencijalni interes i otpočne egzistencijalni razvoj. Kako bismo razjasnili ovu estetsku i etičku dimenziju indirekne metode, otvorićemo istraživanje razmatranjem razlike između subjektivne i objektivne refleksije na kojoj je utemeljena i razlika između direktne i indirektne metode opštenja. U ključnom delu rada, bavićemo se analizom strukture indirektne komunikacije, te sagledati razliku između estetske i egzistencijalne reduplikacije. Na samom kraju, uputićemo na Sokratovo shvatanje majeutike kako bismo istakli značaj i beneficije Kjerkegorove indiretkne metode.

Ključne reči: *indirektna (metoda) saopštavanja, direktna (metoda) saopštavanja, subjektivna refleksija, objektivna refleksija, subjektivna istina*

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EXTRACURRICULAR ACTIVITIES IN THE FUNCTION OF IMPROVING PRACTICAL SKILLS OF FUTURE STUDENTS IN THE FIELD OF ELECTRICAL ENGINEERING AND COMPUTING

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Abstract. *This paper is based on the authors' many years of experience in teaching, organizing special courses and one-day workshops for different groups of students, as well as IEEESTEC students' project conferences. The manuscript contains a brief description and results of the implementation and evaluation of the special course "Let's put knowledge into practical work" for grammar school students. In order to continue their study and provide students with additional knowledge, the Arduino course was designed. Since 2018, by attending the course as an extracurricular activity, students gain new knowledge in the field of electronic components and microcontroller programming. Based on the conducted analyzes and evaluations, as well as current pedagogical trends, the authors give recommendations on how to overcome problems that may arise due to a lack of practical knowledge and increase students' self-confidence and indicate the importance of a course designed in this way for those freshmen who want to acquire some new skills and knowledge.*

Key words: *practical work, Arduino, workshops, IEEESTEC*

1. INTRODUCTION

Since the adoption of the Bolognas Process in Serbia and the adoption of the new Law on higher education in 2005, the education process in Serbia has undergone many phases. The first problems appeared immediately after the implementation of new documents. The first generations of students who graduated from technical faculties under the new regulations did not achieve the expected results. This can be seen in university and company conducted surveys as well from the students' own experience. According to

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these sources, the main skill that was not obtained during the studies is knowledge about practical work that failed to follow theoretical knowledge. The analysis of this problem suggested that realization of practical exercises was expensive, but also the lack of the required level of quality and competence on the teachers' part. To tackle these crucial problems, the Ministry of Education, Science and Technological Development of the Republic of Serbia firstly founded the Centers for the Promotion of Science (CPS, 2022) throughout the country, including the one in Niš in 2010 (RCPDEE, 2022), with the aim of increasing the level of the quality of teaching and promoting teaching and science.

The review of the educational system in Serbia made by National Education Council of the Republic of Serbia in 2011 addresses the lack of the practical work (NECRS, 2011), not only at the level of higher education, but at the secondary level of education as well. Therefore, the Strategy for Education Development in Serbia 2020 which was adopted in 2012 (GRSMESTD, 2012) envisages that to tackle the problem of the lack of the practical knowledge of the students, some basis of the work should be covered on a high school level too. Mainly, because of the absence of this type of work, but also because students weren't prepared enough to comprehend this type of knowledge. It was clear that for a comprehensive solution of the problem, participation of multiple educational stakeholders was needed.

It is important to note that many state institutions in Serbia were involved in providing measures and solving this problem in education, and they will be presented in detail in this manuscript.

1.1. Literature review

In the next chapter, some of the results of the other research groups will be presented, which illustrate the importance of practical work during regular classes at faculties or at high schools. Namely, the significance and the comparison of circumstances pre- and post-course which attended the electrical and electronics engineering undergraduate students in performing complex computer programming tasks represented in manuscript (Kittur, 2020). The importance of computer programming as an essential skill that all engineers must possess, as is expected by most companies, has been seen as practical knowledge in our case. The motivation of an individual student to believe in his/her ability to complete a certain task successfully is the same in both events. An individual with higher motivation was more likely to have higher confidence levels to complete the task successfully with increased performance.

The importance of practical work is clearly highlighted in manuscript (Yilmaz, 2011) which investigates the effect of a Web-based mixed learning approach model on mechatronics education. The model combines different perception methods such as reading, listening, speaking and practice methods. It was shown that perception methods differ among individuals. Some individuals learn effectively only by using reading materials, while the others need practical experience. However, psychological research indicates *that people generally remember approximately 10% of what they read; 20% of what they hear, and 90% of what they try and realize* (Yilmaz, 2011). Moreover, practical experience is of prime importance in effective learning, particularly in engineering and science disciplines. A similar study is presented in manuscript (Jing, 2011), and it is also related to students' skills. Namely, it was shown that lecture-centered educational methodologies are one of the effective ways for knowledge learning, but they do not help students to transform their knowledge into skills. That is the main reason why combined lecture-laboratory methodologies have been adopted in some curriculum designs for skills training. It was

shown that laboratory work can consolidate the learned knowledge and transform some of this into skills through practice.

The importance of practical and direct work, an important aspect in the development of young people, can be seen in the work of author Spasić (2022). Namely, the application of modern multimedia technology as an assistive tool in working with children with learning disabilities is described in the paper. In addition to its great sociological significance, the accompanying multimedia video game was designed and developed as a learning tool especially for this occasion.

During the learning process, students react differently to certain situations, so it is completely clear that the individual is motivated by the activity driven by internal factors. Cenić (2018) points out on some more significant aspects of the motivation for successful learning and try to answer to some crucial questions like as: why motivation is crucial in the teaching process, how does the social environment affect motivation, where is the place of assessment as motivation and how encouragement affects successful learning.

Also, Vojinovic (2020) noted that ways of organization and realization of teaching is important pointing out on an example of introducing the model of tiered-lab in the field of engineering. This model of lab programming sessions is suitable for the organization of flipped teaching and learning. However, the lack of research focused on the effects of in-class organization is remained.

Based on abovementioned research as well as valuable experiences of authors in the field an initiative was launched for implementation the new course "Let's put knowledge into practical work" at the beginning and the Arduino course in the following years.

1.2. National strategy of the Republic of Serbia in previous period

At the state level, despite all the measures that had been introduced to 2015 and regardless of the positive progress, no significant progress has been made in terms of practical work among grammar school students. The Ministry of Education, Science and Technological Development of the Republic of Serbia also acknowledged that problem, which is reflected in the introduction of a new elective subject in the third and fourth grade of the practical classes at grammar school. The Institute for Evaluation of the Quality of Education and Training (IEQEU, 2022) was responsible for the incorporation of these subjects into the high school education system.

The programs that lead to the improvement of practical knowledge and skills at the high school level have been outlined as one of the specific goals of the National Youth Strategy of the Republic of Serbia for 2015-2025 (NYSS, 2015). The problems that have arisen are that high school students do not have the knowledge and the skills required at the job market even though those skills are included in the expected outcome of formal education. Therefore, this Strategy provides support to the programs as this one, that enables young people to acquire practical knowledge and both technical and soft skills required in the world of business. To develop and improve these skills, educational institutions like faculties and high schools are marked as key stakeholders. According to the Action Plan of the Development of the City of Niš for 2015-2020, organization of programs on the topic of promoting practical education and possible cooperation between high schools' students and educational institutions as faculties is marked as one of the specific goals (DSCN, 2014).

1.3. Exact situation at the Faculty of Electronic Engineering Niš in last two decades

Even before the adoption of the Strategy for Education Development in Serbia 2020 (GRSMESTD, 2012), the Faculty of Electronic Engineering Niš, had noticed the problems in the education system. Namely, 15 years ago, the Faculty of Electronic Engineering Niš enrolled only 70% of the planned number of students, and some of them were with only 51% of maximum points, which were and still are the legal minimum. In other words, neither the quality nor the number of students was at the appropriate level. On the other hand, during this period there was a great interest in studying at technical faculties at universities all over the world.

