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### To cite this article:

Maksimović, A., Stašević, F., & Milenković, A. (2025). Differences in parental involvement and expectations during primary education: Reflections of STEM and Non-STEM grammar school students. *International Journal of Education in Mathematics, Science, and Technology (IJEMST)*, 13(6), 1595-1614. <https://doi.org/10.46328/ijemst.5521>

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# Differences in Parental Involvement and Expectations during Primary Education: Reflections of STEM and Non-STEM Grammar School Students

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## Article Info

### Article History

Received:  
30 April 2025  
Accepted:  
27 September 2025

### Keywords

Parental involvement  
Grammar school students  
Educational choice  
STEM  
Non-STEM

## Abstract

Parental involvement during primary education plays an important role in shaping students' academic trajectories and aspirations. The aim of this study was to examine how grammar school students perceive parental involvement during their primary school years, and how it differs depending on whether they later chose STEM or Non-STEM tracks (languages, social sciences, sports, and arts). Furthermore, the present study explores how these patterns vary by gender, place of residence, and parental education. Using a quantitative research design, data were collected from grammar school students in Serbia. The results indicate that students who chose Non-STEM departments experienced greater parental involvement than those who chose an educational pathway that prepares them for academic studies in STEM subjects. Data analysis on parental involvement across STEM and Non-STEM groups yielded valuable findings in relation to students' sociodemographic backgrounds: differences reflected in homework supervision, encouragement to pursue higher education, and expectations about immediate employment. These findings emphasize the importance of recognizing the multifaceted nature of parental engagement, ranging from practical help to symbolic encouragement, and its interaction with social and cultural capital. The study concludes with recommendations for inclusive education policy and practice that recognize and strengthen family-school partnerships.

## Introduction

The issue of the level and manner of parents' involvement in their children's education is an important research topic. In the extensive literature dealing with the influence and relationship of parents' activities on the different aspects of the education of their children, the Coleman Report and the work of Pierre Buride have been stated as particularly important resources. The Coleman Report (Coleman et al., 1966), the most important American policy document of the 20th century, laid the foundation for educational policy in all subject areas during the civil rights era, emphasising the positive influence of the family on student achievement (Craig et al., 2018). Coleman examines the impact of social capital in the context of the family on educational outcomes. He argues that parental

involvement is a crucial tool for individuals to create social capital, similar to other forms of capital, e.g. economic, human and cultural capital, from which individuals can draw to increase their productivity and promote upward mobility (Zhu et al., 2023). Coleman first divides the social capital of the family into social capital within the family and social capital outside the family. Since parents' attitudes and encouragement support their children's efforts and involvement in school, intra-family social capital consists mainly of parents' expectations and concerns about their children's education. Extra-familial social capital, which includes parents' social connections, occupations and rank, and family social contacts, symbolises the family's ability to access social resources. Coleman emphasises how the availability of social capital affects whether an actor is able to achieve a particular instrumental action goal because it is productive. According to Coleman's concept of social capital, social structures such as families, schools, and communities can produce social capital. Based on the predicted performance of a student's socioeconomic conditions, success in education can be explained by the interaction between family and community (Zhu et al., 2023). In the European context, French sociologist Pierre Bourdieu's concept of family capital goes back to his expansion of the meaning of social capital, which he divides into three dimensions: economic, social and cultural. For Bourdieu, the educational system represents the fundamental starting point for the study of cultural and social reproduction, or more precisely, for the study of the mechanisms that ensure the reproduction of the structure of relations between classes. The existing class relations are maintained by in school by the unequal distribution of economic, social and cultural capital among students and their families (Bourdieu, 1977).

## **Literature Review**

Since the 1990s, research on parental involvement in education has generally categorized it into three key domains: academic socialization, involvement at school, and involvement at home (Kim, 2022). A comprehensive view of parental involvement encompasses various aspects such as monitoring children's academic behavior, engaging in communication with schools, and participating in educational decision-making processes (Özyıldırım, 2024; Türe & Deveci, 2021). According to Hill & Tyson (2009), academic socialization refers to parents conveying their values, expectations, and the importance of education to their children, such as discussing educational goals and future plans. Home-based involvement includes activities like assisting with homework or supporting learning routines, while school-based involvement refers to direct participation in school events and communication with teachers. Hill & Tyson (2009) further indicated that academic socialization showed the strongest link to adolescent academic success, whereas school-based involvement had a weaker association, and the impact of home-based involvement was inconsistent. This distinction is particularly significant considering the documented influence of parental involvement on students' academic progress and achievement during adolescence (Park & Kim, 2024). Given that parental involvement is a potentially adjustable factor, subject to improvement through guidance, interventions, or training, it becomes crucial to determine which forms of involvement most positively (or negatively) influence academic outcomes. The nature and effectiveness of parental involvement also appear to shift notably as children transition from primary to secondary education (Hill & Tyson, 2009; Karbach et al., 2013).

