Annales Mathematicae et Informaticae
62 (2025) pp. 158–170
DOI: 10.33039/ami.2025.03.001
URL: https://ami.uni-eszterhazy.hu

Mathematics teachers' beliefs about primary school students' mathematical attitudes*

Peter Csiba, Zoltán Fehér, Ladislav Jaruska, Szilárd Svitek, Miklós Vontszemű

J. Selye University, Komárno, Slovakia
csibap@ujs.sk, feherz@ujs.sk, jaruskal@ujs.sk, sviteks@ujs.sk, vontszemum@ujs.sk

Abstract. Primary school mathematics education is crucial to building a strong foundation for students' mathematical knowledge and skills. Students' attitudes towards mathematics and the teaching habits of their teachers play a significant role in their engagement and achievement. Teachers' perceptions of primary school mathematics lessons and their understanding of students' attitudes and teaching habits are critical in designing effective instructional strategies. In our article, we investigated these areas by conducting research among primary school mathematics teachers. The main findings are that mathematics teachers are mostly positive about their students' attitudes toward mathematics, the atmosphere of their lessons, and their own teaching methods in terms of suitability.

Keywords: teachers' perceptions, students' attitudes, teaching habits, attitudes towards mathematics

2020 *Mathematics Subject Classification:* 97-11, 00A35, 97C20

1. Introduction

The role of mathematics teachers is to prepare people who will be enriched with a sound foundation of mathematical culture in the antechamber of various professional scientific disciplines. The findings of several studies suggest that teachers'

*This research was supported by the VEGA grant (Vedecká Grantová Agentúra MŠVVaŠ SR) number 1/0386/21.

Submitted: June 24, 2024
Accepted: March 1, 2025
Published online: March 15, 2025

perceptions of primary school mathematics lessons are influenced by various factors, including students' attitudes towards mathematics, teachers' beliefs about student engagement, instructional practices, personal goals, student-teacher relationship quality, students' self-efficacy in mathematics teaching and practices in primary schools. Teachers' beliefs about students' attitudes towards mathematics and their instructional practices can significantly impact students' engagement and attitudes towards the subject. Positive teacher attitudes, enthusiasm, and effective instruction are associated with higher student engagement and positive attitudes towards mathematics.

According to Voss et al. [17] teachers' beliefs about mathematics, their teaching experiences, and the students' skills and attitudes toward mathematics all had an impact on how they perceived mathematics teaching. Voss et al's research with 328 mathematics teachers investigated mathematics teachers' beliefs about the nature of knowledge (epistemological beliefs) and about the teaching and learning of mathematics. The survey results showed that constructivist beliefs were positively connected to instructional quality and student accomplishment, while cognitive activation potential mediated the association between teacher beliefs and student achievement. Teachers' beliefs about mathematics and the teaching and learning of mathematics might "*influence how they interact with students in the classroom, thus affecting the quality of their instruction and, in turn, students' learning outcomes*" [17].

Dowker [8] identified several teaching habits that are conducive to creating a positive learning environment in mathematics, including creating a supportive classroom atmosphere, using interactive teaching methods, and providing individualized feedback to students. Many variables influence the practice of mathematics education, such as beliefs and attitudes towards mathematics education. Baier [1] investigated the predictive validity of mathematics teacher characteristics (cognitive ability, personality, professional knowledge, beliefs about teaching, and enthusiasm for teaching) on instructional quality (learning support, classroom disruptions, and cognitive activation) as rated by their students in a study focusing on mathematics teachers. Regardless of other relevant predictor variables, they discovered that extraversion was positively connected with learning assistance, but conscientiousness was significant for classroom discipline.

According to Campbell's [5] research, teachers' knowledge and views are potentially interconnected and influence teaching practice, which influences student accomplishment. The study's findings demonstrated a statistically significant association between teachers' knowledge and students' performance, and the study emphasizes the significance and power of teachers' beliefs, particularly when specific ideas interact with teachers' mathematical knowledge. Campbell contends that mathematics knowledge alone is insufficient for effective instruction. Attention must be made to both teachers' mathematical knowledge and teachers' ideas about teaching and learning mathematics in order to improve successful mathematics teaching.