To solve this problem, in 2008 the Faculty of Electronic Engineering Niš adopted measures with the following goal: to find a way to improve the quality of the educational process in the first year of study, as well as to improve the success of students in the first year of study. A detailed analysis found that it is necessary to improve the quality and number of high school students enrolling in the Faculty. It was found that in those years, 70% of professional high school students and 30% of grammar school students enrolled at the Faculty of Electronic Engineering Niš. More years of lecturers' experience from the Faculty of Electronic Engineering Niš shows that students who come from grammar schools show better results, and the goal is to enroll a larger number of them. On the other hand, more practical work should be provided for high school students, so that they would be better prepared for studying at the Faculty.

The following measures were planned: Organize competitions in the field of hardware and software for high school students and university students; provide prizes for students' projects; promote as much as possible the awarding of the best students and the best graduate theses during the celebration of the Day of the Faculty. In addition to the entire above, one of the motivating measures regarding the enrollment at the Faculty of Electronic Engineering Niš was to enable high school students to enroll without taking the entrance exam if they won one of the awards at National competitions in physics and mathematics or an engineering subject.

As a result of these efforts and proposed measures, three very important things can be observed that were realized in the years that followed. The first of them was the *IEEESTEC Conference*, the second was the introduction of new subjects at the first year of study, and the last was the implementation of special course "Let's put knowledge into practical work" for grammar school students.

Students and high school students that have the ambition to participate at the *IEEESTEC Student's Project Conference* first go through the process of learning how to write a manuscript. For that, they need scientific results. Some of them write exclusively theoretical manuscripts, but most of them also have the practical realization of their projects. In this way, with the help of their professors, they gain a lot of experience, and it is a great opportunity to promote IEEE manuscript template which is used for conference proceedings. This conference enables the promotion of teamwork, technical sciences, as well as the studies themselves at the Faculty of Electronic Engineering Niš.

After establishing cooperation with high school students through the *IEEESTEC Student's Project Conference*, it was concluded that a small number of grammar school students participated and that they had little practical knowledge. The latter placed them in a disadvantaged position at the Faculty. The goal was to introduce them to that practical work right at the beginning of school, to raise their self-confidence. The Faculty of Electronic

Engineering Niš noticed the low threshold of freshman student's practical knowledge. As a result, the Accreditation in 2013 introduced new subjects that made this possible.

The step forward in promoting practical classes among grammar school students was reflected in the organization of a special course "Let's put knowledge into practical work". Besides, it is recognized as a possibility for the successful promotion of the Faculty of Electronic Engineering Niš.

The results of such implemented projects are presented in detail in (Danković, 2022), based on which the idea of the Arduino course was developed and implemented, which represents *the core* of this paper. The importance of the course and its syllabus will be briefly mentioned in the next chapter. It should be pointed out that course directly enabled the best grammar school students to gain self-confidence and enroll in the Faculty of Electronic Engineering Niš. The monitoring during their studies confirmed the benefit of additional hands-on learning. At this point, we will look at the significance of this additional effort.

2. "LET'S PUT KNOWLEDGE INTO PRACTICAL WORK"

The professors and assistants associated by the Faculty of Electronic Engineering Niš tried to raise the level of practical knowledge among high school students by implementing workshops, and under the auspices of City of Niš Youth Office, a project "Let's put knowledge into practical work" was created.

2.1. Motivation for work with high school students

The Smart Specialization Strategy of the Republic of Serbia for the period from 2020 - 2027 (2018) in all priority areas emphasizes the necessity of practical knowledge building, bringing the academy closer to the economy, which has already found its place in the educational process, as well as developing academic skills necessary for successful cooperation with the other stakeholders. This can also be seen with the new Law on higher education (2017) and the new Law based on the education system (2107) that was adopted in 2017, which encourage start-up and spin-off companies.

Hence, providing more experiences to high school students every year in the different programs and activities will enable growth of their confidence and motivation in practical classes' tasks. With this, the high school students at each level in the class standing will be relatively more confident in their abilities in performing well in practical tasks related to different problems in science. The goal of this manuscript is to present a systematization of long-standing activity and effort in this field, which will be accompanied by numerous analyses that indicate the importance and the impact of practical work at all levels of education.

During four years of high school education in Serbia, especially in grammar school, high school students need to acquire thousands of terms, definitions, formulas..., but the level of their practical knowledge and skills is low. In their higher education, lack of practical skills can put high school students in unequal and inferior position. Even highly motivated high school students that put greater effort often do not achieve as much as they initially expected. As acknowledged by the professors on subjects on the first year at the Faculty of Electronic Engineering Niš, this can lead to lack of motivation and struggle in further education.

It is well known that practical work and application in modern engineering sciences require and unite knowledge from various scientific disciplines. Often, it is not possible to tackle these needs using only a standard classroom lecture-based approach often leading to student's dilemma as: *Where and how am I going to implement these materials.*

Based on these facts and all previously mentioned, the authors created a syllabus for a course intended for grammar school students.

2.2. Syllabus of the course "Let's put knowledge into practical work" for grammar school students

Contrary to the traditional deductive teaching approach, where material is presented to the grammar school students and it is expected that they understand and reproduce presented material, this course puts an inductive approach into use. Grammar school students aren't bound to reproduce circuits (for example on the breadboard), but to make one as they see it. This leads to discussion between team members about possible solutions, which expand their knowledge, thereby boosting both technical skills and skills for teamwork. When grammar school students practically apply their knowledge to solve a problem, their motivation for work and their confidence grow. Also, if the grammar school students have no success in developing appropriate practical solutions at first, they try to reinforce their theoretical knowledge by learning necessary materials until a better solution is found. In this way, the whole engineering cycle is adequately emulated. Also, the presence of both simulations and practical work can more easily express possible lack of understanding of certain materials or a certain topic. This can help professors to identify these misunderstandings and to clarify needed theoretical facts. Based on the above, the basic learning objective of the course is to acquire applied knowledge of applications of electronic components in modern electronic circuits.

The course was held for 15 weeks, having 2 classes per week. During the course, grammar school students worked with two simulators (LTspice and LogiSim) and practically with breadboards and electronic components. Handbook and PowerPoint presentations for each week are provided, as well as homework assignments for some terms. Two individual tests and one group test were conducted. Individual tests were done after 10 weeks of the course and at the end of the course. These tests were done using an online application. On the other hand, the group test was done only at the end of the course, and it was conducted in a written manner.

Two additional surveys were done, one after 10 weeks of the course, and a second at the end of the course. The syllabus of course consists of adapted materials of basic engineering sciences such as physics, electrical circuits, algorithms and programming, analog electronics, and digital electronics. Systematized timeline of all activities is shown in Fig. 1.

Some results of the post-survey questions taken by high school students are in Table 1. Answers are graded from 1-lowest to 5-highest.