Parental involvement in children's education constitutes one of several critical contextual influences on academic

development and their long-term educational pathways, alongside peers, teachers, and broader community factors (Aslan, 2017). Unlike other external influences, parents exert a direct and sustained impact through both home- and school-based activities, ranging from monitoring homework completion to participating in parent-teacher relationships (Thomas et al., 2020).

Within STEM disciplines, parental engagement assumes added significance. Empirical studies link home-based involvement to improvements in children's quantitative reasoning and problem-solving skills, suggesting that early parental support can lay the groundwork for later proficiency in mathematics and science (Sellami et al., 2023). A study encompassed 206 Finnish students found that mothers' and fathers' beliefs played different roles in shaping students' task values, with subject-specific variations: mothers' ability beliefs predicted students' interest in mathematics and their perceived importance of literacy, while fathers' beliefs were linked to changes in math-related interest and importance (Viljaranta et al., 2015). Similarly, in a large-scale study with 8,071 students and their parents across six European countries, researchers identified significant relationships between parents' attitudes toward mathematics, their practices, and students' perceptions of the value and cost of learning mathematics (Peixoto et al., 2024). A study involving 849 adolescents from Germany demonstrated that students' perceptions of their parents' valuing of mathematics were positively associated with high motivation profiles (Lazarides et al., 2016). These findings align with the notion that when schools actively foster home-based learning activities involving parents, the number of mathematically gifted students increases (Sheldon & Epstein, 2005). Olivares & Ceglie (2019) emphasized that when suburban parents engage with their children in mathematics at home, regardless of whether the activities are directly tied to coursework, it helps cultivate a more positive attitude toward the subject. However, large-scale assessments offer a more nuanced perspective: PISA data indicate that direct parental assistance with science homework may coincide with lower achievement among early adolescents, potentially reflecting mismatches between parental methods and students' developing autonomy (OECD, 2013; Hill & Tyson, 2009). Such findings underscore the importance of the quality and timing of parental actions, rather than their mere presence. Moreover, the quality of parental involvement is just as important as its frequency. In particular, when parents exhibit autonomy-supportive behaviors, encouraging independent problem-solving and providing constructive feedback, they help children build self-regulation and resilience, key skills for succeeding in challenging academic environments, including those that require STEM expertise (Vasquez et al., 2016). Conversely, overly controlling or directive parental involvement can undermine students' academic motivation and discourage autonomy, particularly in high school, when students are expected to take more responsibility for their learning (Patall et al., 2010).

In shaping students' choices and achievements in Non-STEM tracks, such as social sciences, languages, arts, and sports, parental involvement could also be significant. In contrast to the emphasis placed on STEM education in many societies, social sciences, arts, and languages are sometimes perceived as less academically rigorous or economically valuable. For example, in the context of the social sciences and humanities, studies have highlighted that parental encouragement and support for critical thinking, reading, and engaging with societal issues can foster a lifelong interest in these subjects (Lareau, 2011). Parents who engage in intellectual discussions at home, share reading materials, or encourage participation in cultural and social activities create an environment where students feel motivated to explore these subjects further, leading to their choice of Non-STEM academic tracks in

secondary education. Parents who expose their children to art-related activities such as attending theater performances, art exhibitions, or participating in community-based arts programs tend to have children who develop a deeper passion for creative pursuits (Oosterhuis, 2012). Similarly, in sports, parental support is a key driver of students' participation and commitment. Parents who encourage and facilitate their children's involvement in sports, whether through regular practice, attending games, or offering moral support, contribute to the development of a strong work ethic, discipline, and teamwork (Babkes Stellino & Sinclair, 2013; Valianto et al., 2023).

In addition to the parents' aspirations themselves, the students' perception of the parents' involvement in their school duties and the expectations that the parents have regarding the education of their children are also significant. Students' assessment of the values and importance parents attach to education, the willingness to participate in the fulfilment of duties related to their children's education, as well as the support they provide to children directly and indirectly in the educational process, has a great influence on students' educational path and experience (Jokić et al. 2019). Some studies have shown that students' aspirations are most strongly influenced by their parents: if parental aspirations are high, so are students' aspirations. Parents' involvement in their children's education, linked with parental academic expectations, had a positive effect on students' educational and career aspirations. Students are therefore more likely to internalize parental academic expectations to aspire to a more prestigious educational path and higher career (Al-Bahrani, 2020).

Parental involvement in students' academic journeys plays an important role in shaping their motivation, achievement, and educational pathways (Hill & Tyson, 2009; Yelgün & Karaman, 2015). A recent study in Serbia has examined the relations of some socio-demographic characteristics as well as school achievement on students' STEM interests, identifying potential relations between students' interest in STEM and parental education (Stašević et al., 2025). However, there are limited empirical data on does that factor influences parental involvement, also how such involvement differs across various student subgroups, especially when considering the divergence between STEM and Non-STEM educational trajectories. While the benefits of parental involvement are widely recognized by educators, there remains limited understanding of how these benefits are influenced by the type of school setting. Different school environments, urban, suburban, and rural, each come with their own unique challenges and characteristics, which can affect the level of parental engagement (Thomas et al., 2020). Understanding how parental involvement manifests not only in terms of support and academic expectations but also concerning contextual factors such as students' gender, place of residence, and parents' education level is essential for addressing educational inequality and promoting informed career choices among youth.