Leavy et al.'s [13] investigation examining prospective primary teachers' per-

ceptions of their own competence in teaching mathematics and the elements that shape those perceptions shed light on how supportive relationships might influence students' attitudes about the mathematics. A study on student and teacher impressions of the quality of the student-teacher interaction was undertaken by [14]. The research focused on the interactions between the ten mathematics teachers and 336 middle school students in the fifth and sixth grades. The authors used a five-step hierarchical multiple linear regression to examine teacher and student factors related to students' quality of relationships with their teachers. Analyses revealed that "*teachers' student relationship perceptions positively predicted their students' perceptions, and the students' reports of their mathematics interest and self-efficacy positively predicted teacher relationships*" [14].

According to Beswick [2], the interaction patterns and pedagogical choices made by teachers in math classes are influenced by their views. The need for a greater comprehension of instructors' knowledge of and attitudes toward student engagement has been acknowledged. This knowledge may also extend to the best ways to change these attitudes and thereby affect pre-service and in-service teachers' practices [4].

The relationship between instructor enthusiasm and instructional behaviors was examined by Kunter et al. [12]. They discovered that the perception of teacher excitement as a crucial component of successful mathematics instruction is shared by both students and teachers. Their distinguished teachers' passion for mathematics as a topic stems from their passion for mathematics as a subject to be taught. Questionnaires were utilized to evaluate the teaching practices and zeal of the teachers from the viewpoints of both the teachers and the students. According to structural equation modeling, teachers who were more passionate about their work displayed better instructional behavior that was both self-reported and student-rated. In contrast, instructors' self-reports but not students' evaluations of instructional behavior were predicted by teachers' excitement for mathematics as a topic [12]. A micro-longitudinal study of students' self-efficacy in learning a new mathematical topic was conducted by Street et al. The authors discovered that "*(a) students' self-efficacy changed across lesson sequences; (b) there were differences in students' self-efficacy starting points and changes depending on perceived task difficulty and grade; and (c) there was more individual variation in self-efficacy starting points and changes in association with harder tasks*" [16].

According to Hannula [10], empirical research on beliefs in mathematics reveals a general pattern in which positive and negative beliefs are connected to one another, to positive and negative emotions, and to positive and negative motivation [11]. In their study, Di Martino and Zan [6] examined how students define their own relationship with mathematics and discovered similar correlations. They gathered 1600 essays with the subject "me and mathematics" from students in grades 1 through 13. According to their analyses, a negative emotional state was consistently associated with either a low self-esteem (low perceived competence) or a negative belief about mathematics (instrumental).

Di Martino and Zan [7] contend that attitudes toward mathematics are multi-

faceted entities with emotive, cognitive, and behavioral elements. These attitudes are formed and impacted by a variety of elements, such as the beliefs of the teachers, their methods of instruction, and the setting of the classroom. Some research suggest a causal relationship between instructors' affective beliefs and their classroom behavior. This method can occasionally produce paradoxical outcomes; for instance, the issue of the discrepancy between instructors' professed beliefs and their actions is well-known [6].

2. Methods

To achieve the research objectives, we used a single-group quasi-experiment. Our research was conducted on a sample of Hungarian upper primary school (Grade 5–9) mathematics teachers in Slovakia. By the term "Hungarian in Slovakia", we mean residents of Slovakia whose citizenship is Slovak and their nationality is Hungarian. According to the 2021 census data, 7.75% of the population in Slovakia (422,065) is of Hungarian nationality [15]. They have been provided with education in the Hungarian mother tongue at all levels of education, from kindergarten to university. Of these educational institutions, we targeted in our research the mathematics teachers who taught in primary school. As researchers at the only Hungarian-language university in Slovakia and not least as lecturers of the next generation of mathematics teachers, we have a duty to examine the opinions, attitudes, and perspectives of the mathematics teachers who are currently teaching so that we can respond to the challenges of the present.