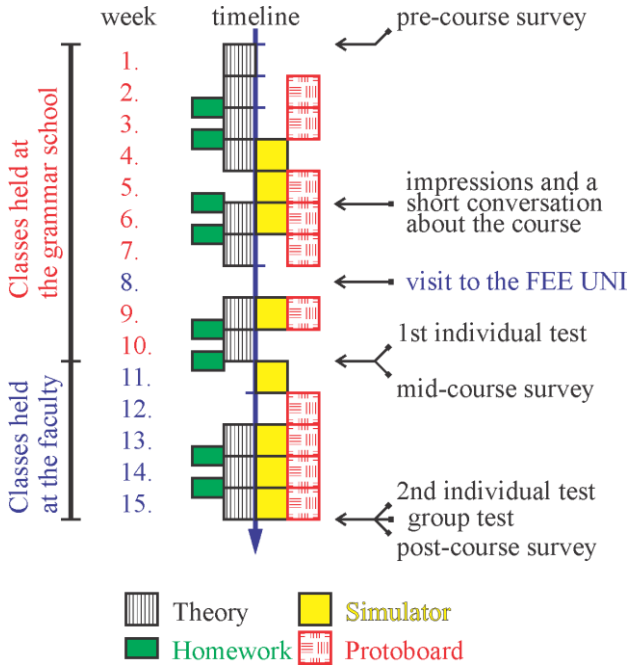

Fig. 1 Course timeline

Table 1 Part of survey done after the course "Let's put knowledge into practical work"

Q. No.	Question	Answer
1	I prefer between practical work and simulators	1-Using the simulator (0%) 2-Practical work (100%)
2	I am satisfied with the knowledge gained during the course.	1(0%) 2(0%) 3(7%) 4(63%) 5(30%)
3	I think that the length of the course is quite adequate.	1(0%) 2(0%) 3(7%) 4(63%) 5(30%)
4	I don't think the course is too difficult.	1(0%) 2(0%) 3(7%) 4(63%) 5(30%)
5	It would be good to continue with the realization of this course.	1(0%) 2(0%) 3(7%) 4(63%) 5(30%)
6	I recommend the course to others.	1(0%) 2(0%) 3(7%) 4(63%) 5(30%)

3. ARDUINO COURSE

Some of the impressions of the students, which they expressed through the survey after the course "Let's put knowledge into practical work" were: "*I warmly recommend other generations to be part of the course*" or "*I'm sure I'd attend a continuation of this course*". These statements from course participants, as well as the results of the survey shown in Table I, motivated us and gave us an idea for the implementation of a new course, the *Arduino* course. The *Arduino* course is intended for freshmen attending the Faculty of Electronic Engineering Niš. The course has been implemented since 2018.

The participants of the course were in their first year of study at the Faculty of Electronic Engineering in Niš. Data on students who attended the *Arduino* course is given in Table II. The table shows the number of those who previously attended the high school course "Let's put knowledge into practical work", as well as their gender structure was present. In addition to the students at the high school "Bora Stanković" who were part of the high school course, students from the grammar school "Svetozar Marković" Niš, as well as grammar schools from Sokobanja and Leskovac participated in the *Arduino* course.[1] The diversity of the displayed data by gender, school, and by previously attended the course, proves that the analysis of the results after the *Arduino* course will be successful.

Table 2 Information about the participants of Arduino course

Number of students: 13	Male	Female
Students who already finished "Let's put knowledge into practical work" course	4	2
Students without any experience with practical work	3	4

3.1. Syllabus of the Arduino course

The core of the course is the practical realization of electronic systems based on open-source microcontroller platform *Arduino*. Table III shows the syllabus of the *Arduino* course. The course walks participants through the basics in a hands-on way, with creative projects which they build by teach (Fitzgerald, 2017). Compared to the course "Let's put knowledge into practical work", the *Arduino* course has a smaller fund of classes, consisting of 7 two-hour workshops. We decided on this duration of the course (half of the semester) keeping in mind that we are dealing with freshmen. It is very hard to acquire the legal condition for the second year of studies, as shown by numerous analyses. Namely, only 55% pass the second year of studies, while in the higher years it is about 85%.

In addition to practical exercises at the workshops at the Faculty, course participants had homework assignments, and after the Course they worked on group projects for the *IEEESTEC Student's Project Conference*.

It should be noted that this concept of working with students has only recently come to life within the professional association IEEE Solid State Chapter Society. Namely, it is planned to organize lectures and workshops on this topic in 2023 (Arduino, 2022), as well as competition for high school and undergraduate students throughout the USA and Canada.

[1] Note that: A total of 11 course participants "Let's put knowledge into practical work" attended the *Arduino* course. 6 participants attended in 2018, as shown in the Table II, and 5 participants in 2019 (which is not included in the analysis of this paper).

Table 3 Syllabus of the Arduino course

Lesson	Subject	Description
1	Introduction	Introduction to the Arduino development board and Arduino IDE. LED blink program.
2	LEDs and buttons	Control LEDs with buttons and Arduino. Connecting buttons and LEDs on breadboard. Pull-up and pull-down resistors. IF statement. Arduino functions: pinMode(); digitalRead(); digitalWrite(); delay().
3	Keyboard and buzzer	Realization of a mini-piano using a piezo buzzer and Arduino. Voltage divider. Piezo buzzer. Realization of keyboard on breadboard. Array in Arduino. Arduino functions: analogRead(); tone().
4	Serial communication and LDR	Light dependent resistors (LDR). Determination of illuminance using LDR and Arduino. Analog-to-digital conversion. Serial communication between Arduino and computer. Arduino function: Serial.print().
5	DC motors	Starting a DC motor using an Arduino. DC motors. MOS transistors. Serial communication – start and stop DC motor via the computer keyboard.
6	Temperature sensors and LCD display	Display of the measured temperature on the LCD display using Arduino. Temperature sensors. LCD display. Arduino functions for LCD displays.
7	Project tasks	Some of the projects that the students realized were: distance measurement using an ultrasonic sensor, control of the opto-coupler using Arduino, Arduino calculator, Arduino height measurement system.

One of the project tasks after the *Arduino* course was the realization of a device prototype for measuring distances. The project task corresponds to the STEM concept and combines several fields: physics, mathematics, hardware, and software. The system consists of an *Arduino* and an ultrasonic distance sensor SR04 (2022). The novelty in this project to the previously learned electronic devices was the ultrasonic sensor, which required the students to study the operation principle of this sensor module. The ultrasonic sensor module emits ultrasound, with a frequency of 40 kHz, which travels through the air, bounces off the object, and returns to the sensor module (Fig. 2). Based on the measured time and speed of sound, it is possible to determine the distance. The SR04 sensor module (Fig. 3) has four pins: two for power (5 V, GND), a sensor trigger pin (TRIG), and a time readout pin (ECHO). To perform a successful distance reading, a 10 μs pulse must be sent to the trigger pin of the sensor. After that, the sensor module from the transmitter emits eight ultrasonic pulses that propagate through the air and the ECHO pin is set to the logic one state. The ECHO pin remains in the logic one state until the ultrasound travels to the object and returns to the sensor module, which is detected by the sensor receiver. The microcontroller measures the time that the ECHO pin spent in the logic one state. Note that the measured time is the total time required for the signal to go from the module to the object and back to the module, the obtained value should be divided by two. The real-time that the ultrasound traveled from the sensor to the object is:

$$t = \frac{t_{measured}}{2}. \tag{1}$$

If the sound speed moving through the air is known as c = 340 ms^{-1}, the distance is:

$$s = ct. \tag{2}$$

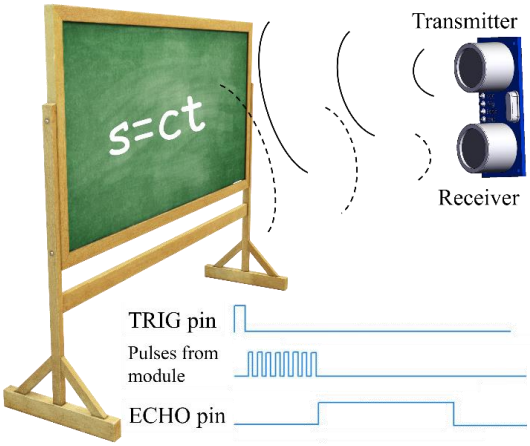

Fig. 2 Explanation of the operation principle of the ultrasonic sensor module SR04

After studying the operation principle of the sensor module, the practical connection of the sensor with the *Arduino* follows. Only jumpers are required for connection. *Arduino* digital pins 2 and 3 were chosen to connect the sensor's TRIG and ECHO pins, respectively. After connecting, the students should write a simple code for the *Arduino* that will read the distance from the sensor and display the measured results on the PC serial terminal. All the used *Arduino* functions were learned and applied during the course. The code is provided below.

