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STUDENTS' ATTITUDES TOWARDS MATHEMATICS IN LOWER GRADES AS AN ELEMENT OF MOTIVATION FOR LEARNING[**]

Abstract: An important condition for effective teaching in mathematics is the attitude of students towards the subject. Our research seeks to answer the question as to what attitudes students have towards mathematics by examining three elements: emotional (affective) relations, intellectual (cognitive) stimulation and moral (effective) parameters. We have examined a total of 364 pupils in the lower grades of the primary schools. The research is based on the method of scaling. Students have been asked questions in order to find out which factors have the strongest influence on their motivation to learn mathematics. The results show that students have positive attitude towards mathematics and they have good relationship with the teacher. The research demonstrated that motivation to learn mathematics is most strongly influenced by emotional and moral impact, followed by intellectual impact. Within the dimensions, the most intense effects are represented by anxiety, the interesting nature of the lessons, relationship with the teacher, and attachment to mathematics as a subject. The results have implications for developing a broader understanding of the nature of students' motivation to learn mathematics and for improving their engagement in mathematics learning.

Keywords: *motivation, emotional effect, intellectual effect, moral effect, mathematics.*

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Introduction

Motivation is a complex part of human psychology and behavior that influences how individuals choose to invest their time, how much energy they exert on any given task, how they think and feel about the task, and how long they persist at completing the task. Motivation is seen as a mental impulse that drives and directs human behaviour, including learning behaviour. Motivation has a willingness to activate, mobilize, channel and direct the attitudes and behaviour of a learner (Dimyati & Mudjiono, 2006). This is visible in students' choices of learning tasks, the time and effort they devote to them, their persistence in learning tasks, as well as their coping with the obstacles they encounter through the learning process (Bakar, 2014).

The motivation of learners is essential for their academic success in school. Motivation is what causes a person to want to know, act, understand, believe, or gain particular knowledge, skills, attitude, or values (Filgona et al., 2020) and a significantly important factor for academic learning and achievement across childhood through adolescence (Elliott & Dweck, 2005).

Researchers generally divide learning motivations into two categories: intrinsic and extrinsic (Deci & Ryan, 2008; Mester, 2010; Ryan & Deci, 2000). Intrinsic motivation to learn: motivation is generated by specific personality traits of the learner or by the specificities of the learning situation (Mester, 2010). If the students do not enjoy learning a subject in class, the material taught will be difficult to assimilated. Intrinsic motivation is created by an individual's self-influenced-personal-factors that are needs, interest, and enjoyment. This shows that learners can create motivation by themselves. Highly intrinsically motivated students are able to learn new concepts successfully and show better understanding of the subject matter (Filgona et al., 2020). Intrinsic motivation is driven by an interest or enjoyment which a person feels in a task. Extrinsic motivation to learn: learning is only a means to an external goal. Thus the learner learns for a good grade, social recognition or to avoid negative consequences (Mester, 2010). Extrinsic motivation is any external stimulus that comes from outside of a learner, and which drives the learner in the learning process (Filgona et al., 2020).

Researchers generally agree on three major dimensions that contribute to students'motivation (Kozeki, 1980; Mester, 2010; Ryan & Deci, 2000a). First, the affective dimension includes the drives to relate to other people. Its main components are: warmth (which covers emotional relationships ranging from dependence to the urge to care), identification (which refers to the desire to identify and to be like others) and affiliation, sociability (which examines the urge to belong to a group, to be friends, to feel a sense of community). Second, cognitive dimension includes the motivations to perform the task. Its main components are: independence (the urge for autonomy, independence, the urge to navigate the world independently,

the urge to comply with the task and the urge for self-confidence), competence (the urge to know, the urge to be efficient, the urge to achieve the pleasure of mastery) and interest (which is actually the pleasure of activity ranging from playing to problem solving). Third, effective dimension reflects a person's relationship to himself/herself as a social being. Its main components are conscience (the urge to conform to the self-ideal), the need for a system (the desire to be valued by the environment) and responsibility (the urge to be moral, to approximate one's individual values to the social norms). This basic framework can be helpful in designing or analyzing the impact of various strategies to increase students' motivation (Toth, 2000).

