Pegem Journal of Education and Instruction, Vol. 14, No.2, 2024 (pp. 309-315)

RESEARCH ARTICLE WWW.PEGEGOG.NET

An investigation of the students' viewpoint on factors affecting achievement in mathematics

Valbona Berisha[1], Mjellma Rexhepi[2], Habib Rexhepi[3*], Ben Klinaku[4]
[1,2]Faculty of Education, University of Prishtina, Kosovo
[3]Faculty of Education, University of Gjilan, Kosovo
[4]Faculty of Mathematics and Natural Sciences, University of Prishtina, Kosovo

Abstract

According to the PISA and TIMSS results, Kosovo is among the low-achieving countries in mathematics. Analyzing the factors that contribute to this situation is a local priority. This study focuses on secondary school students' beliefs and attributions related to the level of impact of four main groups of factors (student characteristics; teacher characteristics; school and classroom environment characteristics; and home environment characteristics) on achievements in mathematics. Respondents in the study were 410 students, randomly chosen from eight secondary schools in Prishtina. A Likert scale questionnaire was used for data collection. The reliability of the questionnaire was checked using Cronbach's alpha. The descriptive analysis was used to measure the students' answers according to the four subscales (groups of factors). To explore the effect of gender and the type of school attended on students' opinions, independent samples t-test was used, while one-way ANOVA served to explore the effect of success and age. Students believe that teacher characteristics are the most critical determinant for achievements in mathematics. According to students' opinions, the order of the impact of the groups of factors, ranked from highest to lowest, is teacher characteristics; student characteristics; school and classroom environment characteristics; home environment characteristics. The findings revealed no statistically significant effect of gender on students' opinions. There were some differences in students' opinions based on the type of school, age, and success. However, the effect size of the difference was considerable only in the case of the type of school attended regarding the influence of teacher characteristics.

Keywords: Achievement factors, attributions, mathematics, students, secondary school

Introduction

Students' performance in mathematics has been a source of general interest and concern in recent decades (Mazana, Montero, & Casmir, 2020; Brezavšček, Jerebic, Rus, & Žnidaršič, 2020). Proficiency in mathematics is seen as one of the essential precursors to success in modern society (Mata, Monteiro, & Peixoto, 2012). It is thought that mathematics performance represents a strong indicator of tomorrow's success and status, both from the individual professional point of view, as well as from the state economic point of view (Geary, 2011). This is best seen through the fact that mathematics is one of the leading indicators of the quality of an education system in large-scale international student achievements studies like Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) (Mullis & Martin, 2017; OECD, 2016).

In Kosovo, there is widespread concern regarding the situation with the teaching and learning of school mathematics. This issue began to be raised and discussed publicly with the beginning of Kosovo's participation in international students' assessments. The first international assessment in science, reading and mathematics for Kosovar students took place in PISA test 2015. The results were overwhelming. In mathematics, Kosovo students scored 362 points, 128 points less than the OECD average. Our students' scores also revealed a performance gap compared to regional countries like Albania (413 points), North Macedonia (371 points), Montenegro (418 points) etc. Kosovo was the third from the bottom in the list of participating countries ranked by average scores in mathematics (and overall) (OECD, 2016). No significant changes were detected in the 2018 edition of PISA. The average performance of Kosovar students in mathematics was 366 points, compared to an average of 489 points in OECD countries. According to the mathematics results, Kosovo was ranked 75th out of 78 countries (Schleicher, 2019).

Kosovo's everyday schooling context includes complaints about poor teaching and learning environment and experiences, especially related to mathematics. Two of the study authors work in the Faculties of Education in two different Universities in Kosovo,

Corresponding Author e-mail: habib.rexhepi@uni-gjilan.net
https://orcid.org/0000-0003-4657-7852

How to cite this article: Berisha V, Rexhepi M, Rexhepi H, Klinaku B (2024), An investigation of the students' viewpoint on factors affecting achievement in mathematics, Vol. 14, No. 2, 2024, 309-315

Source of support: Nil

Conflict of interest: None.

DOI: 10.47750/pegegog.14.02.35

Received: 09.10.2022
Accepted: 28.03.2023 Publication: 01.04.2024

where they have daily contact with mathematics teachers and students.