## **Research Methodology**

### **General Background**

The research, grounded in a quantitative research design, was conducted during the 2023/24 academic year. The study sample consisted of grammar school students from the Republic of Serbia, including those enrolled in both specialized STEM departments and other academic tracks. The instrument was specifically designed to capture

students' retrospective perceptions of parental involvement and expectations during primary school and how such support influenced their choice between STEM and Non-STEM grammar school tracks. Given that the Serbian education system is structured into four levels: pre-primary, primary, secondary, and tertiary, an important transition occurs at the end of primary education, when students choose between grammar schools and vocational schools. Grammar schools are academically selective and oriented toward further academic education, while vocational schools prepare students for specific professions through practical qualifications. This decision point marks a critical stage in students' educational pathways, making it particularly relevant to examine the nature and extent of parental involvement and expectations during the earlier stages of schooling, as these factors can significantly influence students' secondary school choices and long-term academic trajectories.

### **Research Aim and Research Questions**

The aim of the study is to comprehensively investigate the forms, scope, and intensity of parental involvement and expectations experienced by students. Following Hill & Tyson (2009) definition of the types of parental involvement, the direction of the current investigation was on some aspects of academic socialisation and home-based involvement. The focus of the present research was on the students' perception of parental involvement they received during primary education, with particular reference to their subsequent enrollment in STEM or Non-STEM grammar school tracks in Serbia. Furthermore, the study seeks to explore how these patterns of parental involvement additionally vary with students' gender, place of residence, and parental education levels. Research questions arising from this context include:

1. What are the differences in parental involvement and expectations between students enrolled in STEM and Non-STEM tracks during their primary education?
2. What are the gender-based differences in parental involvement and expectations within STEM and Non-STEM student groups?
3. What are the differences in parental involvement and expectations based on students' place of residence within STEM and Non-STEM student groups?
4. What are the differences in parental involvement and expectations based on parents' education level within STEM and Non-STEM student groups?

### **Sample**

The sample consisted of 1,045 grammar school students from Serbia, enrolled in either STEM or Non-STEM academic tracks. In accordance with the primary aim of the study, to investigate the forms, scope, and intensity of parental involvement and expectations, particularly in relation to students' enrollment in STEM or Non-STEM tracks, participants were categorized into two groups based on their current academic orientation. The STEM group (435) included 222 students with an orientation toward natural sciences and mathematics, students from specialized classes with special skills in mathematics (63); computer science (84); physics (11); biology and chemistry (55). The Non-STEM group (610) encompassed 464 students from the general stream of studies, 48 students from the socio-linguistic stream, 55 students from the bilingual department, 14 students with special skills in sports, as well as 29 students with special skills in philology. The study focused on students' retrospective

self-reports regarding the parental support they received during primary education, with an emphasis on how this support may have influenced their subsequent academic choices. To address the research questions comprehensively, the sample was further stratified according to gender, place of residence (urban or rural), and parental education levels (for both mother and father). Table 1 provides an overview of the sample structure across the variables of academic track, gender, parental education, and place of residence, aligning with the analytical framework of the study.

Table 1. Distribution of the Sample by Academic Track, Gender, Parental Education, and Place of Residence

Students Characteristics	STEM	Non-STEM	Total
<b>Gender</b>			
Male	196	134	330
Female	239	476	715
<b>Parental Educational Level</b>			
<b>Mother</b>			
University Degree	346	404	750
Pre-university education	89	206	295
<b>Father</b>			
University Degree	288	350	638
Pre-university education	147	260	407
<b>Place of Residence</b>			
Urban Locality	364	446	810
Rural Locality	71	164	235

## Ethics

Participation in the study was voluntary for all students. Data collection was carried out in compliance with the highest ethical standards in educational research. Prior to data collection, participants were informed of the purpose, procedures and requirements of the study by means of a detailed form. The study complied with the relevant legal and institutional regulations and was approved by the Ethics Committee of the Faculty of Science of the University of Kragujevac (No. 01-06/24).

## Instrument

The data was collected using an online questionnaire via Google Forms, which was used to gather socio-demographic, family and academic background information about the students. The students indicated the extent to which they agreed with several statements on a five-point Likert scale. These statements related to parental involvement in terms of monitoring school lessons, assessments, homework, help with learning before exams and hiring private tutors. As these items had a positive connotation, the responses were summed, and a new variable was created to represent the level of parental involvement. In addition, students answered four further questions about their parents' expectations of academic success, whether they expected their children to pursue higher

education after high school or whether they would be satisfied if they started working immediately after high school, and the extent to which parents influenced their child's educational path when they enrolled in secondary school. Also, one item required students to rate the overall involvement and support received from their parents. The internal consistency of the scale was assessed using Cronbach's alpha coefficient, which was  $\alpha = 0.82$ , indicating good reliability of the instrument. To establish content validity, two external experts independently evaluated the questionnaire.