Some researchers mention four dimensions (Bandura, 1996; Dweck, 2010; Murray, 2011; Pintrich, 2003; Ryan & Deci, 2000; Seifert, 2004, as cited in Filgona et al., 2020). They believe that the more dimensions are met, and the more strongly they are met, the greater the motivation will be. These dimensions are:

– Competence: The student believes he/she has the ability to complete the task.

– Control/autonomy: The student feels in control by seeing a direct link between his/her actions and an outcome and retains autonomy by having some choice about whether or how to undertake the task.

– Interest/value: The student has some interest in the task or sees the value of completing it.

– Relatedness: Completing the task brings the student social rewards, such as a sense of belonging to a classroom or other desired social group or approval from a person of social importance to the student (Filgona et al., 2020).

An important condition for effective teaching is the selection of appropriate teaching content, work format, sources of knowledge, as well as increasing the motivation and activity of students (Lalić-Vučetić, 2016; Lungulov, 2010). Several studies (Kennedy, Tipps & Johnson, 2008: 56; Middleton & Spanias, 1999; Szabo-Thalmeiner, 2011; Turner et al., 2002) highlight the importance of motivation in teaching mathematics. Motivating students to learn in school is a topic of great concern for educationists today, and motivating students so that they can succeed in school is one of the greatest challenges of education. Student motivation is an essential element that is necessary for quality education (Filgona et al., 2020).

Motivation to learn is a state of being when a person is inspired to learn and aquire something. In order for learners to be successful in learning, it is necessary that they are interested and motivated (Lungulov, 2010: 295; Middleton & Jansen, 2011) and that they have a positive attitude towards Mathematics. An essential condition for effective mathematics teaching is to increase the motivation of learners (Putwain et al., 2018), which contributes to better performance in learning

(Fredericks et al., 2004; Lungulov, 2010; Putwain et al., 2018; Skaalvik et al., 2015). Learning should be made a motivating activity, because skills and abilities can only function optimally when learners are properly motivated (Rethy, 2003). Kozeki argues that only 50% of the success in learning depends on intellectual factors, the remaining part is determined by processes that cluster around motivation (Kozeki, 1980).

The degree to which a student is motivated to learn mathematics, or to achieve better results, depends to a significant extent on the attitudes one has towards mathematics. Many authors consider students' attitudes towards mathematics as a key contributor to higher or lower performance in mathematics (Mata, Monteiro, Peixoto, 2012; Mazana, Montero, Casmir, 2019; Mensah, Okyere, Kuranchie, 2013; Nicolaidou & Philippou, 2003) and once a positive attitude is formed, it can improve students' learning (Akinsola & Olowojaiye, 2008). Attitudes are affective responses that accompany a behavior initiated by a motivational state (Guthrie & Knowles, 2001). Attitudes "can therefore be linked directly to motivation and provide key information to a better understanding of attitudinal and motivational processes. In the domain of maths there is little research that studies the relationships between motivation and attitudes" (Mata, Monteiro, Peixoto, 2012: 3).

If the child has not been discouraged but rather encouraged at home to search and explore, to try to learn and discover everything independently, the teacher can easily arouse interest in learning as well as in the subject (Kozeki, 1980: 253). The teacher's task is to stimulate the motivation of the students and to create an appropriate stimulating environment for initial teaching and learning (Lungulov, 2010: 295; Molnar et al., 2020; Skinner & Belmont, 1993; Turner et al., 2002). Effective teachers have long been familiar with the idea that learners learn more when they are active than when they just watch and listen (McKeachie, 2002; National Research Council, 2000). Motivated learners have greater intellectual activity and better attention span, leading to more substantial learning outcomes. It is necessary to motivate learners, to stimulate their desire and need to learn, because motivated learners learn much better, faster and more easily than unmotivated learners (Lungulov, 2010: 295).