As a research tool, an online questionnaire using Google Forms was performed in March 2023. The online questionnaire sent to schools was completed by 115 teachers. Four of them were not included in the target group, so further analyses were based on data from 111 questionnaires. The vast majority of the respondents (95.5%) have a tertiary qualification in mathematics, with five teachers with non-mathematics degrees who teach mathematics in their school. On average, responding teachers have 20.8 years (SD 10.9 years) of professional experience in terms of years taught. The sample is not representative. There is no precise information about the Hungarian mathematics teachers in Slovakia. However, we can estimate their number by examining the number of schools and the weekly lesson plan stated in the curriculum. Using this method, the research indicates that there should be around 200 mathematics teachers teaching in Hungarian at primary schools in Slovakia. Therefore, the data collected covers approximately half of the mathematics teachers. This number cannot be significantly higher, as there is a constant demand for mathematics teachers, especially in rural schools. The responses were analyzed and evaluated using IBM SPSS version 27 software.

In accordance with the aims of the research, the questionnaire asked for teachers' perceptions of primary school mathematics lessons in terms of students' attitudes and teaching habits. The questionnaire included 25 questions divided into 4 groups:

(1) teacher's perception of students' attitudes,

(2) questions about the way the mathematics lessons are taught,

(3) teacher's self-evaluation/self-efficacy,

(4) and questions regarding the flow.

Most of the questions were answered on a four-point Likert scale; two questions had a test response selected from the given list of possibilities. In this paper, we will therefore analyze topics (1) and (2), which cover 14 of the 25 questions. It is difficult to reach such a large sample of the studied population, so in the original 25-question questionnaire we asked a broader range of questions, covering several areas.

3. Results

In the questionnaire, which was divided into two groups of questions, we inquired about the perceptions of mathematics teachers in upper elementary schools where Hungarian is used as the language of instruction. The first group of questions inquired about the opinions of the teachers' students, while the second group inquired about the teaching of mathematics.

In terms of years taught, the teachers who responded had the least 1 year and the most 40 years of professional experience. While 14.4% of the respondents could be considered early-career teachers (1–5 years of experience), the majority had several years of experience, and two-thirds of them had been teaching for more than 16 years. In terms of subject combinations, physics (26.1%) and computer science (18.0%) are the most common subjects, with chemistry (14.4%), biology (9.9%), and Hungarian language and literature (6.3%) being the second subjects chosen alongside mathematics.

The responding teachers obviously teach in upper grades (5–9), but ten of them also indicated lower grades. Due to the compulsory number of lessons, the majority of the teachers are teaching in several grades, with 12.6% of those teaching mathematics in only one grade. 31.5% of the 111 teachers have only mathematics lessons; 46.8% of teachers have more than half of their compulsory lessons in mathematics; the rest have less than half of their lessons devoted to mathematics.

4. Evaluation of responses

The first set of queries inquired about how teachers perceive students' attitudes toward mathematics. The first three questions were on a 4-point Likert scale, and two questions allowed teachers to choose from the options offered (more than one, if needed). Table 2 contains a summary of the responses.

According to the teachers, approximately 2/3 of their students prefer (64%) and find (62.2%) mathematics interesting, while a much higher percentage of students find the teacher's own lessons interesting (88.3% positive). This is typical of the

Table 1. Cronbach's Alpha.

Dimension	A1, A2, A3	B1, B2, B3 (subjective opinions)	B4, B5, B6, B7, B8 (more factual)
No. of items	3	3	5
Cronbach's Alpha	0.779	0.627	0.381

Table 2. Questions A1–A3 on Likert scale.