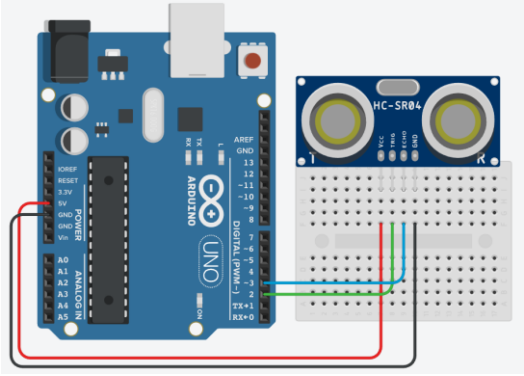

Fig. 3 Schematic of *Arduino* and ultrasonic sensor SR04

At the beginning of the code, the labels for the pins are defined and variables are declared. Within the void setup() function that is executed only once, when the microcontroller receives

power, the TRIG and the ECHO pin are set as output and input, respectively. This is where the serial communication between the microcontroller and the PC is initialized, using the function Serial.begin(9600), where the number indicates the bit rate. Within the infinite loop, ie. void loop() function, which is executed while the microcontroller has power, first sets the TRIG pin to a logic zero state, then to a logic one state for 10 μs, and again to a logic zero state. In this way, the trigger impulse was generated. After that, the result returned by the pulseIn function, which measures time, is written into the variable *vreme*. The arguments of this function are the pin and the parameter to be measured. In this case, the function measures how long the ECHO pin was in the logical one state, ie. HIGH. The measured time is expressed in μs. After that, the distance is calculated and written into a certain variable. The obtained value is sent to the PC via serial communication, using the print and println functions from the Serial class.

```
#define trigPin 2
#define echoPin 3
long vreme;
int rastojanje;
void setup() {
  pinMode(trigPin, OUTPUT);
  pinMode(echoPin, INPUT);
  Serial.begin(9600);
}
void loop() {
  digitalWrite(trigPin, LOW);
  delayMicroseconds(2);
  digitalWrite(trigPin, HIGH);
  delayMicroseconds(10);
  digitalWrite(trigPin, LOW);
  vreme = pulseIn(echoPin, HIGH);
  rastojanje = vreme*0.034/2;
  Serial.print("Rastojanje do prepreke je: ");
  Serial.println(rastojanje);
}
```

After compiling and flashing the program into the microcontroller, the students read the measured distance on the PC's serial monitor. The displayed code is provided for educational purposes and, together with the schematic shown in Fig. 3, allows those who are interested to implement the detailed exercise.

The students showed the initiative to improve the project by adding an LCD and printing the measured value on it, and by adding a piezo-buzzer that is activated when the distance is less than expected. They got the inspiration for these modifications based on the previous exercises (Fig. 4) realized during the *Arduino* course (Table 3).

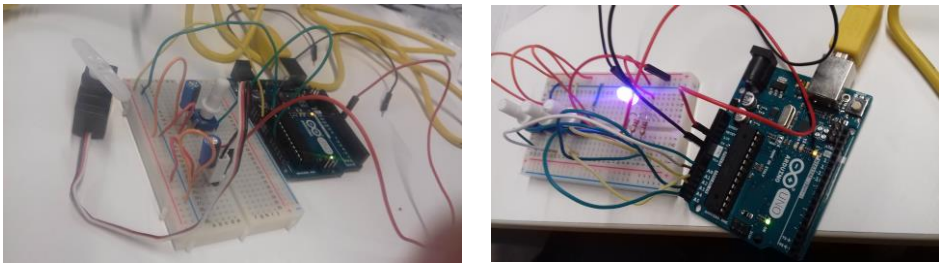

Fig. 4 Examples of practically realized Arduino projects

3.2. Assessment of the course

At the end of each term, the students took a quiz to check the knowledge gained during that exercise. At the last session, a survey was conducted, 13 students participated. The results of the survey are shown in Fig. 5. The average rating on a scale of 1-5 was 4.9. Although the students thought that the course was useful and they would participate in a similar course again, not all of them saw, at the time of the survey, how to apply the knowledge they had acquired in practice. Also, the students presented their impressions after the Arduino course. Some of the answers are:

"*The course is excellent; I would like it to be continued.*"

"*Very useful time spent, I don't regret signing up, the workshops were inspiring*."

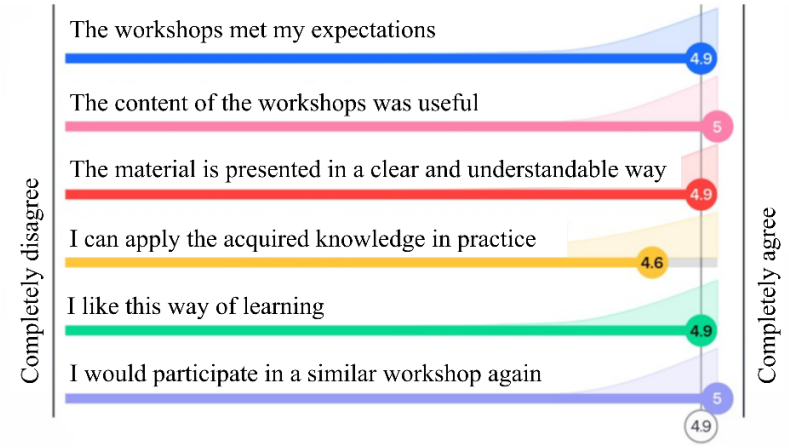

Fig. 5 Survey results after the *Arduino* course

Figure 6 shows two word clouds. By surveying the participants of the course and giving them the opportunity to write five words each that they associate with the course, before and after its holding, the following results were obtained. It is interesting to note that of the general

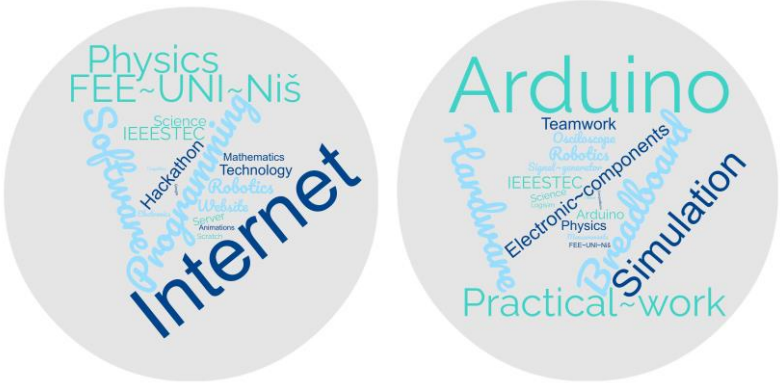

Fig. 6 Words those students associated with the course (left-before, right-after course)

words that they pointed out before attending the course, after the workshops, those words were much more concretely related to the terms they learned about during the course, for example *Arduino*, *Breadboard*, *Simulation*, *Electronic Components* and *Practical Work*.

Students who participated in the course "Let's put knowledge into practical work" in addition to knowledge and practical skills gained many other skills and abilities like as: leadership, open and flexible communication, managing fear especially in asking the questions, logical and critical thinking in problem solving, efficacy and effectiveness in doing home works, independence, team-work and collaboration.

The very important impact of the course could also be seen through an example that illustrates it well. It is worth pointing out some valuable effects that resulted from this work. For example, some participants who were in both courses, further developed their interests and obtained skills like as continuing working with Arduino microcontroller, transfer of acquired knowledge into scientific papers, consultative and practical work with young, non-experienced students, motivating students to create ideas and publish then by using the knowledge and skills developed within Arduino and related courses.

The concept of the *Arduino* course was liked by the high school professors. They launched an initiative to organize a course for their students in the laboratories of the Faculty of Electronic Engineering Niš. Also, at the request of many high school professors, *Arduino* courses were organized for them as well. Although this course was not accredited by any competent institutions, professors were motivated to complete this course and pass the knowledge on to their students.