Students' perceptions of mathematics in primary school can influence their motivation and engagement and their willingness to participate in mathematical learning activities (Lazarides et al., 2020). Starting school can also be seen as a significant turning point in the development of motivation. It is at this time that the child is forced for the first time – and this is based on at least as much internal as external impulses – to act independently, to find his or her way around the world independently and, above all, to find a place for himself or herself in the community of peers (Kozeki, 1980: 259). Our experience shows that mathematics is a very popular subject among children before they start school and during the first years of school. The presumed reason for this is the colourfulness and the level of interestingness of the subject, the variety of activities and experiences in the

classroom. However, this enthusiasm for mathematics wanes in later years (Dowker et al., 2019). According to the opinion of Jozsa (2000), the number of tasks increases rapidly and the initial fascination fades. Some students continue to conquer obstacles with great diligence and ease, but others become discouraged and regular work no longer seems as interesting for them (Jozsa, 2000). Research shows that as the school years progress, students' motivation steadily declines and they become bored with learning, and as a result they develop negative attitudes towards mathematics (Jozsa, 2001; Turner et al., 2002).

Increasing a positive attitude towards mathematics is really necessary to achieve better results (Dowker et al., 2019). A good emotional climate in the classroom is necessary not only to make children have a good time in the class, but also because self-awareness can develop only amid such circumstances. And if we want to establish an environment in which children can change their self-image, a warm human atmosphere is needed in which the child can trust the teacher completely (Kozeki, 1980: 264). An open and fearless relationship is therefore essential in a good maths class, and the teacher can play a major role to achieve that (Woodard, 2004). In the classroom we should strive for an atmosphere where children can trust their peers and not feel anxious if they give a wrong answer. It is essential that questions are freely asked in the classroom and that pupils get answers to their questions. In a conducive learning environment, joy can be discovered not only when one finds the solution to a problem but during the process of learning (Kozeki, 1980; Turner et al., 2002). Focusing on motivation we may find ways to influence what the subjects want to do, not only how they try to achieve it. The basic needs for autonomy, competence and social belonging can all be met in a classroom that emphasises exploration, understanding and communication instead of rules, routines and rote learning. However, this requires that all feel safe and perceive that they can contribute to the process (Hannula, 2006).

The level of anxiety plays an important role in how a student performs, so the attitude towards mathematics is an important factor (Rodrígueze et al., 2020). If a learner has had a bad experience during primary and secondary school, anxiety associated with mathematics will continue to occur also later in life, even in adulthood (Jackson & Leffingwell, 1999; Rasmussen, 1999). In our survey, one question we sought to answer was what gives learners pleasure in learning mathematics and what prevents others from finding any satisfaction in maths class activities. Researchers interested in basic questions about how and why some students seem to learn and thrive in school contexts, while other students seem to struggle to develop the knowledge and cognitive resources to be successful academically, must consider the role of motivation (Pintrich, 2003).

When studying attitudes, it is worth bearing in mind that three factors influence attitudes: cognitive (knowledge, experience), affective (emotions) and behavioural information (Fredricks et al., 2004, 2016; Kozeki, 1980; Smith & Mackie, 2004). Behavioral engagement focuses on participation, effort, and

persistence in academic and social activities; emotional engagement encompasses the positive and negative emotions associated with others in education (e.g., teachers, peers, etc.) and the feelings that reflect the inclination to learn; cognitive engagement can be defined as the mental investment and efforts to grasp complex ideas or concepts and to develop self-regulatory skills and metacognitive strategies (Fredericks et al., 2016).