Question	not at all	rather not	rather yes	very
A1 – math popularity	0	40	71	0
A2 – mathematics (as subject) is interesting	0	42	69	0
A3 – mathematics lessons are interesting	0	13	90	8

responses to the questionnaire, with respondents being presumably subjective in their self-assessment.

Most of the teachers (82) answered that their students find mathematics difficult, but at the same time, the mathematics lessons are interesting (60 answers), which are of course not mutually contradictory (Figure 1). More respondents said that mathematics is necessary (44) than unnecessary (19), and more said it is useful (35) than useless (10).

Teachers reported mostly positive opinions about mathematics lessons, saying that their students generally find the lessons interesting, funny, fun, and enjoyable (Figure 2). The second most common response was that the lessons were also tiring.

There were 9 questions on the teaching of mathematics in the questionnaire. It can be observed that the questions that refer to the teacher's work and thus indirectly evaluate the teacher were typically answered positively. This is basically what we expected, which is typical for such questionnaires. In other words, the teachers consider that mathematics is taught well, as they take into account the students' knowledge and solve corresponding problems, which are mostly interesting for the students and are carried out in a good atmosphere (B1, B2, and B3 questions, Table 3).

Further answers reveal the extent to which teachers use different didactic methods. Group work obviously cannot be used in every lesson, but it is apparent that 6.3% of teachers never use it. On the other hand, everyone mentioned the use of teaching aids, with the majority using them frequently in their lessons. Encourag-

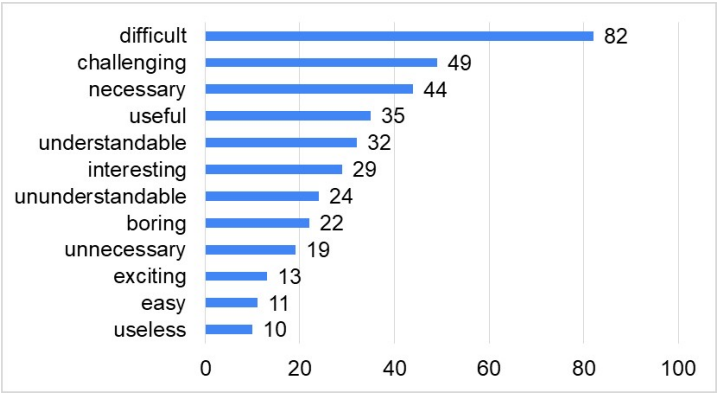

Figure 1. Answers to question: "According to students, mathematics is . . . "

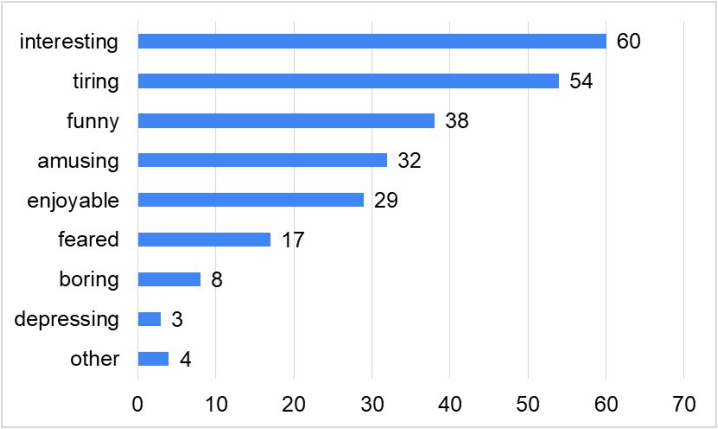

Figure 2. Answers to question: "According to students, mathematics lessons are . . . "

Table 3. Questions B1–B3 on Likert scale.