4. CONCLUSION

The author's many years of experience have shown that when students enroll in the Faculty of Electronic Engineering Niš, they lack practical knowledge, which also affects the loss of students' self-confidence. The authors carried out a series of described activities to eliminate the shortcomings. After completing the course "Let's put knowledge into practical work", students pointed out that they learned a lot because they practically realized electric circuits, that they are interested in more similar courses and would recommend this course to future generations. The course influenced the raising of self-confidence of grammar school students, which can be seen through their high school graduate theses in which they used the acquired practical knowledge but also improved it. Later at Faculty, some of these students attended a facultative *Arduino* course, also based on the practical application of knowledge, where they also showed self-confidence in solving problems compared to the other course participants. Namely, in addition to the students who passed the course "Let's put knowledge into practical work", there were also the other students on the *Arduino* course who had no prior practical knowledge. The research showed that grammar school students who attended a special course achieved better results in regular education compared to the other students from their generation, did not study "for grade" but to deepen practical knowledge.

In many activities, the authors were ahead of the time of activities carried out by state institutions. Based on all the above, the authors recommend organizing special courses and workshops, conferences of practically realized projects to overcome the problem of the lack of practical work in high school and to increase students' self-confidence in further education.

After two years of holding the course in the premises of the Student Creative Center at the Faculty of Electronic Engineering in Niš, the course had to be held online in accordance with the regulations during 2020-2022. Despite everything, the continuity of this course has been preserved. So, we will organize an extracurricular activity in 2023 as well, in the hope that students will continue to show interest. For this purpose, a special space was set aside this year in the new the Faculty annex. Students will work with state-of-the-art equipment and devices provided by the Ministry of Education, Science and Technological Development's teaching improvement projects, as well as projects of the Center for the Promotion of Science and international STEM projects within the IEEE TryEngineering initiatives and the Engineers Demonstrating Science: An Engineer Teacher Connection program.

One of the goals of the authors of this paper is to create a student team from the Electronic Components and Microsystems module, two students from each year of study, who will undergo training to hold this type of workshop. In this way, students would gain a new experience that will be useful to them later when they start working in some companies or schools, and in addition, this concept of workshops and *Arduino* courses would be sustainable.

As a special task that the authors will carry out in the coming period, is the writing of a booklet, as well as the preparation of online material, which would contain all the exercises that are covered during the course, as well as homework that the course participants could do independently.

The main goal of these mentioned projects, *IEEESTEC Student's Project Conference*, workshops, professional trainings as well as special course for grammar school students, was an evolutionary shift in the way of teaching the subject with the aim of improving the perception of high school students. The goal was that the high school students did not experience the material they were working on as unrelated items, but as parts of a functional entirety. This was achieved by intensive introduction of practical examples, thus increasing the motivation of high school students to look deeper into the principles on which their realization is based. In this way, they are enabled not only to just passively go through the subject matter, but also to essentially learn it. In support of this project and the raising of the level of practical work among high school students, the newly introduced subjects that promote practical work also go.

The development of such projects and courses are motivated by the fact that the Faculty of Electronic Engineering Niš is a higher education institution involved in the implementation of the Action Plan for the Implementation of Strategy of Development of the Information Technology Industry for the period from 2017 to 2020 (APISDITI, 2016) and the Action Plan for the Strategy for Development of the Education in the Republic of Serbia in 2020 (APSDE, 2012). The Faculty of Electronic Engineering Niš provided the appropriate space, and the professors and associates prepared appropriate literature and provided the necessary equipment for the realization of one-day and multi-day workshops.

Acknowledgement: *We would like to thank the students who participated in the courses and the management of the Faculty of Electronic Engineering Niš who made the workshops possible.*
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VANNASTAVNE AKTIVNOSTI U FUNKCIJI UNAPREĐIVANJA PRAKTIČNIH VEŠTINA BUDUĆIH STUDENATA U OBLASTI ELEKTROTEHNIKE I RAČUNARSTVA

Ovaj rad se zasniva na višegodišnjem iskustvu autora u nastavi, organizovanju specijalnih kurseva i jednodnevnih radionica za različite grupe studenata, kao i IEEESTEC konferencije studentskih projekata. Rukopis sadrži kratak opis i rezultate realizacije i evaluacije specijalnog kursa „Pretočimo znanje u praktičan rad" za učenike gimnazije. Kako bi nastavili učenje i pružili studentima dodatna znanja, osmišljen je i Arduino kurs. Od 2018. godine pohađanjem kursa kao vannastavne aktivnosti studenti stiču nova znanja iz oblasti elektronskih komponenata i programiranja mikrokontrolera. Na osnovu sprovedenih analiza i evaluacija, kao i aktuelnih pedagoških trendova, autori daju preporuke kako da se prevaziđu problemi koji mogu nastati usled nedostatka praktičnih znanja i kako povećati samopouzdanje učenika, te ukazuju na značaj osmišljenog kursa na ovaj način za one brucoše koji žele da steknu neke nove veštine i znanja.

Ključne reči: *praktičan rad, Arduino, radionice, IEEESTEC*

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THE FUNCTION OF ANALOGY IN PIANO PEDAGOGY

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Abstract. *The paper explains the role played by the practice of analogical reasoning in piano lessons, especially at the beginner level. The first stage of piano studies is the most important one in raising musicians. In order to develop a young student's understanding and appreciation of music and piano playing, teachers use interesting and logically connected stories with plenty of entertaining characters, colorful illustrations and imaginative scenes. Comprehensive analogies with images of characters and their adventures used to introduce and expand on musical concepts in working with beginners make complicated playing techniques understandable and acceptable to them. It is very important to invoke students' imagination and creativity using fantasy, as well as analogies from everyday life, in order to help them to envisage musical images and express them through physical movements. By making progress in piano playing, students also improve their problem-solving skills in the arts, sciences, natural environment and social life.*

Key words: *imagination, learning, piano pedagogy, piano playing, teaching, analogical reasoning*

1. INTRODUCTION

Piano pedagogy arose with the appearance of the piano itself at the beginning of the eighteenth century. The practice of learning and teaching to play keyboard instruments has always reflected "the integrity of the musical culture of the time" (Zafranas, 2003, p. 134), and lessons in playing these instruments were an integral part of the education of children and youth in middle-class families. The romantic pianism of the nineteenth century leads to flourishing of both piano art and piano pedagogy. During the twentieth century, piano learning has a privileged status in the educational systems of many countries where specialized state music schools were established, and as a teaching discipline it continues to represent one of the significant achievements of contemporary educational programs at all levels - from preschool to university. Contemporary piano pedagogy has become so-

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called 'lifelong learning', with piano lessons for adults following the general world trend that the improvement process does not have to end with our regular schooling.

Nowadays, people believe almost indisputably that learning to play the piano brings numerous benefits, starting with motor and intellectual ones, all the way to the development of creativity, imagination and inner spirit. Playing the piano is considered "one of the most complex motor acts performed by the human being" (Koschevitsky, 1995, p. iii). In that sense, the vocation of a professional pianist presumes a long and demanding education, and implies certain personal physical and psychological predispositions. The education of a future professional pianist usually begins in early childhood and involves many personal abstentions and sacrifices, because learning is hard and requires many hours of daily practice over a number of years. The modern age is dominantly determined by the use of technology in all areas of human activity and creativity, including music performance. Nowadays we have recorded music available on devices. It is no longer necessary to learn to play music in order to hear it. Despite this, the interest in music performance studies is still evident throughout the world. According to available data, only in China there are more than thirty million young people who study piano playing (Ćeklić, 2015, p. 94).

From the perspective of today's man, it is not easy to understand why so many students persist in learning to play the piano despite all the challenges and difficulties that come with playing music professionally. There are studies demonstrating that piano and keyboard lessons lead to improved spatial-temporal test results in kindergarten children, and based on this, music and piano-keyboard lessons are recommended as an integral part of kindergarten education (Zafranas, 2003, p. 2). However, children are not motivated to learn to play the piano just because of the effects music lessons have on their cognitive abilities, as if was is a kind of medicine, or mental therapy. There is something else about piano playing that appeals to countless enthusiasts, from eighteenth-century times to the modern technological age.

