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PRIMARY SCHOOL TEACHERS' VIEWS ON TEACHING CRITICAL THINKING

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Abstract/Izvleček

The main purpose of the study is to examine the views of classroom teachers on the teaching of critical thinking. It is a qualitative study wherein the data are collected through semi-structured interviews. Thirteen classroom teachers comprised the study group for the research. Descriptive and content analysis is also used in the analysis of the data. According to the findings, teachers believe that critical thinking is a teachable skill, and they know how important their roles are in teaching this skill. However, teachers emphasize that skill training would not be possible without family support.

Keywords:
teaching critical thinking, primary school, teachers' views

Pogledi učiteljev osnovnih šol na poučevanje kritičnega mišljenja

Glavni namen študije je preučiti stališča učiteljev pri poučevanju kritičnega mišljenja. Gre za kvalitativno študijo, pri kateri se podatki zbirajo s polstrukturiranim intervjujem. Raziskovalno skupino predstavlja 13 učiteljev razrednega pouka. Pri analizi podatkov se uporabljata tudi opisna in vsebinska analiza. Glede na ugotovitve učitelji verjamejo, da je kritično mišljenje učljiva veščina in se zavedejo svoje pomembne vloge pri poučevanju te veščine. Učitelji so poudarili, da usposabljanje otrok za tovrstne spretnosti brez podpore družin ne bi bilo mogoče.

Ključne besede:
poučevanje kritičnega mišljenja, osnovna šola, pogledi učiteljev

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Introduction

Learners' learning capacity is a basic feature that distinguishes human beings from other creatures. The curriculum gives us the answer to the question of what should be taught to these individuals who have learning skills. In every society, basic knowledge, skills, values and attitudes that must be learned are presented to individuals through school curricula (Varış, 1996, Demirel, 2011). In today's world, in addition to content that differs from society to society, common skills for all individuals are also mentioned. The basic skill that individuals use to determine the purpose of their lives, to set their goals in achieving that purpose and to make smart decisions is "thinking" (Chaffee, 1994, cited in Yıldırım, 2005). Teaching students thinking skills create the core of the learning-teaching process. In this way, the information gained piece by piece in lessons is transformed into a meaningful whole and can be transferred to life. Therefore, thinking skills and the thinking habit should be developed in students (Saban, 2000).

Theoretical Framework

What the thinking is or how it is thought, has been an important issue recently. The widespread goal of educational purposes such as understanding how an individual thinks and teaching to think has also popularized the teaching of critical thinking (Kazancı, 1989). According to Ennis, critical thinking is the correct evaluation of causes. It means, before doing or believing something, questioning causes, thinking intensely, and then making decisions. The critical thinker should have skills such as observation, participation, generalizing, questioning, and evaluating causes and interest (Ennis, 1985). Critical thinking is an active, organized mental process that aims to understand ourselves and the events that occur in our environment, by being aware of our own thought processes, considering the thought processes of others and by applying what we have learned (Cüceloğlu, 2001).

Critical thinking has also taken its place among the 21st-century skills announced by ME. It has drawn attention to the teaching of critical thinking. It is especially emphasized that the teacher is the most important factor in teaching critical thinking skills. So, teachers' perspectives and the importance they give to critical thinking, will guide the efforts to encourage this thinking skill among students (Halpern, 1998;

Paul and Elder, 2001; Gürkaynak, Gülgöz and Üstel, 2003; Doğanay and Sarı, 2002; Seferoğlu and Akbıyık, 2006). It is recommended that the new generation be able to think and be aware that the only truth may not be what it knows or believes. For this, teachers are needed who think and try to make their students realize how they think (Narin, 2009). During the teaching of critical thinking, it is expected from a teacher to be an example for students by showing critical thinking examples, to avoid judgmental reactions, to listen to students to gain understanding, to give all students the opportunity to express their opinions but not to pressure them, to avoid embarrassing anyone, to be willing and equipped during the methods and techniques used (Gürkaynak et al., 2003). For example, a teacher who tries giving students critical thinking skills can have group work to increase the interaction between them while they are learning. Open-ended questions that do not have a single right answer may be asked. Such learning should provide opportunities for students to apply their new learning or past experiences to different situations (Özden, 2003). According to Fisher (1995), while the teacher tries to communicate with children, he should focus on their efforts and positive behaviours rather than on their mistakes. The teacher should encourage children to think creatively and critically; to this end, instead of judging students in the classroom, he should create an independent environment for them, treating everyone equally and as an effective listener. Teachers' low academic expectations and negative attitudes toward their students will prevent students from thinking critically. In addition, teachers should not treat students in a way that makes them dependent on their teachers.

There is a range of approaches to teaching critical thinking. In the Subject Based Teaching Approach, critical thinking is considered a subject, and its principles and content progress together. In the Content Based Teaching Approach, the content, principles and rules of critical thinking are combined, and students are encouraged to think critically during learning content. In this approach, content teaching is at the forefront, and general principles of critical thinking are not directly stated. In the Skill Based Teaching (General Approach) Approach, critical thinking instruction is conducted as a separate discipline without depending on the content. The Blended Teaching Approach is a combination of a general approach and a subject-based or content-based approach (Vural and Kutlu, 2005; Ennis, 1989). In Turkey, the blended teaching approach has been adopted in the teaching of critical thinking. While thinking skills are taught by associating them with the lesson content, on the other hand, they are also taught through the "teaching of thinking" lesson added to

the primary school curriculum in 2007. This is an indication that it is important for students to acquire all thinking skills, especially critical thinking skills. However, the main element that will teach critical thinking is not the content of the lesson or lessons added to the programs; it is the perspective of teachers and the teachers themselves who are the implementer of these programs. Although the curriculum is implemented across the country, there may be differences in classroom practices. Although teaching activities are shaped in line with the curriculum, the knowledge, skills, opinions and beliefs of the teacher shape the classroom learning-teaching environment, the culture created in the classroom, the outline of the methods and techniques used. This creates differences between classes (Doğanay and Sarı, 2002). In general, research on critical thinking overlooks the work done by teachers in the classroom to develop this skill. However, understanding critical thinking from the teacher's perspective is key to closing the gap between theory and practice (Caseres, Nussbaum and Ortiz, 2020). Teachers' perspectives on critical thinking skills and the practices they uphold while teaching will support or inhibit student learning. Especially considering the strength of the teacher-student relationship in primary school, the opinions of primary-school teachers about teaching critical thinking become more important.

Purpose of the Study

The main purpose of this qualitative study is to examine the views of primary school teachers on the "teaching of critical thinking." For this purpose, answers to the following questions were sought:
What are the teachers' views on the definition of critical thinking?
What are the teachers' views on teaching critical thinking?
What activities do teachers use to teach critical thinking?
What are teachers' perceptions of efficacy in teaching critical thinking?

Methodology

This study determines classroom teachers' thoughts about critical thinking and their perceptions about teaching critical thinking. For this purpose, the research was designed as a qualitative study, and teachers' views were gathered through interviews.

Participants

The study group consists of thirteen classroom teachers (7-female, 6-male) working in Ereğli district of Konya. Participants were selected using the purposeful sampling method (maximum diversity) and on a voluntary basis (Fraenkel and Wallen, 2006). To ensure maximum diversity, primary schools at different social-economic levels were selected. The seniority of teachers is between 14 and 30 years. The study group description is given in Table 1.

Table 1. Study Group

Data Number (Mean voice record number)	Code by Gender	Name of School	Social-economic status of school	Seniority
1	F1	A	Lower	22/15
2	M1	B	Upper	25/9
3	M2	B	Upper	29/6
4	F2	B	Upper	15/5
5–6	F3	B	Upper	23/8
7	M3	C	Lower	15/7
8	M4	C	Lower	20/9
9	F4	C	Lower	22/16
10	M5	D	Middle	27/2
12	F5	E	Upper	17 / -
13	M6	E	Upper	23/9
23	M6	F	Middle	44 /-
24	F7	F	Middle	20/10

Data collection

The data were collected through a semi-structured interview format. The original form of the interview was developed by Kanik (2010). In this study, the questions were reviewed, and the form was greatly revised. A pilot study was conducted with two classroom teachers from the study group, after which the final form was constructed. The form consists of twelve main questions and nine exploratory questions.

Data were collected in the spring term of the 2018–2019 academic year. The interviews were conducted face-to-face by the researcher at predetermined times and locations (library, principal's office, an empty classroom, or the teacher's office). During the interviews, a voice recorder was used in line with the permission received from the participants. Data collection was completed within two weeks.

Data analysis

The data obtained from the interviews were read line by line and transferred to the computer. Seventy-three pages of raw data were obtained. Content analysis and descriptive analysis were both used for analysing data. According to Yıldırım and Şimşek (2013), primarily, the data summarized and interpreted in descriptive analysis are subjected to a deeper process in content analysis. Concepts and themes that cannot be noticed with the descriptive approach can be discovered through content analysis. This perspective was also adopted in the current research. First, "possible" codes and themes were created in line with the questions in the interview form, and then new themes or sub-themes emerging from the statements of the teachers were determined.

Validity and reliability

To ensure validity and reliability, the research process was explained step by step. Direct quotations from the participants' statements are frequently included in the research report (F1M: female, middle social-economic status). Two different researchers coded the randomly selected interview record. The reliability coefficient was calculated as 0.87. Since this value is greater than 80%, its reliability level is set as "good" (Miles and Huberman, 1994).

Findings

The findings of the study are presented in accordance with the themes created based on the questions in the interview form. The codes determined under each theme are also described in the text. Direct quotations from the participants' discourse on the subject were added. After this section, the abbreviation CT will be used to replace the phrase "critical thinking."

General views on critical thinking and on teaching critical thinking

The opinions of the participants regarding the "what" of CT, its teachability and the role of the teacher in this process are discussed under this title. Teachers were first asked to define CT. Only one of the participants (F6M) refrained from making a clear definition. The other twelve teachers created a definition of critical thinking based on the characteristics of the critically thinking individual. Details of the definitions are given in Table 2.

Table 2. Codes in teachers' critical thinking definitions

Description	f
Explanation of the reasons	3
Defending your mind	3
Finding the truth	2
Generating solutions	2
To be able to express thought correctly	2
Reasoning	2
Total	14

The teachers who defined CT were asked about the characteristics of critical thinkers. All participants identified the characteristics they believe should be found in individuals who think critically according to their critical thinking definitions. These traits consist of personality traits, skills or behaviours. Themes and codes are given in Table 3.

Table 3. Critical thinker features

Theme	Code	f
Skill/Behaviour	Asking questions/Questioning the reasons	8
	Explaining/defending your mindset	5
	Listening to speaker effectively	3
	Reading habit	2
	Defending your rights	2
	Being interested in school and lessons	1
	Ability to dream	1
	Organizational ability	1
Personality/Habit / Temperament	Self-reliance	7
	Supporting/democratic family	5
	Perseverance	3
	IQ	2
	Leadership	2
	Wonder	1
Other	Attention	1
Total		**44**

All teachers participating in the study stated that CT is a teachable skill. This situation suggests that teachers will not hesitate to try teaching a skill that they believe can be taught. The most striking statement form a participant is given below:

F1L: …of course It is something that can be taught because critical thinking is one of the types of thinking. As we know, there are 3 types of thinking and we tell this to the children repeatedly. One

is pure, unintentional thinking - right thinking, another is selfish thinking, just self-thinking. Therefore, we say again and again, do not be prejudiced against everything, do not decide right away, do not be fooled by whatever is said, think without prejudice. The other is critical thinking. Therefore, critical thinking can be taught. . .

Teachers who declare that CT is teachable are asked about the role of the teacher in the teaching process. While all 13 participants emphasized that the role of the teacher was definitive, three teachers explained that "it is about personal effort." One teacher (M1U) explained the situation by asking, "Does the teacher have this skill first, does he provide guidance, can he bring the student to the forefront, is he democratic, it is necessary to change and develop the teacher before the system." The explanations of one female teacher on the subject are as follows:

F6M: So yes, the teacher is doing this. The student should feel comfortable in the classroom, should not feel like a machine and should be able to appeal to his teacher when necessary, and the teacher should tolerate this. If the teacher is confident and can encourage the student, if the teacher respects the student's opinion, critical thinking may develop there. However, if the teacher has strict rules with solid lines, and he has a mind-set like "only I know", the child cannot show it. It is up to the teacher to make the student think freely. It's all about the teacher's self-knowledge. We reward them by mobilizing, encouraging them. That critical thought develops in parallel with us, that is, in parallel with our mind-set.

Views on the effect of the current curriculum on the teaching of critical thinking

In this section, the teachers were asked to evaluate the content, educational and test situations of the primary school curriculum in the context of its effect on teaching critical thinking. First, the participants who teach many different courses in primary education were asked whether the content of each lesson is appropriate to gain this skill. When the teachers' responses were examined, it emerged that they thought this to be more about the personal disposition of the teacher than the content of the lesson. In other words, CT can be taught in each lesson as long as the teacher has a strong academic capacity. In addition, four of the teachers emphasized that CT can be taught more easily in the social sciences. Alternatively, all the participants stated that the teaching of CT does not need to be based on a separate lesson, but it is more appropriate to do this by adding it to other lessons. Examples of teachers' statements about these two situations are as follows:

M5: …it may be useful if we put it as a CT lesson. However, for example, the child is criticizing me. If I say "No, not now, say it in the CT lesson." It means that the child should shut up.
M4: Now, there is something like that, especially in lessons that require talent, we cannot develop that opportunity, so we cannot develop it. However, we can give them in mathematics and verbal lessons.

Teachers were asked to evaluate the activities in the programs in terms of their contribution to the teaching of CT. On this question, the opinions of the teachers varied the most. Two participants think that the activities and content in the curriculum support CT. Five participants state that the content of the curriculum is loaded with information and therefore they are trying to complete it. Three participants stated that the program was prepared in good faith but could not be implemented under current conditions. Two participants (M1, F2) stated that whatever is written in the curriculum, the teacher behaves as he knows. For this reason, teachers find it unnecessary to discuss whether the program is effective in teaching any skills. Examples of teachers' views are given below:

F1L: Even if it supports, it is not enough. It is already by social-economic status. So, it gives results according to its location. We are doing the curriculum according to ourselves, that is, we are choosing the activities that concern us. It's about time and possibilities. You must do many activities in the curriculum; but I can do only appropriate ones.
F2U: The success of the primary school curriculum depends on the teachers enacting it. There are enough directions in our textbooks. True questions were asked to guide the student and to encourage them to think.
M5M: …it supports CT theoretically but not in practice. It says, you will do the following experiments in our guidebooks. However, none of the materials are available in my school. What should I do?

Teachers were asked which of the methods and techniques they use to support CT. There was no clear answer. It emerged that the main reason was that the teachers did not want to name the methods and techniques they used. Accordingly, the question was changed to make the participants feel more comfortable and asked again (what kind of activities they do in their classes). The teachers said that they use discussion (six teachers), essay writing (two teachers), and completing the story (two teachers). The comments of the two teachers are as follows:

F1L: Telling the techniques one by one? When you open the teachers' guidebook for curriculum, they all in there. We cannot say that we are doing this for sure. In a lesson, we use all of them in 40 min. Sometimes we do other things, but we do not know the name. What you are doing has no

name. We combine or add something from ourselves. Because you prepare before coming to class. You plan, you study, but when you come to class, the situation of the class at that moment, students' mood or your own mood also causes you to employ different techniques. Therefore, there is no such thing as "this technique is good, study and memorizes it and apply it." So, techniques change according to the level, situation and classroom. You add a little bit of yourself, but it has no name.
M2U: …I also use the expression technique in the classroom. I look for presentations on the internet. I teach the lesson through lectures, I use all the techniques. I use both visual and all the techniques.

After classroom practice, the teachers were asked whether these efforts could be transferred by students. Nine of the 12 participants think that transfer is possible to the extent that school-family cooperation can be achieved. Three teachers think that what is learned cannot be transferred to life.

F2U: Actually, it is in our hands. Instead of complaining about the facilities or other things, we can create it ourselves. We have our canteen, I can say "everyone will bring money tomorrow; they go to the canteen and shop. We can create the situation ourselves.
F1L: "We have the opportunity as well. For example, most of the parents work in construction. As pavers. I associate this knowledge within patterns and ornaments. I say, "Children think that you are working in construction or your fathers are laying tiles, triangular, square rectangular; how do you lay them?" This is also a pattern.

Teachers described the classroom environment that supports CT. The first point emphasized by teachers is the need for an uncrowded classroom. Teachers also emphasized that it should be a democratic environment (five teachers), materials should be available in the classroom (six teachers), and there should be no level difference between students in the classroom (three teachers). The participants' view of M4L is "the leadership qualities of the children should be improved because non-leaders do not criticize and feel passive."

Finally, teachers were asked to evaluate their exam and homework practices in terms of their contribution to the teaching of CT. All the teachers, except one explained this in detail. The point that teachers emphasize is the necessity to ask comment questions to support the teaching of critical thinking. However, the requirements in the curriculum (trial exams, joint exams) make such activities difficult for them. A teacher's assessment of the exams from his own life:

M1U: I avoid preparing questions based on knowledge. My child is studying in the eighth grade. He took the TEOG exam. All four wrong answers were related to comment questions. He was unable to do comment questions. There is no need to take action, there is a simple visual, and he

could not do it while he should interpret it. The meaning given in the above paragraph or given below, which of the following could it be? Can he comment or can he think? Does it make him think? In other words, not to determine that two plus two is four, but to question why it is four?

After previous explanations, teachers were asked whether they gave homework to their students and how they structured it. The teachers stated that they use homework for reinforcement or preparation. Two teachers emphasized that homework was given to meet parental expectations rather than student needs (F1L, M3L). Eight of the participants stated that they regularly gave homework assignments to improve their students' interpretation skills. Examples of participant opinions are as follows:

F1L: I assign homework activities in the workbook on the subject, but the aim is to have them repeat at home. I say you will study five pages. Only this. I do not give any homework. Homework was given above the level of such a child. The child cannot manage. So, either Mom will do it, or someone else. The performance task prepared by the child is not visually good, what the child himself prepared is clear, seems bad, half wrong and half correct. Of course, we give him a low grade. However, the one prepared by parents, also visually good, we give these high marks, but it does not help the child. It does not help unless you did it in the classroom with the child.

M4L: I am against homework full of pages. Because that homework is far from being homework; simultaneously, I cannot control it. When you give dozens of homework assignments to the students, the child gets tired. However, there is also homework we give to reinforce. In the form of a couple of activities. In addition, it does not matter what the student does when you can't control the assignment day by day.

M2U: When I have covered a subject, I give at least 4–5 activities on the same topic. I have some activities done at school, and some of it as homework. To reinforce the issue. We also give them plenty of activities, so that we can reinforce even more.

Views on factors affecting the teaching process of critical thinking, whether positive or negative

Teachers were asked to indicate the factors that they encountered during CT education in general and that affected the process positively or negatively. The main factor that all teachers think has both positive and negative effects is "family." The opinions of the participants are positive or negative according to the socio-economic level of the school. The main reason for this is that the main determinant of the socio-economic level is the social, cultural and economic condition of the families.

Parents at the lower socio-economic level do not have professional positions; they may be seasonal workers or even unemployed. In terms of marital status, there may be a broken family or one parent not at home. According to teachers, all these features affect children negatively in terms of learning and applying CT. Alternatively, in upper socio-economic schools, parents are generally senior civil officers, or teachers in the same school. This ensures that the teaching process started at the school is supported at home. Another point is "teacher attitude." Nine participants said that teacher attitude may affect the student learning CT process positively or negatively. Sample statements from both perspectives are as follows:
M3L: If the teacher allows the child to make such criticisms in the classroom, if he considers what the child is saying, if can listen to him... To have critical thinking, all children should be given the opportunity to speak, and the teacher should try encouraging students who do not speak. The important thing is to ensure that the child gains self-confidence. I think that children who have gained their self-confidence will contribute to the development of the country and to providing better development of a peaceful environment in the future, in terms of their careers, their future, and the development of our country.
M4L: The family at home should also be open-minded. Sometimes I ask students about their family. They said, "My parents do not ask me and get angry with me." At that time the child is in a dilemma. If the teacher thinks the same as the family, it is a pity.

Discussion

Teachers as practitioners of the curriculum are at the key point in transmitting knowledge, skills and attitudes, which are among the objectives of the curriculum. In this context, the opinions, experiences, and activities of teachers with sufficient professional experience, which are defined among the 21st-century skills and planned to be taught in all lessons, are considered important. According to the findings, teachers are mainly aware of their roles in the process. However, they cite the possibilities or non-possibilities of the schools where they work, and the parent profile of students as the most basic factors in achieving their teaching goals. When the teachers' discourses are examined, it emerges that the teachers are self-critical, and that teacher effort will contribute positively to the process regardless of the conditions.
Participants were asked to define critical thinking; a definition was obtained from all participants except one. Even if the number is one, it is noteworthy and alarming

that a teacher who has been actively working for more than 15 years is unable to provide a definition of critical thinking. The Ministry of Education (MEB, 2007) in Turkey explained that eight basic thinking skills should be taught in each lesson. The renewed perspective and primary curriculum are explained by in-service training. Everyone is not expected to be a critical thinker, but teachers who have priority in teaching this skill should have it, because only a teacher who thinks critically can teach students how to think critically. In a study conducted by the Organization for Economic Development and Cooperation [OECD] (1994, cited in Gelen 1999) on how to improve the quality of education, it was stated that teachers should first learn to think. Alternatively, teachers should be adequately supported and guided correctly in this regard. Countries constantly update their education programs according to the requirements of the day and apply for educational reforms when necessary. However, the targeted development will never be achieved unless the reforms change teacher habits, and the teachers are properly supported during the implementation process (Scheidler, 1994). The teacher, the practitioner, should fully understand the system to do his duties. Alternatively, even if the teachers understand the program, teachers who are accustomed to the traditional approach are likely to favour the old system in practice, even though they agree with the new system in theory (Kamber, Acun and Akar, 2011).

In the teachers' statements about the characteristics of the critical thinker, it was observed that they used similar expressions. Teachers used the same definition for a successful student as for a critically thinking student. Teachers also used the terms *clever* or *intelligent* for a critical thinker. Looking at the literature, intelligence emerges as the most important mental factor that affects the development of critical thinking power. When other conditions are equal, the ability to think increases as the level of intelligence increases (Kazancı, 1989). Activities such as thinking, and decision making are actions that require a certain level of intelligence. However, it is not true that every person with high intelligence will think critically, or that people with lower intelligence cannot think critically (Şahinel, 2002). Critical thinking is not an innate feature. It is a thinking system, one that is teachable, can be explained and can be applied (Kökdemir, 2005). It is important to note that no single definition of critical thinking exists for every discipline at every level (Alsalesh, 2020).

All the teachers stated that the skill of critical thinking was a teachable skill. As the participants emphasize, critical thinking skills are skills that can be given to individuals of all ages. The purpose of education is to educate effective individuals

who are constantly thinking, realizing their thoughts in the most appropriate way, and providing both individual and social development. This makes it mandatory to include activities for teaching critical thinking in schools (Cüceloğlu, 2008). However, encouraging these skills in individuals of all ages follows a different order. For example, according to Presseisen (1985, cited in Doğanay, 2001), while in the first level of primary education, the important thing is teaching basic skills, depending on the level of mental development, it would be appropriate to teach more complex skills in secondary education. In introducing the student to a more advanced thinking process, the 8th grade and the first year of high school are good times. At the end of primary education, thinking skills can be given more comprehensively and complexly. Some higher order thinking skills may be more relevant to some lessons. However, the most important thing here is that the purpose of complex thinking processes and the learning objective of a lesson should be compatible with each other and reinforce and support each other (Doğanay 2001). In addition, the teachers who participated in the study advocated that this skill should be taught in existing lessons and not as a separate lesson. There are four approaches to teaching critical thinking in the literature (see introduction). These approaches are included in the problem section. The situation described by the participants aligns with the "content-based approach."

Within the scope of the research, teachers were asked to evaluate the role of critical thinking in the teaching process. Here are some highlights from the teacher statements: the teacher who gives the opportunity to the student can be a role model, develops a democratic classroom environment, knows his students well, empathizes, cooperates with students' parents and other colleagues, directs the student, encourages students, asks questions and comments. In line with the literature, they argued that teachers with the features described above can improve their students' critical thinking skills. Critical thinking is among the basic attitudes and skills that teachers should have. The critical thinker teacher provides students with high-level skills such as analysis, synthesis and evaluation (Şahinel, 2002). In addition, these teachers, by contributing to student cognitive development, also positively increase their students' critical thinking attitude (Seferoğlu and Akbıyık, 2006).

One of the points where teacher opinions differ most is whether the activities in the curriculum contribute to the teaching of CT. Ten teachers think that the current curriculum does not support critical thinking skills. In his study, Polat (2014) examined the Turkish, mathematics, science and technology, life science and social

studies curriculua and teacher guidebooks. He stated that in the curriculum and teacher guidebooks, activities related to critical thinking skills were adequately included. In the current study, the evaluation of teachers is considered subjective. We observed that the participants in the study answered this question in accordance with the socio-economic level of the school in which they work, the opportunities they have at school and their personal predisposition. Teachers working at the lower socio-economic school stated that they could not perform the activities in the curriculum because of impossible obstacles. There are teachers who find the activities in the program incorrect in terms of duration; there were also participants who argued that anxiety about performing activities and completing them on time decreased the quality of teaching. In the qualitative research, the exploratory questions asked during the interview showed that the main criticism from teachers is not the content and application dimension of the program; the primary education that was previously applied as 5 + 3 was restructured as 4 + 4. This is among the unexpected findings of the current research. Primary school teacher dissatisfaction continues despite the passing years (the 4 + 4 + 4 education system was implemented in 2012–2013). It is also apparent that this dissatisfaction is reflected in teaching practices. Alternatively, the teacher working in a lower socio-economic school makes an important observation: "The program is already by level. So, it gives results according to its location and level. We implement the program according to ourselves (our possibilities)." The research was conducted in the relatively small district of Ereğli. Here, the inequality of opportunity between even nearby schools is remarkable. These impossibilities are reflected in teacher evaluations of the program and workload during teaching.

Teaching methods and techniques come to mind when seeking an answer to the question of how to teach critical thinking (Varış 1996; Demirel, 2011). Teachers were asked what methods and techniques they used to support the teaching of critical thinking that were useful for this purpose. The most frequent method used by teachers is composition and story completion. Both are activities, not methods or techniques. These are the activities in the guidebook that is expected to be implemented. Discussion, asking questions and debate are other practices that teachers mentioned. At this point, the finding of the research aligns with those from other studies (Baysal, Çarıkçı and Yaşar, 2018; Eğmir and Ocak, 2017; Adams, 2013; Demir, 2006; Gelen, 1999).

The classroom environment (physical or emotional atmosphere) is another factor that plays a decisive role in educational activities (Çengel, 2013; Alnesyan, 2012; Burke & Williams, 2008). It is important to create classroom environments where students can research and inquire, communicate, think critically, justify, easily share their ideas and offer divergent methods of solution (MEB 2013). From the findings regarding the classroom environment, we observed that teachers made evaluations about the physical environment of the classroom and then touched on the atmosphere of the classroom. Teachers particularly emphasized classroom size and accessibility to materials. In all studies related to the effect of class size on teaching quality, findings supporting this teacher concern are included. This is also valid for the teaching of critical thinking. In many OECD countries, the number of students per teacher varies between 11.2 and 15.6. In our country, this number is 22. In addition, the number of students per classroom in OECD countries is 21.4 (report by Türkeğitimsen). Although this is a goal in our country, the desired level has not yet been reached.

The most basic factor in ensuring the permanence of what is learned is its capacity to be transferred to life. What is learned at school gains meaning as long as it finds a response in life. When teachers are asked about this issue in the critical thinking axis, all the participants emphasized family and environmental support. This discourse of teachers thus aligns with the literature. In their research, Tümkaya and Aybek (2008) found that parental attitudes were influential on the critical thinking disposition, because families set an example for their children with their behaviour, and parents' attitudes cause positive or negative behaviours and tendencies in children (Özdoğan, 2000, Çalışkan, 2019).

The effect of measurement and evaluation activities in the curriculum on teaching critical thinking was also examined within the scope of the research. Exams that allow students to express themselves and examine high-level achievements contribute to the teaching of critical thinking. Alternatively, process and product evaluation must be conducted together (Facione, 1990; Şahinel, 2002; Seferoğlu & Akbıyık, 2006). As the findings shoe, this situation cannot be achieved. Although the curriculum focuses on the teaching of eight basic thinking skills, the examinations used are multiple choice. In many schools, common exams are held, or ready-made materials are used for the exam. The quality of the questions included here is the main element determining their contribution to the teaching of critical thinking. Tests can only handle what are called well-structured problems with logical

solutions. That is not an unimportant part of critical thinking, but it leaves out what are called ill-structured problems (Larsson, 2017). Another way to evaluate teaching is homework. The teachers give reading homework to increase the pupils' interpretation skills. Comprehending reading that requires understanding the meaning and details of a written material is among the basic language skills that should be given to primary school students (Rose et al., 2000, cited in Erçapan, 2009). Instructors who want to have a positive impact on critical thinking skills should consider including multiple written assignments and emphasizing research, then provide feedback on those assignments (Nold, 2017). According to Ennis, critical thinking involves finding the meaning of the narration and deciding whether to accept it or not (Kazancı, 1989). The literature shows that there is a relation between reading skills and critical thinking (Karasakaloğlu, Saracaloğlu and Yılmaz-Özelçi, 2012; Çetinkaya, 2011; Kuş andTürkyılmaz, 2010; Şen, 2009). At this point, it can be said that these teachers are following an effective strategy.

Conclusion

In this study, the views of primary school teachers who teach the fourth grade about teaching critical thinking are examined. Opinions of 13 primary teachers working in schools at low, middle and upper social-economic status were included. The professional seniority of teachers is between 15 and 44 years. According to the findings, the following recommendations were made:

Teachers who take an active role in critical thinking teaching can be examined to establish whether they have this skill. If deemed necessary, in-service training involving teaching critical thinking could be employed throughout the process. A student-oriented system/unit can be developed to strengthen school-family cooperation in schools.

References

Adams, J. W. (2013). *A case study: using lesson study to understand factors that affect teaching creative and critical thinking in the elementary classroom.* Unpublished PhD Thesis. Drexel University.

Alnesyan, A. (2012). *Teaching and learning thinking skills in The Kingdom of Saudi Arabia: Case Studies from Seven Primary Schools.* Unpublished PhD. Dissertation. University of Exeter, UK.

Alsalesh, N. J. (2020). Teaching critical thinking skills: Literature review, *The Turkish Online Journal of Educational Technology*, *19*(1). 21–39.

Baysal Z. N., Çarıkçı, S., and Yaşar, B. (2018). Analysis of academics' views on teaching thinking skills. *Inonu University Journal of the Faculty of Education, 19*(2), 174–188. DOI: 10.17679/inuefd.3-39151

Burke, L. A. and Williams, J. M. (2008). Developing young thinkers: An intervention aimed to enhance children's thinking skills. *Thinking Skills and Creativity, 3*(2), 104–124.

Çalışkan, M. (2019). Eleştirel Düşünmenin Öğretimi [Teaching critical thinking], *Nevşehir Hacı Bektaş Veli University, Journal of Social Sciences Institute, 9*(1), 114–134.

Caseres, M., Nussbaumi, M., and Ortiz, J. (2020). Integrating critical thinking into the classroom: A teacher's perspective, *Thinking Skills and Creativity*, *37*(1), 1–12.

Çengel, M. (2013). *Sınıf ikliminin oluşması sürecinde örtük program: Meslek liseleri üzerine bir araştırma [Implicit program in the formation of classroom climate: A research on vocational high schools],* Unpublished doctoral thesis, Adnan Menders University, Aydın.

Çetinkaya, Z. (2011). Türkçe öğretmen adaylarının eleştirel düşünmeye ilişkin görüşlerinin belirlenmesi [Determining the views of Turkish teacher candidates on critical thinking], *Ahi Evran University Journal of Education Faculty*, *12*(3), 93–108.

Cüceloğlu, D. (2008). *İyi düşün doğru karar ver [Think well make the right decision],* (50th Edition), İstanbul: Sistem Publishing.

Demir, M. K. (2006). *İlköğretim dördüncü ve beşinci sınıf öğrencilerinin sosyal bilgiler derslerinde eleştirel düşünme düzeylerinin çeşitli değişkenler açısından incelenmesi [Investigation of primary school fourth and fifth grade students' critical thinking levels in social studies lessons in terms of various variables].* Unpublished doctoral thesis. Gazi University, Ankara.

Demirel, Ö. (2011). *Eğitimde program geliştirme: Kuramdan uygulamaya [Curriculum Development in Education: from Theory to Practice].*16th edition. Ankara: Pegem Academy.

Doğanay A. (2001). *Yaratıcı öğrenme [Creative learning],* (Editor: Ali Şimşek) Sınıfta demokrasi [Democracy in class], Ankara: Eğitim-Sen Publishing.

Doğanay, A., and Sarı, M. (2003). İlköğretim öğretmenlerinin sahip oldukları eğitim felsefelerine ilişkin algılarının değerlendirilmesi: Öğretmenlerin eğitim felsefeleri [Evaluation of primary school teachers' perceptions of their educational philosophies: Teachers' educational philosophies], *Turkish Educational Sciences Journal, 1*(3), 1–10.

Eğmir, E. and Ocak, G. (2017). The effect of curriculum design of critical thinking on students' reflective thinking skills, *Journal of Theoretical Educational Science*, *11*(3), 431–456.

Ennis, R. (1989). Critical thinking and subject specificity: Clarification and needed research. *Educational Researcher, 18*(3), 4–10.

Ennis, R. (1985). *Goals for a Critical Thinking Curriculum*. Wadsworth Publishing Company, Belmont (ERIC no:16476)

Erçapan, C. (2009). Okuduğunu anlama stratejilerine genel bir bakış [An overview of reading comprehension strategies], *International Journal of Social Studies, 2*(6), 207–223.

Facione, P. A. (1990). *Critical Thinking: A statement of expert consensus for purposes of educational assessment and instruction* "The Delphi Report" (Executive Summary), California Academic Press: Millbrae.

Fisher, R. (1995). *Teaching Children to Think*. Cheltenham UK: Nelson Thornes Publishing.

Fraenkel, J. R., and Wallen, N. E. (2006). *How to Design and Evaluate Research in Education* (6th ed.). New York: McGraw-Hill.

Gelen, İ. (1999). *İlköğretim okulları 4. sınıf öğretmenlerinin sosyal bilgiler dersinde düşünme becerilerini kazandırma yeterliklerinin değerlendirilmesi [Evaluation of primary school 4th grade teachers' ability to gain thinking skills in social studies lessons],* Unpublished Master's thesis, Çukurova University, Adana.

Gürkaynak, İ., Üstel, F., and Gülgöz, S. (2003). *Eleştirel düşünme [Critical thinking],* Education Reform Initiative, İstanbul: Sabanci University Publishing.

Halpern, D. (1998), Teaching critical thinking for transfer across domains, dispositions, skills, structure training and metacognitive monitoring, *American Psychologist*, *1*(43), 449–455.

Kamber, T., Acun, İ., and Akar, C. (2011). İlköğretim birinci kademe sosyal bilgiler öğretim programının uygulanabilirliği [Applicability of primary education first stage social studies curriculum], *Uşak University Journal of Social Sciences*, *4*(2), 195–218.

Karasakaloğlu, N., Saracaloğlu, A. S., and Yılmaz Özelçi, S. (2012). Türkçe öğretmeni adaylarının okuma stratejileri, eleştirel düşünme tutumları ve üstbilişsel yeterlilikleri [Reading strategies, critical thinking attitudes and metacognitive competencies of Turkish teacher candidates], *Journal of Ahi Evran University Kırşehir Faculty of Education*, *13*(1), 207–221.

Kazancı, O. (1989). *Eğitimde eleştirici düşünme ve öğretimi [Critical thinking in education and teaching],* İstanbul: Kazanci Books.

Kökdemir, D. (2005). Üniversitede bir eleştirel düşünme yöntemi [A critical thinking method in college], *Science Technical, 6*(32), 4–15.

Kuş, Z., and Türkyılmaz, M. (2010). Sosyal bilgiler ve Türkçe öğretmeni adaylarının okuma durumları: (İlgi, alışkanlık ve okuma stratejilerini kullanım düzeyleri) [Reading status of social studies and Turkish teacher candidates: (Level of use of interests, habits and reading strategies)], *Turkish Librarian, 24*(1), 11–32.