Question	not at all	rather not	rather yes	very/always
B1 – atmosphere of the lessons	0	2	88	21
B2 – difficulty of tasks	0	11	80	20
B3 – interesting "stuff"	0	11	84	16
B4 – group work	7	83	21	0
B5 – teaching aids	0	41	68	2
B6 – competition	5	55	50	1
B7 – homework	2	22	53	34

ing pupils to compete can also contribute to the effectiveness of lessons; it is used by 95.5% of teachers, of whom almost half use it frequently. Assigning homework is also traditionally part of mathematics lessons, with 30.6% of teachers using it in all classes. Two teachers never use it and 22 only sometimes, which could be related to the ability of the students in the class. Competitive tasks (question B8) are mostly composed of more demanding tasks than the required curriculum and are more difficult and challenging for the majority of students. 40.5% of the responding teachers also use competitive tasks in their lessons. 19 of the teachers (17%) do not have extracurricular activities outside their class; the others do so. Most of them (75%) regularly provide preparation for competitions, as well as workshops (52%), tutoring (26%), and some of the teachers have more than one of these extracurricular activities, e.g., running a workshop, preparing for a competition, and tutoring.

Cluster analysis. Based on the teachers' responses, we tried to identify the typical, characteristic answers for each group of questions. Cluster analysis was used to cluster the teachers. For each group of questions, 3-4 clusters of typical answers were identified. The main question of group A was "What does the teacher believe about the opinions of his or her students?" In this case only questions A1, A2, and A3 were analysed, because A4 and A5 are open-ended questions. With the analysis we identified three typical groups of teachers whose students tend to dislike mathematics and find it less interesting but whose own mathematics lessons are considered more interesting by their students. This cluster included 30.6% of teachers, with the majority of teachers (62.1%) in the second cluster (Figure 3). Here, the answer to the three questions was 'rather yes', i.e., they rather like mathematics and find it rather interesting, and similarly, the teacher's lessons are rather interesting. The analysis placed the remaining teachers (7.2%) in the third group, with students finding their lessons very interesting, preferring mathematics, and finding them interesting.

Based on the questions regarding mathematics lessons (B1–B8), cluster analysis was used to create 4 groups, 3 of roughly equal size and one smaller. In all 4 groups, the typical answers to the first 4 questions (B1, B2, B3, and B4) are the same. Teachers tend to agree that the lessons are in a good atmosphere, the tasks they deal with are of appropriate difficulty and mostly interesting, and group work is used only occasionally in lessons.

The difference between the clusters can be seen in the other 4 questions (B5–B8) (Figure 4). Teachers in the first cluster often use teaching aids but only sometimes encourage their students to compete and only sometimes give homework, but they do solve competitive tasks in class. This is the smallest group, with 18 (16.2%) participants. For the second cluster (28.8%), it is typical that they use fewer teaching aids, often encourage competition in the classroom, and give homework in every class, but do not usually solve competitive tasks. The third group (27.0%) typically uses teaching aids frequently, gives homework, and does competitive tasks, but uses competition between the students less often. The fourth group (27.9%) is

typically observed to use aids frequently, to encourage competition in the classroom, to give homework frequently, and to solve competitive tasks.

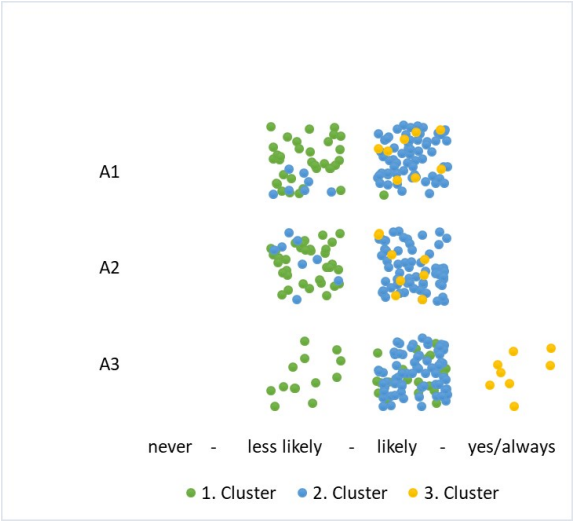

Figure 3. Students' opinions on mathematics: A1 – math popularity, A2 – math is interesting, A3 – math lessons are interesting.