There are two basic approaches to teaching piano. The approach which could be described as 'algorithmic', is represented in words originating, according to oral tradition, from Johann Sebastian Bach who allegedly claimed that there was nothing remarkable about playing and that "all one has to do is hit the right keys at the right time and the instrument plays itself." Viewed in this way, musical notation represents a specific algorithm, a sequence of instructions used to perform a computation of musical score, and all the performer needs to do in order to play the music is to follow the instructions. But, if the student/performer desires "disclosing the vast field of artistic interpretation", (s)he "must learn to perceive the invisible something which unifies the seemingly separate notes, groups, periods, sections, and parts into an organic whole" (Hofmann, 1920, p. viii). That "spiritual eye for this invisible something is what musicians have in mind when they speak of 'reading between the lines' which is at once the most fascinating and most difficult task of the interpretative artist; for, it is just between the lines where, in literature as in music, the soul of a work of art lies hidden" (Ibid, p. viii-ix). Because "to play its notes, even to play them correctly, is still very far from doing justice to the life and soul of an artistic composition" (Ibid, p. ix). This approach of creating music could be described as 'transcendent', as it goes beyond or above the range of normal or merely physical human experience, and its functioning mechanism is the subject of this paper.

In the following sections it will be explained that piano playing is a creative artistic activity which takes place on an imaginary level through associative thinking and analogical reasoning. In piano pedagogy, the function of analogy is to introduce and expand musical concepts in the work with beginners, as well as to illuminate the symbolic 'meaning' of an articulated musical phrase in the work of professional pianists.

2. Learning to Create Music on The Piano Through Analogical Reasoning

Piano pedagogy involves the study and teaching of motor, intellectual, problem-solving, and artistic skills required to play the piano effectively (Uszler, Gordon, & McBride Smith, 2000). In order to understand what it means to 'study and teach playing the piano effectively', it is first necessary to explain the technical capabilities and possibilities of the piano, resulting from the construction of the instrument, which differ from the way that other musical instruments and the human voice create musical sounds.

The piano is a musical instrument with strings struck by wooden hammers coated with a softer material made of dense wool felt. Music is played using the instrument's keyboard, which is a row of keys where each of them is linked to a complex system of levers. The keys touched by the performer with the fingers and thumbs of both hands cause the hammers to strike the strings. The key raises the 'wippen', which forces up the jack against the hammer roller and lifts the lever carrying the hammer. The key also raises the damper and immediately after striking the string the hammer drops back, allowing the string to sound. On releasing the key, the damper drops back onto the string and cuts off the sound **(**Macaulay & Ardley, 2016, p. 26**).** The vibrations of the piano strings are not very loud, but they are transmitted to a large soundboard that moves air and thus converts the energy to sound. The irregular shape and off-center placement of the bridge ensure that the soundboard vibrates strongly at all frequencies. The raised damper allows the instrument to sound until the key, or sustain pedal, is released. The auditory sensation in which a listener assigns musical tones to relative positions on a musical scale based primarily on their perception of the frequency of vibration as 'higher' and 'lower' is called the tone 'pitch'. The factors that affect the pitch of a vibrating string are its length, thickness and tension (Reblitz, 1997, p. 203). The elements that determine the pitch are fixed through the processes of construction and tuning of the instrument, and the performer has no influence on them.

In piano playing, the performer effects on the speed and quality of keystrokes. Striking the piano key with greater velocity increases the amplitude of the waves and therefore the volume of the sound. When someone plays from pianissimo (extremely quiet) to fortissimo (extremely loud) sound dynamics, the velocity of hammers hitting the strings changes, and contact time of the hammer with the string in fortissimo dynamics is several times shorter than in pianissimo dynamics. The piano sound can be impressively dramatic in its dynamic nuances and directly depends on the delicacy of the pianist's touch when pressing the key. Its sound can be as powerful as the sound of an orchestra, and at the same time it has the ability to imitate the finesse of each individual instrument in the orchestra, as well as the sensitivity of human voice. The nature of writing for the piano is multivoiced and piano texture frequently includes orchestral elements (Schenker, 2000, p. 7). Its range includes the highest and deepest practicable tones, although limited by the invariance of the semitonic scale (Busoni, 1911, p. 43).

The advantages and prerogatives of the piano are evident, but it also has one important disability compared to string and wind instruments that is physically impossible to overcome - the lack of sustained tone. The intensity of the piano sound is constantly decreasing from the moment the tone is created. This happens even when the sound is extended with 'sustaining' pedal, the lever pressed by right foot, which raises all of the dampers at once allowing all played notes, as well as the sympathetic vibrations of all unstruck strings, to continue sounding after the keys are released (Reblitz, 1997, p. 15). Unlike the piano, string and wind instruments can maintain the same intensity of the tone

volume as long as it allows the length of the bow that stroke the string or the capacity of the air insufflated into the wind instrument. The volume of the tone produced on these instruments, as with the human voice, can even increase while it continues, which is physically impossible on the piano. The lack of sustained tone is an irreparable physical disability in the sound quality of the piano that can be overcome only with the help of imagination as the creative power.

Imagination is a crucial mental instrument that pianists use in order to create the illusion of sustained tone and thereby imitate singing on the piano. Illusion is an instance of a wrong or misinterpreted perception of a sensory experience, which implies a false ascribing of reality based on what one imagines. In order to perceive the imaginary singing of the piano, it is necessary to seduce the senses. Many illusions are probably partly influenced by human's past experiences, which have taught humans to expect certain order in the world of physical reality (Solso, MacLin, & MacLin, 2014, p. 93). Human expectations based on knowledge received from previous experiences facilitates the illusion effect. There are even suggestions that illusions reflect "deeply embedded immutable structures of the brain", and that they are important "not because they indicate a flaw in our perceptual ability, but because they provide insight into how our perceptual system works" (Ibid). From the above, it can be understood that most people share the features of the perceptual system that enable pianists to be convincing in creating the illusion of sustained tone sonority on the piano. In this regard, a crucial problem in piano pedagogy is how to teach a child, whose experience is quite limited, to create the illusion of a sustained tone or some other imaginary sound on the piano.

The first 'instrument' that piano teachers use in their work is analogical reasoning. Analogical reasoning, which is "fundamental to human thought", is "any type of thinking that relies upon an analogy", that is, upon "a comparison between two objects, or systems of objects, that highlights respects in which they are thought to be similar" (Bartha, 2022). In piano pedagogy, analogical thinking has an irreplaceable function. From the first piano lesson, the student is shown that the hands are held 'as if the upper arms were supported by rubber balloons full of air' or 'as if they were floating in thick water'; that the whole arms from the shoulders to the tips of the fingers should fall freely and flexibly 'as if they were branches of willow swaying in the wind'; that the hands should come down on the keyboard 'as if the palms lie on the hemispheres'; that the fingers move 'like walking legs'. In piano pedagogy, each new knowledge is compared with something that the student knows from personal experience or is imaginable as someone else's experience.

The ability to understand analogies leads to the development of imagination - another important cognitive process that also helps to make knowledge applicable to problem solving, which is the basis for the integration of experience and the learning process. Imagination is "the act or power of forming mental images of what is not actually present to the senses or what has not actually been experienced" and "also the act or power of creating new ideas or images through the combination and reorganization of previous experiences" (Efland, 2002, p. 133). Imagination has an emphasized significance in performing arts. In his piano textbook *The Art of Piano Playing*, which is considered one of the most authoritative and comprehensive approaches to the subject, Heinrich Neuhaus explains the 'antinomies' of the pianistic art by describing his work method with the example of motifs from the beginning of the second movement of Beethoven's sonata op.27 no.2 which 'resembles a flower'. Neuhaus's explanation deserves to be given in his original words (Neuhaus, 1973, p. 26):

> "I never 'illustrate' music, i.e. in the case of point I do not say that the music represents the flower; I say that it can create the spiritual and visual impression given by a flower, it can symbolize it, and call forth in imagination the image of a flower. […] But we have in our brains a 'photocell' (I think that everyone knows this miracle gadget) which can translate the phenomena of a given world of perception into another. After all, the curve traced on a film produces a sound! Surely the human spirit is not poorer or duller than the apparatus it has created! That is way for people who have the gift of creative imagination all music in its entirety is programme music (even the so-called pure music devoid of programme) and at the same time does not need any programme, since it expresses in its own language the whole of its content."