## Data Analysis

The collected data were processed using the IBM SPSS Statistics 20 software package. Statistical measures and procedures included: frequencies, arithmetic means, and standard deviations, as well as a statistical test for determining the normality of data distribution (the Kolmogorov-Smirnov test), and the Mann-Whitney test. Initially, there were examined whether the variables follow a normal distribution. The results of the Kolmogorov-Smirnov test for each of the variables: nine individual variables and the tenth variable representing the composite score of the first five items reflecting students' level of agreement with statements related to family support indicate that the variables do not follow a normal distribution in either the STEM or Non-STEM student groups. Moreover, in all 20 cases, the significance level was  $p < 0.005$ .

## Results

### Differences in Parental Involvement and Expectations between Students Enrolled in STEM and Non-STEM Tracks during Primary Education

To address the first research question, a comparison was conducted to determine whether there were differences in the scores representing the level of parental support students reported receiving during primary education. The maximum value of this score is 25, while the minimum is 5. Table 2 presents the results of the Mann-Whitney U test. The results indicate that the differences are statistically significant, showing that students who chose to pursue studies outside the STEM field received greater parental support.

Table 2. Parental Support Scores Among Students in STEM and Non-STEM Tracks

Item	Group	<i>M</i>	<i>SD</i>	Mann-Whitney <i>U</i> test	
				<i>Z</i>	<i>P</i>
Score*family support	STEM	13.97	4.65	-4.903	<0.0005
	Non-STEM	15.52	5.13		

Since students who chose to study social sciences, Serbian and foreign languages, arts, and sports in greater depth received significantly more parental support during their primary education, the authors wanted to determine the source of these differences (see Table 3). By analysing the individual responses to five statements that contributed to the composite score variable, it was found that these students reported, at a statistically significantly higher rate, that their parents checked their homework more regularly, helped them more often with homework, quizzed them more frequently before tests, and were more likely to hire and pay private tutors for them.



Table 3. Parental Involvement Among Students in STEM and Non-STEM Tracks

Item	Group	<i>M</i>	<i>SD</i>	Mann-Whitney <i>U</i> test	
				<i>Z</i>	<i>P</i>
My parents asked me about what we did at school.	STEM	4.13	1.14	-0.023	0.982
	Non-STEM	4.14	1.15		
My parents checked my homework.	STEM	1.93	1.19	-4.323	<0.0005
	Non-STEM	2.28	1.34		
My parents helped me with doing my homework.	STEM	2.63	1.39	-5.137	<0.0005
	Non-STEM	3.08	1.40		
My parents quizzed me before the test.	STEM	2.84	1.43	-3.482	<0.0005
	Non-STEM	3.16	1.43		
My parents paid for a private tutor.	STEM	2.43	1.52	-4.492	<0.0005
	Non-STEM	2.87	1.64		

On the other hand, students who have focused on STEM education in grammar school believe to a significantly greater extent that their parents expect them to continue their education at the university level after completing high school. Additionally, their parents statistically expect them to achieve excellent results to a significantly greater degree. In contrast, students focused on other fields of study believe to a significantly greater extent that their parents would be satisfied if they were to start working immediately after high school graduation (see Table 4).

Table 4. Parental Expectations and Influence on Track Selection

Subject	Group	<i>M</i>	<i>SD</i>	Mann-Whitney <i>U</i> test	
				<i>Z</i>	<i>P</i>
My parents expect me to go to college.	STEM	4.75	0.67	-3.459	0.001
	Non-STEM	4.60	0.77		
My parents expect me to have excellent academic performance.	STEM	3.97	1.30	-2.382	0.017
	Non-STEM	3.77	1.31		
My parents would be satisfied if I got a job after finishing high school.	STEM	2.36	1.40	-3.266	0.001
	Non-STEM	2.62	1.30		
My parents influenced my decision when choosing a high school.	STEM	3.10	1.22	-2.315	0.021
	Non-STEM	2.90	1.27		

There are also differences in the level of parental influence when choosing a high school. For the group of students who were more focused on STEM subjects, parents statistically had a significantly greater influence in encouraging them to attend a grammar school and choose the appropriate track.