Very frequently students complain about poor teaching methods and classroom management, bad teacher behavior damaging their egos and motivation. Teachers, on the other hand, frequently complain about students' lack of motivation and learning efforts as well as parents' neglect and lack of nurturing the sense of schooling. This study is concerned with the students' side of view on the issue. Students, being the key participants in everyday schooling, develop opinions and beliefs about themselves as mathematics learners and other surrounding factors related to everyday classroom and home experiences in mathematics learning. Opinions and beliefs built with time have a huge impact on behavior, actions, practices, and efforts related to mathematics learning. They determine a great deal of mathematics achievement and success (Leder, & Grootenboer, 2005; Mason, 2003). By the time they reach secondary school, students are provided with abundant experience to talk about the factors affecting their achievement. Revealing and feeding on their perspective and beliefs about the impact of the main potential factors on mathematics achievement is the primary purpose of this study. The study also does concern with the ways that students' gender, their success in mathematics, their age, and the type of school they attend, affect their beliefs.

The conceptual framework of the study

The list of potential cognitive and affective factors that might influence performance in mathematics is a wide one (Mohammadpour, 2012). Studies reveal different patterns in the occurrence, association, and impact of factors on mathematics achievement. The relationship between various factors and the level of their impact on mathematics achievement is complex and state-specific, culture-specific, and even school-specific. In addition, the impact of different factors on mathematics achievement can be direct and indirect. The current study uses a conceptual framework developed according to the existing studies' measurements and results on the factors that might influence performance in mathematics. The designed framework categorizes the potential factors into four main groups:

- The first group of factors includes student characteristics. The individual components of this group are gender, age (Zhao, Valcke, Desoete, Zhu, Sang, & Verhaeghe, 2014), class attendance (Mohammadpour, 2012), learning styles (Altun, & Serin, 2019; Tatar, & Dikici, 2009), homework completion (Choudhury, & Das, 2012), peer influence, motivation, attitude toward mathematics (Kiwanuka, Van Damme, Van Den Noortgate, Anumendem, & Namusisi, 2015; Engelhard, 2001), and participation in private supplementary tutoring (He, Zhang, Ma, & Wang, 2021).
- The second group of factors includes teacher characteristics. The individual components of this group are age (Mohammadpour, 2012), gender (EscardĆbul, & Mora, 2013), experience (Maat, Zakaria, Nordin, & Meerah, 2011; Eshiwani, 2001), teaching methods (Damrongpanit, 2019), assessment practices (Liang, 2010), classroom management (Van Dijk, Gage, & Grasley-Boy, 2019), student collaboration in mathematics classes (Zakaria, Solfitri, Daud, & Abidin, 2013), teacher behavior (Den Brok, Brekelmans, & Wubbels, 2004), and homework allocation (Fernández-Alonso, Álvarez-Díaz, Suárez-Álvarez, & Muñiz, 2017).
- The third group of factors includes school and classroom environment characteristics. The individual components of this group are the type of school attended (Adamuti-Trache, Bluman, & Tiedje, 2013), chosen mathematics textbooks (Törnroos, 2005), class size (De Paola, Ponzo, & Scoppa, 2013), class climate (Kiwanuka, Van Damme, Van Den Noortgate, Anumendem, & Namusisi, 2015; Al-Agili, Mamat, Abdullah, & Maad, 2012), class schedule (Gruber, & Onwuegbuzie, 2001), and school resources (Chiu, 2010).
- The fourth group of factors includes home environment characteristics. The individual components of this group are parents' education (Ajuonuma, & Oguguo, 2020; Kiwanuka, Van Damme, Van Den Noortgate, Anumendem, & Namusisi, 2015; Wang, Li, & Li, 2014; Farooq, Chaudhry, Shafiq, & Berhanu, 2011), parental involvement in terms of homework assistance, home supervision, educational expectations for children (Wilder, 2014), family socioeconomic status (Kiwanuka, Van Damme, Van Den Noortgate, Anumendem, & Namusisi, 2015; Wang, Li, & Li, 2014; Liang, 2010; Sirin, 2005), family cultural background (Thien, & Ong, 2015; Liang, 2010), and family obligations that might weight on children (Kim, & Chung, 2012).

The research questions

The study addresses the following questions:

1. What are the secondary school students' beliefs about the impact of teacher characteristics, student characteristics, school and classroom environment characteristics, home environment characteristics on mathematics achievement?
2. Does students' gender, their success in mathematics, their age, and the type of school they attend, affect their beliefs about the impact of four main groups of factors on mathematics achievement?

METHOD

Research Design

Following the research situation and exploration questions involved, an analytical cross-sectional survey design, quantitative in nature, was used for the study. Besides providing a "snapshot" of Prishtina secondary school students' beliefs on the levels of impact of four main groups of factors (student characteristics, teacher characteristics, school and classroom environment characteristics, and home environment characteristics) on achievement in mathematics, it assesses the relationships between dependent variables (students' beliefs) and the independent variables (gender, type of school, age, and success) involved in the study.