Larsson, K. (2017). Understanding and teaching critical thinking: A new approach, *International Journal of Educational Research*, *84*(1), 32–42.

Ministry of Education (MEB). (2007). *İlköğretim düşünme eğitimi dersi öğretim programı [Elementary thinking Education curriculum],* Ankara: State Books Directorate.

Ministry of Education (MEB). (2010). *Sosyal bilgiler dersi (4-5. sınıflar) öğretim programı [Social sciences curriculum]*. MEB Publication: Ankara.

Ministry of Education (MEB). (2013). *Ortaokul matematik (5, 6, 7 ve 8. sınıflar) dersi öğretim programı [Elementary maths curriculum]*. MEB Publication: Ankara.

Ministry of Education (MEB). (2015). *Türkçe (1-8. sınıflar) öğretim programı [Turkish (grades 1-8) curriculum]*. MEB Publication, Ankara.

Miles, M. B., and Huberman, A. M. (1994). *Qualitative Data Analysis: An Expanded Sourcebook* (Second Edition). Thousand Oaks, CA: Sage Publications.

Narin, N. (2009). *İlköğretim ikinci kademe sosyal bilgiler öğretmenlerinin eleştirel düşünme becerilerinin incelenmesi [Investigation of critical thinking skills of primary education second level social studies teachers]*. Unpublished Master Thesis. Çukurova University Institute of Social Sciences. Adana.

Nold, H. (2017). Using critical thinking teaching methods to increase student success: An action research project, *International Journal of Teaching and Learning in Higher Education, 29*(1), 17–32.

Özden, Y. (2003). *Öğrenme ve öğretme [Learning and teaching],* (5th Edition), Ankara: Pegem Academy Publishing

Özdoğan, B. (2000). *Çocuk ve oyun [Child and game],* Ani Publishing: Ankara.

Paul, R. W., and Elder L. (2001). *Critical Thinking: Tools for taking charge of your learning and your life.* Upper Saddle River, NJ: Prentice.

Polat, S. (2014). *Eleştirel düşünme becerisi öğretiminin çok yönlü incelenmesi [Multifaceted examination of critical thinking skill instruction]* Unpublished PhD Thesis. Necmettin Erbakan University Institute of Educational Sciences. Konya.

Saban, A. (2000). *Öğrenme ve öğretme süreci: Yeni teori ve yaklaşımlar [Learning and teaching process: New theory and approaches],* Ankara: Nobel Publishing.

Şahinel, S. (2002). *Eleştirel düşünme [Critical thinking]*. Baran Publication, Ankara.

Scheidler, K. P. (1994). Changing teacher thinking in school restructuring: A view from the trenches. *Journal of Education, 176*(2), 45–56.

Seferoğlu, S., and Akbıyık, C. (2006). Eleştirel düşünme ve öğretimi [Critical thinking and teaching], *Hacettepe University Journal of Educational Faculty, 30*(1) 193–200.

Şen, Ü. (2009). Türkçe öğretmeni adaylarının eleştirel düşünme tutumlarının çeşitli değişkenler açısından değerlendirilmesi [Evaluation of Turkish teacher candidates' critical thinking attitudes in terms of various variables], *Zeitschrift für die Welt der Türken (Journal of World of Turks)*, ZfWT *1*(2), 69–89.

Tümkaya, S., and Aybek, B. (2008). Üniversite öğrencilerinin eleştirel düşünme eğilimlerinin sosyo-demografik özellikler açısından incelenmesi [Examination of university students' critical thinking dispositions in terms of socio-demographic characteristics], *Çukurova University Journal of Social Sciences Institute, 17*(2), 387–402.

Türk Eğitim Sen (n.d.). *OECD ülkeleri baz alındığında ilköğretimde derslik açığı 158 BİN 999 [Based on OECD countries, the gap in primary education 158 THOUSAND 999],* Report. (Retrieved in May, 2020 Available from https://turkegitimsen.org.tr/icerik_yazdir.php?Id=8909).

Varış, F. (1996). *Eğitimde program geliştirme, teoriler, teknikler [Program development, theories, techniques in education]*. Ankara: Alkım Publishing.

Vural, R. A. and Kutlu, O. (2004). Eleştirel düşünme: Ölçme araçlarının incelenmesi ve bir güvenirlik çalışması [Critical thinking: Examination of measurement tools and a reliability study]. *Çukurova University Journal of Social Sciences Institute, 13*(2). 12–24.

Wiersma, W. (1985) *Research Methods in Education: An introduction*, Third Edition. Allyn and Bacon, Int.

Yıldırım, A. Ç. (2005). *Türkçe ve Türk dili edebiyatı öğretmenlerinin eleştirel düşünme becerilerinin incelenmesi [Examination of Turkish and Turkish language literature teachers' critical thinking skills],* unpublished Master's thesis, Zonguldak Kara Elmas University, Zonguldak.

Yıldırım, A., Şimşek, H. (2013) *Sosyal bilimlerde nitel araştırma yöntemleri [Qualitative research methods in the social sciences],* (9th edition). Ankara: Seçkin Publication.

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CROSS-CURRICULAR CONNECTIONS OF MUSICAL CULTURE AND OTHER SUBJECTS IN CROATIAN ELEMENTARY SCHOOLS

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Abstract/Izvleček

Music lessons provide many opportunities for cross-curricular connections with other subjects. As part of the study, research was conducted on a sample of 110 teachers of Musical Culture in elementary school. The aim of the research was to find out the teachers' views on the implementation of cross-curricular connections between the teaching of Musical Culture and other subjects, the frequency and methods of conducting such teaching, as well as any statistically significant differences between teachers in the attitudes towards and implementation of cross-curricular connections with regard to sociodemographic variables. We believe that the results of this research indicate the need for more intensive implementation of cross-curricular connections between the teaching of Musical Culture and other subjects.

Keywords:
teaching of Musical Culture, cross-curricular connection, interdisciplinarity, elementary school

Medpredmetno povezovanje Glasbene kulture in drugih predmetov v osnovni šoli v Republiki Hrvaški

Glasbeni pouk daje veliko možnosti za medpredmetno povezovanje. V okviru prispevka je bila izvedena raziskava na vzorcu 110 učiteljev, ki poučujejo Glasbeno kulturo v osnovni šoli. Cilj raziskave je bil ugotoviti stališča učiteljev do izvajanja medpredmetnega povezovanja pri pouku Glasbene kulture in drugih predmetov, nato pogostost in načine izvajanja takega poučevanja ter morebitne statistično pomembne razlike med učitelji v stališčih in izvajanju medpredmetnih povezav glede na sociodemografske spremenljivke. Menimo, da so rezultati te raziskave pokazali na potrebo po intenzivnejšem izvajanju povezovanja pouka Glasbene kulture z drugimi predmeti.

Ključne besede:
pouk Glasbene kulture, medpredmetno povezovanje, interdisciplinarnost, osnovna šola

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Introduction

Teaching in schools is divided by disciplines, i.e., subjects. The question arises to what extent disciplinary teaching and learning are in line with the needs of the 21st century, which requires an understanding of economics, communication, cultural identity, citizenship, and the environment (Morari, 2022). In accordance with the above, schools should give importance to interdisciplinary learning within *correlation, project or thematic* integrated teaching, which is more effective in many areas than traditional and established teaching methods. Through such teaching, students acquire knowledge that is applicable in various life situations and lasts longer than knowledge acquired through traditional teaching methods (Tomljenović and Novaković, 2012), and such teaching is more interesting for students (Migles, 2015; Cosenza, 2005; Barrett, 2001) than the traditional way of teaching. Kostović-Vranješ and Šolić (2011) divide the integration of teaching content according to the degree of complexity of the implementation into the *connection model, the community model and the partnership model*. Connection teaching content is a feature of modern teaching and is implemented in the creation of teaching plans and programs, i.e., curriculum, both in foreign countries and in the Republic of Croatia.

The earliest mention of the concept of correlation in the curriculum dates to 1936, when *The National Council of Teachers of English* issued a correlated curriculum. The curriculum supports teaching that is focused on a specific subject with the possibility of interdisciplinary and integrated teaching. To this day, integrative teaching is an indispensable part of any new curriculum (Huang, 2012). Art subjects, among them music lessons, enable numerous correlations with other subjects and, in this way, the organization of integrated teaching. Also, the experience of works of art offers the possibility of connecting the inner world of the individual with the world that surrounds him (Morari, 2022). Langbehn (2012) believes that art encourages awakening and enables education based on "education of the heart" and not only "education of the mind." Therefore, the integration of art and other subjects, for example, STEM fields (Science, Technology, Engineering and Mathematics), is for the purpose of extending knowledge through art. Thus art plays an important role in conveying what cannot be expressed in words (Morari, 2022). With such integration, STEM becomes STEAM (Science, Technology, Engineering, Arts and Mathematics), i.e., art is combined with STEM subjects for the purpose of improving

student engagement, creativity, innovation, etc. (Perignat and Katz-Buonincontro, 2019). The experience of learning through art can change young people's attitudes towards themselves and others, while developing self-control, empathy and tolerance towards others (Hanna et al., 2011). Given that art contributes to imagination, creativity and innovation, its contribution is manifested in raising the quality of thinking and learning in various non-art subjects. Therefore, with the help of art, students can better understand the world around them, build better relationships in the community, stimulate intrinsic motivation for work, learn more effectively and acquire the ability to face school and life challenges (Tadić, Mrvoš and Antonijević, 2018).

Connecting music lessons with non-music subjects

Music is often used in the education of preschool children, but this is not the case when the child starts regular school. The desire to achieve the educational learning outcomes of subject curricula leads to less integration of music into the teaching of non-musical subjects (Lazar, 2004). Moreover, the results of research showing that learning through art can be an effective method to improve results in, e.g., language and mathematics, are ignored (Upitis et al., 2001; Elster and Bell, 1999; Fiske, 1999; Wilkinson, 1998 cited in Russell-Bowie, 2009). However, with a little creative planning, music can serve as a teaching method for selected curriculum topics. In this context, music is viewed as a multi-sensory tool for improving learning and acquiring knowledge and skills (Lazar, 2004). Thus, in a study conducted by An, Capraro and Tillman (2013), during the integrated teaching of Mathematics and Music, students were given the opportunity to play instruments such as drums and keyboards. The main task of musical activities and the availability of instruments was improving motivation for learning Mathematics. It was found that the integration of music into mathematics lessons increased students' mathematical abilities many times (An, Capraro and Tillman, 2013). Moreover, musical activities such as singing, rapping, dancing, and rhythmical movement helped students who were afraid of Mathematics content to relax and achieve better learning outcomes in Mathematics classes (Szczygiel, 2020). Van Vuuren (2022) also believes that music can help in the classroom to remove student anxiety and tension when learning mathematics and language content, i.e., calculation, writing and reading (van Vuuren, 2022). It is possible to connect music with language teaching so that singing a song with instrumental accompaniment precedes learning the song by heart, after which, the

students will easily learn the song and recite it by heart (Shuck, 2005). Also, language learning and acquisition of new words is more successful if the use of picture cards is combined with singing and rhythmic pronunciation of new words, compared to the use of picture cards alone (Lawson-Adams et al., 2022).

Šulentić Begić (2009) determined that Musical culture classes are most often associated with the Croatian language and Religious Studies, followed by History, Art and Geography, while the other subjects are less represented. Tonkovac (2018) determined that primary education teachers most often correlate Musical Culture with the Croatian language and then with Nature and Society, Art Culture, and Physical and Health Culture. Most teachers believe that Mathematics is the subject with which Musical Culture has the least correlation. Migles (2015) determined that primary education teachers connect the teaching of Musical Culture to the least extent with the teaching of Mathematics, while they most often connect it with the teaching of Physical and Health Culture. She also determined that musical activities in non-musical subjects are most often used as a sound backdrop, as a means of motivating and relaxing students and improving the working atmosphere. Belošević (2019) came to very similar results, i.e., she found that primary education teachers most often associate the teaching of Music with the teaching of Fine Arts, then with Physical and Health Culture, Croatian Language and Nature and Society, and the least with Mathematics. Šulentić Begić and Špoljarić (2011) determined that the teaching of Musical Culture is most often associated with the teaching of Nature and Society, followed by Physical and Health Culture, Croatian Language, and Art Culture and that it was not associated at all with the teaching of Mathematics.

Given the lack of research on the topic of connecting music teaching with other subjects in the Republic of Croatia, research was conducted using an anonymous questionnaire within the scope of this paper. The sample consisted of Musical Culture teachers of music in elementary general education schools. In the continuation of the paper, the presentation and results of the research will follow.

Methodology

The Aim, Research Questions, and Research Hypothesis

The aim of the research was to determine the views of teachers of Musical Culture in elementary school about the implementation of cross-curricular connections

between Musical Culture and other subjects, as well as the frequency and methods of conducting such lessons.

The research was based on the following research questions and hypotheses:

RQ1: How often and in what way do teachers of Musical Culture connect Musical Culture lessons with lessons in other subjects?

RQ2: What are the teachers' views on cross-curricular teaching, its impact on students and the acquisition of their own competences for conducting cross-curricular teaching?

H1: There is a statistically significant difference between teachers in the frequency, method of implementation and attitudes regarding the implementation of cross-curricular connections between the teaching of Musical Culture and other subjects , depending on various socio-demographic variables (gender, years of experience, school location, active involvement in music).

Sample and Data Collection

The research took place during the 2020/2021 school year and included 110 teachers of Musical Culture from elementary schools in the Republic of Croatia. The data was collected through an online survey. The authors of the paper financed the research. The sample of research participants can be seen in Table 1.

Table 1. Description of the sample (N=110)

		n	%
Gender	male	19	17.3
	female	91	82.7
Years of service	up to 5	23	20.9
	6-15	26	23.6
	16-25	38	34.5
	more than 25	23	20.9
The location of the school where the teacher works	rural	35	31.8
	urban	59	53.6
	both rural and urban*	16	14.5
Actively engaged in music	yes	80	73
	no	30	27

*Teachers who work in two or more schools in different areas.

As can be seen from Table 1, 110 teachers who teach Music Culture participated in the research. Less than one-fifth of the research participants were male. With regard to the length of service, most teachers have had 11 to 25 years of experience (slightly more than a third).

Also, almost two-thirds of the research participants work in primary general education schools located in urban areas, while almost three-quarters of the teachers are actively engaged in music.

The Instrument

The anonymous online questionnaire filled out by the teachers consisted of questions and statements that sought to find out how often and in what way the teachers organize cross-curricular connections between the teaching of Musical Culture and other subjects. In addition, we wanted to get an opinion on the acquisition of competences for conducting cross-curricular classes and its impact on students. A total of 34 items made up the survey questionnaire, of which 28 were included in this study.

The instrument that was used to find out from the participants how often and in what way teachers connect the teaching of Musical Culture and the teaching of other subjects consisted of fourteen items, one of which was dichotomous in nature (the answers offered were *yes/no*), five in the form of a Likert scale (example: *On a scale from 1 to 5, mark the extent to which you agree with the statement that when organizing the cross-curricular connection of Musical Culture with other subjects, you sometimes deviate from the usual methodological approach to the teaching of Musical Culture, where 1 means that you do not agree with the stated statement at all, 2 that you do not agree, 3 that you do not have an opinion, 4 that you agree and 5 that you completely agree with the stated statement*), while eight items were constructed in the form of multiple choice questions (example: *Cross-curricular connection of Musical culture with other subjects I organize through: (you can mark several answers) a) Classroom lessons; b) Extracurricular classes; c) Regular classes; d) Project classes; e) I do not organize cross-curricular connections; f) Other*). Teachers' attitudes about the acquisition of competences for the implementation of cross-curricular connections were examined with an instrument consisting of two items in the form of a Likert scale. Furthermore, the teacher's opinion about the influence on students of the cross-curricular connection between the teaching of Musical Culture and the teaching of other subjects was examined with an instrument consisting of seven items in the form of a Likert scale. To verify hypothesis H1, the Chi-square test was used with the aim of determining any statistically significant differences in the frequency, method of implementation and attitudes about the implementation of cross-curricular connections depending on various sociodemographic variables. Quantitative data was processed with SPSS software.

Results and Discussion

At the beginning of the questionnaire, we wanted to find out from the teachers whether and how often they connected the teaching of Musical Culture and the teaching of other subjects (Tables 2 and 3).

Table 2. Implementation of cross-curricular connection (N=110)

Do you organize cross-curricular connections between Musical Culture and other subjects?	yes		no	
	n	%	n	%
	105	95.5	5	4.5

As can be seen in Table 2, almost all respondents stated that they implementd cross-curricular connections. Five participants answered negatively, citing a lack of information about methods of conducting cross-curricular connections, lack of time and the inability to connect teaching content. In the continuation of the work, answers from these five teachers will not be listed in the tables, nor will their answers be included in the statistical calculations.

Table 3. The frequency of implementation of cross-curricular connection (N=105)

I organize cross-curricular connection of Musical Culture and other subjects:	every day		four times a week		three times a week		Twice a week		once a week	
	n	%	n	%	n	%	n	%	n	%
	16	15.2	7	6.7	18	17.1	32	30.5	32	30.5

Table 3 shows that more than a third of teachers organize cross-curricular connections at least three times a week, and slightly less than a third do it once or twice a week.

The next question was: *What kind of music do you use for cross-curricular connection?* (Table 4).

Table 4. Type of music

What kind of music do you use for cross-curricular connection?	popular music		folk/traditional music		art music		children's songs		I do not use	
	n	%	n	%	n	%	n	%	n	%
	62	56.4	63	57.3	64	58.2	62	56.4	6	5.5

As can be seen from Table 4, teachers equally use different types of music when connecting subjects. In addition, six teachers stated that they did not use any of the offered types of music, but at the same time, they did not indicate another type of music even though this was offered as a possibility.

Furthermore, the teachers were asked the following question: *What activities and content do you use when connecting Musical Culture with other subjects*? (Table 5).

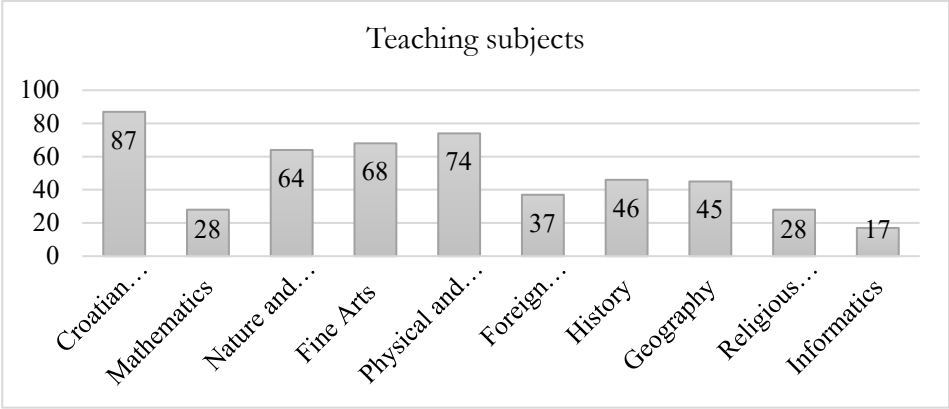
Table 5. Activities and content

What activities and content do you use for cross-curricular connection?													
listening to music		singing		playing		musical games/ movement and dance to music		musicological content		musical alphabet		musical creativity	
n	%	n	%	n	%	n	%	n	%	n	%	n	%
86	78.2	81	73.6	18	16.4	70	63.6	25	22.7	3	2.7	26	23.6

Table 5 indicates that when connecting subjects, teachers most often use music, which, according to the current national curriculum, i.e., *the curriculum for the subject Musical Culture for Elementary Schools and Musical Arts for High Schools* (MZO, 2019), is a central activity in music teaching, followed by singing, musical games and musical creativity. In addition, five teachers stated that they did the same while conducting the choir and one while leading dance classes.

With which subjects do you associate the teaching of Musical Culture? was the following question (Graph 1).

Most of the teachers, more than three-quarters, associate the teaching of Musical Culture with the teaching of the Croatian language. Less than three-quarters of teachers do this with the teaching of Physical and Health Culture and about two-thirds with the teaching of Fine Arts and Nature and Society. Teachers do this least often with Mathematics (only one in four teachers) and only one in six teachers do this with Religious Studies (Graph 1). These results are mostly in line with earlier research (Belošević, 2019; Migles, 2015; Šulentić Begić and Špoljarić, 2011).



Graph 1. Teaching subjects

In the continuation of the questionnaire, research participants were asked the question *In which part of the lesson do you conduct cross-curricular connections between Musical Culture and other subjects?* (Table 6).

Table 6. Part of the class hour

In which part of the lesson do you conduct cross-curricular connections between Musical Culture and other subjects?	introductory part		central part		the final part	
	n	%	n	%	n	%
	67	60.9	62	56.4	63	57.3

Teachers equally organize cross-curricular connection during all three parts of the lesson (Table 6) and mostly in the introductory part of the lesson, as in the research conducted by Tonkovac (2018) and Migles (2015).

Furthermore, the teachers were asked the question *For what purpose do you most often organize cross-curricular connections between Musical Culture and other subjects?* (Table 7).

Table 7. Purpose of connection

For what purpose do you most often organize cross-curricular connections between Musical Culture and other subjects?	as motivation		as an announcement of new teaching content		for relaxation		for a better understanding of the teaching content	
	n	%	n	%	n	%	n	%
	72	65.5	36	32.7	54	49.1	69	62.7

Table 7 shows how teachers make cross-curricular connections between the content of Musical Culture and other subjects, primarily for the purpose of motivating students and for a better understanding of the teaching content. Tonkovac (2018) also obtained personal results, which determined that primary education teachers use music in non-musical subjects as motivation for new teaching content.
Furthermore, we wanted to find out from the teachers in which type of teaching they organize cross-curricular connections (Table 8).

Table 8. Type of teaching

I organize cross-curricular connection of Musical Culture and other subjects within the framework of:	classroom lessons		extracurricular classes		regular classes		project classes	
	n	%	n	%	n	%	n	%
	58	52.7	28	25.5	86	78.2	35	31.8

Cross-curricular connections are most often organized by teachers within the framework of regular and classroom teaching and much less frequently during extracurricular or project teaching (Table 8).
In the continuation of the questionnaire, the teachers were supposed to state whether they cooperated with their male and female colleagues during the implementation of cross-curricular classes (Table 9).

Table 9. Cooperation with colleagues

When organizing cross-subject l connection of Musical Culture and other subjects:	I cooperate successfully with colleagues		I find it difficult to cooperate		I don't have to cooperate because I conduct it independently	
	n	%	n	%	n	%
	58	52.7	-	-	47	42.7

As can be seen from Table 9, slightly more than half of teachers cooperate with other teachers in the implementation of cross-curricular connections, which is in line with other research (Tomljenović and Novaković, 2012), and slightly less than half of them organize such classes themselves.
The next statement read: *When implementing the cross-curricular connection of Musical Culture with other subjects, I sometimes deviate from the usual methodological approach to the teaching of Musical Culture* (Table 10).

Table 10. Methodological approach

When organizing the cross-curricular connection of Musical Culture and other subjects, I sometimes deviate from the usual methodological approach to the teaching of Musical Culture.									
I don't agree at all		I disagree		I have no opinion		I agree		I completely agree	
n	%	n	%	n	%	n	%	n	%
2	1.9	6	5.7	28	26.7	41	39.0	28	26.7

Two-thirds of the teachers (Table 10) stated that when conducting cross-curricular classes, they occasionally deviate from the usual methodological approach to teaching Musical Culture.

To answer research question RQ1 *How often and in what way do teachers of Musical Culture connect the teaching of Musical Culture with other subjects?* We can conclude that listening and singing are the most frequently used activities, equally in all parts of the lesson. The largest number of teachers use cross-curricular connections during regular classes to better motivate students and for students to better assimilate teaching content; more than half of them emphasized that they successfully cooperate with other teachers when conducting such classes and two-thirds that they occasionally deviate from the usual methodological approach.

In the continuation of the questionnaire, teachers were asked for their opinion on the acquisition of their own competences for conducting cross-curricular classes (Table 11).

Table 11. Opinion on the acquisition of competences

During my studies, I developed the competences necessary to organize cross-curricular connections between Musical Culture and other subjects.									
I don't agree at all		I disagree		I have no opinion		I agree		I completely agree	
n	%	n	%	n	%	n	%	n	%
15	14.3	26	24.8	30	28.6	14	13.3	20	19
During my life-long education, I continue to develop the competences necessary to organize cross-curricular connections between Musical Culture and other subjects.									
I don't agree at all		I disagree		I have no opinion		I agree		I completely agree	
n	%	n	%	n	n	%	n	%	n
-	-	3	2.9	13	12.4	30	28.6	59	56.2

Only one-third of participants believe that during their studies they developed the necessary competences for organizing cross-curricular connections, while at the same time, the vast majority claim that they have done so during lifelong education (Table 11).

The teachers then gave their opinion on the implementation of cross-curricular connection by responding to four statements in the form of a Likert scale. Almost all teachers are of the opinion that cross-curricular connections make teaching more interesting (the same is stated by Migles, 2015; Arredondo and Rucinski, 1998 cited in Cosenza, 2005; Barrett, 2001), while only slightly more than a quarter think that such teaching is demanding to perform, which is not in accordance with the opinions of some authors (Kostović-Vranješ and Šolić, 2011). Also, nine out of ten teachers think that cross-curricular connections can be implemented in varied ways, and the same number think that organizing such classes depends on the preference of students and teachers.

Furthermore, we wanted to know the teacher's opinions on how cross-curricular connections affect their students. The majority of teachers (between 83% and 94%) agreed with the given statements: that cross-curricular connection positively affects student motivation, that it provides comprehensive access to teaching content, reduces student stress (see also Szczygieł, 2020; Tonkovac, 2018; Migles, 2015), encourages creativity, enables easier transfer of knowledge, which is claimed by Tomljenović and Novaković (2012) as well as An, Capraro and Tillman (2013), and contributes to the acquisition of skills. Only to a lesser extent (slightly less than half) did they agree with the statement that younger students are more receptive to cross-curricular connections. Therefore, answering research question RQ2 *What are the teachers' views on cross-curricular teaching, its impact on students and the acquisition of their own competences for conducting cross-curricular teaching?* we can conclude that most teachers believe that cross-curricular connection makes teaching more interesting, that it should be organized in agreement with students, that it is not demanding to perform and that it has a positive effect on students. Also, most teachers believe that competence is developed primarily through lifelong education.

For the purpose of testing hypothesis H1 *There is a statistically significant difference between teachers in the frequency, method of implementation and attitudes about the implementation of cross-curricular connection of the teaching of Musical Culture with other subjects by various socio-demographic variables* (gender, years of experience, school location, active involvement in music), the Chi-square test was performed.

With respect to gender, no statistically significant difference was found. Regarding length of service, the difference was found in four variables (Table 12).

Table 12. Chi-square test by length of service

variable	the use of art music	implementation due to announcement	opinion on developing competence during studies	opinion on the impact on student creativity
years of service	9.53*	8.41*	29.88**	16.78**

p<.05*; p<.01**; p<.001***

Art music is used to a significantly greater extent by teachers with the least and most seniority (about three-quarters of them) and to a lesser extent, by about half of them, those with a length of service of 6 to 25 years. A little less than half the teachers implement cross-subject connections for the purpose of announcing the teaching content, but only one in six who have 16 to 25 years of experience do so. A statistically significant difference was also determined for the opinion about developing the necessary competence during studies. Overall, a third of participants agreed with the statement, but to the greatest extent those with the least experience, almost two-thirds of them.

Most teachers have a positive opinion about the influence of cross-curricular connections on student creativity, but those with the least and most seniority agree to a greater extent. Furthermore, with regard to the location of the school, a statistically significant difference was found in six variables (Table 13).

Table 13. Chi-square test by school location

variable	the use of art music	connection with the subject History	connection with the subject Geography	conducting during the central part of the class	implementation due to the understanding of the teaching content	implementation during extracurricular classes
school location	6.17*	9.60**	10.12**	7.33*	8.31*	7.73*

p<.05*; p<.01**; p<.001***

More than three-quarters of teachers working in urban and rural schools use art music, two-thirds of them from urban schools and slightly less than half from rural schools.

An almost identical result was obtained with regard to the connection of the teaching of Musical Culture with the subject of History and the subject of Geography. This makes up more than three-quarters of teachers working in urban and rural schools, with slightly less than half in urban schools and about a third in rural schools. Implementation during the central part of the lesson is carried out by almost all teachers in urban and rural schools, more than half from urban schools and less than half from rural schools. Cross-curricular connection is carried out by almost all teachers working in urban and rural schools, two-thirds from urban schools and half from rural schools.

Finally, with regard to teachers' active involvement in music, a difference was found in four variables (Table 14).

Table 14. Chi-square test with regard to active music practice

variable	frequency of implementation	connection with the subject foreign language	connection with the subject History	connection with the subject Geography
actively engaged in music	13.23*	3.88*	4.00*	5.52*

p<.05*; p<.01**; p<.001***

Every fifth teacher who is involved in music conducts cross-curricular connections every day or three times a week, while teachers who are not musically active do so to a much lesser extent (every tenth teacher, three times a week and none every day). Furthermore, slightly less than half the teachers who are actively involved in music associate Musical Culture with the subject Foreign Language, and half with the subjects History and Geography. Every fifth teacher who is not actively involved in music makes a connection with the subject Foreign language, a quarter of them with the subject History and the subject Geography. Given these results and taking into account the large number of variables, hypothesis H1 *There is a statistically significant difference between teachers in the frequency, method of implementation and attitudes about the implementation of cross-curricular connection of the teaching of Musical Culture with other subjects depending on various socio-demographic variables (gender, years of experience, location of school, active involvement in music)* is not accepted.

Conclusion

The results of this study showed that almost all teachers implement cross-curricular connections using all types of music. Listening and singing are the activities most often used equally in all parts of the lesson, during regular classes, with the purpose of motivating students for the best possible acquisition of teaching content. Most teachers cooperate successfully with other teachers but occasionally deviate from the usual methodological approach. Most research participants believe that cross-curricular connections make classes more interesting; that they should be organized in agreement with students; that they are not demanding to perform; and that they have a positive effect on students. Additionally, most teachers believe that they did not sufficiently acquire the competence required for teaching such classes, but instead developed it primarily through lifelong education. At the same time, socio-demographic variables (gender, years of experience, location of the school, teachers' active involvement in music) did not prove to be predictors of differences between teachers in the frequency, method of implementation and attitudes about the implementation of cross-curricular connections between the teaching of Musical Culture with other subjects.

These results and conclusions should be considered with a caution, owing to several limitations of this research. By increasing the sample, more complete insight into the issue could be obtained.

At the same time, the research could also include teachers of Musical Arts in grammar and secondary schools, which would provide more complete insight into cross-curricular connections during elementary and high school education.

We believe that the results of this study indicate the need for more intensive implementation of the cross-curricular connection between the teaching of Musical Culture and other subjects, which contributes to the integrity, efficiency and modernity of teaching for the benefit of the students. Integrated teaching is particularly achievable with music teaching, given the nature of the subject; it is therefore important to point out the need to adapt the content of study programs at the university so that future teachers can more effectively acquire the competences needed to implement integrated teaching as an important part of modern teaching in elementary schools.

References

An, S., Capraro, M. M. and Tillman, D. A. (2013). Elementary Teachers Integrate Music Activities into Regular Mathematics Lessons: Effects on Students' Mathematical Abilities. *Journal for Learning through the Arts*, *9*(1), 1–21. https://files.eric.ed.gov/fulltext/EJ1018326.pdf

Barrett, J. R. (2001). Interdisciplinary work and musical integrity. *Music Educators Journal*, *87*(5), 27–31. http://dx.doi.org/10.2307/3399705

Belošević, I. (2019). *Mogućnosti korelacije predmeta Glazbena kultura s ostalim predmetima u primarnom odgoju i obrazovanju* (Unpublished undergraduate thesis). Zagreb: Sveučilište u Zagrebu, Učiteljski fakultet. https://urn.nsk.hr/urn:nbn:hr:147:213057

Cosenza, G. (2005). Implications for Music Educators of an Interdisciplinary Curriculum. *International Journal of Education & the Arts*, *6* (9), 1–7. http://www.ijea.org/v6n9/v6n9.pdf, 05/02/2021.

Hanna, G., Patterson, M., Rollins, J. and Sherman, A. (2011). *The Arts and Human Development – framing a national research agenda for the arts, lifelong learning, and individual well-being*. Washington: National Endowment for the Arts. https://www.researchgate.net/publication/290978827_The_-Arts_and_Human_Development_Framing_a_National_Research_Agenda_for_the_Arts_Lifelong_Learning_and_Individual_Well-Being

Huang, Y. E. (2012). *Music integration in the elementary school community: an investigation of integration styles and collaborative modes in Pennsylvania and Taiwan* [Unpublished doctoral dissertation]. The Pennsylvania State University. https://etda.libraries.psu.edu/files/final_submissions/7671

Kostović-Vranješ, V. and Šolić, S. (2011). Nastavni sadržaji Prirode i društva – polazište za interdisciplinarno poučavanje u razrednoj nastavi. *Život i škola*, *25*, 207–216. https://hrcak.srce.hr/71657

Langbehn, J. (2012). *Rembrandt als Erzieher*. Hamburg: Tradition Classics.

Lawson-Adams, J., Dickinson, D. K. and Donner, J. K. (2022). Sing it or speak it? the effects of sung and rhythmically spoken songs on preschool children's word learning. *Early Childhood Research Quarterly*, *58*, 87–102. http://dx.doi.org/10.1016/j.ecresq.2021.06.008

Lazar, M. (2004). Interactive Music Strategies for the Academic Curriculum, New Horizons for Learning: Teaching and Learning Strategies. *Quarterly Journal*. http://www.songsforteaching.com/lazar/interactivestrategies.html

Migles, Ž. (2015). *Interdisciplinarno povezivanje glazbe s neglazbenim predmetima razredne nastave* (Unpublished Master's Thesis). Osijek: Fakultet za odgojne i obrazovne znanosti. https://repozitorij.foozos.hr/islandora/object/foozos:55/preview

Morari, M. (2022). 13. Integrating Functions of Music in Learning and Education. *Review of Artistic Education*, *23*(1), 96–110. https://doi.org/10.2478/rae-2022-0013

MZO (2019). *Kurikulum za nastavni predmet Glazbena kultura za osnovne škole i Glazbena umjetnost za gimnazije*. Zagreb: Ministarstvo znanosti i obrazovanja. https://narodne-novine.nn.hr/clanci/sluzbeni/2019_01_7_151.html

Perignat, E. and Katz-Buonincontro, J. (2019). STEAM in practice and research: An integrative literature review. *Thinking Skills and Creativity*, *31*, 31–43. https://doi.org/10.1016/j.tsc.2018.10.002.