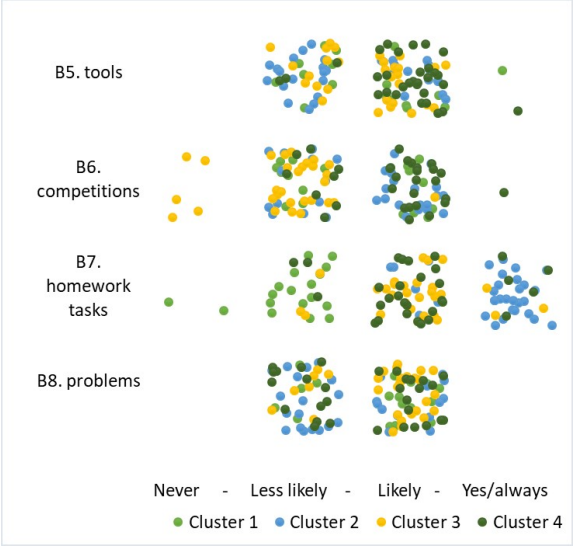

Figure 4. Use of methods in mathematics lessons, B5 – use of tools, B6 – competitions, B7 – homework tasks, B8 – problems.

5. Discussion

The purpose of our research was to obtain a more complete picture of teachers' perceptions of their students in mathematics education at the elementary level. In addition, we sought responses from as many experienced teachers and active teachers as feasible. Although some of the teachers who completed the questionnaire had "only" a few years of experience, the vast majority had more than 10 years of professional experience, as shown in the Results section. We have analyzed the opinions of teachers with a significant amount of relevant experience, and we have reached roughly half of the targeted teachers. From these perspectives, our survey was successful.

Questions A1, A2, and A3 were about the popularity of mathematics. At first glance, one might presume that the majority of student's dislike mathematics and do not find mathematics classes to be particularly engaging. We examined these concerns from the perspective of the teachers. In the A1 question, we only inquired about the preference for mathematics as a discipline, and as a consequence, teachers believed that their students preferred mathematics. This may appear to contradict the assumption at first glance. This view did not change in response to questions A2 and A3, which asked, "How interesting is mathematics?" and "How interesting is mathematics class?" A3 was a separate question on the teacher's own mathematics lesson on purpose, as we were interested to see if there would be a difference in perception. As anticipated, teachers rated their own lessons as even more engaging than mathematics in general, with the maximum number of positive responses increasing. Overall, teachers viewed the attitudes of their students toward mathematics as positive.

Several options were presented to teachers in questions A4 and A5 regarding their students' perceptions of mathematics and their mathematics lessons. These results align more closely with the more pessimistic assumptions about the public's perception of mathematics. The majority of responses to question A4 were negative, including "difficult" and "challenging." The majority of teachers do not consider mathematics to be easy, but they prefer to view it as "necessary." This was the third most common response, which also has a negative tone, as it could be interpreted as implying that mathematics is a subject that must be learned. In the responses to the A5 question about their own lessons, "interesting" is once again the most prevalent descriptor, but "tiresome" is the second most common, suggesting that negative feelings are evoked when mathematics is mentioned. The preponderance of comments on this item are negative.

Questions B1–B8 were concerned with the teaching aspect of mathematics. Question B1 was about the atmosphere in the lessons, to which teachers gave overwhelmingly positive answers. Question B3 also revealed that the vast majority of respondents attempt to engage in interesting activities. If this is indeed the case, they provide an excellent foundation for students to cultivate a positive attitude toward mathematics. Positive emotions and motivation, according to research by Hannula [9, 11], play a crucial role in the development of students' positive per-

ceptions of mathematics. Lessons with a good atmosphere elicit positive emotions in students, and interesting lessons can motivate them, hopefully fostering their attitudes towards mathematics.