Sample

The respondents in the study were 410 students, randomly selected from eight high schools (public and private) in the

Prishtina district, Kosovo. The general characteristics of the student respondents are displayed in Table 1. As for their gender, students were almost equally distributed to girls (55.4 %, n = 227) and boys (44.6%, n = 183). Most students attended a public school (85.6%, n = 351). Almost half of the students were in the twelfth grade (46.1%, n = 189), and the most frequent mark for success in mathematics was excellent (5) (27.1%, n = 111).

Data Collection Tool

A closed, student questionnaire was used for data collection. The questionnaire consisted of two parts, and it was developed based on measures available in previous research studies concerning the potential factors which impact mathematics achievement The first part of the questionnaire requested the students to answer questions related to their demographic profile such as gender, their success in mathematics, the type of school they attend (public or private), and the school grade they attend. The second part consists of 32 issues distributed among the four subscales (groups of factors) involved with mathematics performance: student characteristics, teacher characteristics, school and classroom environment characteristics, and home environment characteristics. The four subscales were naturally derived from the four categories of concept variables built in the conceptual framework. The subscale of student characteristics was composed of nine variables including age, gender, learning style, motivation, attitude toward mathematics, doing homework, learning mathematics with a private tutor, peer influence, and class attendance. The subscale of teacher characteristics was composed of nine variables including age, gender, experience, behavior with students, classroom management, teaching methods, assessment methods, the allocation of homework, and collaboration in mathematics classes. The subscale of school and classroom environment characteristics was composed of seven variables including type of attended school (public or private), chosen mathematics textbooks, school material resources, school electronic resources, class size, class schedule, and class climate. The subscale of home environment characteristics was composed of seven variables, including parents' education, parents' interest in children's mathematics achievement, parents' help with homework, parents' supervision, family socioeconomic status, family cultural background, and family obligations that may weigh on children. The respondents were asked to determine the level of impact of each individual variable on their achievement in mathematics, using a 5-point scale from 1= no impact, to 5=high impact. The results of the reliability statistics for the overall questionnaire are presented in Table 2, while Table 3 gives the results of the reliability statistics for each of the four subscales (groups of factors). The Cronbach's alpha coefficient resulted to be higher than 0.70 in each case, suggesting very acceptable internal consistency of the whole questionnaire as well as each subscale.

Data Collection

The questionnaire was created, distributed, and administered online, using Google Forms.

Data Analysis

The collected data was analyzed using the statistical program for social sciences SPSS. First, the descriptive analysis was performed to measure and evaluate the students' answers according to the four subscales. To explore the effect of gender and the type of school attended on students' opinions, independent samples t-test was used since in both these cases the comparison of the mean values was run between two large independent samples (n>30). The significance of the tests was set at 95%. The standardized Cohen's d was used for determining the effect size of the observed differences in opinions. One-way ANOVA for equal variances was used to analyze the effect of success and age on students' opinions since in both cases the mean values were compared between three or more large independent samples (n>30). The significance of the tests was also set at 95%. In cases when there were detected statistically significant differences in ANOVA tests, the post hoc analysis LSD was used for the multiple comparisons. The partial eta squared was used for determining the effect size of the observed differences in opinions.

FINDINGS

Table 4 displays the descriptive statistics for the student responses based on the groups of factors. Students believe that the most relevant group of factors in terms of learning and achievement in mathematics is the teacher and his/her characteristics, while the student characteristics represent the second group of factors by relevance. They also believe that school environment as a factor is less relevant than teacher and student characteristics, and the family environment has the least relevance in this matter.

Viewed as individual factors outside the groups, students' answers express the belief that the teacher's behavior with students is the most relevant individual variable in terms of students' achievement in mathematics (M = 4.4713; SD = 1.0099), followed by the teacher's experience (M = 4.4652; SD = 1.0161), classroom management (M = 4.3682; SD = 1.0493), class attendance (M = 4.3465; SD = 1.12), teaching methods (M = 4.2943; SD = 1.0645), assessment methods (M = 4.2705; SD = 1.0575), parent's interest in the children's achievement in mathematics (M = 4.2293; SD = 1.1193).