Russell-Bowie, D. (2009). Syntegration or disintegration? Models of integrating the arts across the primary curriculum. *International Journal of Education & the Arts*, *10*(28), 1–23. https://www.researchgate.net/publication/263389309_Syntegration_or_Disintegration_Models_of_Integrating_the_Arts_Across_the_Primary_Curriculum

Shuck, C. M. (2005). *Music Integration: Educators' Perceptions of Implementation and Student Achievement in Public School Elementary Education* [Unpublished doctoral dissertation]. University of South Florida. https://scholarcommons.usf.edu/cgi/viewcontent.cgi?article=1862&context=etd

Szczygiel, M. (2020). More Evidence that Math Anxiety is Specific to Math in Young Children: The Correlates of the Math Anxiety Questionnaire for Children (MAQC). *International Electronic Journal of Elementary Education, 12*(5), 429–438. http://dx.doi.org/10.26822/iejee.2020562-133

Šulentić Begić, J. (2009). Hrvatski nacionalni obrazovni standard i permanentno obrazovanje učitelja glazbe. *Tonovi*, *54*, 49–65. https://www.bib.irb.hr/468998

Šulentić Begić, J. and Špoljarić, B. (2011). Glazbene aktivnosti u okviru neglazbenih predmeta u prva tri razreda osnovne škole. *Napredak – časopis za pedagogijsku teoriju i praksu*, *152*, 447–462. https://hrcak.srce.hr/82786

Tadić, A., Mrvoš, I. and Antonijević, R. (2018). Theoretical Foundation and Actuality of the Concept Education through Art. In S. Marinković (Ed.), *Language, Culture, Education* (267–278). Užice: Pedagoški fakultet. https://reff.f.bg.ac.rs/bitstream/id/8018/bitstream_8018.pdf

Tomljenović, Z. and Novaković, S. (2012). Integrirana nastava – projekt u izbornoj nastavi likovne kulture u osnovnoj školi. *Metodički obzori*, *14*(3), 119–134. https://hrcak.srce.hr/index.php?show=clanak&id_clanak_jezik=117130

Tonkovac, M. (2018). *Interdisciplinarni pristup poučavanju glazbe u prva tri razreda osnovne općeobrazovne škole* (Unpublished Master's Thesis). Osijek. Fakultet za odgojne i obrazovne znanosti. https://urn.nsk.hr/urn:nbn:hr:141:218426

van Vuuren, E. J. (2022). Integrated Music Education in Primary School: A Position Paper. *Journal of Culture and Values in Education*, *5*(1), 211–222. https://doi.org/10.46303/jcve.2022.16

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AN OVERVIEW OF MENTAL CALCULATION STRATEGIES AND THE FREQUENCY OF THEIR APPLICATION

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Abstract/Izvleček

The paper aims to explore mental calculation strategies and the frequency of their application in tasks. In the paper, we categorized mental calculation strategies related to four basic mathematical operations, looked at several different strategies used by students in a test containing mental calculation tasks, and presented an overview of the interview results. We also analyzed age-related differences in the number of strategies applied by participants. It was found that Mathematics in school does not always contribute to the development of and flexibility in the use of mental calculation strategies. One apparent reason is student preference for previously acquired written algorithms.

Keywords:
mental calculation, categorization of mental calculation strategies, school Mathematics, teaching mental calculation, frequency of application of mental calculation strategies

Pregled miselnih računskih strategij in pogostost njihove uporabe

V prispevku predstavljamo raziskavo strategij miselnega računanja in pogostost njihove uporabe pri nalogah. Kategorizirali smo strategije miselnega računanja pri štirih osnovnih matematičnih operacijah in ugotavljali koliko različnih strategij so učenci uporabili pri testu, ki je vseboval miselne računske naloge ter pripravili pregled odgovorov v intervjujih. Analizirali smo tudi razlike v številu uporabljenih strategij glede na starost. Ugotovili smo, da uporaba matematike pri pouku, ne prispeva vedno k razvoju in fleksibilnosti uporabe miselnih strategij računanja. Eden od ugotovljenih razlogov je ta, da študenti raje uporabljajo že prej usvojene pisne algoritme.

Ključne besede:
miselno računanje, kategorizacija strategij miselnega računanja, matematika v šoli, učenje miselnega računanja, pogostost uporabe strategij miselnega računanja

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Introduction

The twenty-first century requires problem solvers, people who can apply their arithmetical knowledge to unknown problems in new situations. Today's society is looking for a mathematically literate individual who has the capacity "to identify and understand the role that mathematics plays in the real world, to make well-founded judgments and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned and reflective citizen" (OECD, 2003, p. 24). Although we live in a world of rapid technology development, Mead's (2014) research on technology dependence in everyday calculation has shown that most people still solve real-world Math problems with mental calculation.

According to the *Cambridge Dictionary* (2018), *calculation* is the process of using the information you already have and adding, taking away, multiplying, or dividing numbers to judge the number or amount of something. *Collins English Dictionary* (Forsyth and Mangan, 2014) defines calculation as something that you think about and work out mathematically; something that you think carefully about and arrive at a conclusion on after having considered all the relevant factors. A *method* (Greek *μέθοδος:* research path, mode, procedure) is a planned or premeditated procedure for achieving a certain theoretical or practical goal (*Hrvatska enciklopedija*, 2013). As with calculation methods, numerical tasks can be solved with three methods: using mental calculation, or written calculation (paper and pencil), or using a calculator (McIntosh et al., 1995; Selter, 2000). In this paper, we will focus on mental calculation (known also as mental computation).

"*Mental calculation* means solving arithmetic problems mentally without using a standard written procedure" (Rathgeb-Schnierer and Green, 2019, p. 2). It is integrated into the child's knowledge of numbers and refers to calculating the exact result "in the head," without the use of aids such as a calculator or paper and pen (Sowder, 1988). Mental calculation is based on understanding the structure of numbers; it increases the comprehension of the number system and is closely related to the concept of number sense (Bruinsma, 1961; Lemonidis, 2016; Sowder 1992). Number sense refers to a person's general understanding of numbers and operations and the ability to use this understanding in flexible ways to make mathematical judgments and to develop useful and efficient strategies for managing numerical situations (McIntosh et al., 1997b).

When children learn to manipulate numbers in their heads, they develop better number sense and increase confidence in their mathematical abilities that will encourage them to consider mental calculation as an option when solving an arithmetic problem (McIntosh et al., 1997a). Real life demands the ability to perform simple mental calculations quickly and flexibly; the child must therefore be able to promptly understand relationships and know which calculation to perform (Bruinsma, 1969). "Flexible mental calculating is a situation-dependent and individual response to specific number and task characteristics and the corresponding construction of a solution process using strategic tools" (Korten, 2017, p. 362). It includes two aspects: the knowledge of various *strategies* and the ability to adapt these appropriately when solving a problem (Rathgeb-Schnierer and Green, 2013; Threlfall, 2009; Verschaffel et al., 2009).

Mental Calculation Strategies

In this section, we will present a definition of and recommendations for teaching mental calculation strategies, the results of certain research on this topic, and an overview of the strategies of mental addition, subtraction, multiplication, and division.

Mental calculation strategies are "the application of known or quickly calculated number facts in combination with specific properties of the number system to find the solution of a calculation whose answer is not known" (Thompson, 1999, p. 2).

Teaching Mental Calculation Strategies

Formal education has the greatest impact on one's arithmetic development, and thus their mental calculation skills. Mental calculation can be developed through carefully planned teaching and practice, to which primary school Mathematics makes a decisive contribution. "The term of mental calculation describes best the objective to be achieved by learning calculating in mathematics classes. Mental operations, knowledge linking, applying strategies, efficiently, accurately and quickly are the benefits we get from calculating" (Cindrić et al., 2019, p. 80).

For rapid, accurate mental calculations, students need to apply learned or invented strategies (Baranyai et al., 2019). "Using mental computation strategies flexibly requires sound number sense and by using a strategies approach to computation, rather than a focus on procedural algorithms, students have opportunities to work

with numbers in flexible ways" (Hartnett, 2007, p. 345). Systematic work on mental calculation promotes the development of students' own strategies by exploring, discussing, and justifying their thinking and solutions based on the interrelationships of numbers and properties of operations, allowing students to develop logical thinking that will help them learn algebra (Carvalho and da Ponte, 2013; Heirdsfield, 2011). Murphy (2004, p. 16) points out that teaching mental calculation strategies supports children in moving towards more flexible deductive strategies by making links to their existing knowledge. Schröder (2007) noted problems in the usage of strategies where students cannot determine which are the best options for solving a given calculation task: even if students do know the strategies, they often cannot adapt and use these. During Math class, talking about strategies can help students choose the best one: "Through class discussions, students can compare the ease of use and ease of explanation of various strategies. Many times, students' invented approaches are based on a sound understanding of numbers and operations, and they can often be used efficiently and accurately" (NCTM, 2000, p. 84). In addition to the calculation strategies recommended in the curriculum, students can demonstrate their own strategies during class discussions, which has the following benefits: the student who explains crystallizes his/her thoughts; students who listen become familiar with the idea that there are various strategies; and some strategies may be more effective than those currently used (QCA, 1999). Analyzing task-solving strategies is not only beneficial for students; it also gives the teacher information about the students' cognitive development level, individual learning style, and readiness to adopt a new concept (Sharma, 2001).

Teacher actions that influence students' mental calculation performance include carefully selected tasks to highlight coherence and encouragement in strategic thinking (Heirdsfield, 2005). Therefore, during preparation for teaching mental calculation and related strategies, connected tasks should be chosen, and during lessons, the teacher must actively participate in the discussion by asking carefully chosen questions to guide the students and clarify potential misconceptions. This approach supports the development of strategies and enables students to become more competent and effective. Furthermore, to increase student motivation for learning Mathematics and to internalize success, it is necessary to create learning environments that will enable students to experience success in Mathematics, support their self-confidence, and develop positive attitudes towards Mathematics

(Suren and Kandemir, 2020). "Teacher support has proven to be a statistically significant predictor of students' self-confidence and mathematics anxiety, whereas enthusiasm makes an independent contribution to explaining student self-confidence" (Vidić et. al., 2022, p. 63). Activities that contribute to developing a different view of number patterns and numerical relationships do not emphasize solving the problem in the first place, but instead focus on problem characteristics, patterns, and numerical relationships. "Mental procedures that a person applies trying to determine the solutions are more important than the results themselves, especially in today's availability of computer technology" (Cindrić et al., 2019, p. 80). This approach supports the development of flexibility in mental calculation and conceptual knowledge (Rechtsteiner and Rathgeb-Schnierer, 2017). Moreover, Korten (2017) argues that during mutual learning (the combination of an individual and an interactive way of learning), flexible mental calculation competences were fostered on different cognitive levels in this inclusive situation.

Categorization of Mental Calculation Strategies

Several mental calculation strategies have been formally categorized using different names and varying numbers of categories. The application of proficient number facts (speedy recall and efficient number fact strategies) is not separately listed in every table, but in the data analysis we will observe it as a mental calculation strategy. Table 1 shows strategies for mental addition and subtraction in the set of natural numbers, where each strategy is illustrated by an example (Beishuizen et al., 1997; Beishuizen and Anghileri, 1998; Fuson et al., 1997; Heirdsfield, 2011; QCA, 1999; Rezat, 2011; Threlfall, 2002; Thompson, 2000; Van den Heuvel-Panhuizen, 2000).

Table 1. Strategies for mental addition and subtraction

Name of strategy	**Example**
partition	65+77 → (60+70)+(5+ 7)=130 + 12 → 65+77=142; 85−32 → (80–30)+(5–2) → 85–32=53
advanced version of partition	87–49 → 87–49=(70+17)–(40+9)=(70–40)+(17–9)=30+8 → 87–49=38
sequencing	56+32 → 56+30=86 and 86+2 → 56+32=88; 53–28 → 53–20=33 and 33–8=33 –3–5 → 53–28=25
modified sequencing	45+27 → 45+10=55, 55+10=65, 65+7 → 45+27=72; 34–25 → 34–10=24, 24–10=14, 14–5 → 34–25=9
combination of partition and sequencing	57+35 → (50+30)+5+7=85+7 → 57+35=92; 68–31 → (60–30)+8–1= 98–1 → 68–31= 37; 84–27 → (80–20)+4–7 → 64–7=64–4–3 → 84–27=57
compensation	45+29 → 45+30–1 → 45+29=74;

	65–39 → 65–40+1 → 26; 47–18 → 47–20+2 → 47–18=29
complementary addition	83–78 → 78+2+3 → 83–78=5
counting by adding or subtracting tens then ones	48+25 → 48, 58, 68, 69, 70, 71, 72, 73 → 48+25=73; 74–26 → 74, 64, 54, 53, 52, 51, 50, 49, 48 → 74–26=48
counting by adding (subtracting) tens to tens and then ones	56+25 → 50, 60, 70, 76, 77, 78, 79, 80, 81 → 56+25=81; 63–24 → 60, 50, 40, 43, 42, 41, 40, 39 → 63–24=39
balancing	45+27 → 45+27=50+22 → 45+27=72
permanence of the difference for supplementing the subtrahend to ten	73–25 → 73–25=78–30 → 73–25=48; 73–24 → 73–24=69–20 → 73–24=49
near double	37+35 → 35+2+35 → 35+35+2 → 37+35=72

Table 2 shows strategies for mental multiplication in the set of natural numbers (Baranyai et al., 2019; Caney and Watson, 2003; Heirdsfield et al., 1999; Hope, 1987; Mulligan and Mitchelmore, 1997; QCA, 1999).

Table 2. Strategies for mental multiplication

Name of strategy	**Example**
counting by	7·5 → 5, 10, 15, 20, 25, 30, 35 → 5·7=35; 3·4 → 4, 8, 12 → 4·3=12
multiplication as addition	6·5 → 5+5=10, 10+5=15, 15+5=20, 20+5=25, 25+5=30 → 6·5=30
using multiplication table facts	5·22 → 10·22=220, and 10 is twice as 5 → 5·22=110
double and half	25·36 → 50·18=100·9 → 25·36=900
separation from the right	4·26 → 4·6=24, 4·20=80, 80+24=104 → 4·26=104
separation from the left	5·17 → 5·10=50, 5·7=35, 50+35=85 → 5·17=85
compensation	6·29 → 6·30–6=180–6 → 6·29=174; 7·21 → 7·20+7=140+7 → 7·21=147
factorization	25·6 → 25·2·3=50·3 → 25·6=150; 75·16 → 3·25·4·4=3·100·4=12·100 → 75·16=1200
zero exclusion	5100·20 → 5100·20=51·2=102 → 5100·20=102000
using distributive property	12·35 → 12·(30+5)=12·30+12·5=360+60 → 12·35=420

Table 3 shows strategies for mental division (Caney and Watson, 2003; Heirdsfield et al., 1999; Mulligan and Mitchelmore, 1997; QCA, 1999).

Table 3. Strategies for mental division

Name of strategy	**Example**
halving	40:8 → 40:2, 20:2, 10:2 → 40:8=5
counting by	20:4 → 20, 16, 12, 8, 4, 0 → 20:4=5
division as subtraction	10:5 → 10–5=5, 5–5=0 → 10:5=2
division as addition	27:9 → 0+9=9, 9+9=18, 18+9=27 → 27:9=3
using multiplication table	8·6=48 → 48:8=6

separation from the left	84:4 → 8:4=2, 4:4=1 → 84:4=21; 120:6 → 12:6=2, 0:6=0 → 120:6=20
separation from the right	84:4 → 4:4=1, 8:4=2 → 84:4=21; 120:6 → 0:6=0, 12:6=2 → 120:6=20
holistic	154:22 → 22·5=110, 154–110=44, 22·2=44, 5+2=7 → 154:22=7
compensation	84:7 → 77:7=11, 84–77=7, 11+1=12 → 84:7=12; 108:12 → 120:12=10, 120–108=12, 10–1=9 → 108:12=9
zero exclusion	400:20 → 400:20=40:2 → 400:20=20
dividing a sum	76:4 → 76:4=(36+40):4=36:4+40:4=9+10 → 56:4=19; 125:5 → 125:5=100:5+20:5+5:5=20+4+1 → 125:5=25

Methodology

Research Objective

Having reviewed the literature on mental calculation and the variety of existing strategies, we were curious to see how much students apply the strategies. In this paper, we seek to answer the following questions:

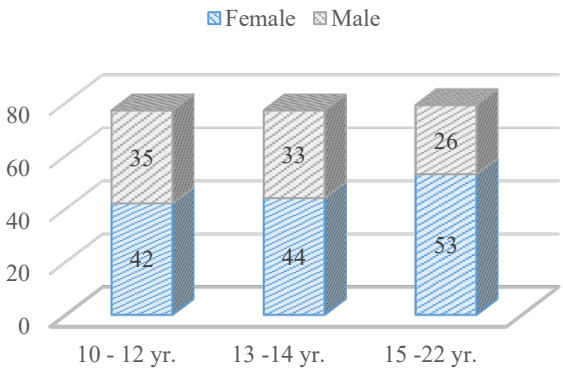
- What is the number of different strategies used in mental calculation tasks that include four basic arithmetic operations (addition, subtraction, multiplication, division)?
- Do students use procedural algorithms of written calculation in tasks that require mental calculation, i.e., do they use procedural algorithms as a "method" of mental calculation?
- Are there age-related differences among students in terms of the number of different strategies used in tasks that require mental calculation?

Research Instrument, Sample, Data Collection, and Analysis Techniques

For the purpose of the research, a test and an interview were conducted with each respondent, with mental calculation tasks modeled on a study about mental calculation by McIntosh et. al. (1995). In the analysis of the data obtained in the empirical part of the research, descriptive statistics were used in combination with parametric methods to check the differences between age groups in the number of different strategies used. The resulting data were supplemented by analyzing the students' answers from the in-depth interviews. Since it includes both qualitative and quantitative data collection procedures, this is a multi-method study.

It was conducted in Croatia during the 2020-2021 academic year. The research sample was composed of 233 students (139 females and ninety-four males) aged 10 to 22.

The mental calculation test consisted of twenty mental arithmetic tasks, five tasks for each of the four basic arithmetic operations. When compiling the assignments, care was taken to ensure that the selected numbers in the assignments were appropriate for students at a certain level of education according to the Croatian curriculum. Therefore, the test was made for three levels: students 10-12 years old attending upper elementary and lower middle school (grades 4-6); students 13-14 years old attending upper middle school (grades 7-8), and students 15-22 years old attending high school or university. The following graph shows the number of students taking the age-appropriate levels of the test.



Graph 1. Number of students taking different test levels

The tasks were chosen in various ways so that students could use several different mental calculation strategies. The mental calculation tasks were presented via mobile phone with the help of a wireless speaker, and students were given 20 seconds per task. The same test conditions were ensured for all participants including the volume and duration of reading the tasks, the number of readings, and estimated time needed for the calculation. Tasks were presented orally, not visually, and with a time limit to avoid written calculation. The mental calculation lasted approximately 20 minutes, including giving instructions and distributing worksheets. This was followed by an interview lasting approximately 10 minutes per participant. Student responses were recorded, and based on the theoretical part of the research, a coding system was constructed and a calculation strategy was identified for each completed task.

Those who solved tasks correctly were asked this question during the interview: *"What strategy did you use? Describe the calculation procedure in words."* Students who did not calculate correctly were asked to try to recalculate the result and describe the strategy they would use. This part of the research certainly required an interview, not a questionnaire with multiple-choice questions or open-ended questions. The skilled examiner thus can better explain the question to the respondent and understand what the respondent wants to say and describe because the students in the school were not taught most of the strategies and had not heard their names. In contrast, multiple-choice questions would suggest the strategy to be used. Open-ended questions could produce many unanswered questions because the respondent does not know how to express, write, or describe the applied strategy. The interview resulted in the identification of a range of different mental calculation strategies used for each individual arithmetic operation. The prevalence of written calculation was also determined, i.e., how often in mental calculation tasks a written algorithm was used. Namely, although students were asked to solve tasks using mental calculation, some still applied a written arithmetic algorithm by imagining it in their heads. A pilot study with seventeen students aged 12, and 14 students aged twenty-one was conducted before creating the final version of the test. Based on the results of the pilot study, the number of mental calculation tasks was reduced from 28 to 20.

Data collection lasted about two months during the school year. The whole procedure was carried out independently by the first author of the paper, because the research results, especially the interviews, are the most credible.

The data analysis first identified elements of descriptive statistics: arithmetic mean ± standard deviation, median, minimum, maximum of the number of mental calculation strategies used for each age group. The Kolmogorov-Smirnov test verified the normality of the data, and the homogeneity of variance was confirmed using Levene's test for equality of variances. One-way analysis of variance (ANOVA) was then applied. The statistical significance of the main effect was calculated, and the existence of significant differences between individual subgroups of respondents was examined by Bonferroni's post hoc correction.

Results and Discussion

We will first look at the number of mental calculation strategies used in each of the subgroups. Descriptive data on the number of strategies used in each of the subgroups are shown in Tables 4 and 5.

Table 4. Descriptive statistics for the number of addition and subtraction strategies

		mental addition strategies				**mental subtraction strategies**			
age	N	AM ± SD	MED	MIN	MAX	AM ± SD	MED	MIN	MAX
10	19	3.84±0.83	4	2	5	2.21±0.97	2	1	4
11	16	3.44±0.81	2	0	4	2.38±1.09	2	0	4
12	42	3.33±1.03	3	1	5	2.41±0.94	2	1	4
13	46	3.35±0.85	3	1	5	2.46±1.19	2	0	4
14	31	3.59±1.12	4	1	5	2.55±0.81	2	1	4
15	26	3.42±0.95	3.5	2	5	2.92±1.02	3	1	5
16	23	3.61±0.84	4	2	5	2.44±0.73	2	1	4
17-22	30	3.57±0.94	4	2	5	2.40±0.93	2	1	4

This shows a surprisingly low minimum for addition tasks, i.e., it ranges from 0 to 2 for the strategy used in five tasks. Zero strategies used means that the respondent used written calculation strategies instead of mental calculation strategies by imagining the procedure in their head. The median ranges from 3 to 4 in all age groups except the 11-year-old group, which used two or fewer mental addition strategies. This group also has the lowest maximum number. The minimum number of subtraction strategies for all respondents is low: one strategy or no strategies being used in all five tasks. Half the students in all age groups, except the group of 15-year-olds, used two or fewer than two mental subtraction strategies. Only in the group of 15-year-olds were all five mental subtraction strategies used. In general, respondents in all age groups used more different mental addition strategies compared to subtraction strategies.

The number of mental multiplication and division strategies ranges from zero to a maximum of five. Half the number of students younger than 15 years use a maximum of two strategies for mental multiplication. Surprisingly, the median of the number of mental division strategies used by students in elementary and middle school is greater than the median number of mental multiplication strategies used.

Table 5. Descriptive statistics for mental multiplication and division strategies

		mental multiplication strategies				**mental division strategies**			
age	N	AM ± SD	MED	MIN	MAX	AM ± SD	MED	MIN	MAX
10	19	1.95±1.35	2	0	4	2.16±0.90	2	1	3
11	16	1.69±1.30	1	0	5	2.31±0.88	3	1	3
12	42	2.14±1.26	2	0	4	2.62±0.80	3	1	4
13	46	2.20±1.05	2	1	4	2.04±1.05	2	1	4
14	31	2.71±1.01	2	1	4	2.65±1.05	3	0	5
15	26	2.81±1.06	3	1	4	2.73±1.15	3	1	5
16	23	2.74±0.86	3	2	5	2.96±0.88	3	2	5
17-22	30	2.40±0.86	2.5	1	4	2.13±0.14	2	0	4

The following are the results of examining the statistical significance of differences in arithmetic means in the number of strategies for mental calculation among the observed age groups, using one-way analysis of variance for independent samples (ANOVA).

Table 6. ANOVA test results

	F	**p**	η^2
Number of mental addition strategies	0.84	0.56	0.03
Number of mental subtraction strategies	1.08	0.38	0.03
Number of mental multiplication strategies	3.11	<0.001	0.09
Number of mental division strategies	3.10	<0.001	0.09

The results in Table 6 show the main effect of addition and subtraction is not statistically significant (0.56>0.05, 0.38>0.05) and that increasing the years of education does not increase the base and application of mental addition and subtraction strategies, which leads us to conclude that formal education neither offers nor improves mental calculation skills. This contrasts with the previously conducted research (Caney and Watson, 2003; Carpenter et al., 1997, Heirdsfiel et al., 1999). Regarding the number of mental multiplication and division strategies, the main effect proved to be statistically significant ($p<0.001$). To note exactly where the differences occur, we also conducted the Bonferroni post hoc test, the results of which are shown in Table 7 and Table 8.

Table 7. Results of the Bonferroni post hoc test for the number of mental multiplication strategies

	11	12	13	14	15	16	17-22
10	0.49	0.52	0.42	0.02	0.01	0.02	0.16
11		0.16	0.11	0.01	0.00	0.00	0.04
12			0.82	0.03	0.02	0.04	0.33
13				0.04	0.02	0.05	0.43
14					0.74	0.92	0.27
15						0.83	0.17
16							0.26

Table 7 shows that the greatest differences are present among respondents aged 10 to 13, compared to those aged 14 to 16. With an accuracy of 95%, we can say that students attending the first and second years of secondary school use more mental multiplication strategies than elementary and middle school students.

Table 8. Results of the Bonferroni post hoc test for the number of mental division strategies

	11	12	13	14	15	16	17-22
10	0.66	0.11	0.69	0.10	0.07	0.01	0.94
11		0.31	0.37	0.30	0.20	0.06	0.57
12			0.01	0.91	0.67	0.21	0.04
13				0.01	0.01	0.00	0.71
14					0.75	0.27	0.05
15						0.00	0.03
16							0.26

Older students use more mental division strategies compared to younger students. Although the main effect is statistically significant, a more detailed analysis of the data in Table 8 shows that in only 29% of couples is the difference statistically significant. In contrast to the significant differences in the use of mental multiplication strategies between groups of students attending primary school and those in the first half of secondary education, no clear pattern can be seen in significant differences between age groups in terms of the number of mental division strategies.

Since for each arithmetic operation in at least one of the age groups, the application of zero mental calculation strategies was noted, we will pay special attention to this phenomenon. When examining the students about the methods of calculation, it was found that a certain number of students imagined the procedure of written calculation in their heads.

According to Baranyai et al. (2019), most students do not use various mental calculation strategies: more than a quarter of respondents did not use mental calculation strategies, but only followed the written arithmetic algorithms in their heads, and more than one-third used only one or, at most, two different strategies. The most common answers received during the interview and indicating written calculation include: "*It's like school ... on the board, so I imagine writing,*" "*I imagine paper and write one below the other,*" "*I imagine in my head one below the other and subtract,*" "*I divide just like in school on the board.*" Students who used 12 or fewer mental calculation strategies, out of a total of 20, resorted to imagining written calculation in their heads. On the other hand, students who used 13, 14, or 15 mental arithmetic strategies made only sporadic use of written arithmetic by imagining it in their heads. This is noticeable in all age groups. In the following table, we look at some answers and explanations given when interviewing students.

Table 9. Students' verbal descriptions of mental calculation strategies used.

Mental addition tasks	47+4 or 147+4 → "*I break apart 4 into 3 and 1; add 3 to 47 to obtain the next ten and add 1 to 50*" or "*I know that 4+7 is 11, so the sum is 51*"
	70+80 → "*It's like 7+8; I know by heart that it's 15 and then I add zero*"
	54+99 → "*I add 100 to 54; then subtract 1 from 154*" or "*It's the same as 53+100*"
	57+36 → "*It's 50+30 and 7+6; then I add 13 to 80*" or "*I take 3 from 36, then 57 and 3 is 60; then add the remaining 33*"
	26+25 → "*That is twice 25 and then 1 more*" or "*That is 25 and 25 and 1 more*" or "*20 and 20 and 11*"
Mental subtraction tasks	153–99 → "*That's the same as 154–100*" or "*I take 100 from 153, then add 1*"
	44–26 → "*That's the same as 50–32*" or "*I take 24 from 44 and get 20 and take 2 more*" or "*I see how many I have from 26 to 30 and then from 30 to 44, which is a total of 18*"
	200–54 → "*I know that 100–54 is 46 and then add 100 more*" or "*200–50 is 150 and then I take 4 from 150*"
	85–78 → "*From 78 to 80 is 2 and another 5 to 85 which is all together 7*" or "*That is the same as 15–8*"
	63–21 or 142–21 or 263–21 → "*60–20 and 3–1*" or "*63–20 and take 1 more*" or "*I know that 42 is twice as 21, then 142–21=121*" or "*263–20 is 243 and then I take 1 more*" or "*63 is three times 21 so 63–21=42 and then I add 200 more*"
Mental multiplication tasks	23·6 → "*20·6 and 3·6*" or "*23 and 23 equals 46, and 46 and 46 equals 92, plus 46 equals 138*"
	14·4 or 34·4 → "*14·2 equals 28, and 28·2 equals 56*" or "*10·4 and add 4·4" or "30·4=120 and 16 more*" or "*34·5 and then take 34" or "34·2 and then 68·2*"
	19·5 or 39·5 or 69·5 → "*10·5 and 9·5 more*" or "*20·5 equals 100, then take 5 and get 95*" or "*69·10=690, then 690:2*" or "*40·5 and then take 5*"
	25·3 → "*25 and 25 equals 50, and 25 more is 75*" or "*I know it by heart, that's 75*" or "*20·3 equals 60 and 15 more*" or "*That is 100–25*"
	40·20 or 300·20 or 800·70 → "*That's 4·2 and write two zeros*" or "*8·7 with three zeros*" or "*300·10 equals 3000, and this is twice as much, 6000*"

Mental division tasks	143:13 → "*I know 13·10 equals 130 and 13 one more time, so answer is 11"* or "*That is 130+13, so the answer is 11*" or "*Using Vedha math, 4 equals 1+3, this is 11*"
	56:4 or 136:4 → "*I know that 14·4=56*" or "*That is 120+16, so the result is 30 and 4, i.e. 34*" or "*140:4 equals 35, so this is 34*"
	63:9 or 153:17 → "*7·10 equals 70, then this is 7·9*" or "*I know it by heart–multiplication table*" or "*That's 170–17, so the answer is 9*" or "*I know that result is a one-digit number, so I look for a number that multiplied by 7 gives last digit 3, and that is 9*
	60:5 → "*I know it by heart*" or *"That is 50+10, so I get 10 and 2 and result is 12*" or "*11·5 equals 55, so this is 12*"
	400:20 or 300:20 or 2400:80 → "*4:2 and put 0*" or "*20 fits five times in 100 and 3 times more, which is 15 altogether*" or "*That is the same as 240:8, which is 30" or "24:8 and put zero*"

Finally, let us look at the use of the "school" strategy for mental calculation. The test follows the official Mathematics curriculum in the Republic of Croatia, which recommends several mental calculation strategies: sequencing and addition to the next ten (using permanence of sum and difference) in addition and subtraction; separation from left to right and zero exclusion in multiplication and division; dividing a sum in division. Since these are recommended strategies, they are widespread in teaching Mathematics in Croatian classrooms. However, students in this study used other strategies as well. This could be a result of their teachers' instruction or of students' own "invention." It should also be noted that the least used strategy in mental addition is the one learned in school. We can explain this by the fact that addition is the easiest operation for students, so they feel confident in their own knowledge and free to apply their own creations and modifications in calculating.

Conclusion and Implications

Mathematical competences are among the key competences for personal development, active citizenship, social inclusion, and employability in the knowledge society of the 21st century. An indispensable segment of mathematical competences is mental calculation, which is the most common method in the calculations we perform during everyday activities (paying bills, calculating time, estimating, etc.). The results of our research showed that school Mathematics does not contribute to students' progress in terms of mental calculation addition and subtraction strategies. Furthermore, according to our results, the use of mental calculation strategies learned in school decreases with increasing years of education.

This is in contrast to previously conducted research; the study shows that "calculation ability of the primary school children increases with age; scores of calculation fluency and accuracy increased in higher school grades" (Zhou et. al., 2021, p.289). Older students apply a wider range of mental calculation strategies for all four arithmetic operations, and at the same time independently modify them or combine several known strategies to suit them in order to be as efficient as possible in a given task (Anghileri, 1989; Caney and Watson, 2003; Carpenter et al., 1997; Heirdsfiel et al., 1999). Because of the lack of time and the wide scope of the mathematics teaching content, teachers often stick to the curriculum requirements, which assign a lot of time to teaching and practising written calculation. Once the written calculation procedure is demonstrated, it is given priority in the calculation. After students learn a standard calculation algorithm, they tend to stop using previously learned strategies, even when those are more advantageous and appropriate (Selter, 2009). When students learn by example, they acquire specific procedures rather than general rules, and those procedures tend to have a negative impact on the development of flexibility (Schütte, 2004). The results of our research showed the use of written calculation, even though the tasks required only mental skills. We believe that the rigid imposition of written arithmetic rules that are taught in school affects students in their choice and ability to use effective mental calculation strategies. Students are forced to develop and discover various strategies based on their own knowledge, insights, and experience independently and outside the mathematics classroom. Most students are not motivated to do this, and others find it impossible without the teacher's guidance. However, it would be good to further investigate whether preferences for written calculation limit the use of mental calculation strategies or, conversely, underdeveloped mental calculation skills push students towards the use of written calculation.

The results of this research provide insight into the number of different mental calculation strategies used in mental calculation tasks. Of course, we must say that the results are not satisfactory; some students did not use mental calculation strategies in the tasks at all, and the arithmetic mean is also low, considering that these tasks rely on four basic calculation operations used daily. Future research should focus on studying the possible correlation between student confidence and motivation to learn Mathematics with the ability to create their own mental calculation strategies.

We also recommend organizing training for teachers to show them the variety of mental calculation strategies and to help them improve their teaching of it, and to choose and prepare tasks and heuristic questions for class discussion.

References

Anghileri, J. (1989). An investigation of young children's understanding of multiplication. *Educational Studies in Mathematics*, *20*(4), 367–385.

Baranyai, T., Egri, E., Molnár, A. É., and Zsoldos-Marchis, I. (2019). Mental calculation strategies used by pre-service primary school teachers. In L. Gómez Chova, A. López Martínez and I. Candel Torres (Eds.), *Proceedings of the 11th International Conference on Education and New Learning Technologies* (8717–8724). Valencia: IATED Academy.

Beishuizen, M., and Anghileri, J. (1998). Which mental strategies in the early number curriculum? A comparison of British ideas and Dutch views. *British Educational Research Journal*, *24*(5), 519–538.

Beishuizen, M., Van Putten, C. M., and Van Mulken, F. (1997). Mental arithmetic and strategy use with indirect number problems up to one hundred. *Learning and Instruction*, *7*(1), 87–106.

Blöte, A. W., van der Burg, E., and Klein, A. S. (2001). Students' flexibility in solving two-digit addition and subtraction problems: Instruction effects. *Journal of Educational Psychology*, *93*(3), 627–638.

Bruinsma, B. (Ed.). (1969). *Nieuw rekenen. Algemene Inleiding* [New arithmetic. General introduction]. Baarn, The Netherlands: Bosch en Keuning.

Cambridge University press (2018). *Cambridge Dictionary*. Cambridge. https://dictionary.cambridge.org/ Retrieved June, 14, 2018

Caney, A., Watson, J. M. (2003). Mental computation strategies for part-whole numbers. In J. Hattie (Ed.), *NZARE AARE Conference 2003: educational research, risks and dilemmas* (1–13). University of Auckland Press.

Carpenter, T. P., Franke, M. L., Jacobs, V. R., Fennema, E., Empson, S. B. (1997). A longitudinal study of invention and understanding in children's multidigit addition and subtraction. *Journal for research in mathematics education*, *29*(1), 3–20.

Cindric, M., Zorica, I. M., Juric J. (2019). From "calculation in mind" till "mental calculation". In Kolar-Begović Z., Kolar-Šuper R. Jukić Matić L. (Eds.), *Towards New Perspectives on Mathematics Education*, (74–82). Element.

Forsyth, M., and Mangan, L. (2014). *Collins English Dictionary*: Complete and Unabridged. UK: Harper Collins.

Fuson, K. C., Wearne, D., Hiebert, J. C., Murray, H. G., Human, P. G., Olivier, A. I., ... Fennema, E. (1997). Children's conceptual structures for multidigit numbers and methods of multidigit addition and subtraction. *Journal for Research in Mathematics Education*, *28*(2), 130–162.

Hartnett, J. (2007). Categorisation of mental computation strategies to support teaching and to encourage classroom dialogue. *Mathematics: Essential Research, Essential Practice, 1*, 345–352.

Heirdsfield, A. M. (2005). One Teacher's Role in Promoting Understanding in Mental Computation. In Chick, H. L. and Vincent, J. L. (Eds.), *Proceedings of the 29th Conference of the International Group for the Psychology of Mathematics Education, 3*, 113–120. Melbourne: PME.

Heirdsfield, A. M. (2011). Teaching mental computation strategies in early mathematics. *Young Children*, *66*(2), 96–102.

Heirdsfield, A. M., Cooper, T., Mulligan, J., and Irons, C. (1999). Children's mental multiplication and division strategies. In Zaslavsky O. (Ed.), *Proceedings of 23rd Conference of the International Group for the Psychology of Maths Education* (89–96). Haifa: Technion.

Hope, J. A. (1987). A case study of a highly skilled mental calculator. *Journal for Research in Mathematics Education*, *18*(5), 331–342.

Korten, L. (2017). "The fostering of flexible mental calculation in an inclusive mathematics classroom during Mutual Learning." CERME 10, Feb 2017, Dublin, Ireland. ffhal-01873470f.

Leksikografski zavod Miroslav Krleža. (2013). *Hrvatska enciklopedija, mrežno izdanje*. Retrieved from http://enciklopedija.hr/

Lemonidis, C. (2016). *Mental Computation and Estimation: Implications for mathematics, education research, teaching and learning*. Abingdon, OX: Routledge.