Research indicates that mathematical anxiety and mathematical attitudes are related (Ashcraft, 2002; Ashcraft & Faust, 1994; Woodard, 2004). Mathematical anxiety is essentially a feeling of tension, unease or perplexity, mental distress, fear and dread in the course of manipulating numbers and solving mathematical problems (Ashcraft & Faust, 1994). Mathematical anxiety has a direct and negative impact on higher mental processes (e.g. divergent thinking), thus affecting mathematical performance negatively (Skemp, 1975; Videnović i Radišić, 2011; Zakaria & Mohd Nordin, 2008). Consequently, as anxiety increases, motivation and performance decrease (Rodrígueze et al., 2020). Students with high anxiety are less motivated to do maths-related tasks, leading to a decrease in performance (Dowker, 2019; Thompson et al., 2013; Wang, 2021; Zakaria & Mohd Nordin, 2008). An individual with a high fear of failure perceptually and cognitively orientates to failure-relevant information and thus encounters anxiety prior to and during the task engagement. He/she seeks to avoid failure by avoiding the situation, by quitting or withdrawing effort, or by trying hard to succeed and thus avoid failure. The core emotion of fear of failure is most likely shame, a devastating emotion that entails a sense of one's global incompetence (Pantziara & Philippou, 2015). Ashcraft and Kirk, based on the fact that mathematical anxiety influences performance, found that those who perform well in maths tend not to be anxious about math, while those who perform poorly are more prone to mathematical anxiety (Ashcraft & Kirk, 2001). It may also be correct to conclude that negative attitudes towards the subject of mathematics cause math anxiety, which negatively affects performance, reflected in mathematics grades. Fear of failure is hypothesized to prompt the adoption of performance-avoidance goals that focus on the avoidance of negative consequences (Pantziara & Philippou, 2015). Ramirez and his colleagues (2013) also examined the relationship of mathematical anxiety with children's mathematical performance. They argue that it is important to identify and treat mathematical anxiety at an early stage because these initial anxieties increase over time and may lead to students with the highest chances avoiding subjects related to maths and mathematics-related career choices. These findings are are in accordance with other previous studies (Ashcraft, 2002; Middleton & Spanias, 1999; Ramirez et al., 2013; Rasmussen, 1999; Thompson et al., 2013).

If the attitudes towards the subject are positive, the learner will basically be eager to learn the subject and will be sufficiently motivated to do so. However, those with negative attitudes are not motivated and exhibit avoidance behaviour towards the subject (Aschaft, 2002; Notin et al., 2012: 226). They should be helped to adjust their psychological and emotional attitude toward the academic burden so that they

have a positive attitude toward learning (Wang, 2021). During the examination of attitudes towards mathematics, it has been observed that 80% of boys and 62% of girls had positive attitudes towards mathematics at the age of seven and boys still like mathematics at the age of 8–10 (Dowker, 2005). Research has confirmed gender differences, even in primary education, in mathematics self-concept, self-efficacy, and interest, suggesting that boys generally have better motivational profiles in mathematics than girls (Rodrígueze et al., 2020). Regarding the gender difference in mathematics anxiety, girls tend to have higher levels of anxiety than boys (Ashcraft & Faust, 1994; Rodrígueze et al., 2020; Schleepen & Van Mier, 2016; Schulz, 2005; Videnović & Radišić, 2011). A possible reason for the higher anxiety levels of girls is that they have more negative attitudes towards mathematics and that they are better in associating feelings of anxiety with mathematics (Dowker, 2005), whereas boys tend to have stronger mathematics self-efficacy and intrinsic interest than girls (Plenty & Heubeck, 2011). In particular, it is important to study the relations between attitudes and performance, which attitudes are particularly important to performance, and when these relations may emerge (Dowker, 2019).

Teachers should not ask too many questions or contradict (refute), but encourage students to try out ideas, explain and complement their findings, sketch their ideas, to discover what is known and what is unknown. The teacher should maintain the pupils' curiosity and pondering for as long as possible, as these activities deepen ingenuity and develop critical thinking. A cooperative atmosphere should be created in the classroom, and students should always be encouraged to engage and collaborate in new activities (Miletić, 2007; Wæge, 2010: 90). Valuable and interesting mathematical tasks should be chosen that interest children (Kennedy, Tipps, Johnson, 2008; Paunović & Gajtanović, 2020).

A successful teacher sees himself/herself first as a pedagogue (the organiser and leader of the learning process), and only then as an expert in his/her subject. The fundamental role of a teacher is to organise learning (creating effective learning situations) and to cooperate with students during learning (teacher-student partnership is required) (Lalović, 2009). The teacher must demonstrate a sincere, caring, nurturing attitude towards his/her students to help them overcome mathematical anxiety (Turner et al., 2002; Zakaria & Mohd Nordin, 2008).