### **The Gender-Based Differences in Parental Involvement and Expectations Within STEM and Non-STEM Student Groups**

Given the significant differences between students enrolled in STEM and Non-STEM tracks, further analyses of parental support and expectations during primary education were conducted separately for these groups, with additional attention to potential gender-based differences. In the group of students who chose to study STEM subjects, there are no differences in parental support for boys and girls during their elementary school years. Likewise, there are no differences in parents' interest in what their children are learning in school, the level of help provided with homework, quizzing children before important school exams, or hiring a private tutor to help students achieve a higher level of knowledge. The only difference within this group of students is that parents checked the homework of girls ( $M=2.06$ ,  $SD=1.25$ ) more often than that of boys ( $M=1.78$ ,  $SD=1.09$ ) ( $Z=-2.353$ ,  $df=1045$ ,  $p=0.019$ ). When it comes to parental expectations, there is no significant difference in the extent to which parents expect their children to be top students, to attend university after finishing high school, or to start working after high school. Additionally, there are no differences in the degree to which parents influenced their children's choice of high school or the specific track they enrolled in.

In Non-STEM group of students, there are also no differences in the level of support received during elementary education, nor in parental interest in the subjects studied in elementary school, nor in checking knowledge before school assessments, or in homework supervision and assistance. There is also no gender-related difference in the extent to which parents hired private tutors for their children. Furthermore, there are no differences in students' perceptions of how much their parents expected them to achieve excellent academic performance regarding students' gender. Interestingly, there is no difference in how much parents want their children to get a job after finishing high school, but there is a statistically significant difference in the level of parental expectation that students will pursue higher education after high school ( $Z=-3.13$ ,  $df=1045$ ,  $p=0.002$ ) — parents of girls are significantly more supportive of the idea that their daughters continue their education after high school ( $M=4.70$ ,  $SD=0.67$ ) compared to parents of boys ( $M=4.40$ ,  $SD=1.02$ ). On the other hand, girls were less influenced by their parents to choose tracks oriented toward social sciences, humanities, languages, and sports ( $M=2.84$ ,  $SD=1.38$ ) than boys were ( $M=3.11$ ,  $SD=1.36$ ). This difference is also statistically significant ( $Z=-2.06$ ,  $df=1045$ ,  $p=0.039$ ).

### **The Differences in Parental Involvement and Expectations based on Students' Place of residence Within STEM and Non-STEM Student Groups**

It was also analysed whether there are differences in parental involvement and expectations for students during their primary school based on whether they live in urban or rural areas. The parental support was specifically investigated for the group of students who pursued STEM education by choosing a STEM-oriented high school track and the group of students who opted to focus more on social sciences, humanities, languages and sports during high school.

In the group of students who chose to study STEM subjects, there is no statistically significant difference in parental involvement based on place of residence. Individual differences are present in the frequency of help with

homework ( $Z=-2.28$ ,  $df=1045$ ,  $p=0.023$ ), where students living in urban areas ( $M=2.70$ ,  $SD=1.38$ ) received more help from parents compared to students living in rural areas ( $M=2.31$ ,  $SD=1.41$ ). Differences in how much parents monitored what their children were learning in school, how often they checked the completion and accuracy of homework, how they assessed their children's knowledge before school assessments, and to what extent they hired and financed a private tutor are not statistically significant. When it comes to parental expectations, there are no differences in any of the previously mentioned aspects related to academic success or whether students will continue their education at the university level or enter the workforce after high school, based on whether the students (and their parents) live in rural or urban areas. Additionally, the influence of parents on the choice of school and high school track is not statistically significant.

As in the STEM tracks, there are statistically significant differences ( $Z=-1.98$ ,  $df=1045$ ,  $p=0.048$ ) in the extent to which parents helped Non-STEM students with their homework in these tracks as well. Compared to students living in rural areas ( $M=2.91$ ,  $SD=1.13$ ), children living in urban areas ( $M=3.19$ ,  $SD=1.42$ ) received significantly more parental support and help with completing homework. In other forms of involvement, we considered and previously listed, the differences were not statistically significant concerning where students live. After analysing the responses of students who did not pursue a STEM-oriented track regarding their parents' expectations, it was found that there were no statistically significant differences in parental expectations regarding whether students would be top-performing or continue their education. However, parents of students living in rural areas ( $M=2.80$ ,  $SD=1.61$ ) were statistically significantly more likely ( $M=2.55$ ,  $SD=1.32$ ) to be satisfied if their children entered the workforce immediately after high school compared to parents of students living in urban areas ( $Z=-2.29$ ,  $df=1045$ ,  $p=0.022$ ).

### **The differences in Parental Involvement and expectations based on parents' education Level Within STEM and Non-STEM Student Groups**

The final aspect that was examined, related to the parental involvement and expectations of students who pursued STEM fields or social and humanistic sciences, was the influence of parents' level of education. The analysis was conducted separately for the educational level of the mother and the father. There is no significant difference based on whether their mothers have a university degree or not. Moreover, there are no statistically significant differences in parental interest in what students were learning at school, checking and assisting with homework, hiring private tutors, or preparing students for school assessments during elementary school regarding mothers' level of education. There are also no differences in parents' expectations regarding whether students would be top-performing or whether they would go on to pursue higher education. The only aspect in which statistically significant differences were observed is in the expectation that students would enter the workforce after high school ( $Z=-2.18$ ,  $df=1045$ ,  $p=0.029$ ). In cases where mothers do not have a university degree, students are more likely to believe that their parents expect them to seek employment immediately after high school ( $M=2.63$ ,  $SD=1.34$ ), compared to mothers with higher education ( $M=2.29$ ,  $SD=1.28$ ).