Dowker [8] found that interactive teaching methods also contribute to positive perceptions. The next two questions focused on teaching methods. Questions B4, B5 focused on the use of group work and teaching aids. The first part of the result is not surprising, as expected the vast majority of trainers use teaching aids. However, the majority of teachers rarely or never use group work in their lessons, which is lower than expected. This may be due to the fact that group work was not an integral part of education twenty years ago. In addition to less group work, their teaching methods may contain other deficiencies.

Questions B2, B7, and B8 were for mathematics problems. In order: teachers' perceptions of whether students do tasks of appropriate difficulty for their level of knowledge, whether they are given homework, or whether they do competitive tasks in class. In B2, the vast majority of teachers consider that students do appropriate tasks in class. According to Bobis et al. [3], appropriate tasks are also essential because the more concrete and relevant an example is to real life, the more easily students can comprehend it. Moreover, performance improves with the degree to which assignments are understandable and approachable. Regularly presenting students with tasks that appear insurmountable and unsolvable can be demotivating. According to the responses to question B7 show that the majority of teachers assign homework to students. Question B8 deals with the prevalence of tasks in lessons that also occur in competitions. The majority of competition tasks are not straightforward practice exercises but rather require critical thinking and problem-solving. Emotions, curiosity, and motivation play an important role [9]. 40% of respondents answered yes to this question. Even though this is not a majority, it is a significant percentage for primary education.

6. Conclusion

The results of our survey indicate that, in general, teachers have positive perceptions of their students' attitudes toward mathematics. Teachers think their students find mathematics fascinating, and their own teachings even more so. In addition, they were generally pleased with their mathematics classes, the atmosphere of the classes, and the teaching methodologies. They believe that they assign appropriate-difficulty tasks to their students. According to Hannula [10], this amounts to a positive outcome. Positive emotions can contribute to the development of a positive attitude toward mathematics as a result of a positive environment, a sense of accomplishment after solving the right problems, and the use of appropriate teaching techniques. Positive emotions and motivation on the part of the teachers reflect teacher enthusiasm, which, according to [12], is a crucial component of effective mathematics teaching. It is important to note that teachers could only answer the questions in general terms, i.e., they reflected their average opinion of a class or group of students. There may be considerable dif-

ferences between classes as well as within classes in terms of students' knowledge and abilities. In addition, family background, financial and social circumstances, and even the disadvantaged situation of individual pupils, should be taken into account. Furthermore, since our survey was conducted within the constraints of the online space, it is assumed that, for example, face–to–face interviews could provide additional valuable information on the subject.

References

[1] F. Baier, A.-T. Decker, T. Voss, T. Kleickmann, U. lusmann, M. Kunter: *What makes a good teacher? The relative importance of mathematics teachers' cognitive ability, personality, knowledge, beliefs, and motivation for instructional quality*, British Journal of Educational Psychology 89.4 (2019), pp. 767–786, doi: 10.1111/bjep.12256.

[2] K. Beswick: *The role of knowledge and beliefs in helping learners to progress their mathematical understanding*, Journal of Mathematics Teacher Education 22.2 (2019), pp. 125–128, doi: 10.1007/s10857-019-09432-5.

[3] J. Bobis, J. Mulligan, T. Lowrie: *Mathematics for children: Challenging children to think mathematically (4th ed.)* Sydney, Australia: Pearson, 2013.

[4] J. Bobis, J. Way, J. Anderson, A. J. Martin: *Challenging teacher beliefs about student engagement*, Journal of Mathematics Teacher Education 19.1 (2016), pp. 33–55, doi: 10.1007/s10857-015-9300-4.

[5] P. F. Campbell, M. Nishio, T. M. Smith, L. M. Clark, D. L. Conant, A. H. Rust, J. N. DePiper, T. J. Frank, M. J. Griffin, Y. Choin: *The Relationship Between Teachers' Mathematical Content and Pedagogical Knowledge, Teachers' Perceptions, and Student Achievement*, Journal for Research in Mathematics Education JRME 45.4 (2014), pp. 419–459, doi: 10.5951/jresematheduc.45.4.0419.