The role of teachers in motivating learners cannot be overemphasized (Filgona et al., 2020). Teachers of mathematics have a key role in the development and change of students'motivation (Pantziara & Philippou, 2015). The teacher primarily motivates by interacting, activating, instructing, as well as by facilitating better insight, and helping comprehension (Kozeki, 1980: 115). Teachers who recognize how children acquire mathematical concepts provide educational experiences that support the needs of the learner and the requirements of the content (National Council of Teachers of Mathematics, 2000).

A true teacher's love of his/her subject sets a good example during his work. By creating a pleasant, encouraging atmosphere, it is ensured that students will work

independently, will be active and interested (Đorđević, 2019; Tambunan, 2018), and encourages learning by providing a good emotional connection (Skaalvik et al., 2015). A true teacher accepts all students fully as human beings, but is honest in pointing out their faults and virtues. He jokes a lot and creates a cheerful atmosphere, but from time to time he reprimands those who do not work well and do not pay attention (Kozeki, 1980: 261; Lungulov, 2010; Skinner, 1993). The teacher's presence gives the students a sense of security, but also reminds them of their work. Practices that prohibit mocking of poor responders and that allow students to ask their peers for help with schoolwork are closely linked to the goal structure (Patrick et al., 2011).

To summarise the aboved, a responsible teacher gets down to holding a class after thorough, quality planning and adequate preparation. He/she has to make an inspiring effect on the students and establish a suitable motivational basis (Lungulov, 2010; Middleton & Spanias, 1999; Skinner, 1993; Turner et al., 2002). The ability to create will develop more successfully if a healthy curiosity has been developed in the learner who is also capable of finding joy in problem solving. It is more important for mathematics teachers to cultivate primary students' curiosity, interest, and adaptive motivation in mathematics learning (Xia, 2022). The greatest motivating force lies in teaching that stimulates interest (Kovacs & Manojlovic, 2022).

Our research seeks to answer the question of what factors have the strongest impact on motivation to learn mathematics: emotional (affective) relations, intellectual (cognitive) stimulation, or moral (effective) parameters.

Methological framework

Students' attitudes towards learning and towards the subject of mathematics in the first cycle of primary education are crucial to their progress and achievement in mathematics education. In this research we have aimed to investigate what attitudes students have towards mathematics by examining three elements: emotional (affective) relations, intellectual (cognitive) stimulation and moral (effective) parameters, so that, based on the attitudes, we could get a picture of the students' motivation. The questionnaire was based on the questions of Orosz (1997) and has been adapted for lower grade students. The questionnaire contains 22 questions, and students had to give their answers on a five-point scale. The questions focus on three important areas in a similar way as in Orosz's study.

1. In the field of the emotional-social dimension of learning, an intensive factor is marked by the school's empathic, identification and affiliative motivation systems.

In this area, we looked at the following factors: emotional relationship with mathematics, with learning mathematics, with the teacher, and students' performance.

2. In terms of the cognitive dimension, students' interest in learning, activity, persistence and independence have been analysed.

3. In the moral (effective) dimension of self-integration, we examined the student's sense of duty and self-esteem.

We were curious to find out which dimension has the strongest impact on motivation to learn mathematics and the order of these effects within a dimension. The processing was carried out using the comparative ranking method.

The data were collected during school hours with the prior consent of the school administration and the students' teachers. Before participating in the study, teachers, students and parents (depending on the school policies) were informed about the content and procedure of the study. Before the data collection, which took place in a single classroom lesson, participants were reminded of the importance of answering the various questions honestly.

The results of the survey are derived from the average scores of each question. The Likert scale was treated as an interval scale in order to take advantage of the possibilities offered by complex statistical procedures, thus the scores can be summed accordingly (Csapo, 2002: 252). The questions were answered by the students on a 5-point Likert scale. The value of 1 ("strongly disagree") indicated the least positive attitude towards mathematics, while a value of 5 ("strongly agree") indicated the most positive attitude towards mathematics. Accordingly, students can score a minimum of 1 and a maximum of 5 points for each item. A score of 3 ("not entirely/not agree nor disagree") indicates a neutral attitude. Scores above this value indicate a positive attitude and scores below this value indicate a negative attitude towards the item in question. In case of the full scale, scores range from 4 to 20, with a score of 12 being neutral.