For students who chose to focus more on social sciences and humanities, there are no statistically significant differences in the overall level of parental support, nor in individual aspects of parental support during elementary

school, based on the mother's level of education. However, statistically significant differences were found in the level of expectation that students would enter the workforce after high school ( $Z=-2.25$ ,  $df=1045$ ,  $p=0.025$ ). As with the group of students who pursued STEM fields, in this group as well, students whose mothers do not have higher education ( $M=2.78$ ,  $SD=1.29$ ) are more likely to believe that their parents expect them to start working immediately after high school, compared to students whose mothers have higher education ( $M=2.54$ ,  $SD=1.31$ ). Regarding expectations related to students' academic achievements and whether parents expect them to continue with academic studies, the influence of the mother's education level is not significant. However, students whose mothers have higher education ( $M=3.00$ ,  $SD=1.36$ ) are significantly more likely ( $Z=-2.54$ ,  $df=1045$ ,  $p=0.01$ ) to believe that their family had a greater influence on their choice of school and academic track compared to students whose mothers do not have higher education ( $M=2.70$ ,  $SD=1.39$ ). Similarly, there is no statistically significant difference in the level of support families provided to students during elementary school based on the father's level of education, neither in the overall support score nor in the individual aspects of parental support that have been mentioned multiple times throughout the results section of the paper.

There are also no statistically significant differences in parental expectations regarding student success or post-high school choices, whether related to pursuing higher education or entering the workforce. However, in families where fathers have higher education, students believe that their family had a significantly greater influence on their orientation toward STEM fields when choosing a high school track ( $M=3.25$ ,  $SD=1.37$ ), compared to families where fathers do not have a university degree ( $M=2.81$ ,  $SD=1.36$ ). This difference is statistically significant ( $Z=-3.12$ ,  $df=1045$ ,  $p=0.002$ ).

In the group of students who did not choose to study STEM subjects in depth but rather focused on social sciences, humanities, languages, or education in sports, it cannot be claimed that the father's level of education generally influenced the level of parental support during elementary school (as measured by the score we calculated). When it comes to individual aspects of parental support, an interesting finding is that students whose fathers do not have a university degree ( $M=2.49$ ,  $SD=1.35$ ) were statistically significantly more likely ( $Z=-2.016$ ,  $df=1045$ ,  $p=0.044$ ) to report that their parents checked their homework compared to students whose fathers have higher education ( $M=2.19$ ,  $SD=1.33$ ).

Additionally, students whose fathers do not have higher education ( $M=2.80$ ,  $SD=1.30$ ) were statistically significantly more likely ( $Z=-3.00$ ,  $df=1045$ ,  $p=0.003$ ) to believe that their parents would be satisfied if they sought employment immediately after finishing high school, compared to families where fathers have a university degree ( $M=2.49$ ,  $SD=1.30$ ). Otherwise, there are no differences based on the father's level of education regarding whether parents expect their children in this group to be top-performing students or continue their studies. The father's level of education in this group of students does not significantly influence the extent to which students believe their parents contributed to their choice of high school or specific high school track.

## **Discussion**

The findings of the present study indicate statistically significant differences in students' perceptions of parental

involvement and expectations between those who chose STEM and those who opted for Non-STEM educational tracks. These results align with existing literature that emphasizes the crucial role of parents in shaping students' academic development and educational trajectories (Hill & Tyson, 2009).

Helping children with homework is the most typical form of parental involvement, which is believed to contribute to children's academic success and motivation in school subjects. However, investigations on the effectiveness of parental involvement in homework on children's academic performance have shown mixed results (Silinskas & Kikas, 2019) corresponding with findings of the present study. Students in Non-STEM tracks report significantly higher levels of parental support during primary school, especially in terms of direct academic assistance such as homework checking, test preparation, and hiring tutors. This suggests a strong parental presence in the academic lives of students pursuing social sciences, humanities, sports and arts; such patterns of parental behaviour can be interpreted through the lens of authoritative parenting, characterized by high involvement and emotional responsiveness (Vasquez et al., 2016). In contrast, STEM students experienced stronger parental expectations in terms of academic excellence and continuing to higher education, while receiving less explicit help with learning. This discrepancy may be attributed to differences in parents' perceived efficacy in supporting content-specific learning, particularly in science and mathematics. Prior research highlights that parents tend to withdraw from academic involvement when they believe they lack the skills or knowledge to contribute meaningfully, especially as students progress to more advanced STEM content (Knapp et al., 2017). Some studies pointed out that parents are generally less involved in their children's science education (compared to reading) due to low self-efficacy and a lack of communication between home and school (Kaya & Lundeen, 2010). That is also in line with findings that parents' beliefs about their ability to support their child's education can impact their level of involvement, especially in STEM subjects (Thomas et al. 2020). Further, parental influence was more frequently reported by these students when selecting their high school track. This may suggest that parents of STEM students place more emphasis on future-oriented academic and career achievements, potentially driven by perceptions of STEM fields as offering better professional prospects (Stefani, 2024). The study conducted in Slovenia, which investigated the perception of 365 adolescents about their parental involvement, presented that Slovene parents show strong involvement in their children's education, particularly in math and that two-thirds of participants feel pressured to perform well in math to please their parents (Levpušček & Zupančič, 2009).