Maghfirah, M., and Mahmudi, A. (2018). Number sense: The result of mathematical experience. *Journal of Physics: Conference Series*, *1097*(1), 012141.

Mead, K. C. (2014). *Exploring Everyday Math without Using Technology* (Doctoral dissertation).

McIntosh, A., Bana, J., and Farrell, B. (1995). *Mental Computation in School Mathematics: Preference, Attitude and Performance of Students in Years 3, 5, 7, and 9*. Mathematics, Science and Technology Education Centre (MASTEC), Edith Cowan University, Perth, Western Australia, Australia.

McIntosh, A., Reys, B. J., and Reys, R. E. (1997a). *Number Sense: Simple effective number sense experiences, Grades 1-2*. USA: Dale Seymour Publication.

McIntosh, A., Reys, B., Reys, R., Bana, J., and Farrell, B. (1997b). *Number Sense in School Mathematics: Student performance in four countries*. Perth, Australia: Mathematics, Science Technology Education Centre, Edith Cowan University.

Mulligan, J. T., and Mitchelmore, M. C. (1997). Young children's intuitive models of multiplication and division. *Journal for Research in Mathematics Education*, *23*(3), 309–330.

Murphy, C. (2004). How do children come to use a taught mental calculation strategy? *Educational Studies in Mathematics*, *56*(1), 3–18.

National Council of Teachers of Mathematics (NCTM). (2000). *Principles and Standards for School Mathematics*. NCTM: Reston, VA.

Nunes, T., Dorneles, B. V., Lin, P. J., and Rathgeb-Schnierer, E. (2016). *Teaching and Learning about Whole Numbers in Primary School*. Springer Nature.

OECD (Organisation for Economic Co-operation and Development). (2003). *Mathematics Teaching and Learning Strategies in PISA*. Paris: OECD Publishing.

Qualifications and Curriculum Authority (QCA). (1999). Teaching Mental Calculation Strategies: Guidance for teachers at Key Stages 1 and 2. Retrieved from: https://silo.tips/queue/the-national-numeracy-strategy?queue_id=-1v=1596432539u=NzcuMjE2LjE3My4xNzU=

Rathgeb-Schnierer, E., and Green, M. (2013). Flexibility in mental calculation in elementary students from different math classes. In B. Ubuz, Ç. Haser, and M. A. Mariotti (Eds.), *Proceedings of the Eighth Congress of the European Society for Research in Mathematics Education* (353–362). Ankara, Turkey: Middle East Technical University.

Rathgeb-Schnierer, E., and Green, M. G. (2019). Developing flexibility in mental calculation. *Educação Realidade*, *44*(2).

Rechtsteiner-Merz, C., and Rathgeb-Schnierer, E. (2015). Flexible mental calculation and "Zahlenblickschulung". In K. Krainer and N. Vondrovà (Eds.), *CERME 9-Ninth Congress of the European Society for Research in Mathematics Education* (354–360). Prague, Czech Republic, Charles University.

Rechtsteiner, C., and Rathgeb-Schnierer, E. (2017). Zahlenblickschulung" as approach to develop flexibility in mental calculation in all students. *Journal of Mathematics Education*, *10*(1), 1–16.

Schröder, U. (2007). Förderung der Metakognition. In J. Walter, and F. B. Wember (Eds.), *Entdeckendes Lernen im Mathematikunterricht der Schule für Lernbehinderte* (271–311). Göttingen, Germany: Hogrefe.

Rezat, S. (2011). Mental calculation strategies for addition and subtraction in the set of rational numbers. In M. Pytlack, T. Rowland, and E. Swodoba (Eds.), Proceedings of CERME-7 (pp. 396-405). Rzeszow, Poland: CERME.

Schütte, S. (2004). *Die matheprofis 1. Lehrermaterialieen*. Ausg. D., München: Oldenbourg.

Selter, C. (2000). Vorgehensweisen von Grundschüler (inne) n bei Aufgaben zur Addition und Subtraktion im Zahlenraum bis 1000. *Journal für Mathematik-Didaktik*, *21*(3), 227–258.

Selter, C. (2009). Creativity, flexibility, adaptivity, and strategy use in mathematics. *ZDM*, *41*(5), 619–625.

Sharma, M. C. (2001). *Matematika bez suza*. Lekenik: Ostvarenje.

Sowder, J. T. (1988). Mental computation and number comparison: Their roles in the development of number sense and computational estimation. *Number concepts and operations in the middle grades*, 182-197.THIS ENTRY IS INCOMPLETE. IT NEEDS THE NAMES OF EDITORS, THE PUBLISHER AND PLACE OF PUBLICATION

Star, J. R., and Newton, K. J. (2009). The nature and development of experts' strategy flexibility for solving equations. *ZDM Mathematics Education, 41*(5), 557–567.

Suren, N., and Kandemir, M. A. (2020). The effects of mathematics anxiety and motivation on students' mathematics achievement. *International Journal of Education in Mathematics, Science and Technology, 8*(3), 190–218.

Thompson, I. (1999). Mental calculation strategies for addition and subtraction: Part 1. *Mathematics in school*, *28*(5), 2–4.

Thompson, I. (2000). Mental calculation strategies for addition and subtraction: Part 2. *Mathematics in school*, *29*(1), 24–26.

Threlfall, J. (2002). Flexible mental calculation. *Educational Studies in Mathematics*, 50, 29–47.

Threlfall, J. (2009). Strategies and flexibility in mental calculation. *ZDM*, *41*(5), 541–555.

Torbeyns, J., Verschaffel, L., and Ghesquière, P. (2005). Simple addition strategies in a first-grade class with multiple strategy instruction. *Cognition and Instruction,23*(1), 1–21.

Van den Heuvel-Panhuizen, M. (2000). Mathematics education in the Netherlands: A guided tour. *Freudenthal Institute Cd-rom for ICME9*. Utrecht: Utrecht University.

Verschaffel, L., Luwel, K., Torbeyns, J., and Van Dooren, W. (2009). Conceptualizing, investigating, and enhancing adaptive expertise in elementary mathematics education. *European Journal of Psychology of Education*, *24*(3), 335–359.

Vidić, T., Klasnić, I., and Đuranović, M. (2022). The Role of Teachers' Support and Enthusiasm in Predicting Mathematics Anxiety and Confidence among Students. *Journal of Elementary Education*, *15*(1), 51–69.

Zhou, H., Aheto, D. L., Gao, Q., and Chen, W. (2021). Mathematical calculation ability of primary school children: A comparative study between Ghana and China. *Journal of Psychology in Africa*, *31*(3), 286–291.

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UPORABNOST VPRAŠALNIKA O OTROKOVI PREDELAVI SENZORNIH PRILIVOV PRI OTROCIH Z MOTNJO AVTISTIČNEGA SPEKTRA

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Za otroke z motnjo avtističnega spektra so poleg težav na področju socialne komunikacije ter nefleksibilnega vedenja značilne težave pri odzivanju na senzorne prilive. Naš namen je bil oceniti občutljivost *Vprašalnika o otrokovi predelavi senzornih prilivov* za prepoznavanje posebnosti senzorne predelave pri otrocih z motnjo avtističnega spektra. Na podlagi odgovorov 108 staršev nevrotipičnih otrok in 27 otrok z motnjo avtističnega spektra (3–10 let) smo ugotovili, da vprašalnik med skupinama dobro razlikuje. Vprašalnik lahko uporabljajo strokovnjaki s področja zdravstva, šolstva ali socialnega varstva in je novost na področju prepoznavanja motnje senzorne predelave v Sloveniji. Pridobljene informacije pomagajo načrtovati podporo otroku s senzornimi izzivi.

Utility of the Questionnaire on Children's Processing of Sensory Input in Children with Autism Spectrum Disorder In addition to difficulties with social communication and behaviour flexibility, children with autism spectrum disorder (ASD) often experience difficulty responding to sensory input. Our aim was to assess the sensitivity of the Questionnaire on Children's Processing of Sensory Input to sensory issues experienced by children with ASD. Based on the responses of 108 parents of neurotypical children and 27 parents of children with ASD (3 to 10 years), we found that the questionnaire differentiated well between the groups. The questionnaire may be used by health, education or social services professionals and represents a novel tool for recognizing sensory processing difficulties in children. Information gained from it can help plan additional supports for children with sensory challenges.

Ključne besede:
senzorna integracija, ocenjevanje, motnja senzorne predelave

Keywords:
sensory integration, assessment, sensory processing disorder

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Uvod

Motnja avtističnega spektra (v nadaljevanju bomo uporabili izraz avtizem) je nevrorazvojna motnja, za katero so značilne težave v socialni komunikaciji, socialni interakciji ter prisotnost ozkih in ponavljajočih se vzorcev vedenja, interesov in aktivnosti. Različne raziskave (Robertson in Simmons, 2013; Lane idr., 2010; Tavassoli idr., 2018) ugotavljajo, da imajo osebe z avtizmom pogosto posebnosti pri predelavi senzornih informacij. Sopojavnost avtizma in motnje senzorne predelave je med 45% do 96% (Dellapiazza idr., 2018; Schaaf in Lane, 2015; Jorquera-Cabrera idr., 2017; Thye idr., 2018; Ben-Sasson idr., 2009; Tomchek in Dunn, 2007). Na pomen prepoznavanja motnje senzorne predelave pri osebah z avtizmom kaže tudi dejstvo, da so senzorne posebnosti v peti izdaji Diagnostičnega in statističnega priročnika za diagnosticiranje duševnih motenj (*Diagnostic and Statistical Manual of Mental Disorders*, Fifth Edition – DSM-5; APA, 2013) zajete v enem od dveh osnovnih diagnostičnih kriterijev za motnjo avtističnega spektra. Premajhna ali prevelika odzivnost na senzorne prilive ali nenavadno zanimanje za senzorne dražljaje v okolju je v DSM-5 (APA, 2013) vključeno pod diagnostični kriterij B, skupaj z omejenimi, ponavljajočimi se vzorci vedenja, interesi ali aktivnostmi.
Motnje senzorne predelave so poleg tega eden od najzgodnejših pokazateljev avtizma. V vzdolžnih raziskavah Clifford idr. (2013) ter Germani idr. (2014), pri katerih so sledili napredku otrok od obdobja zgodnjega otroštva naprej, so avtorji ugotovili, da so motnje senzorne predelave, prepoznane pri 6 mesecih starosti eden od najbolj napovednih simptomov za kasnejši razvoj avtizma (Dellapiazza idr., 2018). Zaradi njihovega diagnostičnega pomena ter napovedne vrednosti motnje senzorne predelave je njihova ocena nepogrešljiv del diagnostičnega postopka pri otroku s sumom na avtizem, ne glede na starost. Opredelitev motnje senzorne predelave pri otrocih z avtizmom pa ni pomembna zgolj zaradi postavitve diagnoze, temveč tudi zaradi dejstva, da so senzorne posebnosti pri otrocih z avtizmom povezane z vsakodnevnim prilagoditvenim funkcioniranjem (Suarez, 2012, cit. po Dellapiazza idr., 2018) in vključevanjem v družinsko življenje (Schaaf idr., 2011). Prevelik odziv na taktilne prilive je povezan z rigidnim in nefleksibilnim vedenjem, ponavljanjem besed, vizualnimi stereotipijami ter s težavami na področju pozornosti doma in v šoli (Dellapiazza idr., 2018). Prevelik odziv na druge senzorne dražljaje (vidne in slušne) pa se pogosto povezuje z večjo pojavnostjo stereotipij, kompulzij in vedenjskih ritualov (Reynolds idr., 2012; Dellapiazza idr., 2018).

Pojavnost motnje senzorne predelave v obliki zmanjšane senzorne občutljivosti se je v nekaterih študijah, ki so jih v svoji pregledni raziskavi zajeli Glod idr. (2015), povezovala tudi z motnjami čustvene regulacije in razpoloženja (simptomi tesnobe in depresivnosti, simptomi motenj pozunanjenja), specifičnimi simptomi na področju govora in jezika (slabša socialna komunikacija, slabše splošne govorne sposobnosti) ter s specifičnimi težavami na področju drugih spoznavnih sposobnosti (simptomi motenj pozornosti, pretirana osredotočenost na podrobnosti, slabša skupna deljena pozornost). Iz strokovne literature je tako razvidno, da ocenjevanje motnje senzorne predelave ni pomembno le za diagnostično opredelitev ob sumu na avtizem, temveč tudi za prizadevanja namenjena izboljšanju kakovosti vsakodnevnega funkcioniranja otrok z avtizmom ter zmanjšanju njihovih drugih pridruženih težav. Otroci z avtizmom in motnjo senzorne predelave doživljajo šolsko okolje zelo stresno, saj njihove težave s predelavo vplivajo na samoregulacijo, kar pa vpliva na vključevanje v šolsko delo, igro z otroki med odmori in sodelovanje pri obrokih. Parham (1998) je v štiriletni longitudinalni študiji ugotovila povezavo med posebnostmi senzorne predelave in dosežki pri šolskem delu (zlasti pri branju in matematiki). Ugotovitve raziskave, v katero so Butera idr. (2020) vključili 52 otrok, starih od 8 do 14 let (26 nevrotipičnih otrok in 26 otrok z visoko funkcionalnim avtizmom), kažejo na pomembno povezanost učne uspešnosti otrok z avtizmom z njihovimi senzornimi posebnostmi. Otroci z bolj izraženimi senzornimi posebnostmi so učno manj uspešni. V raziskavi Butera idr. (2020) so senzorne značilnosti pojasnile pomemben delež variance v modelu napovedovanja učne uspešnosti. Kot najbolj vplivne so na učno uspešnost otrok navajali težave pri predelavi slušnih, taktilnih in vidnih prilivov (Butera idr., 2020; Ashburner idr., 2008).

Gentil-Gutiérrez idr. (2021) izpostavljajo, da šolsko okolje, ki je prilagojeno individualnim senzornim potrebam otrok z avtizmom, predstavlja podporni dejavnik. Strokovni delavci v vrtcu in šoli lahko bolj optimalno načrtujejo prilagoditve in nudijo pomoč otroku, če od staršev pridobijo še informacije o otrokovem funkcioniranju v domačem okolju, na katero vplivajo tudi posebnosti senzorne predelave. Tudi Šilc in Schmidt Krajnc (2022) izpostavljata, da lahko vodi dobro sodelovanje med šolo in starši v takih primerih do vzajemne koristi za vse deležnike. Hkrati pa imajo strokovni delavci v vrtcu in šoli pri prepoznavanju senzornih potreb otrok pomembno vlogo, saj so lahko eni prvih, ki opazijo, da se otrok srečuje z izzivi pri predelavi senzornih prilivov.

Pozno odkrivanje posebnosti na tem področju lahko zaradi negativnih šolskih izkušenj vodi v še večjo socialno izključenost otroka in težave z njegovim oz. njenim duševnim blagostanjem (Jeznik, 2022; Šilc in Schmidt Krajnc, 2022). Zaradi teh razlogov je odkrivanje senzornih posebnosti z veljavnimi, standardiziranimi ocenjevalnimi instrumenti pri otrocih z avtizmom lahko pomemben prispevek šolske svetovalne službe.

Diagnostično ocenjevanje motnje senzorne predelave pa ni pomembno zgolj pri otrocih z avtizmom oz. sumom na avtizem. Različne raziskave ugotavljajo, da je pojavnost motnje senzorne predelave pri predšolskih in osnovnošolskih nevrotipičnih otrocih med 5,3% in 16,5% (Ahn idr., 2004; Goldsmith idr., 2006; Ben-Sasson idr., 2009). Pri nekaterih skupinah otrok s posebnimi potrebami je pojavnost motnje senzorne predelave še večja kot pri nevrotipičnih otrocih. Mednje sodijo otroci z motnjo pozornosti in hiperaktivnostjo (Dunn in Bennett, 2002; Miller idr., 2012; Ghanizadeh, 2011; van der Linde idr., 2013), otroci s specifičnimi govornimi motnjami (van der Linde idr., 2013) ter otroci z razvojno motnjo koordinacije (Engel-Yeger in Segal, 2018; Allen in Casey, 2017). Kakovostna diagnostična orodja za ocenjevanje motnje senzorne predelave so zato pomembna tudi za širšo populacijo otrok in so lahko dobrodošla tudi v petstopenjskem modelu učne pomoči, saj lahko pedagoški delavci, ki imajo ustrezna dodatna znanja, otroku s srednje izraženimi odstopanji v senzorni predelavi, nudijo dodatno spodbudo in podporo z uporabo nekaterih senzornih strategij. Pri otrocih, ki imajo večja odstopanja, pa je lahko nudenje pomoči s strani pedagoških delavcev pomemben dodatek terapijam senzorne integracije, ki jih izvaja za to usposobljen terapevt.

Za diagnostično oceno motnje senzorne predelave se v vsakodnevni klinični praksi uporabljajo standardizirane in nestandardizirane oblike diagnostičnega ocenjevanja. Poleg opazovanja otroka v različnih okoljih (šola, dom, terapevtsko okolje) ter intervjuja s starši so lahko v veliko pomoč standardizirani vprašalniki, če so seveda dostopni. V svetu so med najbolj razširjenimi Sensory Profile – SP 2 (Dunn, 2014), Short Sensory Profile (McIntosh idr., 1999), Adolescent/Adult Sensory Profile (Brown in Dunn, 2002) in Sensory Processing Measure – (Parham idr., 2010). Ti merski instrumenti temeljijo na pridobivanju podatkov s strani staršev in/ali učiteljev/vzgojiteljev, ki na postavkah s pet- ali štiristopenjsko lestvico označijo pogostost vedenja značilnega za motnje senzorne predelave. Ocenjevanje s pomočjo takih standardiziranih vprašalnikov nam pri otrocih nudi celovitejši in natančnejši vpogled v njihovo senzorno predelavo in modulacijo, zavedanje telesa in praksijo

kot pa bi bil možen zgolj z nestrukturiranim opazovanjem in/ali intervjujem s starši/učitelji.

V Sloveniji do sedaj nismo imeli standardiziranih ocenjevalnih instrumentov za diagnostično ocenjevanje motnje senzorne predelave, zato smo se odločili oblikovati vprašalnik o otrokovi predelavi senzornih prilivov (VOP-SI) za predšolske (VOP-SIp) in osnovnošolske otroke (VOP-SIš). Pri razvoju vprašalnika VOP-SI smo preverili različne psihometrične značilnosti obeh vprašalnikov, ki so na kratko opisane v naslednjem poglavju, podrobneje pa v slovenskem priročniku vprašalnika (Gričar in Kovačič, 2020). Ocenili smo tudi kriterijsko veljavnost vprašalnika. Kot kriterij smo opredelili uporabnost vprašalnika za prepoznavanje težav pri predelavi senzornih prilivov pri otrocih z avtizmom, za katere je iz strokovne literature znano, da so zanje bolj značilni kot pri nevrotipičnih otrocih (McCormick idr., 2016; Jussila idr., 2020). Pričakovali smo, da bo vprašalnik VOP-SI občutljiv na večjo pojavnost motnje senzorne predelave pri otrocih z avtizmom na vseh zajetih področjih v vprašalniku. Če bi se vprašalnik res izkazal občutljiv za razlike med njimi in skupino nevrotipičnih otrok, bi to predstavljalo dodaten znanstveni argument za uporabo tega novega standardiziranega diagnostičnega pripomočka za prepoznavanje motnje senzorne predelave v Sloveniji.

Metode

Raziskovalni inštrumenti

VOP-SI temelji na teoriji senzorne integracije po Ayresovi (Bundy in Lane, 2020) in uporabnikom pomaga pridobiti informacije o pogostosti pojavljanja vedenj, ki so značilna za motnje senzorne predelave. VOP-SI lahko uporabljajo strokovnjaki s področja zdravstva, šolstva ali socialnega varstva (delovni terapevt, fizioterapevt, logoped, profesor specialne in rehabilitacijske pedagogike, specialni pedagog, psiholog), ki se strokovno ukvarjajo s predšolskimi ali šolskimi otroki in imajo opravljen vsaj uvodni del izobraževanja o senzorni integraciji ali seminar za ocenjevalce VOP-SI.

Zaradi razvojnih posebnosti otrok v predšolskem in šolskem obdobju smo oblikovali dve različici vprašalnika: za predšolske otroke (VOP-SIp), stare od dopolnjenih 3 let in 0 mesecev do 5 let in 11 mesecev, in za šolske otroke (VOP-SIš), stare od dopolnjenih 6 let in 0 mesecev do 10 let in 11 mesecev.

Oba vprašalnika poleg skupne lestvice motnje senzorne predelave vsebujeta lestvice, ki pokrivajo šest vsebinskih področij. Obliki se razlikujeta le po številu postavk (VOP-Sip = 42; VOP-SIš = 47) in nekoliko po njihovi vsebini, ki je prilagojena starosti otrok. Lestvice, ki ju vključujeta oba vprašalnika, so:

- ravnotežje,
- zavedanje telesa,
- ideje in načrtovanje gibanja,
- dotik,
- sluh,
- vonj in okus.

Starši oz. otrokovi skrbniki na vsako postavko s pomočjo petstopenjske lestvice odgovorijo, kako pogosto se določeno vedenje pojavlja pri njihovem otroku (nikoli, redko, včasih, pogosto in vedno). Na koncu ocenjevanja posameznega področja starši zapišejo še svoje mnenje o tem, ali težave na posameznem področju otroka ovirajo pri vključevanju v vsakdanje življenje.

Psihometrične značilnosti smo preverili v procesu standardizacije, ki smo jo izvedli na podlagi podatkov pridobljenih med letoma 2016 in 2018. Zanesljivost skupne lestvice (Težave senzorne integracije) vprašalnika VOP-SIp je bila dobra (Cronbach α_{xx} = 0,86), VOP-SIš pa izvrstna (Cronbach α_{xx} = 0,91). Zanesljivost posamičnih vsebinskih lestvic se je nahajala v razponu od zadostne (npr. Cronbach α_{xx} za lestvico dotik za predšolske otroke = 0,61) do dobre (npr. Cronbach α_{xx} za lestvico ideje in načrtovanje gibanja za šolske otroke = 0,85). Več o merskih značilnosti vprašalnika najdete v priročniku (Gričar in Kovačič, 2020).

Skupini udeležencev

Med otroki z avtizmom je v naši raziskavi kriterijske veljavnosti sodelovalo 27 predšolskih in 29 osnovnošolskih otrok, ki so bili obravnavani v Ambulanti za avtizem Pediatrične klinike UKC Ljubljana.

Za postavljanje diagnoze avtizma so bili uporabljeni klinični kriteriji po DSM-5 in diagnostični opazovalni shemi za avtizem (angl. – The Autism Diagnostic Observation Schedule – ADOS). Vsakemu izmed otrok z avtizmom smo s žrebom določili štiri otroke iz normativne skupine 789 otrok, ki so bili izenačeni po starosti in spolu. Tako smo v kontrolno skupino vključili 108 predšolskih otrok, starih od 3 do 5 let, ter 116 osnovnošolskih otrok, starih od 6 do 10 let (glej tabelo 1).

Tabela 1: Starostna in spolna porazdelitev skupin predšolskih in šolskih otrok z avtizmom ter njunih pripadajočih kontrolnih skupin

	Otroci z motnjo avtističnega spektra	Kontrolna skupina
Predšolski otroci		
N	27	108
Fantje / Dekleta (%)	81,5/18,5	81,5/18,5
Starost		
3 leta (N)	6	24
4 leta (N)	8	32
5 let (N)	13	52
Šolski otroci		
N	29	116
Fantje / Dekleta (%)	89,7/10,3	89,7/10,3
Starost		
6–7 let (N)	11	44
8–9 let (N)	15	60
10 let (N)	3	12

Potek raziskave

Pri izvedbi raziskave je sodelovalo 49 šol, 29 vrtcev in Ambulanta za avtizem Pediatrične klinike UKC Ljubljana. Vse udeležene ustanove so staršem posredovale dopis z opisom raziskave in soglasje za sodelovanje. Pri zbiranju podatkov za normativno skupino otrok smo Slovenijo najprej razdelili na štiri zemljepisna področja: severovzhod, jugovzhod, osrednji del in zahod. Nato smo v teh regijah naključno izbrali vrtce in osnovne šole. Vodstva vrtcev in šol smo poklicali in jih prosili za sodelovanje pri raziskavi, poslali smo jim dopis in obenem navezali stik tudi s svetovalnimi delavci, ki so kasneje (ob privolitvi sodelovanja) prevzeli vlogo koordinatorjev.

Pri novačenju otrok z motnjo avtističnega spektra smo prosili za sodelovanje Ambulanto za avtizem na Pediatrični kliniki UKC Ljubljana. Po soglasju vodstva je delovna terapevtka, ki je zaposlena v Ambulanti, staršem otrok, ki so prišli na pregled, dala dopis z opisom projekta in soglasje k sodelovanju. Starši otrok, ki so privolili v sodelovanje v raziskavi, so dobili ovojnico z anketnim vprašalnikom in priloženo ovojnico, v kateri so vodji raziskave poslali izpolnjen vprašalnik.

Zaradi manjšega odziva, kot smo ga pričakovali, smo anketne vprašalnike poslali tudi na naslove različnih društev za avtizem po Sloveniji, kot so Zavod Modri december, društvo Avtizem, društvo Oko, združenje Bodi zdrav in drugi. Društva so nato vprašalnike razdelila sodelujočim staršem, ki so rešene vprašalnike vrnili po pošti v priloženi ovojnici. Tudi zanje smo preverili, ali je bila pri njih podana diagnoza avtizma na podlagi DSM-5 kriterijev.
Našo raziskavo je odobrila Komisija Republike Slovenije za medicinsko etiko (številka 0120-549/2018/9).

Analiza podatkov
Primerjavo otrok z avtizmom z otroki kontrolne skupine smo opravili s paketom *greta* za programski jezik R+ (Golding, 2019), ki med drugim omogoča primerjavo skupin na osnovi Bayesove statistike tudi ob upoštevanju razlik v razpršenosti rezultatov med skupinami. Zaradi potencialnih razlik v razpršenosti rezultatov med skupinami, smo se za opredelitev moči učinkov odločili za uporabo mere velikosti Hedges *g*, pri kateri razliko med skupinama standardiziramo na podlagi standardne porazdelitve kontrolne skupine. Primerljivi parameter statistične pomembnosti razlik oz. verjetnosti alfa napake, v klasični statistiki opredeljene s pomočjo *p* vrednosti, je v skladu s smernicami o podajanju statističnih rezultatov, osnovanih na Bayesovi statistiki, podan kot delež posteriorne distribucije parametra, ki se med skupinama prekriva (*pd*). Razumemo jo lahko tudi kot verjetnost, da je razlika med skupinama v pričakovani smeri (Makowski idr., 2019).

Rezultati

Pri obeh starostnih skupinah so se pri udeležencih raziskave pokazale velike razlike med otroki z avtizmom ter otroki kontrolnih skupin (tabela 2). Tako pri predšolskih kot tudi osnovnošolskih otrocih z avtizmom so izstopale velike razlike na lestvicah ravnotežje, ideje in načrtovanje gibanja ter sluh. Težave pri zaznavanju lastnega telesa so bile bolj izražene le pri osnovnošolskih otrocih z avtizmom, zanje pa so bile bolj značilne tudi specifične težave pri predelavi senzornih dražljajev preko dotika.

Tabela 2: Razlike med otroki z avtizmom in otroki kontrolne skupine na lestvicah vprašalnika VOP-SI

	Otroci z avtizmom		Kontrolna skupina			
	M	*SD*	*M*	*SD*	*pd*	Hedges *g*
Predšolski otroci						
Ravnotežje	13,65	3,04	10,18	3,13	,021	1,11
Zaznavanje telesa	11,57	4,20	11,00	3,23	,441	0,18
Ideje in načrtovanje gibanja	16,75	2,58	10,74	3,08	< ,001	1,95
Dotik	11,35	3,79	10,41	3,13	,387	0,30
Sluh	13,45	3,21	10,39	2,81	,032	1,09
Vonj in okus	11,06	2,73	9,87	3,28	,224	0,36
Težave s senzorno integracijo	128,98	15,05	103,59	15,53	< 0,001	1,64
Osnovnošolski otroci						
Ravnotežje	12,47	3,52	9,68	3,03	,021	0,92
Zaznavanje telesa	13,52	3,34	10,57	2,88	,028	1,02
Ideje in načrtovanje gibanja	15,90	1,95	10,31	2,80	< ,001	1,99
Dotik	12,05	3,69	10,02	2,95	,097	0,69
Sluh	14,53	3,73	10,34	2,72	,006	1,54
Vonj in okus	11,34	4,30	10,11	3,01	,233	0,41
Težave s senzorno integracijo	128,21	15,57	101,71	13,23	< ,001	2,00

Opomba: Težave s senzorno integracijo – predstavlja rezultat na skupni lestvici vprašalnika VOP-SI; *pd* – delež posteriorne distribucije, ki se med skupinama prekriva.

Manjše razlike med predšolskimi in osnovnošolskimi otroki z avtizmom in njihovimi vrstniki v kontrolni skupini je bilo opaziti na lestvici vonj in okus, a velja opozoriti, da je skupina otrok z avtizmom v šolskem obdobju na tej lestvici izkazovala večjo razpršenost rezultatov. Na podlagi tega ter srednje velikih razlik bi bilo mogoče sklepati, da težave pri predelavi vonja in okusa niso prisotne pri večini, ampak le pri določenem deležu otrok z avtizmom, ki smo jih vključili v našo raziskavo.

Velike razlike, ki smo jih prepoznali med otroki klinične skupine otrok z avtizmom in otroki kontrolne skupine, so nas spodbudile k temu, da smo podrobneje preučili, kako dobro težave pri predelavi senzornih prilivov napovedujejo prisotnost diagnoze avtizem. Za različne kritične vrednosti (od 13 do 19 izravnanih točk oz. od 110 do 145 standardnih točk na skupni lestvici) smo zato opredelili napovedno moč vprašalnika pri napovedovanju diagnoze avtizma s pomočjo pozitivne in negativne napovedne vrednosti, torej deleža pravilno prepoznanih otrok ter deleža otrok, za katerega je pričakovati, da bodo napačno uvrščeni med otroke z avtizmom. Ugotovitve posredujemo v prilogi članka v tabelah P1 in P2.

Pri naši analizi napovedne moči vprašalnika za prepoznavo otrok z avtizmom smo bili pozorni tudi na dejstvo, da napovedna moč vprašalnika ni odvisna le od njegovih merskih značilnosti in kriterijske veljavnosti, temveč tudi od pojavnosti motnje v skupini otrok, pri kateri vprašalnik uporabljamo (Labarge idr., 2003).

Zaradi tega v tabelah P1 in P2 navajamo pozitivno in negativno napovedno vrednost posameznih kritičnih vrednosti ob različni stopnji pojavnosti avtizma (1%, 5%, 10%, 15%, 30%, 50% in 75%). Iz teh tabel je razvidno, da lahko vprašalnik v okoliščinah, kjer je pojavnost avtizma pri populaciji otrok med 10 do 30% (npr. v klinično psihološki ambulanti Centra za mentalno zdravje otrok in mladostnikov), služi kot dopolnilno orodje pri diagnosticiranju motnje. Manj uporaben pa je lahko v ta namen v splošni populaciji (npr. šolski svetovalni službi) ali pa kliničnih enotah, namenjenih obravnavi otrok z avtizmom. V prvem primeru bi njegova uporaba lahko privedla do prevelikega števila lažno pozitivno prepoznanih otrok z avtizmom, v drugem primeru pa k neustreznim izključitvam diagnoze avtizem. V teh primerih je ustreznejše, da se vprašalnik uporablja kot vir dodatnih informacij o specifičnih težavah pri predelavi senzornih prilivov in možnostih njihove obravnave, manj smiselno pa ga je uporabljati za postavitev oz. izključitev diagnoze avtizem.

Razprava in zaključki

Skupna lestvica predšolske ter osnovnošolske oblike vprašalnika VOP-SI je v naši raziskavi pokazala velike razlike v motnji senzorne predelave med otroki z avtizmom in vrstniki kontrolne skupine. Pri osnovnošolskih otrocih je bil obseg motnje senzorne predelave kar za dva, pri predšolskih otrocih pa za nekaj več kot en standardni odklon in pol večji. Podobne velikosti učinka so opisane tudi v predhodnih raziskavah (Ben-Sasson idr., 2009; Tomchek in Dunn, 2007) in kažejo, da skupen obseg motnje senzorne predelave otroke z avtizmom bistveno razlikuje od njihovih nevrotipičnih vrstnikov. Velikosti učinka, ki smo ju dokumentirali ter zanesljivost skupne lestvice obeh oblik vprašalnika VOP-SI nam vzbuja zaupanje, da je z vprašalnikom VOP-SI mogoče učinkovito diagnosticirati prisotnost enega od osrednjih diagnostičnih kriterijev avtizma, še posebej kadar delamo s populacijo otrok, v kateri se pojavnost avtizma giblje med 10 in 30%.

Občutljivost vprašalnika za razlike na posameznih področjih motnje senzorne predelave je bila manjša, a pri osnovnošolskih otrocih še vedno dovolj velika na štirih področij od šestih, ki jih vprašalnik VOP-SI ocenjuje. Med njimi so bila področja ravnotežja, zaznavanja telesa, idej in načrtovanja gibanja ter sluha. Velikost razlik na področju gibalnih spretnosti, ravnotežja in zaznavanja telesa se ujemajo tudi z ugotovitvami Lane idr. (2010), ne pa tudi z ugotovitvami nekaterih drugih avtorjev

(Tomchek in Dunn, 2007; Lane idr., 2010), ki so s pomočjo Sensory profile in njegove krajše različice – Short Sensory Profile največje razlike dokumentirali na področjih preobčutljivosti na zvočne dražljaje ter iskanja senzorne stimulacije (slednjega pri našem vprašalniku nismo preverjali).

Manjše, manj prepričljive razlike med otroki z avtizmom in nevrotipičnimi vrstniki smo zasledili tudi pri predelavi senzornih prilivov na področju dotika ter vonja in okusa. Podobno so tudi Lane idr. (2009) ugotovili, da je bilo število udeležencev s prevelikim odzivom na vonj in okus približno enako tistemu številu, ki niso imeli težav na tem področju. Drugi avtorji pa so ugotovili večje skupinske razlike pri pretiranem odzivu na vonj in dotik (Malhi idr., 2021; Hilton idr., 2010). Pri tem velja izpostaviti razpršitev rezultatov na teh dveh področjih v naši raziskavi. Največja je bila pri otrocih z avtizmom, kar nas navaja na misel, da so bili vključeni otroci z avtizmom glede na te značilnosti senzorne predelave med seboj bolj raznoliki kot na večini drugih področij. Temu v prid govori tudi raziskava Panerai idr. (2020), ki kaže, da se motnje senzorne predelave na področju vonja pojavljajo le pri ožji podskupini otrok z avtizmom, ki pa se obenem srečujejo tudi s pomembnimi težavami pri uživanju hrane.

Pri predšolskih otrocih z avtizmom smo podobno kot pri osnovnošolskih otrocih z avtizmom dokumentirali največje razlike na področjih ravnotežja, idej in načrtovanja gibanja ter sluha. Na lestvicah zaznavanja telesa, dotika ter vonja in okusa pa so bile razlike manjše in niso dosegle ravni, kjer bi glede na število vključenih otrok lahko v naši raziskavi zanesljivo dokazali, da se pomembno razlikujejo od otrok kontrolne skupine. O'Donnell idr. (2012) so tudi ugotovili, da se pri predšolskih otrocih pri več kot polovici otrok pokaže odstopanje za več kot en standardni odklon na področju sluha, vendar v nasprotju z našo raziskavo isti avtorji ugotavljajo to tudi za področje dotika, okusa in vonja. Tudi Ben-Sasson idr. (2007) so ugotovili večje razlike med predšolskimi otroci z avtizmom in njihovimi vrstniki v modulaciji, vendar je potrebno izpostaviti, da so avtorji uporabili Infant/Toddler Sensory Profil, ki se ga uporablja za otroke stare med 7 in 36 mesecev.