Description of the sample

The research sample was selected from primary school students of the lower grades in the territory of the Republic of Serbia. The sample was selected by random selection and consisted of 364 pupils: 165 boys and 199 girls (Table 1).

Table 1. Distribution of the student sample by gender

Gender	Item number	%	Valid Percent
Boys	165	45.3	45.3
Girls	199	54.7	54.7
Full sample	364	100.0	100.0

Students from all four grades of elementary school were selected for the sample: 25% of the group is made up of first-graders, 26.4% of second-graders. 21.2% of the sample consists of third grader pupils and 27.5% of fourth graders (Table 2).

Table 2. Distribution of the student sample by class

Class	Frequency	Percent	Valid Percent
1st graders	91	25.0	25.0
2nd graders	96	26.4	26.4
3rd graders	77	21.2	21.2
4th graders	100	27.5	27.5
Total	364	100.0	100.0

Research results and discussion

First of all, we wanted to examine whether the students have a positive attitude towards mathematics. The answers to the question "Do you like maths?" (M = 4.15; SD = 1.281) show that the students have a positive attitude towards mathematics (Table 3). The positive attitude is confirmed by the answer to the question "Is mathematics a difficult subject?" which is negative (M = 2.56; SD = 1.574), which means that students do not perceive mathematics as something that is difficult to learn. The obtained results are similar to the results of other studies, which show that in the lower grades of primary school, students' attitudes towards mathematics are positive, but that they decrease with the years of schooling (Mata et al., 2012; Mazana, Suero Montero, Olifage, 2019).

Within the domain of attitudes towards mathematics (Table 3), the highest value is attributed to maths games (M = 4,57; SD = 0,952), then the feeling of success when solving problems (M = 4.43; SD = 1.099), followed by the students' enthusiasm for mathematics (M = 4.08; SD = 1.177). Regarding the level of interestingness of maths lessons, the highest score was given to the *funny exercises* (M = 4.34; SD = 1.206), followed by the competitive situations in the class (M = 4.01; SD = 1.421), and finally solving unusual problems (M = 3.94; SD = 1.381). It can be seen that fun, entertaining tasks are more popular than novel, unusual tasks, which are more difficult for students to solve and thus are less popular.

Table 3. Students' attitudes towards mathematics

Questions	N	M	SD
Do you like maths games?	361	4.57	.952
Do you like fun maths problems?	361	4.34	1.206
Do you like new and unusual tasks?	364	3.94	1.381
Do you welcome competition in class?	364	4.01	1.421
Do you like maths?	357	4.15	1.281
Is mathematics a difficult subject?	359	2.56	1.574
Are you happy when you solve a problem?	363	4.43	1.099
Do you enjoy doing maths?	363	4.08	1.177

As the teacher is a very important factor on which the motivation for learning and the attitude towards the subject and learning mathematics depends, we sought to examine the students' attitudes towards the communication with the teacher. In the domain discussing the relationship with the instructor (Table 4), the teacher's help has received the highest scores (M = 4.37; SD = 1.141), the importance of receiving praise scored similarly high (M = 4.32; SD = 1.176), followed by asking for help (M = 4.07; SD = 1.258), and then learning extra tasks (M = 3.07; SD = 1.664).

Table 4. Relationship with the mathematics teacher

Questions	N	M	SD
Are you happy if your teacher helps you if you can't cope with a task?	363	4.37	1.141
Do you get praise from your teacher if you do well in maths?	363	4.32	1.176
Do you ask your teacher if you don't understand something in class?	363	4.07	1.258
Does your teacher give you extra maths tasks?	360	3.07	1.664

The results obtained show that the attitude of the students towards the teacher is positive, which is the basis for a positive attitude and good motivation for learning mathematics. Answers to the question "Does your teacher give you extra maths tasks?" particularly show that students feel confident in learning and that they do not perceive the demands made by the teacher as being difficult. Furthermore, we examined factors like performance, presence of anxiety in mathematics class and the elements of moral and intellectual dimensions.