According to Neuhaus (1973, p. 10), learning to work on the 'artistic image' of musical composition should begin as early as possible, already at the first piano lessons. The young student "should be made, at the early possible stage, to play a sad melody sadly, a gay melody gaily, a solemn melody solemnly, etc. and should make his musical and artistic intensions completely clear (Ibid)." A development of the wide range of musical images should be the main objective at all levels of the piano studies, starting with the initial stage. In the next section it will be explained how the art of piano playing becomes a thoughtful activity when it involves the use of the musical imagination, which functions mainly through analogical reasoning.

3. The Use of Analogies in Piano Learning Methods for Beginners

Teaching young beginners is "the most unique, complex and creative area in piano pedagogy", which "requires the piano teacher not only to be a great educator, pianist and interpreter, but also a child psychologist, actor, storyteller, singer and disciplinarian" (Gorin, 2014, p. 7). The piano is an instrument that demands a great artistic imagination for producing a single musical tone on it. In music playing, every produced sound structure should have a certain 'character' in order to be understood as musical. Regarding to this postulate, as soon as the student begins to play the first musical tones, great attention must be paid to the creation of the sound and the pianist's 'touch'. Piano pedagogues almost as a rule start teaching piano playing by working with students on sound production. Playing one tone of a certain 'character' is considered by many important pedagogues to be the first element of piano technique (Neuhaus, 1973, p. 115; Schenker, 2000, p. 8; Gorin, 2014, p.39).

The first element of technique in piano pedagogy is called 'piano singing', or 'singing on the piano'. This term refers to the application of the principles of vocal technique and string instruments to the piano. The 'piano singing' implies "stroking of the air through up-and-down motions of the hand – as the bow strokes the string: pressure ↓ - ↑ reflex" (Schenker, 2000, p. 8). A motion "demands a single thrusting of the hand" which "must be prepared from the outset, like bow strokes on strings and breathing in playing wind instruments" (Ibid). Producing a tone on the piano implies imitating the tone production on string and wind instruments. This technique is better understood by older students at the academic level. Beginners usually do not have enough experience in performing music, which means that the analogy with playing other instruments is not functional in piano lessons with them.

The explanation of music performance skills and basic body flexibility techniques to beginners should correspond to the level of physical and mental development of the student. The teacher needs to think up exercises, sometimes away from the instrument, which are

adequate "for establishing a whole-body connection at the very beginning of piano studies" (Gorin, 2014, p. 24). These exercises are always based on analogies and usually have picturesque names such as: "Weeping Willow Tree Exercise", "Big Bird Exercise", "Windmill Exercise", "Floating Arms Exercise", "Marionette Exercise", and others (Ibid, p. 25-27).

Exercises for the wrist are very important. As the most important element in the pianistic apparatus, wrist is responsible for the multiple functions in tone producing. Vertical movement of the wrist in piano pedagogy and art is called 'breathing' (Gorin, 2014, p. 29; Schenker, 2000, p. 8, 68, 70, 78). It should be performed with the hand gently placed on a keyboard as it 'breathes in' with the wrist, lifting it up until only the finger touches the key, after which the wrist moves down as it 'breathes out' to its lowest position (Gorin, 2014, p. 30). In an essay discussing the art of piano playing, Schenker insists on 'breathing' in order to bring to student's eyes and ears the model of the human voice for 'singing' playing and 'speaking' articulation (Schenker, 2000, p. viii). When it comes to simulating human speech in piano playing, the group of notes that form a phrase requires a single 'breathing' motion of the hand, which must not be interrupted during a passage as it moves from tone to tone. For this kind of gesture, the student needs to make horizontal movement of wrist and arm. Piano teachers compare this movement with those the monkeys make while swinging on the trees and call it 'the monkey swing' movement. In order to perform this movement, a student should be asked to imagine a monkey paws around his/her forearm, to place the finger on the key and to move the wrist gently side to side (Gorin, 2014, p. 30). The purpose of this exercise is "to create a foundation for tackling phrasing, and to produce a beautiful singing tone" (Ibid, p. 31) or a tune, that is, a group of tones belonging to one 'breath' of the hand.

From 'breathing' wrist movements naturally evolves articulation called *non legato*, which is the Italian term for *not tied* notes. This can be referred to as playing on the 'exhale', which means that "the wrist 'inhales' right above the key, while the finger continuously remains on the surface of the key and 'exhales' with a pressing of the key downward" (Gorin, 2014, p. 37). The student should be encouraged to actually breathe while executing *non legato* technique, because it is a good way "to fell the natural movement of the forearm and hand" (Ibid). When the hand releases the key, it should 'float off' freely and move in the direction of the next key, while the short break between sounds must be heard. This is an important tool in learning the 'geography' of the keyboard, and in that purpose, there are exercises such as "The Rainbow" or "The Butterfly", which can help students to "imagine that their hands are light, supple and elegant" (Ibid, p. 38).

The simplest *non legato* exercises are recommended to start working on the quality of sound production and the pianist's 'touch'. If we keep in mind that one and the same tone can be played in expressively different ways, then "the playing on the piano of one single note with one finger is already a problem" (Neuhaus, 1973, p. 115). Neuhaus explains this through the parallel of an actor who is tasked with pronouncing one 'Ah' seventeen times in different ways: "an admiring 'Ah!', a questioning 'Ah', a threatening 'Ah, an astonished 'Ah, 'Ah' as a cry of pain, a joyful 'Ah', etc., etc." Analogously to this acting exercise, in working with beginners the piano teacher demonstrates playing a tone repeated several times with different expressions and articulations, for example "lilting and gentle or harsh and prickly", and then "attention is directed to how different the notes from the examples will sound on different parts of the keyboard" (Gorin, 2014, p. 39). Some of the well-known analogies that are used in teaching young beginners to create the imitation of sustained 'singing' sound on the piano are: the imagery of dipping child's fingers into his favorite

jelly, or Rachmaninoff's image of fingers which should grow roots in the keyboard, or Hoffman's imagery of the sound produced as if there was a ripe strawberry sitting on the key and you had to push through it (Ibid, p. 39-40).

Obtaining the skill of shaping tonal varieties on the instrument is a basic prerequisite for any further work on developing performative abilities of the student. The following example may illustrate how just one tone performed adequately on the piano can generate the artistic content of the composition. There is a small piece entitled *The Sick Doll* from Tchaikovsky's *Album for Young* (1878), whose structure is very simple, but whose poetic content is extremely suggestive when viewed through the prism of intense emotions that most children experience in their lives. The composition is built on rhythmized broken chord whose last tone in the sequence is *non legato* marked as *tenuto*, which is the Italian term for sustained tone. This kind of tone is particularly suitable for demonstrating a technique that simulates 'breathing' of the wrist, and a tone created in such a way in this particular situation can be understood as a painful 'sigh' or an 'exhalation' (Dinov Vasić, 2019, pp. 98-99).

Another piano technique that involves playing separate tones is *staccato*, the Italian term for *detached* tones. Children usually grasp *staccato* playing very easily. During the initial stages, this technique "is introduced as a thrusting (or pushing) movement, which travels in the opposite direction of *non legato*" (Gorin, 2014, p. 44). It is similar to *non legato* and should be executed on 'exhale' with the hand relaxed "immediately after the springy forward push of *staccato*" (Ibid). The analogy of a 'jumping frog' or 'jumping on a trampoline' is commonly used in teaching beginners how to play *staccato* tones. Detached tones can be played with many nuances that depend on how long the finger stays at the bottom of the key, and on the sharpness or softness of its spring-like movement. Each tone nuance can have a different extra-musical connotation related to musical imagination.