Z ozirom na ugotovljeno občutljivost splošne in specifičnih lestvic vprašalnika VOP-SI za razlike v motnji senzorne predelave med otroki z avtizmom in nevrotipičnimi otroki ter njihovo zanesljivost ocenjujeva, da VOP-SIp in VOP-Slš predstavljata pomemben doprinos h klinični praksi na področju zdravstva ter v pedagoški praksi na področju vzgoje in izobraževanja v Sloveniji.

Omogočata, da učinkovito izkoristimo vpogled staršev v vsakodnevno delovanje otrok za prepoznavanje motnje senzorne predelave in oblikovanje ustreznih intervencij, ki lahko izboljšajo kakovost življenja otrok z motnjo senzorne predelave in njihovih družin.

Kljub velikemu številu raziskav, ki ugotavljajo pojavnost motnje senzorne predelave pri različnih populacijah in njen vpliv na vsakdanje življenje, senzorne intervencije obsegajo različne prakse, ki niso dosledno predstavljene (Case-Smith idr., 2015). V grobem bi lahko vrste pomoči razdelili na terapijo senzorne integracije po Ayresovi (ASI) in na senzoriki temelječe pristope. Terapijo ASI izvaja terapevt s certifikatom senzorne integracije z upoštevanjem meril za izvedbo (Parham, 2011), ki vsebujejo tudi kriterije glede opremljenosti terapevtskega prostora. Schaaf idr. (2013) so z randomizirano in slepo raziskavo opravili pomemben premik glede dvomov o učinkovitosti ASI, saj ugotavljajo, da se pri otrocih z avtizmom po uporabi ASI terapije, ki se izvaja v ustrezno opremljenem terapevtskem prostoru, izboljša vsakdanje delovanje in zmanjša neustrezno vedenje.

Na senzoriki temelječi pristopi obsegajo različne tehnike, ki jih učiteljice in druge strokovnjakinje v šolskem okolju lahko uporabijo pri otrocih s težavami senzorne modulacije (prevelikim ali premajhnim odzivom). Da bi izboljšali vedenjske odzive na različne senzorne prilive se v otrokovo dnevno rutino praviloma vključi različne strategije. Nekaj splošnih strategij, ki jih lahko uporabimo za umirjanje v primeru prevelikega odziva na senzorne dražljaje, je: globok pritisk, uporaba masažnih aparatov, nežno žvižganje, tiha, počasna glasba, nežne barve in svetloba, počasno, ritmično gibanje, guganje, gibanje proti sili težnosti, vonj lavande in kamilice. Nekaj splošnih strategij, ki jih lahko uporabimo za dviganje vzdražnosti (v primeru premajhnega odziva): žgečkanje, glasna, neritmična glasba, vrtenje, neenakomerno gibanje, vibracije, citrusi, mint, led, začinjena, grenka, hrustljava hrana. Aktivnosti, kjer so pri gibanju proti sili gravitacije vključene večje mišične skupine, npr. vlečenje vrvi, kolesarjenje, rolanje, igre z žogo ipd., delujejo v obe smeri – lahko umirjajo ali pa spodbujajo višjo vzdražnost (Gričar, 2022).

Slabost na senzoriki temelječih pristopov je v tem, da zaenkrat ni znanstveno prepričljivih dokazov o njihovi učinkovitosti. Case-Smith idr. (2015) na podlagi ugotovitev sistematičnega pregleda, izpostavijo, da uporaba ene posamezne senzorne strategije v šolskem okolju mogoče ne bo učinkovita, zlasti če ta ni prilagojena potrebam posameznega otroka.

Potrebno je sodelovanje otroka, pedagoškega tima, terapevta senzorne integracije in staršev, ki velikokrat intuitivno prilagodijo okolje in vnesejo določene strategije v družinsko rutino, zato da lahko otrok v šoli lažje funkcionira. Pri oblikovanju pomoči pa je pomembno prepoznati senzorne posebnosti s standardiziranimi instrumenti in ne zgolj z nestandardiziranimi opazovanji in vprašalniki.

Obenem meniva, da so za aktualni različici vprašalnikov VOP-SIp in VOP-SIš značilne tudi nekatere pomanjkljivosti, ki jih velja v bodočih revizijah izboljšati. VOP-SI temelji na podatkih o senzorni predelavi, ki jih pridobimo od staršev, saj v Sloveniji trenutno še nimamo različice, ki bi bila namenjena ocenjevanju motnje senzorne predelave v šolskem okolju. V prihodnje bi bilo zato smiselno razviti različico, ki bi omogočala, da svoja opažanja o otrokovih težavah pri predelavi senzornih prilivov lahko sistematično in objektivno posredujejo vzgojiteljice in vzgojitelji ter učiteljice in učitelji. Poleg tega bi bilo pomembno izboljšati občutljivost VOP-SI na nekaterih področjih motnje senzorne predelave (dotik, vonj/okus), na katerih strokovna literatura pogosto navaja večja odstopanja pri otrocih z avtizmom, kot smo jih zaznali v naši raziskavi. VOP-SI tako ostaja ocenjevalni instrument, ki ga želimo v Sloveniji razvijati naprej tudi v bodoče.

Prav tako meniva, da bi bilo za dopolnitev naših dosedanjih spoznanj o diagnostični občutljivosti VOP-SI našo raziskavo potrebno razširiti na več načinov. Vključitev večjega števila otrok z avtizmom bi nam zagotovila večjo statistično moč in s tem natančnejšo oceno razlik na specifičnih področjih (npr. dotik, vonj/okus), kjer smo v naši raziskavi zaznali manjše razlike. Poleg tega bi bilo v sklop nadaljnjih raziskovalnih prizadevanj z VOP-SI smiselno vključiti tudi druge skupine otrok s posebnimi potrebami, za katere literatura navaja posebnosti pri predelavi senzornih prilivov. Med njimi bi bilo dobro tudi preveriti, kako pogosto in v kašnem obsegu se motnja senzorne predelave na področju vonja in dotika povezuje s težavami s prehrano in/ali z odvajanjem blata, kot je to opisano v tuji strokovni literaturi (Beaudry-Bellefeuille in Lane, 2017; Panerai idr., 2020). Ne nazadnje bi bilo na podlagi izkušenj tujih avtorjev pri raziskovanju motnje senzorne predelave smotrno uporabiti tudi zahtevnejše metodološke pristope, kot so analiza latentnih razredov, mešani modeli ter druge statistične metode, namenjene statističnemu razčlenjevanju fenotipske raznolikosti ter prepoznavanju podskupin otrok s specifičnim profilom motnje senzorne predelave. Priložnosti za raziskovanja z VOP-SI zato ostaja veliko.

Napredek, ki bo privedel do hitrejšega prepoznavanja motnje senzorne predelave in usmeritve otrok v ustrezne oblike pomoči bo temeljil na spremembi klinične in pedagoške prakse, novih raziskovalnih spoznanjih ter jasni teoretični utemeljitvi in opredelitvi motnje senzorne predelave. Vključitev VOP-SI v slovensko strokovno okolje ponuja možnost, da naredimo v tej smeri več pomembnih korakov.

Summary

In addition to difficulties with social communication and behavioral flexibility, children with autism spectrum disorder (ASD) often experience difficulty responding to sensory inputs. Although occupational therapists across the globe use a range of diagnostic tools, including questionnaires, to assess the nature of a child's sensory issues, no such questionnaires currently exist in Slovenia. We therefore developed the "Questionnaire on Children's Processing of Sensory Input" ["Vprašalnik o otrokovi predelavi senzornih prilivov"] (VOP-SI) in both a preschool (VOP-SIp) and a school-aged format (VOP-SIš). The preschool format (3 years and 0 months to 5 years and 11 months) includes 42 items, while the school-aged format (6 years and 0 months to 10 years and 11 months) consists of 47 items. These are divided into six domains: Vestibular, Body Perception, Ideation and Planning, Processing of Tactile Auditory Olfactory and Gustatory Stimuli. Both forms can be completed by either the child's parents or legal guardians by rating the items on a five-point rating scale.

Our validation study of the VOP-SI included 27 preschoolers and 29 school-aged children with ASD, with each child being assigned four neurotypical children of the same age and gender from a control group (108 preschoolers and 116 school-aged children). We analyzed the psychometric properties and discriminative ability of the two forms using the R language for statistical computing (R Core Team, 2021) and the "greta" R package (Golding, 2019).

Our analysis of the reliability of the VOP-SI showed the total scores on the preschool form had good (Cronbach $\alpha = 0{,}86$), while the those on the school-aged form had excellent reliability (Cronbach $\alpha = 0{,}91$).

The internal consistency of domains scales ranged from acceptable for preschool form of the Tactile Processing Scale (Cronbach $\alpha = 0{,}61$) to good for the school-aged form of the Ideation and Planning Scale (Cronbach $\alpha = 0{,}85$).

The VOP-SI total scores discriminated well between the ASD and control groups, with differences ranging between one-and-a-half to two standard deviations, comparable to studies with similar assessment tools (Ben-Sasson et al., 2009; Tomchek and Dunn, 2007). The differences on the individual domain scales were also large for the Vestibular, Body Perception, Ideation and Planning and Auditory scales (Hodges g = 0,92 to 1,99). However, in contrast to several other studies (Malhi et al., 2021; Hilton et al., 2010) the differences on the Tactile and Taste/Smell Processing scales were of small to medium size (Hodges g = 0,18 to 0,69).

Sensory processing issues may impact multiple domains of daily life, as well as participation in the classroom. Children with sensory processing difficulties have been found to have lower grades in both reading and math compared to neurotypical children (Parham, 1998). Participation in these learning and other school activities can present a significant challenge for children with ASD, especially because of their difficulties processing auditory, tactile, and visual stimuli (Butera et al., 2020; Ashburner et al., 2008). The most widely used interventions for children with ASD and sensory processing difficulties are sensory integration therapy and sensory based interventions. Sensory integration therapy is a clinic-based and child-centered intervention originally developed by Ayres (1972). Sensory-based interventions are designed to support a child's self-regulation and often take place in schools and educational centers. Sensory based interventions have thus far had mixed success improving children's participation in academic tasks or have been found to be less effective than behavioral interventions at decreasing challenging behaviors (Case-Smith et al., 2015). Nonetheless, valid, reliable assessment tools are an important starting point for planning appropriate and individualized interventions.

Our study demonstrates that both versions of the VOP-SI represent important additions to the diagnostic toolbox of occupational therapists and other professionals working with children with neurodevelopmental disorders in Slovenia. We hope to add to our current efforts by developing a teacher report form of the VOP-SI and by improving the sensitivity of the items in our Tactile and Taste/Smell Processing scales.

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Literatura

Ahn, R. R., Miller, L. J., Milberger, S., in McIntosh, D. N. (2004). Prevalence of parents' perceptions of sensory processing disorders among kindergarten children. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association*, *58*(3), 287–293. https://doi.org/10.5014/ajot.58.3.287.

Allen, S., in Casey, J. (2017). Developmental coordination disorders and sensory processing and integration: Incidence, associations and co-morbidities. *British Journal of Occupational Therapy*, *80*(9), 549–557. https://doi.org/10.1177/0308022617709183

American Psychiatric Association. (2013). *Diagnostic and Statistical Manual of Mental Disorders*. (5th ed.). Arlington, VA: APA.

Ashburner, J., Ziviani, J., in Rodger, S. (2008). Sensory processing and classroom emotional, behavioral, and educational outcomes in children with autism spectrum disorder. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association*, *62*(5), 564–573. https://doi.org/10.5014

Beaudry-Bellefeuille, I., in Lane, S. J. (2017). Examining Sensory Overresponsiveness in Preschool Children With Retentive Fecal Incontinence. *The American journal of occupational therapy : official publication of the American Occupational Therapy Association*, *71*(5), 7105220020p1–7105220020p8. https://doi.org/10.5014/ajot.2017.022707

Ben-Sasson, A., Hen, L., Fluss, R., Cermak, S. A., Engel-Yeger, B., in Gal, E. (2009). A meta-analysis of sensory modulation symptoms in individuals with autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *39*(1), 1–11. https://doi.org/10.1007/s10803-008-0593-3

Brown, C., in Dunn, W. (2002). *Adult/adolescent sensory profile: User's manual*. San Antonio: Psychological Corporation.

Butera, C., Ring, P., Sideris, J., Jayashankar, A., Kilroy, E., Harrison, L., Cermak, S., in Aziz-Zadeh, L. (2020). Impact of Sensory Processing on School Performance Outcomes in High Functioning Individuals with Autism Spectrum Disorder. *Mind, Brain and Education: The Official Journal of the International Mind, Brain, and Education Society, 14*(3), 243–254. https://doi.org/10.1111/mbe.12242

Case-Smith, J., Weaver, L. L., in Fristad, M. A. (2015). A systematic review of sensory processing interventions for children with autism spectrum disorders. *Autism : the international journal of research and practice*, *19*(2), 133–148. https://doi.org/10.1177/1362361313517762

Clifford, S. M., Hudry, K., Elsabbagh, M., Charman, T., in Johnson, M. H. (2013). Temperament in the first 2 years of life in infants at high-risk for autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *43*(3), 673–686. https://doi.org/10.1007/s10803-012-1612-y

Dellapiazza, F., Vernhet, C., Blanc, N., Stephanie, M., Richard, S., in Baghdadli, A. (2018). Links between sensory processing, adaptive behaviours, and attention in children with autism spectrum disorder: A systematic review. In *Psychiatry Research*, *270*, 78–88). https://doi.org/10.1016/j.psychres.2018.09.023

Dunn W. (2014). *Sensory Profile 2*. Bloomington, MN: Pearson Psychcorp.

Dunn, W., in Bennett, D. (2002). Patterns of sensory processing in children with Attention Deficit Hyperactivity Disorder. *Occupational Therapy Journal of Research*, *22*(1), 4–15. https://doi.org/10.1177/153944920202200102

Engel-Yeger, B., in Segal, D. (2018). Sensory processing difficulties (SPD) and their relation to motor performance and to child's perceived competence among children with developmental coordination disorders. *International Physical Medicine & Rehabilitation Journal*, *3*(2), 120–126. https://doi.org/10.15406/ipmrj.2018.03.00088

Gentil-Gutiérrez, A., Cuesta-Gómez, J. L., Rodríguez-Fernández, P., in González-Bernal, J. J. (2021). Implication of the Sensory Environment in Children with Autism Spectrum Disorder: Perspectives from School. *International journal of environmental research and public health*, *18*(14), 7670. https://doi.org/10.3390/ijerph18147670

Germani, T., Zwaigenbaum, L., Bryson, S., Brian, J., Smith, I., Roberts, W., Szatmari, P., Roncadin, C., Sacrey, L. A. R., Garon, N., in Vaillancourt, T. (2014). Brief Report: Assessment of Early Sensory Processing in Infants at High-Risk of Autism Spectrum Disorder. *Journal of Autism and Developmental Disorders, 44*(12), 3264–3270. https://doi.org/10.1007/s10803-014-2175-x

Ghanizadeh, A. (2011). Sensory processing problems in children with ADHD, a systematic review. In *Psychiatry Investigation*, *8* (2), 89–94). https://doi.org/10.4306/pi.2011.8.2.89

Glod, M., Riby, D.M., Honey, E. in Rodgers, J. (2015). Psychological Correlates of Sensory Processing Patterns in Individuals with Autism Spectrum Disorder: A Systematic Review. Review. *Journal of Autism and Developmental Disorders, 2*, 199–221. https://doi.org/10.1007/s40489-015-0047-8

Golding, (2019). greta: simple and scalable statistical modelling in R. *Journal of Open Source Software, 4*(40), 1601, https://doi.org/10.21105/joss.01601

Goldsmith, H. H., Van Hulle, C. A., Arneson, C. L., Schreiber, J. E., in Gernsbacher, M. A. (2006). A population-based twin study of parentally reported tactile and auditory defensiveness in young children. *Journal of Abnormal Child Psychology*, *34*(3), 393–407. https://doi.org/10.1007/s10802-006-9021-3

Gričar, N. (2022). Pomen poznavanja senzornih profilov za duševno ravnovesje vzgojitelja oz. učitelja in otroka. In K. Alič (Ed.), *Spodbujanje in opolnomočenje za osebno rast: pozitivna psihologija od igralnice do predavalnice* (56–60). Osnovna šola Brezovica pri Ljubljani. https://os-brezovica.splet.arnes.si/files/2022/04/Zbornik-Konferenca-2022.pdf, (Dostopno: 24. 7. 2022.)

Gričar, N., in Kovačič, A. (2020). *Vprašalnik o otrokovi predelavi senzornih prilivov: VOP-SI: priročnik* (D. Gosar & D. Boben, Eds.). Center za psihodiagnostična sredstva.

Hilton, C. L., Harper, J. D., Kueker, R. H., Lang, A. R., Abbacchi, A. M., Todorov, A., in Lavesser, P. D. (2010). Sensory responsiveness as a predictor of social severity in children with high functioning autism spectrum disorders. *Journal of Autism and Developmental Disorders*, *40*(8), 937–945. https://doi.org/10.1007/s10803-010-0944-8

Jeznik, K. (2022). Inkluzivnost dodatne podpore in pomoči za učence. *Revija Za Elementarno Izobraževanje*, *15*(1), 71–90. doi:10.18690/rei.15.1.71-90.2022

Jorquera-Cabrera, S., Romero-Ayuso, D., Rodriguez-Gil, G., in Triviño-Juárez, J. M. (2017). Assessment of sensory processing characteristics in children between 3 and 11 years old: A systematic review. In *Frontiers in Pediatrics*, *5*. https://doi.org/10.3389/fped.2017.00057

Jussila, K., Junttila, M., Kielinen, M., Ebeling, H., Joskitt, L., Moilanen, I., in Mattila, M. L. (2020). Sensory Abnormality and Quantitative Autism Traits in Children With and Without Autism Spectrum Disorder in an Epidemiological Population. *Journal of Autism and Developmental Disorders*, *50*(1), 180–188. https://doi.org/10.1007/s10803-019-04237-0

Labarge, A. S., McCaffrey, R. J., in Brown, T. A. (2003). Neuropsychologists' abilities to determine the predictive value of diagnostic tests. *Archives of Clinical Neuropsychology*, *18*(2), 165–175. https://doi.org/10.1016/S0887-6177(01)00193-7

Lane, A. E., Young, R. L., Baker, A. E. Z., in Angley, M. T. (2010). Sensory processing subtypes in autism: Association with adaptive behavior. *Journal of Autism and Developmental Disorders*, *40*(1), 112–122. https://doi.org/10.1007/s10803-009-0840-2

Luisier, A. C., Petitpierre, G., Ferdenzi, C., Bérod, A. C., Giboreau, A., Rouby, C., in Bensafi, M. (2015). Odor perception in children with Autism Spectrum Disorder and its relationship to food neophobia. *Frontiers in Psychology*, *6*(DEC), 1–10. https://doi.org/10.3389/fpsyg.2015.01830

Makowski, D., Ben-Shachar, M. S., Chen, S. H. A., in Lüdecke, D. (2019). Indices of Effect Existence and Significance in the Bayesian Framework. *Frontiers in Psychology, 10*, 2767. https://doi.org/10.3389/fpsyg.2019.02767

Malhi, P., Saini, S., Bharti, B., Attri, S., in Sankhyan, N. (2021). Sensory Processing Dysfunction and Mealtime Behavior Problems in Children With Autism. *Indian Pediatrics*, *58*(9), 842–845. https://doi.org/10.1007/s13312-021-2305-4

McCormick, C., Hepburn, S., Young, G. S., in Rogers, S. J. (2016). Sensory symptoms in children with autism spectrum disorder, other developmental disorders and typical development: A longitudinal study. *Autism*, *20*(5), 572–579. https://doi.org/10.1177/1362361315599755

Miller, L. J., Anzalone, M. E., Lane, S. J., Cermak, S. A., in Osten, E. T. (2007). Concept evolution in sensory integration: A proposed nosology for diagnosis. *American Journal of Occupational Therapy*, *61*(2), 135–142. https://doi.org/10.5014/ajot.61.2.135

Miller, L. J., Nielsen, D. M., in Schoen, S. A. (2012). Attention deficit hyperactivity disorder and sensory modulation disorder: A comparison of behavior and physiology. *Research in Developmental Disabilities*, *33*(3), 804–818. https://doi.org/10.1016/j.ridd.2011.12.005

O'Donnell, S., Deitz, J., Kartin, D., Nalty, T., in Dawson, G. (2012). Sensory processing, problem behavior, adaptive behavior, and cognition in preschool children with autism spectrum disorders. *American Journal of Occupational Therapy, 66*(5), 586–594. https://doi.org-/10.5014/ajot.2012.004168.

Panerai, S., Ferri, R., Catania, V., Zingale, M., Ruccella, D., Gelardi, D., Fasciana, D., in Elia, M. (2020). Sensory profiles of children with autism spectrum disorder with and without feeding problems: A comparative study in Sicilian subjects. *Brain Sciences*, *10*(6). https://doi.org/10.3390/brainsci10060336

Parham, L. D. (1998). The relationship of sensory integrative development to achievemnet in elementary students: Four year longitudinal patterns. *Occupational Therapy Journal of Research*, *18*, 105–127. https://doi.org/10.5014/ajot.61.2.135

Parham, L. D., Roley, S. S., May-Benson, T. A., Koomar, J., Brett-Green, B., Burke, J. P., Cohn, E. S., Mailloux, Z., Miller, L. J., in Schaaf, R. C. (2011). Development of a fidelity measure for research on the effectiveness of the Ayres Sensory Integration intervention. *The American Journal of Occupational Therapy*, *65*(2), 133–142. https://doi.org/10.5014/ajot.2011.000745

Reynolds, S., Millette, A., in Devine, D. P. (2012). Sensory and motor characterization in the postnatal valproate rat model of autism. *Developmental Neuroscience*, *34*(2–3), 258–267. https://doi.org/10.1159/000336646

R Core Team (2021). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. Pridobljeno s URL https://www.R-project.org/, (Dostopno: 24. 7. 2018.)

Robertson, A. E., in Simmons, D. R. (2013). The Relationship between Sensory Sensitivity and Autistic Traits in the General Population. *Journal of Autism and Developmental Disorders, 43*, 775–784. https://doi.org/10.1007/s10803-012-1608-7

Schaaf, R. C., Benevides, T., Mailloux, Z., Faller, P., Hunt, J., van Hooydonk, E., Freeman, R., Leiby, B., Sendecki, J., in Kelly, D. (2014). An intervention for sensory difficulties in children with autism: a randomized trial. *Journal of Autism and Developmental Disorders, 44*(7), 1493–1506. https://doi.org/10.1007/s10803-013-1983-8

Schaaf, R. C., in Lane, A. E. (2015). Toward a Best-Practice Protocol for Assessment of Sensory Features in ASD. *Journal of Autism and Developmental Disorders*, *45*(5), 1380–1395. https://doi.org/10.1007/s10803-014-2299-z

Schaaf, R. C., Toth-Cohen, S., Johnson, S. L., Outten, G., & Benevides, T. W. (2011). The everyday routines of families of children with autism: Examining the impact of sensory processing difficulties on the family. *Autism*, *15*(3), 373–389. https://doi.org/10.1177/13-62361310386505

Šilc, M., in Schmidt, M. (2022). Izzivi vzgojno-izobraževalne inkluzije učencev z avtističnimi motnjami v osnovnih šolah. *Revija Za Elementarno Izobraževanje*, *15*(2), 181–198. doi:10.18690/rei.15.2.181-198.2022

Tavassoli, T., Miller, L. J., Schoen, S. A., Jo Brout, J., Sullivan, J., in Baron-Cohen, S. (2018). Sensory reactivity, empathizing and systemizing in autism spectrum conditions and sensory processing disorder. *Developmental Cognitive Neuroscience*, *29*, 72–77. https://doi.org/10.10-16/j.dcn.2017.05.005

Thye, M. D., Bednarz, H. M., Herringshaw, A. J., Sartin, E. B., in Kana, R. K. (2018). The impact of atypical sensory processing on social impairments in autism spectrum disorder. In *Developmental Cognitive Neuroscience*, *29*,151–167) https://doi.org/10.1016/j.dcn.2017.04.010

Tomchek, S. D., in Dunn, W. (2007). Sensory processing in children with and without autism: a comparative study using the short sensory profile. *American Journal of Occupational Therapy*, *61*(2), 190–200. https://doi.org/10.5014/ajot.61.2.190

Linde, J.V., Franzsen, D., in Barnard-Ashton, P. (2013). The sensory profile: Comparative analysis of children with Specific Language Impairment, ADHD and autism. *South African Journal of Occupational Therapy, 43, 34-40.*

Pridobljeno s http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S2310-383320130003000-06&lng=en&nrm=iso. (Dostopno: 24. 7. 2021.)

Worthen E. (2010). Sensory-based interventions in the general education classroom: A critical appraisal of the topic. *Journal of Occupational Therapy*, *Schools, & Early Intervention*, *3*(1), 76–94. https://doi.org/10.1080/19411241003684217

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Priloga: Tabela P1: Pozitivna in negativna napovedna vrednost lestvic vprašalnika VOP-SIp pri različni stopnji pojavnosti avtizma

	Pojavnost avtizma						
	1 %	5 %	10 %	15 %	30 %	50 %	75 %
Ravnotežje							
PPV							
IT_19	1,000	1,000	1,000	1,000	1,000	1,000	1,000
IT_18	1,000	1,000	1,000	1,000	1,000	1,000	1,000
IT_17	0,112	0,398	0,582	0,689	0,843	0,926	0,974
IT_16	0,083	0,319	0,498	0,611	0,793	0,899	0,964
IT_15	0,067	0,274	0,443	0,558	0,754	0,877	0,956
IT_14	0,033	0,152	0,274	0,375	0,593	0,773	0,911
IT_13	0,024	0,114	0,213	0,301	0,511	0,709	0,880
NPV							
IT_19	0,990	0,952	0,903	0,855	0,708	0,509	0,257
IT_18	0,991	0,957	0,913	0,869	0,731	0,538	0,280
IT_17	0,992	0,960	0,918	0,876	0,745	0,556	0,294
IT_16	0,993	0,963	0,924	0,885	0,760	0,575	0,311
IT_15	0,994	0,969	0,937	0,903	0,793	0,622	0,354
IT_14	0,993	0,967	0,932	0,897	0,781	0,605	0,338
IT_13	0,993	0,966	0,932	0,895	0,779	0,602	0,335
Zaznavanje telesa							
PPV							
IT_19	0,144	0,468	0,650	0,747	0,878	0,944	0,980
IT_18	0,053	0,227	0,382	0,496	0,705	0,848	0,944
IT_17	0,063	0,260	0,426	0,541	0,741	0,870	0,953
IT_16	0,039	0,173	0,307	0,413	0,630	0,799	0,923
IT_15	0,034	0,155	0,280	0,382	0,600	0,778	0,913
IT_14	0,023	0,110	0,207	0,293	0,502	0,702	0,876
IT_13	0,018	0,087	0,167	0,241	0,436	0,643	0,844
NPV							
IT_19	0,991	0,953	0,906	0,859	0,714	0,517	0,263
IT_18	0,991	0,953	0,905	0,858	0,713	0,515	0,262
IT_17	0,991	0,956	0,911	0,866	0,727	0,533	0,276
IT_16	0,991	0,957	0,913	0,868	0,731	0,538	0,279
IT_15	0,993	0,962	0,923	0,883	0,757	0,572	0,308
IT_14	0,992	0,960	0,920	0,878	0,748	0,560	0,298
IT_13	0,992	0,961	0,921	0,880	0,750	0,563	0,300
Ideje in načrtovanje gibanja							
PPV							
IT_19	0,360	0,746	0,861	0,908	0,960	0,982	0,994
IT_18	0,239	0,620	0,775	0,846	0,930	0,969	0,989
IT_17	0,193	0,555	0,725	0,807	0,910	0,959	0,986
IT_16	0,167	0,511	0,688	0,778	0,895	0,952	0,983
IT_15	0,094	0,350	0,532	0,644	0,814	0,911	0,968
IT_14	0,060	0,248	0,411	0,525	0,729	0,862	0,950
IT_13	0,039	0,174	0,308	0,414	0,632	0,800	0,923
NPV							
IT_19	0,994	0,967	0,933	0,898	0,783	0,607	0,340
IT_18	0,995	0,972	0,943	0,912	0,811	0,648	0,380

IT_17	0,996	0,979	0,957	0,934	0,853	0,713	0,453
IT_16	0,997	0,983	0,964	0,945	0,875	0,750	0,500
IT_15	0,997	0,982	0,963	0,943	0,871	0,744	0,492
IT_14	0,997	0,985	0,969	0,952	0,891	0,779	0,540
IT_13	0,998	0,988	0,976	0,962	0,912	0,817	0,597
Dotik							
PPV							
IT_19	0,078	0,305	0,481	0,596	0,782	0,893	0,962
IT_18	0,101	0,370	0,553	0,663	0,827	0,918	0,971
IT_17	0,033	0,150	0,271	0,371	0,589	0,770	0,909
IT_16	0,033	0,150	0,271	0,371	0,589	0,770	0,909
IT_15	0,042	0,187	0,326	0,435	0,651	0,813	0,929
IT_14	0,029	0,136	0,249	0,345	0,561	0,749	0,900
IT_13	0,019	0,094	0,179	0,258	0,457	0,663	0,855
NPV							
IT_19	0,990	0,952	0,903	0,854	0,707	0,508	0,256
IT_18	0,991	0,953	0,906	0,858	0,714	0,517	0,263
IT_17	0,991	0,952	0,905	0,857	0,711	0,513	0,260
IT_16	0,991	0,954	0,907	0,860	0,717	0,520	0,265
IT_15	0,992	0,958	0,916	0,873	0,738	0,548	0,287
IT_14	0,993	0,963	0,925	0,886	0,762	0,578	0,313
IT_13	0,993	0,963	0,925	0,886	0,762	0,578	0,313
Sluh							
PPV							
IT_19	0,053	0,227	0,382	0,496	0,705	0,848	0,944
IT_18	0,112	0,398	0,582	0,689	0,843	0,926	0,974
IT_17	0,095	0,355	0,537	0,648	0,817	0,913	0,969
IT_16	0,053	0,227	0,382	0,496	0,705	0,848	0,944
IT_15	0,038	0,170	0,302	0,408	0,626	0,796	0,921
IT_14	0,028	0,130	0,240	0,334	0,549	0,739	0,895
IT_13	0,025	0,119	0,222	0,312	0,524	0,720	0,885
NPV							
IT_19	0,990	0,951	0,903	0,854	0,706	0,507	0,256
IT_18	0,991	0,955	0,909	0,863	0,722	0,526	0,270
IT_17	0,992	0,958	0,915	0,871	0,736	0,545	0,285
IT_16	0,992	0,959	0,917	0,874	0,741	0,550	0,290
IT_15	0,992	0,960	0,918	0,876	0,744	0,555	0,294
IT_14	0,992	0,961	0,922	0,881	0,753	0,566	0,303
IT_13	0,994	0,968	0,935	0,901	0,790	0,617	0,349
Vonj in okus							
PPV							
IT_19	0,000	0,000	0,000	0,000	0,000	0,000	0,000
IT_18	0,000	0,000	0,000	0,000	0,000	0,000	0,000
IT_17	0,000	0,000	0,000	0,000	0,000	0,000	0,000
IT_16	0,010	0,052	0,104	0,156	0,309	0,511	0,758
IT_15	0,012	0,061	0,121	0,179	0,347	0,553	0,788
IT_14	0,017	0,084	0,162	0,235	0,427	0,635	0,839
IT_13	0,015	0,074	0,144	0,211	0,394	0,603	0,820
NPV							
IT_19	0,990	0,950	0,900	0,850	0,700	0,499	0,250
IT_18	0,990	0,950	0,900	0,849	0,699	0,499	0,249

IT_17	0,990	0,949	0,899	0,848	0,697	0,496	0,247
IT_16	0,990	0,950	0,900	0,850	0,700	0,500	0,250
IT_15	0,990	0,951	0,901	0,852	0,703	0,504	0,253
IT_14	0,991	0,954	0,908	0,861	0,718	0,522	0,267
IT_13	0,991	0,956	0,911	0,866	0,726	0,532	0,275
Težave s senzorno integracijo							
PPV							
IT_145	0,336	0,725	0,848	0,898	0,956	0,980	0,993
IT_137	0,283	0,672	0,813	0,873	0,944	0,975	0,992
IT_136	0,213	0,585	0,748	0,825	0,920	0,964	0,988
IT_133	0,130	0,439	0,623	0,724	0,864	0,937	0,978
IT_131	0,112	0,398	0,582	0,689	0,843	0,926	0,974
IT_130	0,123	0,423	0,607	0,711	0,857	0,933	0,977
IT_128	0,108	0,386	0,570	0,678	0,837	0,923	0,973
IT_126	0,101	0,370	0,553	0,663	0,827	0,918	0,971
IT_125	0,095	0,355	0,537	0,648	0,817	0,913	0,969
IT_124	0,078	0,305	0,481	0,596	0,782	0,893	0,962
IT_123	0,075	0,296	0,470	0,585	0,774	0,889	0,960
IT_122	0,081	0,314	0,491	0,605	0,788	0,897	0,963
IT_121	0,066	0,269	0,438	0,553	0,750	0,875	0,955
IT_120	0,056	0,236	0,395	0,509	0,716	0,854	0,946
IT_119	0,052	0,222	0,376	0,489	0,700	0,845	0,942
IT_118	0,050	0,215	0,366	0,479	0,690	0,839	0,940
IT_117	0,048	0,208	0,356	0,468	0,681	0,833	0,937
IT_116	0,048	0,209	0,358	0,469	0,682	0,834	0,938
IT_115	0,043	0,191	0,332	0,441	0,657	0,817	0,931
IT_114	0,040	0,180	0,317	0,424	0,642	0,807	0,926
IT_113	0,040	0,180	0,317	0,424	0,642	0,807	0,926
IT_112	0,037	0,165	0,295	0,399	0,617	0,790	0,919
IT_111	0,034	0,156	0,281	0,383	0,601	0,779	0,913
IT_110	0,030	0,141	0,257	0,354	0,571	0,757	0,903
IT_109	0,029	0,133	0,244	0,339	0,555	0,744	0,897
IT_108	0,027	0,124	0,231	0,323	0,537	0,730	0,890
IT_107	0,026	0,122	0,227	0,318	0,532	0,726	0,888
NPV							
IT_145	0,992	0,960	0,919	0,878	0,747	0,559	0,297
IT_137	0,992	0,962	0,923	0,882	0,756	0,570	0,306
IT_136	0,993	0,963	0,926	0,887	0,764	0,581	0,316
IT_133	0,993	0,963	0,925	0,886	0,762	0,579	0,314
IT_131	0,993	0,965	0,928	0,891	0,770	0,589	0,324
IT_130	0,993	0,966	0,932	0,896	0,780	0,602	0,336
IT_128	0,993	0,966	0,931	0,895	0,779	0,601	0,335
IT_126	0,993	0,966	0,931	0,895	0,778	0,601	0,334
IT_125	0,993	0,966	0,931	0,895	0,778	0,600	0,334
IT_124	0,993	0,966	0,931	0,894	0,777	0,598	0,332
IT_123	0,994	0,967	0,934	0,899	0,785	0,610	0,343
IT_122	0,994	0,971	0,941	0,909	0,805	0,639	0,371
IT_121	0,994	0,971	0,940	0,908	0,803	0,635	0,367
IT_120	0,994	0,970	0,939	0,907	0,800	0,632	0,364
IT_119	0,994	0,970	0,939	0,906	0,799	0,631	0,363
IT_118	0,994	0,972	0,942	0,911	0,808	0,644	0,376

IT_117	0,994	0,972	0,942	0,911	0,808	0,643	0,375
IT_116	0,995	0,973	0,945	0,916	0,818	0,658	0,391
IT_115	0,995	0,973	0,945	0,915	0,816	0,655	0,387
IT_114	0,995	0,973	0,944	0,914	0,814	0,653	0,385
IT_113	0,995	0,975	0,948	0,919	0,825	0,668	0,402
IT_112	0,995	0,974	0,947	0,918	0,822	0,664	0,398
IT_111	0,995	0,974	0,946	0,917	0,820	0,662	0,394
IT_110	0,995	0,973	0,945	0,915	0,816	0,656	0,388
IT_109	0,995	0,973	0,944	0,914	0,814	0,652	0,385
IT_108	0,995	0,972	0,943	0,912	0,811	0,648	0,380
IT_107	0,995	0,972	0,943	0,912	0,810	0,647	0,379