The group of performance and anxiety has scored the highest regarding the emotional effects (Table 5), with the importance of learning mathematics being the highest (M = 4.76; SD = 0.640), followed by aspiration and willingness to learn (M = 4.67; SD = 0.755), then students' satisfaction with their performance (M = 4.37; SD = 1.177), and mathematics-related anxiety (M = 2.71; SD = 1.750) coming at the bottom of the list. Not surprisingly, this factor shows the largest deviation, as there is a significant difference between students' opinions. It would be worthwhile to compare whether anxiety is more prevalent in the older age groups, but we would like to address this in our next project.

Table 5. Performance, presence of anxiety in mathematics class

Questions	N	M	SD
Is it important to learn mathematics?	360	4.76	.640
Are you satisfied with your results in maths?	362	4.37	1.177
Are you doing everything you can to get better results?	364	4.67	.755
Do you get nervous in maths lessons?	364	2.71	1.750

Our study shows that the moral dimension has the strongest effect on the motivation to learn mathematics (Table 6). Among the moral effects, the highest scores were obtained by the preparation for the assessment tests (M = 4.45; SD = 1.036), followed by practicing mathematics (M = 4.39; SD = 0.998), and then solving extra-credit tasks (M = 3.96; SD = 1.247). The results suggest that the moral sense of the young students is very strong, and they have admitted to practice and prepare for mathematics classes diligently. The lower scores on optional tasks may also be due to the fact that in some classes children are less often given assignments other than the compulsory homework.

Table 6. Influence of the moral dimension

Questions	N	M	SD	Variance
Do you practice when you are unsure about something?	363	4.39	.998	.996
Are you preparing for the maths quizzes?	362	4.45	1.036	1.074
Are you doing your extra-credit tasks?	362	3.96	1.247	1.555

Our study shows that the intellectual dimension has the weakest effect on motivation to learn mathematics (Table 7). Regarding intellectual effects highest scores have been given to solving problems independently (M = 4.25; SD = 1.073), followed by participation in a mathematics competition (M = 2.43; SD = 1.820), then attending a mathematics clubs (M = 1.79; SD = 1.532).

Table 7. Influence of intellectual effects

Questions	N	M	SD	Variance
Do you do your homework independently?	359	4.25	1.073	1.152
Do you participate in maths clubs?	359	1.79	1.532	2.346
Have you ever been to a maths competition?	361	2.43	1.820	3.312

The results show that students mostly solve problems independently at home, but we also find that they like to ask the teacher for help in class. The lower scores for participation in competitions and in the extracurricular clubs are not surprising, as these activities are mostly associated with better performing pupils. It would be worthwhile to further extend the questionnaire by adding questions about aspects that influence the intellectual effects, as these characterize all pupils in a similar way.

Conclusion

Our research was motivated by our interest in the relationship between students' attitudes towards mathematics and their motivation to learn, which is closely related to it. In selecting the statements in the questionnaire, we tried to take

into account the most important factors that might influence the development of motivation to learn: it has been considered important to assess the students' attitudes towards mathematics, with a strong emphasis on the relationship with the teacher and the level of anxiety. In addition, the questionnaire also included an assessment of the degree of independence and perseverance, and we were also interested in the students' diligence.

The results show that students have positive attitude towards mathematics and they have good relationship with the teacher. The results show that motivation to learn mathematics is most strongly influenced by emotional and moral effects, followed by the intellectual effect. Other studies have also pointed to the power of the emotional effect (Kozeki, 1980; Skaalvik et al., 2015). Within the different dimensions, anxiety is predominantly the most intense effect. The influential effect of anxiety has been proven by several researchers, and our results are consistent with the previous studies (Ashcraft & Kirk, 2001; Notin et al., 2012; Pantziara & Philippou, 2015; Rassmussen, 1999; Zakaria & Mohd Nordin, 2008). The results suggest that it may be worth focusing on reducing anxiety about failure and maintaining confidence in the ability to solve mathematical problems in the early years of school. Moreover, our current results provide further evidence to support that the interesting nature of maths lessons is important from the aspect of the efficiency of teaching. Kennedy, Tipps & Johnson (2008) in their book have found this to be similarly important. We believe that we have succeeded in demonstrating that motivation has a place and an important role to play in mathematics education. By consciously using motivational pedagogies, educators can make learning mathematics fun and comprehensible for their students. These results will help to gain a more comprehensive understanding of students' motivation to learn mathematics and improve their engagement in mathematics.