Interestingly, gender-based analysis within both STEM and Non-STEM groups did not yield significant differences in most aspects of parental support, except for a few specific items. In the STEM group, parents were more likely to check homework for girls. Those findings are in line with data obtained on 70 interviews with adolescents from the UK and showed strong gender differences amongst the children, with girls much more actively in support of parental involvement (Edwards & Alldred, 2000). Furthermore, Svarovsky et al., (2018) reveal that early parent-child interactions during school activities can provide girls with opportunities to express agency, which may foster long-term interest and self-efficacy in STEM. However, this result differs from the evidence gathered on the sample of 712 students from Hong Kong, where the relationship between parental involvement and STEM self-efficacy was consistent across genders, indicating a consistent benefit of parental STEM involvement for both male and female students (Tao et al., 2025). In the current study, parents of girls in Non-STEM tracks more strongly support continued education, while boys report a greater parental influence on

track selection. This aligns with studies indicating that parents may consciously or unconsciously channel boys and girls into different educational paths based on societal gender norms (Jacobs & Bleeker, 2004). In similar research, parental support in STEM education has been found to differ based on the gender of the parent and child: mothers have a particularly significant influence on both sons and daughters, encouraging them to pursue STEM fields, often more so than fathers (Brydsten & Baranowska-Rataj, 2022). From the perspective of the current research, it is important to point out that there are previous contradictory findings regarding the influence of parents' beliefs about the importance of science on their male and female children. The results of some studies show that such beliefs are more strongly reflected in girls (Lazarides & Ittel, 2013), while others argue that they have a greater influence on boys (Taskinen et al., 2015). However, the results of earlier studies also highlighted how important it is for parents to pay attention to how their sons in particular (as opposed to daughters) interpret parental efforts to help with homework: boys' motivation is reduced when boys perceive that their parents are controlling their homework (Silinskas & Kikas, 2019). It is also interesting to note that some studies have shown that mothers tend to endorse gender-stereotypical beliefs about their children's abilities compared to fathers, suggesting that mothers may play a key role in developing children's attitudes towards their abilities in the field of science (Šimunović & Babarović, 2020). This is supported by the results of the 12 years longitudinal study by Bleeker and Jacobs (2004): it was observed that adolescents who rated high self-efficacy in science and high interest in career development in this field were the children of mothers who expressed high beliefs about their children's abilities in math and science at an early age.

In terms of place of residence, urban students, regardless of track, received more homework help, likely due to greater access to educational resources and time availability, a trend consistent with findings from several studies that highlight the advantages urban families typically have in supporting their children's education (Lindberg & Güven, 2021). A study conducted in Turkey, which looked at the factors that influence students' success in the transition from primary to secondary school, showed that the area where the family lives can have an impact on the child's educational opportunities: pupils living in villages are the most disadvantaged group in terms of education (Aslan, 2017). Among Non-STEM students, parents in rural areas were more likely to express satisfaction with their child entering the workforce immediately after high school, reflecting socioeconomic constraints and differing perceptions of education's return on investment in rural contexts (Byun et al., 2012). Similar challenges are reflected in teachers' perceptions from rural Pakistan, where socioeconomic hardship and cultural norms were seen as major barriers to parental involvement, often leading to strained parent-teacher relationships and potentially hindering students' educational progress (Ali et al., 2021). While urban students reported receiving more homework help, likely due to better access to resources, prior research suggests rural parents may show stronger school-related engagement through community-based involvement. Sun et al. (1997) found that rural parents often participate more in school activities than urban parents, driven by stronger social ties. This suggests that differences in type, rather than level, of parental involvement may explain variations across residential settings, with urban areas favouring structural support and rural areas emphasizing relational engagement.