Tabela P2: Pozitivna in negativna napovedna vrednost lestvic vprašalnika VOP-SIš pri različni stopnji pojavnosti avtizma

	Pojavnost avtizma						
	1 %	5 %	10 %	15 %	30 %	50 %	75 %
Ravnotežje							
PPV							
IT_17	0,141	0,462	0,644	0,742	0,875	0,942	0,980
IT_16	0,089	0,337	0,518	0,630	0,805	0,906	0,967
IT_15	0,057	0,239	0,399	0,513	0,719	0,857	0,947
IT_14	0,033	0,150	0,271	0,371	0,589	0,770	0,909
IT_13	0,022	0,104	0,197	0,280	0,486	0,688	0,869
IT_12	0,019	0,093	0,179	0,257	0,456	0,662	0,854
IT_11	0,014	0,068	0,134	0,198	0,375	0,583	0,807
NPV							
IT_17	0,991	0,955	0,909	0,862	0,720	0,525	0,269
IT_16	0,992	0,962	0,923	0,883	0,756	0,570	0,307
IT_15	0,993	0,966	0,930	0,894	0,776	0,597	0,331
IT_14	0,993	0,965	0,930	0,893	0,774	0,595	0,328
IT_13	0,993	0,966	0,930	0,893	0,775	0,596	0,330
IT_12	0,994	0,971	0,940	0,908	0,802	0,634	0,366
IT_11	0,993	0,964	0,928	0,890	0,769	0,588	0,322
Zaznavanje telesa							
PPV							
IT_19	0,305	0,696	0,828	0,885	0,949	0,978	0,992
IT_18	0,215	0,588	0,751	0,827	0,921	0,964	0,988
IT_17	0,099	0,364	0,547	0,657	0,823	0,916	0,970
IT_16	0,060	0,250	0,413	0,528	0,731	0,864	0,950
IT_15	0,058	0,243	0,404	0,519	0,724	0,859	0,948
IT_14	0,038	0,171	0,304	0,409	0,627	0,797	0,922
IT_13	0,029	0,135	0,248	0,343	0,559	0,748	0,899
NPV							
IT_19	0,991	0,956	0,912	0,867	0,729	0,535	0,277
IT_18	0,992	0,958	0,915	0,871	0,736	0,544	0,284
IT_17	0,992	0,959	0,917	0,874	0,741	0,551	0,290
IT_16	0,992	0,960	0,919	0,877	0,746	0,557	0,295
IT_15	0,993	0,963	0,924	0,885	0,760	0,576	0,312
IT_14	0,994	0,968	0,934	0,899	0,786	0,611	0,344
IT_13	0,994	0,969	0,937	0,904	0,795	0,624	0,357

Ideje in načrtovanje gibanja							
PPV							
IT_19	1,000	1,000	1,000	1,000	1,000	1,000	1,000
IT_18	0,397	0,774	0,879	0,920	0,965	0,985	0,995
IT_17	0,305	0,696	0,828	0,885	0,949	0,978	0,992
IT_16	0,141	0,462	0,644	0,742	0,875	0,942	0,980
IT_15	0,091	0,343	0,524	0,636	0,810	0,908	0,967
IT_14	0,054	0,230	0,386	0,500	0,708	0,850	0,944
IT_13	0,037	0,168	0,299	0,404	0,622	0,793	0,920
NPV							
IT_19	0,990	0,952	0,903	0,854	0,707	0,508	0,256
IT_18	0,992	0,959	0,918	0,876	0,744	0,555	0,293
IT_17	0,994	0,969	0,937	0,903	0,794	0,623	0,355
IT_16	0,995	0,974	0,946	0,917	0,819	0,660	0,393
IT_15	0,997	0,983	0,965	0,946	0,878	0,756	0,508
IT_14	0,998	0,988	0,975	0,961	0,909	0,811	0,589
IT_13	0,997	0,987	0,973	0,957	0,902	0,798	0,569
Dotik							
PPV							
IT_19	1,000	1,000	1,000	1,000	1,000	1,000	1,000
IT_18	0,141	0,462	0,644	0,742	0,875	0,942	0,980
IT_17	0,062	0,255	0,420	0,535	0,736	0,867	0,951
IT_16	0,041	0,180	0,317	0,424	0,642	0,807	0,926
IT_15	0,040	0,179	0,315	0,422	0,640	0,805	0,925
IT_14	0,032	0,149	0,270	0,369	0,587	0,769	0,909
IT_13	0,019	0,091	0,174	0,251	0,448	0,655	0,851
NPV							
IT_19	0,991	0,955	0,909	0,863	0,722	0,526	0,270
IT_18	0,991	0,955	0,909	0,862	0,720	0,525	0,269
IT_17	0,991	0,954	0,908	0,861	0,719	0,522	0,267
IT_16	0,991	0,956	0,912	0,867	0,729	0,535	0,277
IT_15	0,992	0,960	0,920	0,878	0,749	0,561	0,298
IT_14	0,993	0,964	0,927	0,888	0,766	0,584	0,319
IT_13	0,992	0,960	0,920	0,878	0,748	0,560	0,298
Sluh							
PPV							
IT_19	1,000	1,000	1,000	1,000	1,000	1,000	1,000
IT_18	0,468	0,821	0,906	0,939	0,974	0,989	0,996
IT_17	0,180	0,534	0,707	0,793	0,903	0,956	0,985
IT_16	0,107	0,384	0,568	0,677	0,836	0,922	0,973
IT_15	0,077	0,304	0,479	0,594	0,780	0,892	0,961
IT_14	0,052	0,222	0,376	0,489	0,700	0,845	0,942
IT_13	0,035	0,158	0,283	0,386	0,604	0,781	0,914
NPV							
IT_19	0,992	0,960	0,918	0,876	0,745	0,556	0,294
IT_18	0,993	0,963	0,924	0,885	0,760	0,576	0,312
IT_17	0,993	0,966	0,930	0,893	0,775	0,596	0,330
IT_16	0,994	0,968	0,935	0,901	0,790	0,617	0,349
IT_15	0,995	0,974	0,947	0,919	0,824	0,667	0,401
IT_14	0,995	0,973	0,946	0,916	0,818	0,659	0,392
IT_13	0,996	0,977	0,953	0,927	0,840	0,692	0,428

Vonj in okus							
PPV							
IT_19	0,305	0,696	0,828	0,885	0,949	0,978	0,992
IT_18	0,180	0,534	0,707	0,793	0,903	0,956	0,985
IT_17	0,155	0,488	0,668	0,762	0,886	0,948	0,982
IT_16	0,076	0,300	0,475	0,590	0,777	0,891	0,961
IT_15	0,044	0,192	0,335	0,444	0,660	0,819	0,931
IT_14	0,027	0,125	0,232	0,324	0,538	0,731	0,891
IT_13	0,017	0,082	0,158	0,230	0,421	0,629	0,836
NPV							
IT_19	0,991	0,956	0,912	0,867	0,729	0,535	0,277
IT_18	0,991	0,956	0,912	0,867	0,728	0,534	0,277
IT_17	0,992	0,958	0,915	0,871	0,735	0,543	0,284
IT_16	0,993	0,963	0,925	0,886	0,763	0,579	0,314
IT_15	0,993	0,964	0,926	0,887	0,764	0,582	0,317
IT_14	0,992	0,962	0,922	0,882	0,754	0,568	0,305
IT_13	0,992	0,960	0,920	0,878	0,748	0,560	0,298
Težave s senzorno integracijo							
PPV							
IT_145	0,497	0,837	0,916	0,945	0,977	0,990	0,997
IT_137	0,354	0,741	0,858	0,906	0,959	0,982	0,994
IT_136	0,215	0,588	0,751	0,827	0,921	0,964	0,988
IT_133	0,232	0,611	0,769	0,841	0,928	0,968	0,989
IT_131	0,180	0,534	0,707	0,793	0,903	0,956	0,985
IT_130	0,169	0,515	0,692	0,781	0,896	0,953	0,984
IT_128	0,161	0,500	0,679	0,770	0,891	0,950	0,983
IT_126	0,146	0,471	0,653	0,749	0,879	0,944	0,981
IT_125	0,123	0,421	0,606	0,709	0,856	0,933	0,976
IT_124	0,106	0,381	0,565	0,674	0,834	0,921	0,972
IT_123	0,071	0,286	0,458	0,573	0,765	0,884	0,958
IT_122	0,065	0,267	0,435	0,550	0,748	0,874	0,954
IT_121	0,056	0,235	0,394	0,508	0,715	0,854	0,946
IT_120	0,052	0,222	0,376	0,489	0,700	0,845	0,942
IT_119	0,045	0,198	0,343	0,453	0,668	0,825	0,934
IT_118	0,041	0,182	0,320	0,428	0,645	0,809	0,927
IT_117	0,040	0,178	0,313	0,420	0,638	0,804	0,925
IT_116	0,035	0,160	0,287	0,390	0,608	0,784	0,916
IT_115	0,034	0,155	0,280	0,381	0,600	0,777	0,913
IT_114	0,033	0,151	0,273	0,374	0,592	0,772	0,910
IT_113	0,032	0,148	0,268	0,368	0,585	0,767	0,908
IT_112	0,030	0,139	0,254	0,351	0,567	0,754	0,902
IT_111	0,027	0,128	0,236	0,330	0,544	0,736	0,893
IT_110	0,027	0,125	0,232	0,324	0,538	0,731	0,891
IT_109	0,025	0,119	0,221	0,311	0,523	0,719	0,885
IT_108	0,026	0,120	0,224	0,314	0,526	0,722	0,886
IT_107	0,024	0,115	0,216	0,304	0,515	0,713	0,882
NPV							
IT_145	0,993	0,964	0,928	0,890	0,769	0,587	0,322
IT_137	0,993	0,966	0,931	0,894	0,777	0,599	0,332
IT_136	0,993	0,966	0,930	0,894	0,776	0,597	0,331
IT_133	0,994	0,967	0,933	0,898	0,784	0,609	0,342

IT_131	0,994	0,969	0,936	0,903	0,792	0,621	0,353
IT_130	0,994	0,970	0,940	0,907	0,801	0,633	0,365
IT_128	0,995	0,972	0,943	0,912	0,810	0,647	0,379
IT_126	0,994	0,972	0,943	0,912	0,810	0,646	0,378
IT_125	0,994	0,972	0,942	0,911	0,809	0,644	0,377
IT_124	0,994	0,972	0,942	0,911	0,808	0,643	0,375
IT_123	0,994	0,971	0,941	0,909	0,804	0,638	0,370
IT_122	0,994	0,971	0,940	0,908	0,803	0,636	0,368
IT_121	0,994	0,970	0,940	0,907	0,801	0,633	0,365
IT_120	0,995	0,973	0,946	0,916	0,818	0,659	0,392
IT_119	0,995	0,973	0,945	0,915	0,816	0,655	0,388
IT_118	0,995	0,973	0,944	0,914	0,814	0,652	0,384
IT_117	0,995	0,974	0,947	0,919	0,823	0,665	0,399
IT_116	0,995	0,974	0,946	0,917	0,820	0,661	0,394
IT_115	0,995	0,975	0,949	0,921	0,829	0,674	0,408
IT_114	0,995	0,977	0,952	0,926	0,838	0,689	0,425
IT_113	0,996	0,978	0,956	0,931	0,848	0,705	0,444
IT_112	0,996	0,978	0,955	0,930	0,846	0,701	0,439
IT_111	0,996	0,977	0,954	0,928	0,842	0,695	0,432
IT_110	0,996	0,977	0,953	0,928	0,841	0,694	0,430
IT_109	0,995	0,977	0,952	0,926	0,838	0,689	0,425
IT_108	0,996	0,979	0,956	0,932	0,850	0,709	0,448
IT_107	0,996	0,978	0,956	0,931	0,848	0,705	0,444

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VLOGA FORMALNEGA IN NEFORMALNEGA IZOBRAŽEVANJA PRI RAZVOJU TEHNOLOŠKE PISMENOSTI; PRIMER MODELARSKEGA KROŽKA

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Izobraževanje otrok za tehnološko pismenost je nuja 21. stoletja, če želimo izobraziti posameznike, zmožne načrtovanja in soočanja s problemskimi situacijami ter sprejemanja informiranih odločitev, ki bodo pripomogle k ustrezni uporabi in razvoju tehnike in tehnologije. Prispevek predstavlja študijo primera, izvedeno med 13 otroki udeleženci modelarskega krožka, 4 mentorji in 3 osnovnošolskimi učitelji z namenom, da preučimo vlogo in pomen, ki jo ima modelarski krožek kot neformalna prostočasna interesna dejavnost na razvoj otrokove tehnološke pismenosti. Ugotavljamo, da modelarski krožek kot neformalna oblika tehniškega izobraževanja dopolnjuje cilje formalnega in pomembno doprinaša k razvoju tehnološke pismenosti, razvija ključna znanja, veščine in spretnosti ter vpliva na izbiro kariere.

Ključne besede:
tehnološka pismenost, tehniško izobraževanje, slovenska devetletka, prostočasne interesne dejavnosti, modelarski krožek

The Role of Formal and Non-formal Education in the Development of Technological Literacy: the Case of an Aeromodelling Club

Education for technological literacy is a necessity in the 21st century if we want to educate individuals capable of planning, problem-solving, and making informed decisions that will contribute to the proper use and advance of technology. The paper presents a case study conducted among 13 child participants of an aeromodelling club, 4 mentors, and 3 primary school teachers. Its aim was to examine the role and importance of the aeromodelling club as a leisure-time activity on the development of a child's technological literacy. Findings suggest that non-formal technical education complements the objectives of formal education and makes an important contribution to the development of a child's technological literacy, develops key knowledge, skills and competencies, and influences career choices.

Keywords:
technological literacy, technical education, nine-year primary school, free-time activities, aeromodelling club

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Uvod

Tehnološka pismenost (dalje: TP) se nanaša na razumevanje tehnike in tehnologije ter njunih vplivov na posameznika, družbo in okolje. Tehnološko pismen posameznik razume, kako uporabljati in ustrezno razvijati tehnološke izdelke, sisteme in procese, da bodo pripomogli k razvoju človeštva (ITEEA, 2020). Izobraževanje za TP spodbuja tehniško mišljenje, ki učence opolnomoča v inovativnosti in ustvarjalnosti, razvija veščine sodelovanja, reševanja problemov in kritičnega razmišljanja ter vzgaja za konstruktivno soočanje in delovanje v današnjem tehnološko razvitem svetu (Avsec, 2012). Pomembno je v procesu vseživljenjskega učenja, saj preobraža posameznikovo dojemanje sebe in vloge, ki jo ima v sooblikovanju stvarnosti (Dierking in Falk, 2020). Dejstvo, da izobraževanje za TP ni omejeno zgolj na formalna učna okolja, ampak uspešno poteka tudi v neformalnih okoljih, odseva vse večje zavedanje pomena, ki ga ima prisotnost tehnike in tehnologije v stvarnosti 21. stoletja (NRC, 2015).

Izobraževanje za TP temelji na konstruktivističnem pristopu, ki poudarja učenčevo aktivno soustvarjanje znanja znotraj problemske situacije, ki jo določa kolektivna dejavnost (Bada in Olusegun, 2015). Najbolj celostno se udejanja prek interdisciplinarnega pristopa po načelih projektnega dela v manjših skupinah na terenu ali v laboratoriju v sodelovanju pedagogov in strokovnjakov z različnih področij, tudi s področja gospodarstva in industrije (Kearney, 2016). Tak pristop učeče se opolnomoča, da prek odkrivanja, raziskovanja in preiskovanja iščejo rešitve za obravnavani problem in tako izkusijo pomen vseživljenjskega učenja (Othman in Shah, 2013).

Prispevek pričnemo s pregledom strukture tehniškega izobraževanja (dalje: TI) v slovenskem osnovnošolskem sistemu, nadalje raziščemo organizacije, ki ponujajo neformalne oblike TI v Sloveniji, in se osredinimo na izvajalce modelarskih krožkov (dalje: MK) kot prostočasne interesne dejavnosti. Pod drobnogled vzamemo MK v organizaciji Modelarskega društva (dalje: MD) Ventus. Sledi opis študije primera, ki smo jo izvedli z namenom, da preučimo vlogo modelarskega krožka kot neformalne prostočasne interesne dejavnosti in njegov pomen za razvoj otrokove TP. Pomen in relevantnost pričujoče raziskave podkrepi dejstvo, da je danes vsak vidik življenja prežet s tehniko in tehnologijo ter je izobraževanje tehnološko pismenih posameznikov ključnega pomena že od najzgodnejših let (Moye in Reed, 2020).

Najočitnejša problema na področju TI in TP, ki sta nas spodbudila k izvedbi raziskave, sta: zapostavljenost TI v slovenskem osnovnošolskem izobraževanju (DRTI, 2011, str. 10) ter vse slabše motorične spretnosti otrok (Ayubia in Komaini, 2021).

Z raziskavo smo hoteli ugotoviti, kako skupina otrok, ki obiskuje modelarski krožek, doživlja tehniško udejstvovanje ter katere doprinose in izzive vidijo v njem; kako na stanje TP in TI gledajo mentorji MK in kako osnovnošolski učitelji, ki otroke izobražujejo za TP znotraj predpisanega kurikula; želeli smo ovrednotiti znanja in veščine, ki jih udejstvovanje v prostočasnih tehniških aktivnostih prinaša v otrokovo življenje ter raziskati videnje učiteljev in mentorjev glede povezave med udejstvovanjem otrok v tehniško usmerjene dejavnosti in njihovo kasnejšo karierno usmeritvijo.

TI v slovenskem osnovnošolskem sistemu

TI se v prvem, drugem in tretjem razredu izvaja znotraj predmeta *spoznavanje okolja,* v obsegu 105 ur v posameznem letu. Med pomembne cilje sodijo razumevanje okolja, razvijanje spoznavnega področja, matematične in sporazumevalne kompetence ter kompetence kritičnega mišljenja (UN Spoznavanje okolja, 2011). Predmet *naravoslovje in tehnika* v 4. in 5. razredu nadgrajuje predmet *spoznavanje okolja* ter je usmerjen v razvoj in nadgradnjo temeljnega naravoslovno-tehničnega znanja, spretnosti ter stališč, kar učencem omogoča razumevanje, razlago in reševanje različnih življenjskih situacij, odgovorno vključevanje v družbo, ohranjanje motivacije po naravoslovni radovednosti in želji po učenju v šoli in izven nje. Poseben napotek se v skrbi za ohranjanje gospodarsko uspešnih panog nanaša na povezovanje snovi s spoznavanjem poklicev učenčevega bližnjega okolja (UN Naravoslovje in tehnika, 2011). Izbirni predmet *tehnik*a, za katerega se lahko otroci odločijo v 4., 5. in 6. razredu, v vsakokratnem obsegu 35 ur, omogoča poglobitev in razširitev predmetov *naravoslovje in tehnika* ter *tehnika in tehnologija* (dalje: TIT) (UN Tehnika, 2013). Na predmetni stopnji je obveznemu predmetu *TIT* namenjenih 70 ur v 6. razredu ter po 35 ur v 7. in 8. razredu. *TIT* omogoča spoznavanje tehničnih sredstev, tehnologij organizacije dela in ekonomike. Učenci z uporabo preprostih orodij ustvarjalno odkrivajo, spoznavajo in rešujejo preproste tehnične in tehnološke probleme, razvijajo kognitivne in psihomotorične sposobnosti ter prek sodelovanja oblikujejo socialne vrednote.

Učitelj ima na voljo dodatni čas, namenjen aktualizaciji in/ali poglabljanju interesov posameznih učencev v okviru projektnih nalog (UN TIT, 2011). V zadnjem triletju OŠ se učenci lahko odločijo za dva predmeta ali tri, in sicer – *obdelava gradiv: les, umetne snovi, kovine; elektrotehnika; elektronika z robotiko; robotika v tehniki; risanje v geometriji in tehniki; projekti iz fizike in tehnike*, ki jim omogočajo poglobitev in sintezo temeljnih naravoslovno-tehničnih znanj s poudarkom na projektnem načinu dela v konkretnih učnih situacijah (UN Izbirni predmet, 2005).

Pregled učnih načrtov predmetov, ki se nanašajo na TI, pokaže, da je TP "na papirju" dobro premišljena in sledi otrokovemu psiho-motoričnemu razvoju. Če učitelji sledijo posodobljenim standardom TP, ki predpostavljajo več praktičnega dela z namenom navajanja učencev na reševanje resničnih problemov ter dajejo konkretnejši pomen vseživljenjskemu in kariernemu usmerjanju mladih za tehnične poklice (ITEEA, 2020), se zdi, da ima TI v slovenski devetletki potencial, da vzgoji mladostnike z dobro razvito TP. Ker pa se število ur, namenjenih TI zmanjšuje, z uvedbo devetletke za kar 33 % (DRTI, 2011), se zastavlja vprašanje zmožnosti celostnega razvoja TP.

Neformalne oblike TI v Sloveniji

Neformalne oblike izobraževanja predstavljajo organizirane prostočasne interesne dejavnosti, ki se jih posameznik udeleži zunaj ustaljenega formalnega sistema. Odsevajo stvarnost in potrebe okolja, ga bogatijo, vzpostavljajo dostopno in povezano družbo ter krepijo infrastrukturo na področju, na katerem delujejo (NRC, 2015). Pomembno vplivajo na razvoj osebnostnih lastnosti, boljši šolski uspeh, mentalno zdravje, občutke uspešnosti in samouresničitve, so pomemben motivator medvrstniškega druženja, medgeneracijskega prenosa znanja idr. (Colley, 2005). Glede na to, da postaja neformalno izobraževanje vse pomembnejše pri pridobivanju specifičnih znanj in zmožnosti ter tako pomembno dopolnjuje formalni proces šolanja in vseživljenjskega učenja (Lavrič in Deželan, 2021), so izobraževalci neformalnih oblik TI pomembni promotorji razvoja TP.

Izobraževalci neformalnih oblik TI

Pri iskanju informacij smo izhajali iz dokumenta *Ocena stanja tehniškega izobraževanja v Sloveniji in predlogi za izboljšanje* (DRTI, 2011), za katerega se zdi, da predstavlja edini pregled stanja na področju TI v Sloveniji do sedaj. Ker gre za poročilo iz leta 2011, smo trenutno situacijo preverjali s pomočjo spleta s ključniki: *tehniška kultura,*

modelarski krožek, modelarstvo, modelarski klub, modelarsko društvo, aeroklub in aviomodelarstvo.

Ugotavljamo, da med pomembne promotorje neformalnih oblik TI in posledično TP sodi Zveza za tehnično kulturo Slovenije (dalje: ZOTKS), ki za mlade pripravlja raziskovalne tabore, delavnice, tekmovanja, razpisuje tehnične projekte idr. (ZOTKS, b. d.). Aktivni sta tudi Fakulteta za strojništvo Univerze v Mariboru in Fakulteta za strojništvo Univerze v Ljubljani, ki organizirata poletne šole za osnovnošolce in srednješolce z namenom mladim omogočiti stik z aktualnimi vsebinami tehniških področij, nadgraditi znanje, jih spodbuditi h kritičnemu mišljenju ter kot navdih za izbiro svoje strokovne poti (Fakulteta za strojništvo Univerze v Mariboru, b. d.; Fakulteta za strojništvo Univerze v Ljubljani, Fakulteta za strojništvo, b. d.). Nadalje za razvoj in promocijo tehnične kulture med mladimi skrbi Fakulteta za elektrotehniko, računalništvo in informatiko Univerze v Mariboru, ki organizira robotsko tekmovanje ROBObum (Inštitut za robotiko, b. d.) in Fakulteta za elektrotehniko Univerze v Ljubljani, kjer poudarjajo, da imajo mladi, ki jih zanima tehnologija, v okviru rednih šolskih vsebin omejen dostop do tehniških znanj, zato za omenjeno ciljno skupino pripravljajo predavanja, delavnice, poletne tabore, tekmovanja ipd. (npr. Poletni tabor inovativnih tehnologij, inovativno okolje OpenLab Kranj) (Fakulteta za elektrotehniko Univerze v Ljubljani, b. d.). V slovenskem prostoru je prisotno tudi Društvo za razvoj tehniškega izobraževanja (DRTI), ki med cilji navede razvoj kvalitete tehniškega izobraževanja na vseh nivojih, kar udejanja prek izvedbe poletnih šol elektronike in robotike, različnih projektov, razvoja laboratorijske in programske opreme idr. (DRTI, b. d.). Izpostaviti želimo še Mestno občino Maribor, ki s ciljem razvoja tehniške kulture med mladimi v sodelovanju z Zvezo prijateljev mladine Maribor že vrsto let prireja javni natečaj *Mladi za napredek Maribora*, kjer mladi sodelujejo s prijavo in izborom raziskovalnih nalog in inovacijskih predlogov tudi na proizvodno-tehničnem področju (Mestna občina Maribor, b. d.). In končno, tudi v poslanstvu Zveze inženirskih društev Maribor (ZID) je zapisano, da stremijo po razvoju tehniške kulture med mladimi, kar udejanjajo prek sodelovanja in organizacije dogodkov z drugimi tovrstnimi institucijami (ZID, b. d.).

Izvajalci modelarskih krožkov

ZOTKS ima na svoji internetni strani razdelek modelarstvo, kjer mladim, zainteresiranim za letalsko modelarstvo, ponuja udeležbo na taborih in tekmovanjih.

Osnovnošolci lahko tekmujejo na vsakoletnem regijskem izbirnem in državnem tekmovanju v kategorijah F1H, F5J 400, tekmovanju z deltoidnimi in škatlastimi modelarskimi zmaji. Pod okriljem Zveze tradicionalno poteka *Timovo tekmovanje s papirnatimi letalci*. Poleg tega se lahko mladi udeležijo poletnih šol modelarjev (ZOTKS, b. d.).

MK izven formalnega šolskega sistema izvajajo tudi modelarski klubi in društva. Navajamo nekaj ponudnikov, ki so svojo dejavnost oglaševali v šolskem letu 2022–2023. To so: Mestna zveza društev za tehnično kulturo Ljubljana, Modelarsko društvo BETAL Postojna, Modelarsko društvo Nova Gorica, Modelarsko društvo Bela Krajina, Aeroklub Kranj, Klub mladih tehnikov Koper, Aeroklub ALC Lesce idr. Med omenjene primere dobre prakse spada tudi MD Ventus iz Ajdovščine.

MK v organizaciji MD Ventus

MD Ventus je nevladna organizacija, ki deluje od leta 2005. Njegovo poslanstvo je izobraževati in privzgajati ljubezen do modelarstva in tehnične kulture. Pod okriljem društva se vse od začetka izvaja MK, v okviru katerega se otroci poleg ur, namenjenih izdelavi letal, udeležujejo tudi tekem v kategorijah RES, F1H, F1A, F1N. V začetnih letih je krožek obiskovalo med 10 in 15 otrok, krožek je vodil en mentor. V zadnjih letih je zaznati porast interesa med otroki in mentorji. V šolskem letu 2022/23 je v MK vključenih 30 osnovnošolcev različnih starosti, ki so razdeljeni v začetno (14) in nadaljevalno skupino (16). Po dva mentorja na skupino vodita otroke pri izdelavi dveh zahtevnostno različnih izdelkov. Srečanja, ki potekajo enkrat tedensko med oktobrom in junijem, trajajo 120 min.

Začetna skupina izdeluje prostoleteči model HotCat, ki ustreza pravilom kategorije F1H. Krilo letalskega modela je narejeno iz rebrc, globina krila je konstantna, kar poenostavi izdelavo. Otroci morajo razumeti mentorjeva navodila in jim slediti. Nadaljevalna skupina otrok izdeluje model na radijsko vodenje, ki ustreza pravilom kategorije RES in se izdeluje po principu seta s predpripravljenimi komponentami. Učenci jih sestavljajo po priloženem načrtu. Tloris kril je zasnovan v konus, tako da morajo biti otroci previdni, da reber ne zamešajo. Korakov izdelave ne smemo preskakovati, saj določenih komponent ni mogoče izdelati, če jih predhodno pozabimo vključiti. Načrti so zahtevni, vendar se od otrok pričakuje, da jih ob pomoči mentorja sami razumejo. Mentor pomoč nudi samo pri zahtevnejših korakih.

Raziskava

Metodologija

Cilj raziskave je bil preučiti vlogo in pomen, ki jo ima MK kot oblika neformalnega TI na razvoj otrokove TP. Zastavili smo si naslednja raziskovalna vprašanja:
RV1: Kako otroci, vključeni v raziskavo, doživljajo TI v formalnih in neformalnih učnih kontekstih?
RV2: Pred katere izzive so v procesu TI postavljeni otroci, učitelji in mentorji?
RV3: K razvoju katerih znanj in veščin TI posebej pomembno prispeva MK?
RV4: V kolikšni meri udejstvovanje v tehniško usmerjenih dejavnostih vpliva na otrokovo kasnejšo karierno usmeritev?

Vrsta raziskave in metode raziskovanja

Odločili smo se za študijo primera, vrsto kvalitativnega raziskovanja, ki se osredinja na razumevanje in razlago situacij, procesov, odnosov, vedenja itd. z različnih vidikov njenih udeležencev (Merriam, 2019). S kvalitativno vsebinsko analizo smo preučili podatke, pridobljene s tehnikami zbiranja podatkov odprtega tipa. Naš namen je bil razumevanje pojava in ne posploševanje na populacijo.

Tehnike zbiranja podatkov in merske značilnosti instrumentov

Podatke smo zbrali s tremi polstrukturiranimi intervjuji in z dvema fokusnima skupinama. Otroke smo intervjuvali na eni izmed ur MK. Zastavili smo jim naslednja vprašanja: *Kako se počutiš pri MK? Kaj ti je še posebej všeč? Kaj ti je v izziv? Česa te MK nauči?* Fokusni skupini z otroki je sledila fokusna skupina z mentorji. Vprašali smo jih: *Kakšen je odnos otrok do tehniškega ustvarjanja? Kakšen je doprinos MK k razvoju otroka? Kaj je otrokom v izziv oz. kje imajo težave? V kolikšni meri udejstvovanje v MK vpliva na kasnejšo karierno usmeritev otrok*? Podobna vprašanja smo v polstrukturiranem intervjuju naslovili učiteljem, pri čemer smo se v vprašanjih nanašali na vsebine, ki se izvajajo v okviru kurikula (npr. ure *TiT, tehniške urice, naravoslovje in tehnika* idr.). Vse udeležence smo pri podajanju odgovorov spodbujali k utemeljitvam.

Udeleženci

V raziskavi je sodelovalo 20 oseb; dve učiteljici razrednega pouka ter učitelj fizike in tehnike, s 13, 22 in 24 leti pedagoških izkušenj; štirje mentorji, ki krožek izvajajo 4,

5, 7 in 15 let; po izobrazbi diplomirani družboslovec, gimnazijski maturant, diplomirani varnostni inženir in magister strojništva; 13 osnovnošolcev, v povprečju starih 11 let; v MK vključenih od dveh do petih let, v povprečju štiri leta.

Postopki zbiranja in obdelave podatkov

Pred pričetkom izvajanja raziskave smo starše otrok obvestili o namenu raziskave in pridobili privolitev za sodelovanje njihovih otrok (Kodelja, 2018). Obvestili smo jih, da bomo intervjuje posneli na diktafon. Zaradi etičnosti in umeščenosti raziskave v celoten proces smo iste informacije posredovali učiteljem in mentorjem. Ti so k sodelovanju pristopili po pogovoru. Iz celote neobdelanih podatkov smo izluščili pomembne za našo raziskavo ter jih združili v smiselne vsebinske sklope, ki se nanašajo na raziskovalna vprašanja. Zadnji korak, ki je predstavljal ponovno sestavljanje in sintetiziranje, je podal celostno razumevanje in razlago raziskovanih pojavov (Forman in Damschroder, 2007).

Rezultati

Sledi predstavitev rezultatov.

Odgovori otrok

Iz odgovorov otrok smo oblikovali vsebinska sklopa: doživljanje in izzivi tehniškega ustvarjanja ter doprinosi MK.

Doživljanje in izzivi tehniškega ustvarjanja

Vsi udeleženi otroci so navdušeni nad tehniškim ustvarjanjem, ker »*je zanimivo sestavljat*«, »*rad delam majhne stvari*«, »*všeč mi je to, da naredim nekaj sam, da je to moje delo*« in »*lepo je videti, da če se za nekaj res trudiš in ti to potem uspe*.« Dodali so še: »*Navdušuje me, kako letala letijo*.« Vsi so bili enotni, da je »*super tekmovati*« in da je »*družba super*«. Ker odgovori kažejo na navdušenje otrok nad tehniškim ustvarjanjem, je logično, da so težave, s katerimi se srečujejo, maloštevilne. Otroci navajajo, da jim je v izziv: »*Brusit lepilo, ker traja dolgo«, »rezat majhne koščke, ker se lahko hitro zlomi«* in *»ko moraš narediti en majhne identičen košček, ker moraš biti ful natančen*.«

Doprinosi MK

Zanimalo nas je tudi, česa jih modelarstvo nauči. Najbolj pogosti odgovori so se nanašali na razvoj motoričnih spretnosti: »*Postaneš bolj natančen. Moji sošolci v šoli niso*

tako spretni, ne znajo rezat, lepit, ker se jim skozi kaj zlomi. Težko mi je gledat, ker ne znajo, ti pa toliko znaš, je prav mučno.« MK so prepoznali kot pomemben gradnik osebnostnih lastnosti. Poudarili so razvoj vztrajnosti: »*Sošolci v šoli nimajo potrpljenja, dajo dele samo skupaj. In potem se jim zlomi.*« Kar nekaj odgovorov se je nanašalo na razvoj socialnih veščin: »*Nauči te medsebojnega sodelovanja,*« in »*tu si ves čas izposojamo stvari.*« Otroci pravijo: »*Te nauči veliko drugega, kar lahko pomaga v življenju npr. znaš brati načrte, uporabljat stroje, razumeš, da vsako lepilo ne prime povsod.*« Eden izmed otrok je dodal: »*Imaš več domišljije,*« in to razložil: »*ker mamo več izkušenj, si zamislimo sami in potem naredimo.*«

Odgovori učiteljev

Odgovori učiteljev se nanašajo na izzive, znanja in veščine ter odnos otrok do TI.

Znanja in veščine

Na vprašanje, kakšen je doprinos TI k razvoju otroka, sta učiteljici razrednega pouka suvereno odgovorili: »*Ogromen.*« Izpostavili sta predvsem razvoj grobe in fine motorike. Učiteljica A pravi: »*Otroci režejo, obrisujejo, merijo, sestavljajo.*« V TI sta videli priložnost za razvoj mnogih kognitivnih veščin, npr. logičnega razmišljanja, povezovanja, načrtovanja, reševanja problemov ter osebnostnih lastnosti, kot so sposobnost koncentracije, samokritičnosti, vztrajnosti. TI doprinaša k sposobnosti timskega dela. Učitelj tehnike in fizike vidi, da »*TI pomembno prispeva k splošni razgledanosti.*«

Izzivi

Ker učitelji izpostavljajo mnoge potenciale TI, so opažanja, ki jih v nadaljevanju navajamo, vredna razmisleka. Učiteljica B pravi: »*Na papirju je sicer marsikaj napisano, a je to potem na učitelju, kako bo izvedel. Vedno manj se odločamo za kaj tehnično ustvarjati, ker so mulci postali tako nespretni.*« Učiteljica A doda:

Gre za trend navzdol že nekaj časa. Fina motorika je slabo razvita. Včasih so otroci prišli pismeni v šolo, danes ne; ker roka ni navajena delati, delajo grobe krace. Včasih so prišli s sposobnostjo zgibanj kapice, zvončka, ladjice in si ti od tu dalje nekaj delal. Sedaj pridejo in ne znajo papirja prepognit na pol. Že škarij niso navajeni držat v roki. Nimajo veščine rezanja.