The process of playing *legato*, the Italian term for *tied* notes, involves the most complex set of technical skills. Since the piano is a percussion instrument, it is very difficult to make the notes in the melody sound like a singing voice. Playing *legato* requires "a keen auditory perception, for one must listen to the moment of transition from one sound to another" (Gorin, 2014, p. 41). It is necessary to teach the student "to distinguish 'good' from 'bad' *legato* by, for example, singing the tune first and then playing the same tune on the piano" (Ibid). The tune must be played very carefully so that the tones are neither disconnected nor overlapped. The student must achieve smooth shifts from one sound to another by making connected 'steps' from one key to another. Learning *legato* technique usually starts with exercises on playing two notes – *legato* pairs – which should "teach a pupil to synchronize the beginning of the second sound with the end of the previous sound" (Ibid, p. 42). Since "a line consisting of sounds of the same volume does not produce the impression of connected sounds", one must be aware that "the connection occurs only if a dynamic and rhythmic relationship between sounds is present" (Ibid). The *legato* pairs are "one of the essential articulation elements of music", which have an enormous importance because students must learn, even at the initial stages, to listen carefully to the ending of the last note in phrase, that is, under the slur. Learning to play legato pairs is "the first step in developing musical sensitivity, which will in the future enable students to beautifully shape and phrase a melody" (Ibid).

The first sound of a *legato* pair should be played "deeply on an inward motion, the same movement as in *non legato*"; the finger must "slowly step over the adjacent key so that the second sound is played softer and lighter, followed by the floating motion of the wrist" (Ibid). While playing *legato* "hand and wrist must be flexible, making it possible to feel the transition of weight from one finger to another" (Ibid, p.42-43). To learn the *legato*

playing, an analogy with walking is commonly used, when the weight of the body is transferred from one foot to the other. It is also very helpful to practice *legato* pairs while breathing (or sighing if the notes are shorter and more agitated). After mastering to play *legato* pairs, connecting three notes in legato articulation is just "a modification of playing a two-note slur", where "the finger that takes the middle note acts as a bridge between the finger on the first and the third note" (Ibid, p. 43). Concerning *legato* technique, it is most important to learn to play a several-finger position "on a combining wrist movement, when the wrist moves slightly toward the last finger of a group" and the hand moves "in a free and flexible manner, connecting notes smoothly, leading fingers from key to key" (Ibid). Such movements are "necessary for a smooth execution of *legato* and for the feeling of 'breathing' hands" (Ibid).

As can be seen from the above, "teachers inevitably and constantly use metaphor to define the various ways of producing tone on the piano", in order to "arouse the pupil's imagination and when accompanied by illustrations at the piano they help to develop his ear and his motor-sensory mechanism", which is called 'touch' (Neuhaus, 1973, p. 62). The use of metaphorical thinking by noticing analogies between phenomena is an approach that pianists permanently retain in their work. In piano playing, the defining feature of the movement that results in a 'singing touch' is that "the fingers and the hand assume a fixed position before striking the keys, and the rhythmic group thus delivered displays less micro-fluctuations in terms of its intensity" (Doğantan-Dack, 2011, p. 257). In that way the 'singing touch', which may affect a single note or a group of notes, becomes "a musical unit through the initial unifying momentum" provided by the motion of the hand (Ibid). In advanced and professional level of piano playing, the hand movement that unifies a musical phrase is equivalent to the expressive playing of a single note at the beginner level. According to Schenker, the essence of piano playing derives from the idea that "the meaning of the phrase determines the position and motion of the hands" (Schenker, 2000, p. 8). An articulated musical phrase represents a certain symbolic idea whose meaning is created by the performer's imagination and expressed through physical movement of the performer's hand. The basic task of piano pedagogy is working on expressive and imaginative performance, which should start from the first lessons and last throughout the entire professional life. In order to teach effectively, a good piano pedagogue should be able to inspire students to give some meaningful content to their hand movements by making analogies between playing music and other experiences. A good teacher also never forgets that "the key to all forms of work is to leave the creative initiative to students" (Gorin, 2014, p. 53), because the student develops his mental capacities primarily through personal engagement in the learning process.

4. Closing Remarks

The most important value of learning to play the piano is nurturing student's, but at the same time the teacher's imagination. Creative musical imagination develops manly through the practice of analogical reasoning and metaphorical thinking. The pianist can obtain from the piano all that is possible only by demanding the impossible of it, which means that in the art of piano playing "imagination and desire are ahead of the possible reality" (Neuhaus, 1973, p. 66). A deaf Beethoven, who "created for the piano sounds never heard before and thus predetermined the development of the piano for several decades to come", showed how "the composer's creative spirit imposes on the piano rules to which it gradually conforms" (Ibid).

The imagery and the formation of mental representations is no doubt of central importance to the creative process for artists. The ability to recreate the composer's message in performing pieces through appropriate tempo, creative phrasing, and dynamic contrast, is possible through the prism of imagination. Imagination is important for scientists as well. In the interview with G. S. Viereck, published on October 26, 1929 in *Saturday Evening Post* under the title "What Life Means to Einstein", the world most famous physicist, who was a solid violin player, said that he often thinks in music, lives his daydreams in music and sees his life in terms of music (Calaprice, 2011, p. 237). The words of the great scientist are one of the biggest confirmations of the importance of the musical imagination for the development of logical and creative thinking. Creativity can't be learned, but it can be modeled by teaching. Piano pedagogy with its methods can help music students to lay a stable foundation for becoming successful artists imbued with a vivid imagination.

In pianism, the position and movement of a hand performing music are directly subjected to the condition of mind. The connection between the human mind and bodily movements in pianism is supremely transparent. There are many reasons to assume that music lessons have the positive effects on cognitive abilities. In addition to improving students' intellectual competencies, piano pedagogy has a strong influence on student's emotional growth. Nurturing the creative spirit of the students, the teacher helps them develop deep love and respect for music, and this constructive emotional relationship developed towards music at an early age will follow them throughout their lives, as a personal characteristic that can influence the nature of new emotional connections. Learning to play music gives students an opportunity to enter new imaginary worlds, introduces them to composer's historical circumstances and unites them emotionally with other people. Works of art reflect the impermanence of human existence, and serious understanding of their contents enables people to better understand everyday life, deal with problems, and profoundly understand the world and its values.

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FUNKCIJA ANALOGIJE U KLAVIRSKOJ PEDAGOGIJI

U radu je objašnjena uloga koju igra praksa analognog zaključivanja u nastavi klavira, naročito na početnom nivou. Prva faza učenja klavira je najvažnija u formiranju muzičara. Kako bi kod mladog učenika razvili razumevanje i uvažavanje muzike i sviranja klavira, nastavnici koriste zanimljive i logički povezane priče sa mnoštvom zanimljivih karaktera, živopisnih ilustracija i maštovitih scena. Sveobuhvatne analogije sa slikama likova i njihovih avantura koje se koriste za uvođenje i proširenje muzičkih koncepata u radu sa početnicima čine im razumljivim i prihvatljivim komplikovane tehnike sviranja. Veoma je važno prizvati maštu i kreativnost učenika koristeći fantaziju, kao i analogije iz svakodnevnog života, kako bi se učenicima pomoglo da zamisle muzičke slike i otkriju fizičke pokrete potrebne za njihovo izražavanje. Kroz napredak u sviranju klavira, učenici takođe poboljšavaju svoje veštine rešavanja problema u umetnosti, nauci, prirodnom okruženju i društvenom životu.

Ključne reči: *imaginacija, učenje, klavirska pedagogija, sviranje klavira, podučavanje, analogno zaključivanje*

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