Mothers' and fathers' levels of education influence their expectations and involvement in subtle but important ways, which is highlighted in many studies (Li, 2024; Puzić et al., 2023; Tantoh, 2023). For instance, students

whose mothers lack higher education are more likely to believe that their parents expect them to start working after high school, while students with more educated mothers report greater parental influence on educational track selection. Consistent with a similar study (Simpkins et al., 2012), the sense of personal capacity to support a child's learning may influence the extent and form of parental engagement, particularly when it comes to STEM-related aspirations. These findings reinforce the importance of parental educational background in shaping students' long-term academic goals and self-perception. Parents' involvement in knowledge and skills positively predicted adolescents' perceived support, which in turn predicted greater academic engagement (Zhu et al., 2023). Similar patterns are seen with fathers, where higher education correlates with increased influence on children's orientation toward STEM, but not necessarily with higher levels of practical support. This reinforces the importance of parental education as a key determinant in educational aspirations and involvement. Findings from related research in Turkey emphasize the impact of maternal education and home resources on student achievement, showing that higher levels of maternal education and better home conditions contribute significantly to academic success, while larger family size tends to hinder it (Gelbal, 2008). In Croatia, a survey on the aspirations, plans and attitudes of high school students in a sample of 4,501 students in their final years of secondary school found strong differences in the intention to attend higher education in relation to the educational level of their parents: 93.4% of students with both highly educated parents expressed the intention to enrol in higher education, 88.8% of students with one highly educated parent, 80.7% of students whose both parents have a secondary school degree, and 68.2% of students whose only one parent has a secondary school degree (Odak & Puzić, 2019).

These findings carry important implications for educational practice and policy. They underscore the value of fostering consistent parental involvement throughout a child's schooling, not only through direct academic support but also through cultivating positive beliefs and expectations. The fact that similar levels of parental engagement were observed in both STEM and Non-STEM tracks suggests that stable, supportive family environments can provide students with the confidence and guidance needed to navigate critical educational transitions. Schools can play a pivotal role by creating opportunities for parents to engage in meaningful ways, particularly through home-based learning activities and open communication. Targeted interventions that recognize the diverse roles of mothers and fathers, and that are sensitive to students' gender, residence, and socioeconomic background, may help ensure more equitable educational outcomes. In this light, investing in policies and practices that strengthen family-school partnerships represents a key strategy for supporting student motivation, academic identity, and long-term educational success.

## **Conclusions and Suggestions**

The present study highlights the multifaceted nature of parental involvement and its enduring role in shaping students' educational aspirations and decisions. Findings suggest that, although students from the sample perceived persistent parental involvement, students from the Non-STEM educational tracks reported receiving more parental support in learning during primary school. However, from the other side, the nuances of this support, ranging from practical help with schoolwork to emotional encouragement and belief in the child's academic potential, appear to be strongly influenced by parents' educational backgrounds and broader socio-cultural capital.

Students whose parents hold higher educational qualifications tend to express greater confidence in their academic futures, including success in final examinations and expectations for university enrolment. This reflects the often subtle, yet powerful, transmission of aspirations, values, and information within families. Notably, the role of cultural and structural factors, such as the type of school attended and gendered educational patterns, continues to shape access to opportunity, even within merit-based systems like grammar schools.

Importantly, the study draws attention to the need for more inclusive and comprehensive approaches to researching parental involvement. While students' perceptions offer valuable insights, they capture only part of a complex dynamic. Future studies should integrate multiple perspectives, including those of parents and teachers, to better understand how support is expressed and experienced. Employing qualitative methods such as interviews or observations could uncover how parents balance task completion with fostering autonomy, whether through direct intervention or by encouraging persistence and independent problem-solving, even when this involves failure and frustration.

Several limitations of the present study should be acknowledged, offering directions for future research. Most notably, the data were collected exclusively from students, focusing on their subjective perceptions of parental involvement. While students' interpretations are valuable, especially in understanding how they internalize support, this approach limits the ability to triangulate data with other sources. Future studies should include both students and parents in the sample to allow for a more comprehensive analysis of how support is enacted and perceived on both sides. Including teachers and school staff could further enrich the contextual understanding of parental influence, particularly in relation to institutional expectations and communication dynamics.

In addition, the present study primarily addressed content-oriented parental support. Future research could benefit from examining autonomy-oriented support, especially in the context of homework assistance. The use of qualitative methods such as interviews and observations could provide deeper insight into how parents support their children's learning, whether by encouraging independence and resilience through trial and error, or by taking a more directive role aimed at efficient and accurate task completion.

As educational systems continue to evolve in response to technological, environmental, and labour market changes, stronger alignment between school initiatives and family engagement will be essential. Encouraging interdisciplinary learning, integrating cultural dimensions into curricula, and supporting autonomy-oriented parenting practices can help equip students for more meaningful, adaptive, and sustainable educational and career pathways. Exploring different modes of involvement would help clarify the multidimensional nature of parental support. Moreover, expanding this line of research across diverse cultural contexts would contribute to a more nuanced understanding of how parental involvement functions within different educational and societal frameworks.

## **Acknowledgements**

The authors would like to dedicate this paper to students and teachers who stood against corruption and the



collapse of the Serbian educational system during the academic year 2024-2025. This work was supported by the Serbian Ministry of Science, Technological Development and Innovation (Agreement No. 451-03-136/2025-03/200122).

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