Podobno, četudi ne v tolikšnem ekstremu, odgovarja učitelj fizike: »*Če pogledam fine gibe pri žaganju, bi lahko trdil, da je motorika slabša, da so otroci manj spretni.*« Učiteljica A izpostavi: »*Če je bilo prej možno delat znotraj skupine, je sedaj le še ena na ena, ne poslušajo skupinskih navodil, otrok posluša samo takrat, ko njemu eksplicitno govoriš. So postali čisti individualisti.*« Druga dodaja: »*Nekoč so se bolj trudili. Na pol naredijo, ne počakajo, da se,*

npr. posuši, hočejo vse takoj po sistemu 'pritisni, zgodi se'.« Opozarja na pomanjkanje samokritičnosti in vztrajnosti: »*Kvaliteta je slaba, oni pa so zadovoljni z vsem, ne vidijo, da je slabo odrezano, da napol dela.*«

Težava se zdi tudi nezadostna usposobljenost razrednih učiteljev za izvajanje tehniških krožkov. Učiteljica A pravi:

Takih dejavnosti se ne ponuja v dovoljšnem številu. To pa za to, ker se učitelji ne čutijo kompetentni za njihovo izvajanje. Sama sem več let izvajala tehniške urice, a se nisem čutila kompetentno. Gre za neskončno ur dodatnega vloženega dela, za ure energije, tisto uro v razredu ne 'mutiš, ampak krvavi pot potiš'. Sem se sama morala izučit za to, da sem se potem čutila nekompetentno druge učit. Otroci te itak vedno gledajo kot boga, ampak jaz sem se tako nekompetentno, nevredno počutila. Ko smo delali letala, sem na koncu prosila modelarja, da mi je pomagal, da so letala res letela, da otroci ne bodo razočarani. In vse to bi se dalo nekako pomašit, če bi imela materiale, s katerimi lahko delam.

Učiteljica B opozori na problem neustreznih pogojev: »*Rabiš deske, olfa nože, žage. In če tega nimaš, potem režeš na karton in gre skozi in jih celo leto poslušaš, da si uničil že itak uničene in odpisane klopi.*«

Odnos otrok do tehniškega ustvarjanja

Kljub številčnim izzivom sogovornici zatrjujeta, da »*četudi učitelju popijejo vso energijo*«, imajo otroci »*noro radi tehniške dneve*«, »*uživajo, ker je tehnika drugačna, praktična.*« Temu se pridružuje učitelj fizike in tehnike: »*Otroci zelo radi izdelujejo izdelke, morda celo bolj kot včasih, ker doma nimajo časa za praktične dejavnosti, ker so bolj na računalnikih.*« Učiteljica B opozarja, da »*so otroci še vedno v svojem bistvu pristni, imajo željo po raziskovanju, samo priložnosti ni. Danes večino ur sedijo v zelo kontroliranem okolju.*« Učiteljica A pravi: »*Ko sem imela MK, so otroci resnično uživali. Imela sem dve skupini, ker je bilo toliko interesa. Če jaz danes rečem, da bom imela tehnični krožek, modelarski krožek in še posebej ker je zastonj, torej ni nikakršnih omejitev s strani staršev, so stranke zagotovljene.*« Na vprašanje, kaj narediti, da se osnovnošolcem, ki si želijo več tehniškega ustvarjanja, to ponudi, učiteljici menita, da gre za problem na razredni stopnji. Učiteljica B pravi:

Koristno bi bilo, da bi tiste razredne učitelje, ki imamo veselje in nekaj občutka za tehniko, ustrezno opolnomočili. V KATIS-u nisem videla, da bi se kaj takega ponujalo. Naj torej zunanji izvajalci razpišejo usposabljanja za učitelje, da se bodo ti čutili kompetentne izvajat krožke oz. če notranjih izvajalcev ni, da bi bili vsaj zunanji, ki bi tehniko ponujali. Pa tudi zunanjih ni.

Nadalje nas je zanimalo, v kolikšni meri tehniške vsebine vplivajo na kasnejšo karierno usmeritev otrok. Sogovornica A pravi:
Stvari je treba razvijat, gojit, da se začnejo povezovati. Če ne ponudiš, ne moreš pričakovati, da se bo kar samo od sebe razvilo. Če otrok ni postavljen ob izzive, ne moreš videti, da je za nekaj talentiran; tudi ne more biti samokritičen, če naredi samo en izdelek. Ko bodo otroci rastli s tem od malega naprej, bo tehnični kader zagotovljen.

Odgovori mentorjev MK
Odgovori mentorjev so nam podali vsebinske sklope: doprinosi in izzivi MK ter zanimanje za tehnično kulturo.

Doprinosi MK
Mentorji izpostavljajo veščine TP:
Otroci se naučijo rezati naravnost, natanko nanesti lepilo, naučijo se milimetre, navadijo se določiti težišče, učimo jih pravilnega brušenja pod kotom ter brušenja ravnih površin, rokovanja z olfa nožem in pilo, uporabe in merjenja z ravnilom, spajkanja, nastavljanja postaje za radijsko vodenje, poznavanja geometrijskih zakonitosti, kot so pravokotnost, vzporednost, kot, simetrija ipd.
Modelar B izpostavi: »*Pri MK dobijo osnove, da lažje razumejo svet okoli sebe, če bodo razmišljali, bodo znali povezovat; dobijo solidno podlago, da si sami razložijo stvari.*« Izpostavljajo branje in razumevanje načrtov: »*Načrti so kompleksni. Še če znaš, narediš napako.*« Poudarjajo pomen vzdrževanja reda na delovnem prostoru. Mentor A pravi: »*Otroci morajo pospravit po končanem delu. V roke morajo prijeti metlo. Prostor mora biti tak, kot so vanj vstopili.*« Velik doprinos vidijo v razvoju strpnosti in vztrajnosti: »*Ne uspe jim vedno takoj, rabijo vztrajat, bit potrpežljivi. Nekaterim je to težko, so različni karakterji. Jih je treba zato spodbujat.*« Doprinos pripisujejo tudi modelarskim tekmovanjem: »*Naučijo jih samostojnosti, organiziranosti in medsebojne pomoči*«, »*se morajo sami kaj znajt*« in »*morajo kaj povprašat.*«

Izzivi
Na vprašanje, s katerimi izzivi se soočajo, mentorji sicer poudarjajo, da imajo »*zelo usmerjeno mladino*« in zato »*majhne težave*«. Vendar pa opažajo, da so otroci »*manj spretni. Se pozna, da mnogi nečesa ne delajo redno. Ne gre za to, da bi bili manj sposobni. Gre za to, da prakse nimajo. Tisti, ki se že doma ukvarjajo, primejo orodje v roke in so bolj suvereni. Za druge je to le enkrat na teden. Delajo pol leta, potem je pol leta prost in ko spet prime v roke olfa nož, ne ve, na kateri strani je rezilo.*«

Zanimanje za tehnično kulturo

Mentorje smo vprašali, ali udejstvovanje v krožku vpliva na kasnejšo otrokovo karierno usmeritev. Mentor A pravi: »*Tu so tisti, ki jih tehnika zanima. Tudi če ne bodo šli to študirat, jih bo tehnika v neki obliki spremljala celo življenje.*« Drugi izrazijo strinjanje.

Na vprašanje, kakšno je zanimanje za tehnično kulturo po šolah, mentor A, ki je več let izvajal krožek na šolah, izpostavlja: »*Izvedba MK na posamezni šoli zavisi od zavedanja ravnatelja. Nekateri so tehniki zelo naklonjeni in bi takoj vzeli zunanjega izvajalca. So pripravljeni na ministrstvu pridobit sredstva. Drugi v modelarstvu ne vidijo smisla.*« Izpostavijo težave z ustrezno izobrazbo učiteljev na razredni stopnji: »*Interesa med otroki je veliko, toda težko je najti dovolj tehnično izobraženih učiteljev, ki bi se bili pripravljeni posvečat predvsem najmlajšim.*« V tem kontekstu nas je zanimalo, kaj lahko društvo naredi. Mentor A izpostavi številčno omejenost članov društva in nujo po tem, da se mentorja osebnostno ujameta. Pravi: »*Reklamiramo se do stopnje, ko še shendlamo. V našem primeru smo štirje, ki smo pripravljeni vlagat svoj čas, veselje in energijo v otroke. Gre za to, da se med seboj poznamo, vemo, kaj pričakovat. Gre za to, da smo skupaj rastli.*« Modelar C pa: »*Potrebna je sistemska rešitev. Mi smo društvo. Češnja na tortici. Eno društvo ne more navdihovati cele države. Mi lahko poskrbimo za medgeneracijski prenos znanja znotraj našega društva in za to, da bo modelarstvo živelo v naši dolini.*«

Razprava

Raziskava potrjuje, da se otroci radi ukvarjajo s tehniko. Izpostavljene so komponente drugačnosti, praktičnosti in ustvarjalnosti, ki jih lahko povežemo z aktivnimi, na učenca osredinjenimi metodami in oblikami dela, na katere v kontekstu ohranjanja zanimanja za tehniko opozorijo tudi druge študije (DRTI, 2011; Swarat idr., 2012; Marasco in Behjat, 2013; Kearney, 2016).

Za ohranjanje navdušenja nad TI je ključnega pomena tudi ustrezna usposobljenost učiteljev (De Vries, 2018). Učiteljici razrednega pouka sta opozorili na pomanjkanje ustrezne usposobljenosti razrednih učiteljev, da bi suvereno poučevali tehniške vsebine. Ker sta omenjali odsotnost seminarjev oz. izobraževanj, ki bi razredne učitelje opolnomočali za kompetentno izvajanje tehniških krožkov, natančneje modelarstva, smo pregledali ponudbo vsebin sistema KATIS za šolski leti 2021/2022 in 2022/2023, ki ponuja osnovnošolskim in srednješolskim učiteljem katalog programov nadaljnjega izobraževanja in usposabljanja.

Ugotavljamo, da katalog ponuja raznovrstne vsebine na področju TI (npr. izdelovanje panskih končnic, nakita, cvetja iz papirja, butaric, voščilnic, predmetov iz odpadnih materialov, učenje vezenja ipd.), ni pa ponudnikov vsebin modelarstva, tako kot sta naši sogovornici izpostavljali. Prav tako v kontekstu doizobraževanja iz tehniških vsebin na odsotnost ponudbe beremo v DRTI (2011). Zato se postavlja vprašanje ustrezne usposobljenosti osnovnošolskih učiteljev, celo razvitega in pismenega pogleda na tehnologijo in njeno naravo (Nilsson idr., 2016). Nekatere evropske države (npr. Nizozemska, Norveška, Irska, Švica in Italija) so v želji po spodbujanju TI zato pripravile nacionalne strategije, ki vključujejo izobraževanje učiteljev za učinkovito in inovativno poučevanje (Kearney, 2016) ter s tem potrdile prepričanje, da lahko le dobro strokovno in pedagoško usposobljen učitelj kakovostno izobražuje (Bell, 2016).

Raziskava osvetli problem materialnih pogojev, ki so lahko posledica manjšega vlaganja v opremo, saj so tehniški predmeti povezani z višjimi materialnimi stroški, mentor pa na kadrovsko politiko posamezne šole, ki določena področja spodbuja, druga zanemarja. Na opis omenjenih težav naletimo tudi v *Oceni stanja* (DRTI, 2011), kar nas navaja na razmišljanje, da je poročilo še vedno zelo relevantno. Zastavlja se vprašanje, v kolikšnem obsegu so se v desetletju razmere na področju TI v Sloveniji sploh spremenile.

Udeleženci so izpostavili mnoga znanja in veščine, neposredno povezane s TI, s poudarkom na MK. Izstopajo veščine TP, praktična znanja, socialne veščine, vztrajnost, samokritičnost, potrpežljivost, kar potrjuje spoznanje, da so formalne in neformalne oblike TI pomemben dejavnik v sintezi in transferju znanja (Colley, 2005; Marasco in Behjat, 2013; Lavrič in Deželan, 2021).

Raziskava izpostavi aktualnost problema upada motoričnih spretnosti. Vdor tehnologije v otrokovo življenje, ki je eskaliral v času pandemije COVID-19 (Komaini in Ayubi, 2021), je dramatično spremenil način preživljanja prostega časa in predvsem otrokovo igro (Frost, 2012; Ploj Virtič in Šorgo, 2016). Otroci se vse manj igrajo na prostem, vse več časa preživljajo znotraj doma, v digitalnem svetu, kar slabo vpliva na njihovo fizično in mentalno zdravje ter razvoj socialnih veščin (Cotman in Berchtold, 2002; Wysocki idr., 2013). To pa posledično onemogoča udejstvovanje otrok v vsakodnevnih praktičnih aktivnosti, ki bi razvijale splošne spretnosti in znanja (Frost, 2012).

Ugotavljamo težnjo po takojšnji uresničitvi potreb in želja, kakršno narekuje potrošniški način življenja, to pa šolo in izobraževalce postavlja pred velike izzive (Roberts, 2014; Biesta, 2019). V tem kontekstu učitelji poročajo o površno in nekritično opravljenem delu otrok ter težnjah po 'instant' rešitvah izzivov, pred katere so otroci postavljeni.

Mentorji in učitelji so izrazili prepričanje, da med vključenostjo otrok v neformalne oblike TI in kasnejšo karierno usmeritvijo obstajajo povezave ter s tem poudarili, da se »*inovatorji ne rodijo šele na fakultetah in raziskovalnih inštitutih, ampak je to proces, ki mora imeti svoje korenine že v predšolskem obdobju*« in »*se nato nadaljevati skozi celotno vertikalo izobraževanja*« (DRTI, 2011, str. 4). Prav tako druge študije povezujejo zanimanje za naravoslovno-tehniške predmete na primarni stopnji s kasnejšo izbiro študija in poklica (Tai idr., 2006; Shahali idr., 2016).

Sklepne ugotovitve

Primer modelarskega krožka potrjuje, da neformalne oblike tehniškega izobraževanja dopolnjuje cilje formalnega tehniškega izobraževanja in pomembno doprinašajo k razvoju tehnološke pismenosti, saj razvijajo mnogotera znanja, veščine in spretnosti, med katerimi izstopajo zlasti motorične spretnosti, praktična znanja in socialne veščine, to pa je povezano z razvojem vztrajnosti, kritičnosti, potrpežljivosti in drugih osebnostnih lastnosti. Raziskava opozori na težave, povezane z razvojem motorike, na porast individualizma, pomanjkanje samokritičnosti in vztrajnosti otrok, občutke neustrezne usposobljenosti učiteljic razrednega pouka za izvajanje tehniških krožkov in problem neustreznih materialnih pogojev. In končno, pomembna je ugotovitev, da tako učitelji kot mentorji menijo, da udejstvovanje otrok v tehniško usmerjene dejavnosti vpliva na njihovo kasnejšo karierno usmeritev.

Dejstvo, da je bila naša raziskava izvedena na nereprezentativnem vzorcu, predstavlja njeno omejitev. V prihodnje bi jo zato veljalo ponoviti na ustrezno velikem vzorcu. Prav tako bi bilo vredno ponovno preučiti stanje tehniškega izobraževanja v Sloveniji in rezultate primerjati s poročilom iz leta 2011 ter ugotoviti morebitne spremembe. Zanimivo bi bilo pogledati, ali med razrednimi učitelji prihaja do generacijskih razlik v prid mlajše, bolje tehniško usposobljene generacije. Vredno bi bilo razmisliti, v kolikšni meri in na kakšne načine sistemsko opolnomočiti razredne učitelje za izvajanje tehniških krožkov bolj specializirane narave, kot je MK.

In končno, veljalo bi raziskati, kolikšen delež diplomantov tehničnih smeri je bil med šolanjem vključen v neformalne oblike TI in kako se to odseva v posameznikovi TP.

Summary

Technological literacy (TL) comprises the understanding of technology and engineering, their impact on an individual, society, and the environment as well as the understanding of how to use and appropriately develop technological products, systems, and processes so that they contribute to the development of humanity (ITEEA, 2020). Education for technological literacy (ETL) promotes a technical mindset that empowers learners to be innovative and creative, develops cooperative, problem-solving, and critical thinking skills, and educates them to face and act constructively in today's technologically advanced world (Avsec, 2012). It is important in the process of lifelong learning as it transforms an individual's perception of themselves and of the role they play in society (Dierking & Falk, 2020). A review of the curricula of subjects related to ETL in the Slovenian primary school system shows that, on paper, ETL is well thought out and follows the child's psycho-motor development. If teachers act in accordance with the updated standards of ETL that foresee more practical work with the aim of preparing pupils for concrete problem-solving situations and emphasize the importance of lifelong and career orientation towards technical careers (ITEEA, 2020), ETL in the Slovenian nine-year school system seems to have the potential to develop TL. Nevertheless, it needs to be emphasized that the number of lessons assigned to ETL has been decreasing over time, with the introduction of the nine-year cycle by as much as 33% (DRTI, 2011). Therefore, the question arises as to the extent to which TL can fully develop. The aim of the research paper was to examine the role and importance of an aeromodelling club as a form of non-formal ETL on a child's TL. The following research questions were asked:
RQ1: How do the children involved in the research experience ETL in formal and non-formal learning settings?
RQ2: What challenges and tasks does ETL pose for children, teachers, and mentors?
RQ3: Which skills and competencies do technically-oriented activities develop?
RQ4: To what extent does participation in technically-oriented activities influence a child's later career orientation?

We opted for a case study, a type of qualitative research that focuses on understanding and explaining situations, processes, attitudes, behaviours, etc. from the different perspectives of its participants (Merriam, 2019). There were 20 participants: two teachers of lower grades, a physics and technology teacher, four aeromodelling club mentors, and 13 primary school pupils, aged 11 years on average, who had been involved in the club's activities from two to five years, with an average of four years. We decided to conduct three semi-structured interviews with the three teachers and two focus groups, one with the children and one with the mentors. The children were interviewed during one of the sessions. They were asked the following questions: *What do you particularly like about aeromodelling activities? What do you find challenging? What skills and knowledge have you gained through participating in aeromodelling activities?* Mentors were asked the following questions: *What is the children's attitude toward technically-oriented activities? How important is participation in aeromodelling activities with regard to knowledge, skills, and competencies? What do the children find challenging? Where do they have difficulties? To what extent does participation in the aeromodelling club activities influence children's later career orientation?* Similar questions were posed to teachers in a semi-structured interview, only with reference to the curricular content of technically-oriented subjects.

The findings suggest that non-formal ways of ETL complement the objectives of formal ones and make an important contribution to the development of a child's overall TL as they develop key knowledge, skills, and competencies, among which motor skills, practical skills, and social skills stand out, which are later linked to the development of perseverance, self-awareness, patience, and other personal qualities. The study points to the problems associated with motor skill development, the rise of individualism, and a lack of self-criticism and perseverance among children. Teachers of lower grades report feelings of incompetence in running technically-oriented clubs, while also pointing to the problem of inadequate material conditions. Both teachers and mentors feel that children's participation in technically-oriented activities has an impact on their later career orientation.

Literatura

Ayubi, N., in Komaini, A. (2021). The Impact of the COVID-19 Pandemic on Children's Motor Skills (Literature Review). *International Journal of Research Publications, 90*(1), 66–70.

Avsec, S. (2012). *Metoda merjenja tehnološke pismenosti učencev 9. razreda osnovne šole.* Doktorska disertacija. Ljubljana: Univerza v Ljubljani.

Bada, S. O., in Olusegun, S. (2015). Constructivism learning theory: A paradigm for teaching and learning. *Journal of Research & Method in Education*, *5*(6), 66–70.

Bell, D. (2016). The reality of STEM education, design and technology teachers' perceptions: A phenomenographic study. *International journal of technology and design education*, *26*, 61–79.

Biesta, G. (2019). What kind of society does the school need? Redefining the democratic work of education in impatient times. *Studies in Philosophy and Education*, *38*(6), 657–668.

Colley, H. (2005). Formal and informal models of mentoring for young people: issues for democratic and emancipatory practice. V L. Chisholm, B. Hoskins and C. Glahn (ur.), *Trading up – Potential and performance in non-formal learning* (str. 31–46). Strasbourg: *Council of Europe*.

Cotman, C. W., in Berchtold, N. C. (2002). Exercise: a behavioral intervention to enhance brain health and plasticity. *Trends in neurosciences*, *25*(6), 295–301.

Dierking, L. D., in Falk, J. H. (2016). 2020 Vision: Envisioning a new generation of STEM learning research. *Cultural Studies of Science Education*, *11*, 1–10.

DRTI. (b. d.). *Poletna šola elektronike in robotike*. Pridobljeno s http://www.drti.si/about.html (Dostopno: 25. marec 2023.)

Društvo za razvoj tehniškega izobraževanja (DRTI). (2011). *Ocena stanja tehniškega izobraževanja v Sloveniji in predlogi za izboljšave*. Ljubljana: DRTI. Pridobljeno s http://www.drti.si/docs/StanjeTeh.pdf (Dostopno: 23. marec 2023.)

De Vries, M. J. (2000). Can we train researchers and teachers to make a team? Win-win strategies in technology education. *Improving Practice Through Research: Improving Research Through Practice: 1st Biennial International Conference on Technology Education Research (TERC 2000),* (str. 1–12). Gold Coast, QLD: Technology Education Research Unit, Griffith University.

Fakin, M., Kocijančič, S., Hostnik, I., in Florjančič, F. (2011). *Učni načrt Tehnika in tehnologija*. Ljubljana: Ministrstvo za šolstvo in šport, Zavod RS za šolstvo.

Fakulteta za elektrotehniko Univerze v Ljubljani. (b. d.). Poletni tabor inovativnih tehnologij. Pridobljeno s https://fe.uni-lj.si/solarji-in-dijaki/poletni-tabor-inovativnih-tehnologij/(Dostopno: 22. april 2023.)

Fakulteta za strojništvo Univerze v Mariboru. (b. d.). *Poletna FS*. Pridobljeno s https://www.fs.um.si/ (Dostopno: 22. april 2023.)

Fakulteta za strojništvo Univerze v Ljubljani. (b. d.). *Poletna šola za učence 2023*. Pridobljeno s https://www.fs.uni-lj.si/raziskovanje/za-ostalo-javnost/poletna-sola-strojnistva-2023-za-ucence/delavnice/(Dostopno: 15. maj 2023.)

Fišer, G., Florjančič, F., Glodež, S., Slukan, D., in Šafhalter, A. (2013). *Učni načrt Tehnika: neobvezni izbirni predmet*. Ljubljana: Ministrstvo za izobraževanje, znanost in šport, Zavod RS za šolstvo.

Forman, J., in Damschroder, L. (2007). Qualitative content analysis. V L. Jacoby in L. A. Siminoff (ur.). *Empirical methods for bioethics: A primer* (str. 39–62). Bingley: Emerald Group Publishing Limited.

Frost, J. L. (2012). The changing culture of play. *International Journal of Play*, *1*(2), 117–130.

Inštitut za robotiko. (b. d.). *ROBObum*. Pridobljeno s https://robobum.um.si/ (Dostopno: 24. marec 2023.)

International Technology and Engineering Educators Association (ITEEA). (2020). *Standards for technological and engineering literacy: The role of technology and engineering in STEM education*. Pridobljeno s https://www.iteea.org/File.aspx?id=177416&v=90d1fc43 (Dostopno: 23. januar 2023.)

Mestna občina Maribor. (b. d.). *Javni natečaj za program »Mladi za napredek Maribora 20236, 40. srečanje*. Pridobljeno shttps://maribor.si/wp-content/uploads/2022/06/01-Javni-natecaj-Mladi-za-napr-edekMaribora-2023-podpisan.pdf (Dostopno: 24. januar 2023.)

Kearney, C. (2010). *Efforts to Increase Students' Interest in Pursuing Mathematics, Science and Technology Studies* and Careers. National Measures taken by 16 of European Schoolnet's Member Countries – 2015. Brussels: European Schoolnet.

Kodelja, Z. (2018). Etika edukacijskega raziskovanja. Šolsko polje, *28*(1–2), 73–85

Kolar, M., Krnel, D., in Velkavrh, A. (2011). Učni načrt. Program osnovna šola. Spoznavanje okolja. Ljubljana: Ministrstvo za šolstvo in šport, Zavod RS za šolstvo.

Komaini, A., in Ayubi, N. (2021). The Impact of the COVID-19 Pandemic on Children's Motor Skills (Literature Review). *The Impact of the COVID-19 Pandemic on Children's Motor Skills (Literature Review)*, *90*(1), 5–5.

Lavrič, M., in Deželan, T. (ur.). (2021). *Mladina 2020: položaj mladih v Sloveniji.* Maribor, Ljubljana: Univerza v Mariboru, Univerzitetna založba, Založba Univerze v Ljubljani.

Marasco, E., in Behjat, L. (2013). Developing a cross-disciplinary curriculum for the integration of engineering and design in elementary education. *2013 ASEE Annual Conference and Exposition Proceedings*, Atlanta, GA, United States.

Merriam, S. B. (2019). Introduction to qualitative research. V S. B. Merriam in R. S. Grenier (ur.). *Qualitative research in practice: Examples for discussion and analysis* (str. 3–18). San Francisco: Jossey-Bass.

Moye, J. J., in Reed, P. A. (2020). Standards for technological and engineering literacy: Addressing trends and issues facing technology and engineering education. *Technology and Engineering Teacher*, *80*(3).

National Research Council (NRC). (2015*). Identifying and supporting productive STEM programs in out-of-school settings.* Washington, DC: National Academy Press.

Nilsson, T., Sundqvist, P., in Gustafsson, P. (2016, August 23rd–26th). A pilot study of the technological literacy among primary school teachers In Sweden [Paper presentation]. PATT2016 – Technology Education for 21st Century skills.

Othman, N., in Shah, M. I. A. (2013). Problem-Based Learning In the English Language Classroom. *English Language Teaching, 6*(3), 125–134.

Ploj Virtič, M., in Šorgo, A. (2016). Can we expect to recruit future engineers among students who have never repaired a toy? *Eurasia Journal of Mathematics, Science and Technology Education, 12*(2), 249–266.

Roberts, P. (2014). *The impulse society. What is wrong with getting what we want?*. London: Bloomsbury.

Shahali, E. H. M., Halim, L., Rasul, M. S., Osman, K., in Zulkifeli, M. A. (2016). STEM learning through engineering design: Impact on middle secondary students' interest towards STEM. *EURASIA Journal of Mathematics, Science and Technology Education*, *13*(5), 1189–1211.

Sušnik, B., Justin, N., in Podbelšek, M. (2005). *Učni načrt. Izbirni predmet: program osnovnošolskega izobraževanja. Obdelava gradiv: les, umetne snovi, kovine*. Ljubljana: Ministrstvo za šolstvo in šport: Zavod RS za šolstvo.

Swarat, S., Ortony, A., in Revelle, W. (2012). Activity matters: Understanding student interest in school science. *Journal of research in science teaching*, *49*(4), 515–537.

Tai, R. H., Qi Liu, C., Maltese, A. V., in Fan, X. (2006). Planning early for careers in science. *Science*, *312*(5777), 1143–1144.

Vodopivec, I., Papotnik, A., Gostinčar Blagotinšek, A., Skribe Dimec, D., in Balon, A. (2011). *Učni načrt Naravoslovje in tehnika*. Ljubljana: Ministrstvo za šolstvo in šport, Zavod RS za šolstvo.

Wysocki, B., McDonald, N., Fanto, M., in McEwen, T. (2013). Designing STEM Activities to Complement Neural Development in Children. *Proceedings of integrated STEM Education Conference (ISEC), 1–5*. Princeton, NJ: IEEE.

Zveza inženirskih društev Maribor (ZID). (b. d.). *Inženirji gradimo prihodnost.* Pridobljeno s https://zid-mb.si/ (Dostopno: 17. april 2023.)

Zveza za tehnično kulturo Slovenije (ZOTKS). (b. d.). *Zveza za tehnično kulturo Slovenije.* Pridobljeno s https://www.zotks.si (Dostopno: 18. april 2023.)

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REVIJA ZA ELEMENTARNO IZOBRAŽEVANJE
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VKLJUČEVANJE STARŠEV V VZGOJNO-IZOBRAŽEVALNI PROCES KOT POTENCIALNI DEJAVNIK UČITELJEVEGA DOŽIVLJANJA STRESA PRI DELU

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Sodelovanje s starši lahko za učiteljice in učitelje predstavlja pomemben dejavnik doživljanja stresa pri delu. V raziskavi je sodelovalo 248 slovenskih osnovnošolskih učiteljic in učiteljev, ki so izpolnili anketni vprašalnik, sestavljen iz lestvic zaznanega stresa in zadovoljstva na delovnem mestu ter vprašalnika o sodelovanju s starši. Rezultati so pokazali, da so učiteljice in učitelji s svojim delom zadovoljni, povezujejo pa ga z visoko mero doživljanja stresa. Med različnimi oblikami sodelovanja s starši so se kot najbolj stresne izkazale prisotnost staršev med vzgojno-izobraževalnim procesom, roditeljski sestanki in govorilne ure. Največ stresa učitelji doživljajo ob starševskem nadzoru in poseganju v vzgojno-izobraževalno delo.

Ključne besede:
učitelji, starši, stres, zadovoljstvo pri delu, socialno-čustvene kompetence, odnosna kompetentnost

Parental Involvement in the Educational Process as a Potential Factor in Tachers' Experience of Work Stress

For teachers, working with parents can represent an important source of work stress. The study involved 248 Slovenian primary school teachers, who completed a questionnaire consisting of scales on perceived stress and job satisfaction and a questionnaire on cooperation with parents. The results showed that teachers are satisfied with their job, although they do associate it with high levels of stress. Among the different forms of engagement with parents, the most stressful was the presence of parents during the educational process and parent-teacher association meetings. Teachers also perceive high levels of stress when parents interfere in and control their work.

Keywords:
teachers, parents, stress, job satisfaction, social-emotional competences, relational competence

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Uvod

Učiteljice in učitelji pri svojem delu dnevno sodelujejo s številnimi déležniki, med katere sodijo tudi starši učencev, ki jih poučujejo. Vključevanje staršev v izobraževanje otrok velja za pomemben element učinkovitega izobraževanja in je lahko koristno za vse vključene v procesu vzgoje in izobraževanja: za učence, starše, učiteljice in učitelje, strokovne delavce in celotno šolo oz. lokalno okolje (Henderson in Mapp, 2002). Kakovostno sodelovanje učiteljic in učiteljev ter staršev spodbuja učne dosežke učencev, poleg tega pa iz njega izhajajo številne druge koristi, kot so boljši medosebni odnosi med učiteljicami in učitelji ter starši, višje zadovoljstvo učiteljev in boljša socialna klima na šoli, večja prisotnost učencev pri pouku, pozitivnejši odnos do šolskega dela in boljše duševno zdravje učencev (Jeynes, 2005; Pomerantz idr., 2007).

Kljub temu pa vidik sodelovanja s starši precej učiteljicam in učiteljem predstavlja potencialen izvor skrbi. Še zlasti to velja za učiteljice in učitelje na začetku njihove profesionalne kariere, ki vključevanje staršev v izobraževanje otrok pogosto doživljajo kot neprijetno in obremenjujoče pri svojem pedagoškem delu (Le Cornu, 2013). V prispevku obravnavamo področje učiteljevega sodelovanja s starši učencev in ugotavljamo, kateri vidiki tega sodelovanja utegnejo učiteljicam in učiteljem predstavljati potencialni izvor pomembnejših psiholoških obremenitev pri njihovem delu.

Doživljanje stresa učiteljic in učiteljev pri opravljanju vzgojno-izobraževalnega dela

Stres predstavlja kompleksen telesni in psihološki odziv na zunanje ali notranje dražljaje, ki ga posameznik doživlja kot občutek čustvenega ali telesnega nelagodja (Kyriacou, 1987). Do tega običajno pride v situaciji, ko posameznik zaznava neravnovesje med zahtevami položaja, v katerem se je znašel, in svojimi sposobnostmi spoprijemanja z njimi (Lazarus in Folkman, 1984). Na delovnem mestu se stres pojavi takrat, kadar zahteve delovnega okolja presegajo zaznane sposobnosti delavcev, da jih izpolnijo oziroma obvladajo.

Četudi večina učiteljic in učiteljev poroča, da so pri opravljanju svojega poklica zadovoljni in zavzeti (npr. Granziera in Perera, 2019), raziskave kažejo, da približno četrtina učiteljic in učiteljev svoje delo ocenjujejo kot 'zelo ali izjemno stresno' (Kyriacou, 2000).

Med najpomembnejše stresorje pri učiteljskem poklicu sodijo zlasti dejavniki, povezanimi s časovnimi pritiski in preveliko količino dela, z vzpostavljanjem discipline v razredu, s pomanjkanjem motivacije učencev za delo, hitrimi spremembami pri delu, z administrativnimi in vodstvenimi nalogami, ocenjevanjem s strani drugih, odnosom in s sodelovanjem z drugimi, zlasti z učenci, starši in sodelavci (za pregled glej npr. Kyriacou, 2000). Pritiski, ki jih učiteljice in učitelji doživljajo zaradi svojega dela, so lahko tudi posledica slabega delovnega okolja, pomanjkanja opreme, prevelikega števila učencev v razredu, slabih odnosov s sodelavci, pomanjkanja avtonomije, žalitev in napadov staršev, dodatnih šolskih zahtev in dejavnosti ter pripomb javnosti o učiteljevem delu (Slivar, 2013). Pomembno pa se je zavedati dejstva, da so stresorji za posamezne zaposlene vedno edinstveni in odvisni od medsebojnega delovanja posameznikove osebnosti, njegovih vrednot, spretnosti, sposobnosti in zunanjih okoliščin.

Poleg učencev, s katerimi oblikujejo tesne medosebne stike in vsakodnevno vstopajo v interakcijo, učiteljice in učitelji vzpostavljajo odnose tudi z drugimi déležniki v procesu vzgoje in izobraževanja. Mednje sodijo starši učencev, člani učiteljskega zbora in drugi strokovni delavci na šoli, predstavniki lokalne skupnosti in različni strokovnjaki. Kadar so ti medosebni odnosi kakovostni, za učiteljice in učitelje predstavljajo pomemben vir zadovoljstva in utegnejo delovati kot nagrada za vloženo delo (Slivar, 2011). Če v medosebnih odnosih prihaja do napetosti in težav, utegnejo ti delovati za učiteljice in učitelje kot stresor in znižati zadovoljstvo z delom, na dolgi rok pa prispevati k pojavu čustvene izčrpanosti (Papatraianou in Le Cornu, 2014). Čustvena izčrpanost se pogosto pojavlja v poklicih, v katerih posamezniki opravljajo delo z ljudmi, torej tudi v učiteljskem poklicu. Predstavlja doživljanje preobremenjenosti in izčrpanosti ob čustvenih zahtevah posameznikovega dela in je pogost znak izgorelosti pri delu (Maslach idr., 2001). Rezultati raziskav kažejo, da je učiteljski poklic povezan z visoko stopnjo izgorelosti pri delu in čustvene izčrpanosti (Hakanen idr., 2006), ki se kažeta tako na individualni kot na sistemski ravni. Prispevata namreč k slabšemu posameznikovemu telesnemu in duševnemu zdravju, občutkom neuspeha pri delu, upadu motivacije za delo, znižani kakovosti dela in posledično k opuščanju učiteljskega poklica.

Sodelovanje učiteljev s starši učencev

Vključenost staršev v proces izobraževanja prinaša za učence številne pozitivne posledice, kot so višji učni dosežki otrok, večji obisk pri pouku, izboljšano samospoštovanje in pozitivnejši odnos do šole (Christensen in Sheridan, 2001; Henderson in Mapp, 2002; McDermott, 2008;). Prav tako rezultati raziskav kažejo, da ima medsebojno sodelovanje učiteljic in učiteljev ter staršev ugodne učinke tudi na starše, saj prispeva k večjemu zaupanju staršev v šolo in šolski sistem na splošno, k višji samozavesti in dvigu pomena, ki ga starši pripisujejo znanju in izobrazbi (Hall in Quinn, 2014).