The importance of the relationship with the teacher has been highlighted by several studies (Lalović, 2009; Middleton & Spanias, 1999; Pantziara & Philippou, 2015; Skinner, 1993; Tambunan, 2018; Turner et al., 2002), while the impact of the relationship with mathematics as a subject has also been pointed out in previous studies (Aschaft, 2002; Dowker, 2005; Kozeki, 1980; Notin et al., 2012; Rodrígueze et al., 2020). The value of examining independence was found to be high during our survey. This result is in line with the research of Benček and Marenić (2006), who have already emphasized in their previous study that students should be taught to be autonomous when working at home, while respecting their individuality (Benček i Marenić, 2006). Teachers of mathematics must be alert to the apparent importance of students' affective domain and to their practices in teaching so as students enjoy learning mathematics, develop their performance, and continue their educational career studying mathematics (Pantziara & Philippou, 2015).

This study reveals the links between motivation and engagement of primary school pupils. These findings have implications for improving mathematics teaching and learning. Research has shown that mathematical performance is positively

related to attitudes towards mathematics (Ashcraft, 2002; Ashcraft & Faust, 1994; Dowker et al., 2019). Previous studies on gender have shown that girls do not associate their success with the presence of ability, but that they do associate their failure with the absence of ability (Middleton & Spanias, 1999: 70). It would be useful to carry out a comparison between genders in the future. It would also be worthwhile to further investigate how learners' motivation to learn mathematics varies across the life stages and how academic performance in mathematics affects motivation to learn, which could be the subject of our next study. It would be important to further investigate the links between attitudes and performance, which attitudes are particularly important for performance, and when these links may develop.

This findings provide implications for developing a more comprehensive knowledge of the nature of students' mathematics learning motivation. However, there are certain restrictions. The questionnaire designed was not comprehensive enough to provide a perfect assessment of the motivational situation of primary school children in mathematics. Moreover, the sample area used was concentrated, which is not representative of the current situation of all students. Furthermore, the analysis of the questionnaire survey data is relatively straightforward, these issues should therefore be addressed in a follow-up study.

The results provide a good starting point for further research on student motivation in all stages of primary mathematics education and in formal education in general.

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СТАВОВИ УЧЕНИКА ПРЕМА МАТЕМАТИЦИ КАО ЕЛЕМЕНТ МОТИВАЦИЈЕ ЗА УЧЕЊЕ У НИЖИМ РАЗРЕДИМА

Резиме

Важан услов за ефикасну наставу математике је однос ученика према предмету. Наше истраживање тражи одговор на питање какве ставове ученици имају према математици, испитујући три елемента: емоционалне (афективне) односе, интелектуалну (когнитивну) стимулацију и моралне (ефикасне) параметре. Прегледали смо укупно 364 ученика основних школа. Истраживање се заснива на методи скалирања. Ученицима смо постављали питања како бисмо сазнали који фактори имају најјачи утицај на њихову мотивацију за учење математике. Резултати показују да ученици имају позитиван однос према математици и добар однос са наставником. Истраживање је дошло до закључка да на мотивацију за учење математике најјаче утичу емоционални и морални фактори, а затим интелектуални фактори. У оквиру димензија, најинтензивније ефекте представљају анксиозност, занимљивост часова, однос са наставником и везаност за математику као предмет. Резултати имају импликације за развијање ширег разумевања природе мотивације ученика за учење математике и на побољшање њиховог ангажовања у учењу математике.

Кључне речи: *мотивација, емоционални ефекат, интелектуални ефекат, морални ефекат, математика*.