[6] P. DiMartino, R. Zan: *'Me and maths': Towards a definition of attitude grounded on students' narratives*, Journal of Mathematics Teacher Education 13.1 (2010), pp. 27–48, doi: 10.1007/s10857-009-9134-z.

[7] P. DiMartino, R. Zan: *The construct of attitude in mathematics education*, in: From beliefs to dynamic affect systems in mathematics education: Exploring a mosaic of relationships and interactions, Cham, Germany: Springer, 2015, pp. 51–72, doi: 10.1007/978-3-319-06808-4_3.

[8] A. Dowker: *Individual differences in arithmetic: Implications for psychology, neuroscience and education*, London, UK: Psychology Press, 2005, doi: 10.1007/s10649-022-10165-1.

[9] M. S. Hannula: *Emotions in problem solving*, in: Selected Regular Lectures from the 12th International Congress on Mathematical Education, Cham, Germany: Springer International Publishing, 2015, pp. 269–288, doi: 10.1007/978-3-319-17187-6_16.

[10] M. S. Hannula: *The structure and dynamics of affect in mathematical thinking and learning*, in: Proceedings of the seventh congress of the European Society for Research in Mathematics Education, Rzeszów, Poland: University of Rzeszów, 2011, pp. 34–60.

[11] M. S. Hannula, P. D. Martino, M. Pantziara, Q. Zhang, F. Morselli, E. Heyd-Metzuyanim, S. Lutovac, R. Kaasila, J. A. Middleton, A. Jansen, G. A. Goldin: *Attitudes, Beliefs, Motivation, and Identity in Mathematics Education*, in: Attitudes, Beliefs, Motivation and Identity in Mathematics Education: An Overview of the Field and Future Directions, Cham, Germany: Springer International Publishing, 2016, pp. 1–35, doi: 10.1007/978-3-319-32811-9_1.

[12] M. Kunter, Y.-M. Tsai, U. Klusmann, M. Brunner, S. Krauss, J. Baumert: *Students' and mathematics teachers' perceptions of teacher enthusiasm and instruction*, Learning and Instruction 18.5 (2008), pp. 468–482, doi: 10.1016/j.learninstruc.2008.06.008.

[13] A. Leavy, A. H. Bjerke, M. Hourigan: *Prospective primary teachers' efficacy to teach mathematics: measuring efficacy beliefs and identifying the factors that influence them*, Educational Studies in Mathematics 112 (2023), pp. 437–460, doi: 10.1007/s10649-022-10181-1.

[14] S. L. Prewett, D. A. Bergin, F. L. Huang: *Student and teacher perceptions on student-teacher relationship quality: A middle school perspective*, School Psychology International 40.1 (2019), pp. 66–87, doi: 10.1177/0143034318807743.

[15] SOSR: *Census Results 2021*, Bratislava, Slovakia: Statistical Office of the Slovak Republic, 2021, url: https://www.scitanie.sk/en/population/basic-results/structure-of-population-by-ethnicity/SR/SK0/SR.

[16] K. E. S. Street, L.-E. Malmberg, G. J. Stylianides: *Changes in students' self-efficacy when learning a new topic in mathematics: a micro-longitudinal study*, Educational Studies in Mathematiucs 111.3 (2022), pp. 515–541, doi: 10.1007/s10649-022-10165-1.

[17] T. Voss, T. Kleickmann, M. Kunter, A. Hachfeld: *Mathematics Teachers' Beliefs*, in: Cognitive Activation in the Mathematics Classroom and Professional Competence of Teachers. Mathematics Teacher Education, Boston, MA, USA: Springer, 2013, pp. 249–271, doi: 10.1007/978-1-4614-5149-5_12.