Slovenski šolski sistem spodbuja različne oblike sodelovanja šole s starši učencev, tako formalne, ki so predpisane in opredeljene z zakonodajo, kot neformalne, ki so organizirane z namenom razvoja pristnejših odnosov med šolo in starši (Intihar in Kepec, 2002). Med formalne oblike sodelovanja s starši sodijo roditeljski sestanki, govorilne oz. pogovorne ure ter pisna obvestila staršem. Njihov namen so redno informirati starše o otrokovem delu in napredku v šoli, vzpostavljanje formalne kulture komuniciranja, zaupanja in sodelovanja (Kalin idr., 2009). Neformalne oblike sodelovanja učiteljev oz. šole in staršev so načrtovane in izvedene z namenom večjega povezovanja obojih, razvoja pristnejših medsebojnih odnosov, vzpostavitvi medsebojnega zaupanja ter večjega razvoja samozavesti staršev pri sodelovanju s šolo nasploh (Kalin idr., 2009). Med najpogostejše oblike neformalnega sodelovanja staršev v osnovni šoli sodijo dan odprtih vrat, sodelovanje staršev na šolskih prireditvah in razstavah, v delovnih in zbiralnih akcijah, obisk staršev pri pouku, sodelovanje pri dnevih dejavnosti in interesnih dejavnostih itd. Vse omenjene oblike sodelovanja nimajo natančno opredeljenih namenov in ciljev. Lahko so organizirane na ravni šole ali na ravni posameznega razreda (Intihar in Kepec, 2002). Raziskave kažejo, da starši visoko vrednotijo pomen neformalnih srečanj z učiteljicami in učitelji, saj ti po njihovem mnenju pripomorejo k oblikovanju kakovostnejših medosebnih odnosov in pozitivnejšemu mnenju staršev o učiteljicah in učiteljih (Leenders idr., 2019).

Čeprav raziskave kažejo, da tako starši ter učiteljice in učitelji podpirajo koncept vključevanja staršev, obe skupini pogosto izražata različna, včasih celo nasprotujoča si prepričanja o tem, kako naj bi starši sodelovali v procesu izobraževanja in katere prakse sodelovanja so najbolj učinkovite (Miretzky, 2004). Učiteljice in učitelji vključenost staršev vidijo predvsem kot sodelovanje staršev pri organiziranih dejavnostih v šoli in pomoči otrokom pri domačih nalogah (Lopez idr., 2001).

Starši pa svojo vključenost v proces izobraževanja vidijo predvsem v obliki neformalnih načinov sodelovanja, pogovorov z otroki, učenju vrednot in preverjanju domačih nalog. Sodelovanje s starši utegne za učiteljice in učitelje predstavljati tudi pomemben vir doživljanja stresa pri njihovem pedagoškem delu. Starši namreč lahko do učiteljic in učiteljev gojijo visoka, včasih nerealna pričakovanja glede njihovega dela, vršijo pritiske po dodatnem času ali pozornosti za svojega otroka, izražajo nestrinjanje z načinom poučevanja ali s pridobljeno otrokovo oceno itd.
V pričujoči raziskavi smo želeli ugotoviti, kolikšen vir stresa učiteljicam in učiteljem predstavljajo posamezne oblike sodelovanja s starši; prav tako nas je zanimalo, kako zadovoljni so s svojim poklicem, koliko stresno ocenjujejo svoje delo na splošno in ali pri tem prihaja do razlik med učitelji z različno dolgo delovne dobe.

Metoda

Udeleženi v raziskavi

V raziskavi je sodelovalo skupno 248 osnovnošolskih učiteljic in učiteljev iz celotne Slovenije, ki so enakomerno zastopali vseh dvanajst slovenskih regij. V vzorcu je bilo 90,7 % žensk (n = 225) in 9,3 % moških (n = 23). Povprečna starost učiteljic in učiteljev v vzorcu je bila 40,21 leta (SD = 8,56). Udeleženi v vzorcu so bili razmeroma enakomerno porazdeljeni glede na delovno dobo: 27,82 % (n = 69) učiteljic in učiteljev v vzorcu je imelo do 5 let delovne dobe, 24,6 % (n = 61) učiteljic in učiteljev je poučevalo od 6 do 15 let, 34,68 % (n = 86) je poučevalo od 16 do 30 let in 12,9 % (n = 32) učiteljic in učiteljev v vzorcu je imelo 30 ali več let delovne dobe. Povprečna delovna doba udeleženih v vzorcu je bila 15,08 leta (SD = 9,56). Več kot polovica (52,82 %) v raziskavo vključenih učiteljic in učiteljev poučuje v prvem triletju osnovne šole, 29,42 % jih poučuje v drugem triletju, 17,74 % pa jih poučuje v tretjem triletju.

Pripomočki

Podatke za raziskavo smo pridobili s pomočjo *Lestvice zaznanega stresa* (Sheldon Cohen, 1994). Poleg slednje smo za namene te študije oblikovali in uporabili tudi dva merska instrumenta: *Lestvico zadovoljstva in doživljanja stresa na delovnem mestu* ter *Vprašalnik o sodelovanju učitelja s starši.*

Lestvica zaznanega stresa (Cohen idr., 1983) meri subjektivno zaznavo stresa pri posameznikih. Sestavljena je iz štirih postavk, ki udeležene sprašujejo o pogostosti občutkov in misli, povezanih z zaznavo stresa v zadnjem mesecu na splošno. Vsebinsko se torej ne nanašajo na različne vidike ali specifične okoliščine stresa. Udeleženi odgovarjajo na petstopenjski lestvici pogostosti Likertovega tipa (0 = nikoli, 4 = zelo pogosto). Rezultat, ki ga posameznik doseže na lestvici, predstavlja seštevek odgovorov. Višji skupni rezultat je povezan z večjim stresom. Cronbachov koeficient alfa za 4 trditve, ki sestavljajo lestvico zaznanega stresa, znaša 0,769, kar priča o dobri zanesljivosti instrumenta. Skupna spremenljivka se glede na rezultate test Kolmogorov-Smirnova ne porazdeljuje normalno ($p < 0,001$).

Lestvica zadovoljstva in doživljanja stresa na delovnem mestu: sestavljena je bila za namene pričujoče študije in zajema dve dimenziji: zadovoljstvo udeleženih z opravljanjem učiteljskega poklica (1 postavka) in zaznano stopnjo stresa pri delu (2 postavki). Na trditev, ki se nanaša na dimenzijo zadovoljstva z opravljanjem učiteljskega poklica, udeleženi odgovarjajo s pomočjo 5-stopenjske ocenjevalne lestvice (1 – zelo nezadovoljen/-a, 5 – zelo zadovoljen/-a). Trditvi na dimenziji stopnja zaznanega stresa pri delu se nanašata na zaznano stopnjo stresa pri poučevanju in pri sodelovanju s starši, udeleženi pa nanju odgovarjajo s pomočjo 5-stopenjske ocenjevalne lestvice (1 – nič stresa, 5 – hud stres). Cronbachov koeficient alfa za 3 trditve, ki sestavljajo uporabljeno lestvico, kaže na ustrezno zanesljivost uporabljenega instrumenta (0,741).

Vprašalnik o sodelovanju učiteljic in učiteljev s starši: za namene te študije smo oblikovali vprašalnik, namenjen merjenju učiteljevega doživljanja stresa pri različnih oblikah sodelovanja s starši. Vprašalnik sestavlja 17 postavk, ki se nanašajo na različne formalne in neformalne oblike sodelovanja s starši in njihovega vedênja pri vključevanju v izobraževalni proces. Udeleženi s pomočjo 5-stopenjske ocenjevalne lestvice označujejo zaznano jakost stresa, ki ga običajno doživljajo v navedenih situacijah (1 – nič stresa, 5 – zelo močan stres). Cronbachov koeficient alfa za uporabljeni vprašalnik kaže na ustrezno zanesljivost uporabljenega instrumenta (0,754).

Postopek

Baterija obeh lestvic in vprašalnika je bila pripravljena v spletni obliki. Zbiranje podatkov je potekalo na portalu spletnega anketiranja 1KA oktobra 2022.

Udeleženi so bili k sodelovanju v raziskavi povabljeni preko svojih vodij oz. pomočnikov vodij, ki so prejeli povabilo za sodelovanje v raziskavi in povezavo do vprašalnika po elektronski pošti. Sodelujočim v raziskavi sta bili zagotovljeni anonimnost in možnost prekinitve sodelovanja.
Obdelava podatkov je potekala v statističnem paketu SPSS, verzija 28.0. Za obdelavo pridobljenih podatkov smo uporabili metode deskriptivne statistike in Kruskall-Wallisov test ter testa mnogoterih primerjav.

Rezultati in interpretacija

Zaznana stopnja stresa pri učiteljicah in učiteljih ter njihovo zadovoljstvo z delom
V tabeli 1 so prikazani rezultati opisne statistike, izvedene za splošno zaznano stopnjo stresa, zadovoljstvo na delovnem mestu in zaznano stopnjo stresa pri delu. Razpon lestvice, ki meri splošno zaznano stopnjo stresa, (Cohen idr., 1983) je med 0 in 16, pri čemer višji skupni rezultat izraža višjo raven stresa pri posamezniku. Iz tabele 1 lahko razberemo, da maksimalna vrednost med udeleženimi ni bila dosežena. Glede na povprečno oceno lahko izmerjeno splošno zaznano stopnjo stresa pri udeleženih označimo kot zmerno, saj ni niti izrazito visoka niti izrazito nizka (M = 7,03; SD = 2,73). Nekoliko drugačni pa so rezultati udeleženih o zaznani stopnji stresa pri delu. Razpon lestvice, ki meri zaznano stopnjo stresa pri delu, se giblje od 2 do 10, višji rezultat izraža višjo stopnjo stresa, ki ga posameznik zaznava pri svojem delu. Opazimo lahko, da je bila dosežena maksimalna vrednost med udeleženimi učiteljicami in učitelji. Prav tako lahko izmerjeno zaznano stopnjo stresa, ki jo učiteljice in učitelji doživljajo pri svojem delu, označimo za visoko (M = 6,81; SD = 2,31).

Tabela 1: Mere opisne statistike za vključene lestvice stresa in zadovoljstva pri delu

	Min	Max	M	Me	SD
Splošna zaznana stopnja stresa	1	14	7,03	7,0	2,73
Zaznana stopnja stresa pri delu	2	10	6,81	7,0	2,31
Zadovoljstvo na delovnem mestu	1	5	4,07	4,0	0,74

Iz tabele 1 je moč razbrati tudi splošno stopnjo zadovoljstva, ki ga udeleženi doživljajo na svojem delovnem mestu. Na podlagi povprečne ocene (M = 4,07; SD = 0,74) lahko sklepamo, da so učiteljice in učitelji zadovoljni s svojo zaposlitvijo.

Tudi pregled deležev po posameznih ocenah zadovoljstva je pokazal podobno sliko, saj je skupno kar 87,09 % (n = 216) udeleženih izrazilo zadovoljstvo (»zadovoljni« oz. »zelo zadovoljni«) s svojim delovnim mestom.

Izid Kruskall-Wallisovega testa je pokazal, da ne prihaja do statistično značilnih razlik v splošni zaznani stopnji stresa med posameznimi skupinami učiteljic in učiteljev, razporejenimi glede na dolžino njihove delovne dobe ($\chi2 = 2440$; $p = 0,368$). Prav tako med omenjenimi skupinami ne prihaja do statistično značilnih razlik v zaznani stopnji stresa na delovnem mestu ($\chi2 = 0,866$; $p = 0,648$) niti v oceni njihovega zadovoljstva z delom ($\chi2 = 1,332$; $p = 0,722$). Primerjava med posameznimi skupinami udeleženih na podlagi njihove dosežene srednje vrednosti pri vseh treh proučevanih spremenljivkah (tj. splošna zaznana stopnja stresa, zaznana stopnja stresa pri delu, zadovoljstvo na delovnem mestu) tako ni pokazala razlik med učiteljicami in učitelji z različno dolžino trajanja njihove učiteljske karierne poti.

Doživljanje stresa pri učiteljicah in učiteljih med posameznimi oblikami sodelovanja s starši

V nadaljevanju raziskave nas je zanimalo, v kolikšni meri učiteljice in učitelji zaznavajo posamezne oblike sodelovanja s starši kot stresne. Tabela 2 prikazuje različne formalne in neformalne oblike sodelovanja učiteljic in učiteljev s starši učencev ter delež učiteljic in učiteljev, ki posamezni obliki sodelovanja pripisuje določeno mero stresa, ki ga med dano obliko sodelovanja s starši doživljajo. Med naštetimi oblikami sodelovanja učiteljic in učiteljev s starši učencev so se kot najmočnejši stresor za udeležene izkazali obisk staršev pri pouku (M = 3,59), roditeljski sestanki (M = 3,54) in govorilne ure (M = 3,38), kot najmanj stresni pa sodelovanje staršev na šolskih prireditvah in razstavah (M = 2,77), pisno obveščanje staršev (M = 2,82), sodelovanje staršev pri dnevih dejavnosti in interesnih dejavnostih (M = 3,01) in dan odprtih vrat (M = 3,02). Pri tem velja omeniti, da so bile ocene doživljanja stresa pri starševski udeležbi vzgojno-izobraževalnih dejavnosti, ki jih organizira šola izven rednega pouka, kot so dnevi dejavnosti ali interesne dejavnosti, bolj razpršene (SD = 1,24). Največ stresa učiteljicam in učiteljem v vzorcu tako povzročajo obiski staršev pri pouku, saj sodeč po samoocenah udeleženih več kot polovica (54,84 %) učiteljic in učiteljev v povezavi z obiski staršev pri pouku doživlja močan ali zelo močan stres. Skoraj polovica (49,59 %) udeleženih roditeljske sestanke označuje kot obliko sodelovanja s starši, pri kateri doživljajo močan ali zelo močan stres.

Nekoliko manjši stresor predstavljajo učiteljicam in učiteljem govorilne ure, v katerih dobra tretjina (39,92 %) udeleženih doživlja močan ali zelo močan stres. Najnižjo zaznano stopnjo stresa pri sodelovanju s starši učiteljice in učitelji doživljajo med sodelovanjem staršev v delovnih in zbiralnih akcijah, ki ga je samo 20 učiteljic in učiteljev (8,07 %) označilo kot situacijo, v kateri doživljajo močan ali zelo močan stres.

Tabela 2: Ocena zaznanega stresa učiteljic in učiteljev med posameznimi oblikami sodelovanja s starši

M	**SD**	**1 – Nič stresa**		**2 – Blag stres**		**3 – Zmeren stres**		**4 – Močan stres**		**5 – Zelo močan stres**	
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Govorilne ure											
3,38	0,78	0	(0,00)	23	9,27	126	(50,81)	77	(31,05)	22	(8,87)
Roditeljski sestanki											
3,54	1,01	2	(0,81)	30	(12,10)	93	(37,50)	79	(31,85)	44	(17,74)
Pisno obveščanje staršev											
2,82	0,89	13	5,24	76	30,65	113	45,56	36	14,52	10	4,03
Sodelovanje staršev na šolskih prireditvah in razstavah											
2,77	0,93	17	6,85	88	35,48	88	35,48	46	18,55	9	3,36
Obisk staršev pri pouku											
3,59	0,86	13	5,24	19	7,66	80	32,26	80	32,26	56	22,58
Sodelovanje staršev pri dnevih dejavnosti in interesnih dejavnostih											
3,01	1,24	20	8,06	50	20,16	107	43,15	49	19,76	22	8,87
Sodelovanje staršev v delovnih in zbiralnih akcijah											
2,31	0,89	36	14,52	121	48,79	71	28,63	18	7,26	2	0,81

Podobno kot pri različnih oblikah sodelovanja učiteljic in učiteljev s starši nas je zanimalo, v kolikšni meri učiteljice in učitelji zaznavajo posamezne oblike starševskega vedênja kot stresne. Tabela 3 prikazuje različne oblike negativnega starševskega vedênja, povezanega z njihovim (ne)vključevanjem v vzgojno-izobraževalni proces, in delež učiteljic in učiteljev, ki posamezni obliki starševskega vedenja pripisuje določeno mero stresa, ki ga sami ob tem doživljajo.

Rezultati kažejo, da je povprečna ocena zaznanega stresa, ki ga učiteljice in učitelji doživljajo, zelo visoka pri vseh naštetih oblikah negativnega vedênja staršev v procesu vključevanja v vzgojno-izobraževalni proces otrok. Vse oblike negativnega starševskega vedênja, povezane z vključevanjem v vzgojno-izobraževalno delo, povzročajo doživljanje močnega ali zelo močnega stresa pri več kot 85 % udeleženih.

Največ stresa učiteljicam in učiteljem predstavlja, kadar starši posegajo v njihovo vzgojno-izobraževalno delo in/ali jim pripisujejo krivdo in odgovornost za otrokov neuspeh, saj sodeč po njihovih samoocenah kar 89,51 % učiteljic in učiteljev ob tem doživlja močan ali zelo močan stres.

Podobno visok delež udeleženih (89,11 %) doživlja močan ali zelo močan stres, kadar starši izvajajo pretiran nadzor nad njihovim vzgojno-izobraževalnim delom, kadar posegajo v njihove metode in oblike poučevanja (87,9 %), načina ocenjevanja (86,69 %) oz. se staršem zdi, da starši prelagajo svojo odgovornost nanje (85,08 %). Kadar pride med učiteljico in učiteljem ter staršem do razhajanj v njihovih prepričanjih ali stališčih, 63,11 % učiteljic in učiteljev v vzorcu ob tem doživlja močan ali zelo močan stres.

Tabela 3. Ocena zaznanega stresa učiteljic in učiteljev ob različnih negativnih starševskih vedênjih

M	SD	1 – Nič stresa		2 – Blag stres		3 – Zmeren stres		4 – Močan stres		5 – Zelo močan stres	
		n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Poseganje staršev v moje vzgojno-izobraževalno delo											
4,47	0,69	0	(0,00)	2	(0,81)	24	(9,68)	78	(31,45)	144	(58,06)
Poseganje staršev v metode in oblike mojega poučevanja											
4,04	0,81	1	(0,40)	8	(3,23)	21	(8,47)	77	(31,05)	141	(56,85)
Poseganje staršev v moj način ocenjevanja otrok.											
4,48	0,76	0	(0,00)	6	(2,42)	27	(10,89)	59	(23,79)	156	(62,90)
Prelaganje starševske odgovornosti name											
4,32	0,78	0	(0,00)	4	(1,61)	33	(13,31)	90	(36,29)	121	(48,79)
Starševsko pripisovanje krivde in odgovornosti za neuspeh svojih otrok name											
4,47	0,82	0	(0,00)	3	(1,21)	23	(9,27)	78	(31,45)	144	(58,06)
Starševsko izvajanje pretiranega nadzora nad mojim vzgojno-izobraževalnim delom											
4,14	0,75	1	(0,40)	7	(2,82)	19	(7,66)	85	(34,27)	136	(54,84)
Razhajanje v mojih in starševskih stališčih ter prepričanjih											
3,86	0,88	0	(0,00)	14	(5,65)	76	(30,65)	89	(35,89)	69	(27,82)
Starši ne kažejo interesa za sodelovanje s šolo											
3,50	0,91	1	(0,40)	33	(13,31)	102	(41,13)	65	(26,21)	47	(18,95)
Starši se kljub pozivom ne udeležujejo formalnih in neformalnih srečanj											
3,31	0,86	3	(1,21)	47	(18,95)	106	(42,74)	53	(21,37)	39	(15,73)

Pri obeh oblikah starševskega vedênja, ki kažeta na nizko stopnjo vključevanja v vzgojno-izobraževalni proces svojega otroka, so učiteljice in učitelji v vzorcu ocenili, da je stopnja njihovega doživljanja stresa ob tem relativno nizka.

Manj kot polovica (45,16 %) učiteljic in učiteljev namreč poroča, da doživljajo močan ali zelo močan stres, kadar starši ne kažejo interesa za sodelovanje s šolo. Dobra tretjina (37,1 %) učiteljic in učiteljev pa doživlja močan ali zelo močan stres v situaciji, ko se starši kljub njihovim pozivom ne udeležujejo formalnih ali neformalnih oblik sodelovanja.

Diskusija in sklepi

S pričujočo raziskavo smo želeli osvetliti področje duševnega zdravja učiteljic in učiteljev v povezavi s tistimi psihološkimi obremenitvami pri njihovem delu, ki izhajajo iz medsebojnega odnosa starši–učitelj. Natančneje, zanimalo nas je, kolikšni sta stopnja zadovoljstva in doživljanja stresa pri učiteljicah in učiteljih ter kakšna je ocena njihovega doživljanja stresa pri posameznih oblikah sodelovanja s starši učencev. Rezultati naše raziskave so pokazali, da učiteljice in učitelji v svojem življenju na splošno doživljajo zmerno količino stresa. Pri tem se je treba zavedati, da je ta ocena rezultat vseh stresorjev, ki na posameznika delujejo v danem trenutku, in je odvisna od številnih dejavnikov, kot so osebnostne lastnosti, življenjske okoliščine, kompetence, strategije spoprijemanja s stresom itd. (Lazarus in Folkman, 1984). Večjo količino zaznanega stresa učiteljice in učitelji v naši raziskavi zaznavajo pri svojem učiteljskem delu. Pri tem ni bilo razlike med udeleženimi v različnih točkah njihovega kariernega razvoja: tako mlajši kot starejši – in torej bolj izkušeni – so poročali o podobno visoki količini stresa, ki ga zaznavajo pri svojem delu. Čeprav bi lahko predvidevali, da bodo starejši zaradi večje količine pridobljenih delovnih izkušenj pri svojem delu doživljali manj stresa, naši rezultati tega niso potrdili. Eden od možnih razlogov je morda v veliki hitrosti sprememb zahtev, s katerimi se učiteljice in učitelji danes soočajo pri svojem delu. Ta povzroča, da so marsikatere delovne obremenitve relativno nove za vse (tako starejše kot mlajše) in v spoprijemanju z njimi starejši kljub večletnim delovnim izkušnjam niso v pomembni prednosti pred svojimi mlajšimi kolegi. Dobljeni rezultati so nekoliko v nasprotju z rezultati nekaterih študij, ki kažejo, da učiteljice in učitelji na začetku kariere običajno doživljajo višjo stopnjo stresa, saj so njihove delovne izkušnje pogosto v nasprotju z njihovimi začetnimi prepričanji o tem, kaj pomeni biti učiteljica/učitelj (Pillen idr., 2013).

Po drugi strani pa so nekatere slovenske študije pokazale, da z naraščanjem delovne dobe pedagoških delavcev narašča tudi njihova zaznana količina stresa (Jerman, 2005).

Kljub stresu, ki ga doživljajo ob svojem delu, so učiteljice in učitelji s svojim delom zadovoljni. Ta podatek je spodbuden, saj raziskave kažejo, da utegne stres, ki ga doživljajo pri svojem delu, povzročati nižje zadovoljstvo pri delu (Landers idr., 2011) in predstavljati enega glavnih razlogov za opuščanje učiteljskega poklica (Algozzine idr., 2011). Da uspejo kljub delovnim zahtevam in stresu doživljati zadovoljstvo pri svojem delu, je ugoden pokazatelj njihovega duševnega zdravja (Capone in Petrillo, 2020). Učiteljice in učitelji z različno dobo poučevanja se med seboj niso razlikovali v stopnji zadovoljstva pri delu; to potrjujejo tudi študije, ki kažejo, da dolžina učiteljske kariere ne vpliva pomembno na zadovoljstvo pri delu (Topchayn in Woehler, 2021).

Med različnimi formalnimi in neformalnimi oblikami sodelovanja s starši učiteljice in učitelji poročajo o doživljanju najvišje stopnje stresa takrat, kadar starši obiščejo pouk oz. izvajanje interesnih dejavnosti ter na roditeljskih sestankih in govorilnih urah. Razumljivo je, da prisotnost staršev med izvajanjem vzgojno-izobraževalnega dela predstavlja dejavnik stresa, saj starši neposredno spremljajo vzgojno-izobraževalno delo, metode in oblike poučevanja, povezanost in interakcijo z učenci, pri tem pa presojajo strokovno usposobljenost in kompetentnost učiteljic in učiteljev. V takšni situaciji utegne učiteljica ali učitelj doživljati dvom vase in v svoje sposobnosti. Da bo svoje zmožnosti za spoprijemanje z zahtevami tovrstne situacije sodelovanja s starši zaznaval kot višje, je treba skrbeti za kontinuirano strokovno izpopolnjevanje učiteljic in učiteljev ter pridobivanje različnih kompetenc, ki so potrebne za uspešno poučevanje, vzpostavljanje medosebnih odnosov in interakcijo z vsemi déležniki v procesu vzgoje in izobraževanja (torej z učenci, s sodelavci, starši, z različnimi strokovnjaki in s predstavniki lokalne skupnosti). Na uspešnost sodelovanja učiteljice ali učitelja s starši vplivajo številni dejavniki, zlasti komunikacija med vsemi vključenimi in kakovost njihovih medsebojnih odnosov. Vloga staršev v odnosu z učiteljicami ali učitelji naj ne bi bila omejena le na aktivno poslušanje, temveč naj bi vključevala tudi postavljanje vprašanj, izražanje lastnih mnenj, predlogov in stališč ter sprejemanje skupnih dogovorov in sklepov (Lepičnik Vodopivec, 2012). Tako učiteljice ali učitelji in starši pa so odgovorni za spoštljiv medsebojni odnos, vzpostavljanje kakovostnega dialoga in prijetnega vzdušja za razpravo (Intihar in Kepec, 2002).

Med posameznimi vedênji staršev, ki utegnejo učiteljici ali učitelju predstavljati večji dejavnik stresa, so učiteljice in učitelji zaznali predvsem visoko starševsko vpletenost v vzgojno-izobraževalno delo, ki ga doživljajo kot poseganje v svoje delo in nadzor in ga starši vršijo nad njihovim delom. Ule (2015) ugotavlja, da so starši ponekod zelo vpleteni v vzgojno-izobraževalno delo in imajo glede slednjega lahko številne pripombe. Zato ne preseneča, da je prav to vedênje staršev pri učiteljicah in učiteljih zaznano kot pomemben dejavnik, ki prispeva k njihovemu doživljanju stresa pri delu. Tudi Slivar (2011) glede vzrokov, ki povzročajo osnovnošolskim učiteljicam in učiteljem stres na delovnem mestu, ugotavlja, da so na drugem, tretjem in četrtem mestu prav stresorji, ki so vezani na sodelovanje s težavnimi starši, konflikte z njimi in njihovo poseganje v vzgojno-izobraževalno delo.

Zanimiv rezultat naše raziskave je podatek, da učiteljice in učitelji precej manj stresa doživljajo, kadar je situacija nasprotna: kadar starši ne kažejo interesa za sodelovanje z njimi oz. se kljub vabilom ne vključujejo v formalne in neformalne oblike sodelovanja. To nakazuje, da učiteljice in učitelji interakcijo s starši v splošnem zaznavajo kot zahtevno in pri sebi morda ne prepoznavajo vseh potrebnih socialno-čustvenih kompetenc, ki bi jih potrebovali za učinkovito medsebojno sodelovanje. Med tovrstne socialno-čustvene kompetence sodijo predvsem sposobnosti samozavedanja, samouravnavanja, socialnega zavedanja, odnosnih spretnosti in odgovornega sprejemanja odločitev (Durlak, 2015). Za kakovostno vzgojno-izobraževalno delo je nujno, da učitelji razvijajo svoje socialno-čustvene kompetence in odnosno kompetentnost. Slednja predstavlja zmožnost za vzpostavljanje medosebnega odnosa, ki namesto rabe moči temelji na vključevanju, dialogu, empatiji, priznavanju drugih in vzpostavljanju notranje avtoritete (Jensen idr., 2015, Juul in Jensen, 2017). Če želimo ustvariti varno in spodbudno učno okolje, je namreč treba razvijati odnosno kompetentnost odraslih v procesu učenja in poučevanja, tako učiteljic in učiteljev ter staršev. Med učinkovita orodja za profesionalni razvoj socialno-čustvenih kompetenc sodijo zlasti redna poklicna refleksija, strokovna izmenjava vsebin v obliki intervizije oz. supervizije in izobraževanje o socialno-čustvenem razvoju, čustvenih odzivih ter strategijah uravnavanja stresne reakcije.

V pričujoči raziskavi ugotavljamo, da enega od pomembnih potencialnih virov stresa za učiteljice in učitelje predstavlja sodelovanje s starši. S tem dokazujemo pomen vzpostavljanja kakovostnih medosebnih odnosov pri delu učiteljic in učiteljev z učenci, s starši in z drugimi, vključenimi v proces vzgoje in izobraževanja.

Za zmanjšanje stresa, ki ga učiteljice in učitelji utegnejo doživljati v teh interakcijah, je ključno, da razvijajo socialne in komunikacijske veščine, izboljšujejo svojo odnosno kompetentnost, pridobivajo uvid v lastno stresno reakcijo ter se v procesu samorefleksije in čuječnosti urijo v konstruktivnejših načinih odzivanja na stresne situacije.

Summary

High-quality teacher-parent collaboration has many benefits, such as improved interpersonal relationships between teachers and parents, greater teacher satisfaction with work, a better social climate at school, increased student attendance, more positive attitudes towards schoolwork, and improved student mental health (Jeynes, 2005; Pomerantz et al., 2007). Nevertheless, their engagement with parents can represent an important source of work-related stress for teachers (Le Cornu, 2013). The aim of the present study was to identify the extent to which particular forms of engagement with parents represent a source of stress for teachers. We were also interested in teachers' satisfaction with their teaching work, how stressful they find their profession in general, and whether there are differences between teachers at different stages of their professional careers.

The survey uses a quantitative method of data collection. The sample of participants included 248 Slovenian primary school teachers, evenly distributed according to their career length. The participants completed an online questionnaire consisting of the Perceived Stress Scale (Cohen et al., 1983) and multiple measurement instruments constructed for the purpose of this study: the job satisfaction scale, the work-related stress scale, and the teacher-parent involvement questionnaire. Data were analysed by using descriptive statistics, the Kruskall-Wallis rank test, and the multiple comparisons test.

The Perceived Stress Scale score showed that teachers perceive a moderate level of stress in their lives in general. They report more stress in their teaching profession. Despite the latter, they are generally satisfied with their work as teachers. Comparing teachers at different points in their career development, there were no statistically significant differences in the experience of stress and job satisfaction between groups of teachers with different career lengths. Among the various formal and informal types of interaction with parents, teachers experience the most stress when parents visit the educational process, as well as during parent-teacher association meetings.

It is understandable that the presence of parents in the classroom can represent a stress factor for teachers, since parents can directly observe teachers' work, methods, and teaching strategies, as well teachers' connection and interaction with students. In such a situation, the teacher may experience self-doubt in him/herself and even doubt his/her abilities. Among the specific parental behaviours that have the potential to represent a major stressor for the teacher, participants identified the following: high level of parental involvement in the teacher's work, parents' interference in the teacher's work, and control over it. On the other hand, teachers experience much less stress when parents do not show interest in working with them or do not engage in formal and informal forms of cooperation. This finding suggests that teachers can perceive interaction with parents as challenging and may feel that they lack the necessary socio-emotional and relational competences for effective interaction with parents. These include, in particular, self-awareness, self-management, social awareness, relational skills, and responsible decision-making (Durlak, 2015).

The present study stresses the fact that interaction with parents can represent one of the important sources of stress for teachers. The findings of this study support the importance of establishing quality interpersonal relationships in teachers' work with students, parents, and others involved in the educational process. In order to reduce the stress that teachers may experience in these interactions, it is crucial for them to develop social and communication skills, improve their relational competence, gain insight into their own stress reactions, and, through a process of self-reflection and mindfulness, establish more constructive ways of responding to stressful situations.

Literatura

Algozzine, B., Wang, C., in Violette, A. S. (2011). Reexamining the relationship between academic achievement and social behavior. *Journal of Positive Behavior Interventions, 13*(1), 3–16.

Capone, V., in Petrillo, G. (2020). Mental health in teachers: Relationships with job satisfaction, efficacy beliefs, burnout and depression. *Current Psychology, 39*, 1757–1766.

Christenson, S. L., in Sheridan, S. M. (2001). *Schools and families: Creating essential connections for learning.* New York: Guilford Press

Cohen, S., Kamark, T., in Mermelstein, R. (1983). A global measure of percieved stress. *Journal of Health and Social Behavior, 24*, 385–396.

Durlak, J. A. (2015). *Handbook of social and emotional learning.* New York: The Guilford Press.

Granziera, H., in Perera, H. N. (2019). Relations among teachers' self-efficacy beliefs, engagement, and work satisfaction: A social cognitive view. *Contemporary Educational Psychology, 58*, 75–84.

Hakanen, J. J., Bakker, A. B., in Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*(6), 495–513.

Hall, N., in Quinn, R. J. (2014). Parental Involvement at the High School Level. *Journal of Ethnic and Cultural Studies, 1*(1), 13–21.

Henderson, A. T., in Mapp, K. L. (2002). *A New Wave of Evidence: The Impact of School, Family, and Community Connections on Student Achievement.* Austin, Texas: National Center for Family & Community Connections with Schools.

Intihar, D., in Kepec, M. (2002). *Partnerstvo med šolo in domom.* Ljubljana: Zavod Republike Slovenije za šolstvo.

Jensen, E., Skibsted, E. B., in Christensen, M. V. (2015). Educating teachers focusing on the development of reflective and relational competences. *Educational Research for Policy and Practice, 14*, 201–212.

Jerman, J. (2005). Stres pri strokovnih delavcih v vzgojnoizobraževalnih in prevzgojnih zavodih. *Socialna pedagogika, 9*(4), 469–497.

Jeynes, W. H. (2005). A meta-analysis of the relation of parental involvement to urban elementary school student academic achievement. *Urban Education, 40*(3), 237–269.

Juul, J., in Jensen, H. (2017). *Relational competence: Towards a new culture of education.* Mathias Voelchert GmbH Verlag.

Kalin, J., Resman, M., Šteh, B., Mrvar, P., Govekar-Okoliš, M., in Mažgon, J. (2009). *Izzivi in smernice kakovostnega sodelovanja med šolo in starši.* Ljubljana: Znanstvena založba Filozofske fakultete.

Kyriacou, C. (1987). Teacher stress and burnout: an international review. *Educational Research, 29*, 146–152.

Kyriacou, C. (2000). *Stress-busting for Teachers.* Cheltenham: Stanley Thornes.

Landers, E., Servilio, K. L., Alter, P., in Haydon, T. (2011). Defining disrespect: A rural teachers' perspective. *Rural Special Education Quarterly, 30*(2), 13–18.

Lazarus, R. S., in Folkman, S. (1984). *Stress, appraisal, and coping.* New York, NY: Springer.

Le Cornu, R. (2013). Building early career teacher resilience: The role of relationships. *Australian Journal of Teacher Education, 38*(4), 1–16.

Leenders, H., De Jong, J., Monfrance, M., in Haelermans, C. (2019). Building strong parent–teacher relationships in primary education: The challenge of two-way communication. *Cambridge Journal of Education, 49*(4), 519–533.

Lepičnik Vodopivec, J. (2012). *Teorija in praksa sodelovanja s starši: priročnik.* Ljubljana: Pedagoška fakulteta.

López, G. R., Scribner, J. D., in Mahitivanichcha, K. (2001). Redefining parental involvement: Lessons from high-performing migrant-impacted schools. *American Educational Research Journal, 38*(2), 253–288.

Maslach, C., Schaufeli, W. B., in Leiter, M. P. (2001). Job burnout. *Annual Review of Psychology, 52*(1), 397–422.

McDermott, D. (2008). *Developing caring relationships among families, children, schools, and communities.* Thousand Oaks, California: Sage Publications.

Miretzky, D. (2004). The communication requirements of democratic schools: Parent-teacher perspectives on their relationships. *Teachers College Record, 106*(4), 814–851.

Papatraianou, L. H., in Le Cornu, R. (2014). Problematizing the role of personal and professional relationships in early career teacher resilience. *Australian Journal of Teacher Education, 39*(1), 100–116.

Pillen, M., Beijaard, D., in Den Brok, P. (2013). Professional identity tensions of beginning teachers. *Teachers and Teaching, 19*(6), 660–678.

Pomerantz, E. M., Moorman, E. A., in Litwack, S. D. (2007). The how, whom, and why of parents' involvement in children's academic lives: more is not always better. *Review of Educational Research, 77*(3), 373–410.

Slivar, B. (2011). Poklicni stres pri učiteljih. *Vzgoja in izobraževanje, 42*(4), 8–18.

Slivar, B. (2013). *Na poti k dobremu počutju: obvladovanje stresa v šoli – teoretični vidik: knjiga za ravnatelje in učitelje o obvladovanju stresa na ravni šole in na ravni posameznika.* Ljubljana: Zavod RS za šolstvo.

Topchyan, R., in Woehler, C. (2021). Do teacher status, gender, and years of teaching experience impact job satisfaction and work engagement? *Education and Urban Society, 53*(2), 119–145.

Ule, M. (2015). Vloga staršev v izobraževalnih potekih otrok v Sloveniji. *Sodobna pedagogika, 66*(1), 30–45.

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