Students believe that the individual factors that have the least influence on mathematics achievement are teachers' gender (M = 1.942; SD = 1.4612), students' gender (M = 2.1128; SD = 1.5587), family obligations of the student (M = 2.5221; SD = 1.3169), teachers' age (M = 2.6085; SD = 1.5697), family cultural background (M = 2.6281; SD = 1.6336), parents' education (M = 2.684; SD = 1.5086), type of school attended (M = 2.6908; SD = 1.5064).

Table 5 displays the results on the potential differences in students' opinions dependent on their gender. There was no significant effect of gender in any of the cases.

Table 6 displays the results on the potential differences in students' opinions dependent on the type of school they attend. A significant difference in the mean values between public school and private school attendee opinions was found for the teachers' characteristics group. The mean value of public-school attendees (M = 3.82) is statistically significantly higher

(t (404) = 2.732; $p < 0.05$) than the mean value of private-school attendees (M = 3.54). This means that students who attend public schools see the role of the mathematics teacher and his/her characteristics as more important for their achievement. The standardized Cohen's d for the independent samples t-test, in this case, is d = 0.38. Considering that this value is closer to 0.5 than to 0.2, it indicates a medium effect size of the observed difference in opinions.

Table 7 displays the results on the potential differences in students' opinions dependent on age (school grade). Significant differences between the different grade students' opinions were observed only for the student characteristics (F (2, 407) = 3.732, p = 0.025). Post hoc analysis LSD for this group revealed that the differences exist between the tenth and eleventh grades (p = 0.011) and between the tenth and twelfth grades (p = 0.014). This means that tenth graders see the role of the students and their characteristics as less important for achievement in mathematics, compared to the eleventh and twelfth graders. However, the partial eta squared has a small value ($\eta^2 = 0.106$) which indicates a small effect size in this case.

Table 8 displays the results on the potential differences in students' opinions dependent on their success in mathematics. Significant differences in students' opinions were observed regarding two groups of factors: student characteristics group (F (4, 405) = 12.140, p = 0.000) and teacher characteristics group (F (4, 401) = 3.279, p = 0.012). The LSD test for both groups indicate differences in opinions between students who have less success in mathematics (marks 1, 2) on one hand and those who have more success in mathematics (marks 3, 4, 5) on the other hand. Less successful students see student and teacher characteristics as less important for mathematics achievement, compared to the more successful ones. But the partial eta squared has a small value in both cases ($\eta^2 = 0.107$ for the student characteristics group; $\eta^2 = 0.032$ for the teacher characteristics group) which indicates a small size effect in both cases.

Discussion And Conclusion

The under-achievement of our students in mathematics is a concern for all the people involved in the Kosovo education system. While many studies reported internationally deal with the problem of unsatisfactory mathematics achievements (Ran, Kasli, & Secada, 2021; Mazana, Montero, & Casmir, 2020; Jameel, Ali, & Phil, 2016), there is a research gap in Kosovo concerning the situation of our students' achievements in mathematics and the potential factors causing it. This study is a contribution in that direction since it examined the secondary school students' beliefs and attributions toward the influence of four main groups of factors (student characteristics, teacher characteristics, school and classroom environment characteristics, and home environment characteristics) on achievement in mathematics. This study's concern was to advance the views expressed by the secondary school students on the issue. The students believe that mathematics teacher characteristics are the main determinants of their achievement. According to their opinions, the order of the group-factors from the most influential to the least influential for mathematics achievement is teacher characteristics, student characteristics, school and classroom environment characteristics, and home environment characteristics. Moreover, students believe that the most influential individual variable for achievement in mathematics is the teacher's behavior with students. There was no significant effect of gender, age, and success on students' opinions. Some statistical differences in opinions were found dependent on age and success, but the effect size of the differences resulted in being small. A significant difference in opinions with a medium effect size was found between public school and private school attendee opinions regarding teacher characteristics. Students who attend public schools see the characteristics of mathematics teacher as more influential for their achievement, compared to students who attend private schools. There are also previous studies revealing students' and teachers' perceptions and beliefs on factors that associate performance and achievement in mathematics (Tsanwani, Harding, Engelbrecht, & Maree, 2014; Tsanwani, Engelbrecht, Harding, & Maree, 2013; Al-Agili, Mamat, Abdullah, & Maad, 2012). In a prior study, the views of mathematics teachers and students from low-performance schools (LPS) and high-performance schools (HPS) were compared. The most frequently LPS teachers-perceived factors that facilitate achievements in mathematics belonged to students' and family characteristics. But LPS students perceived the teachers' characteristics as most important, highlighting teachers' bad behavior, while also accepting the responsibility of their own characteristics, like laziness and absence of self-discipline. HPS students gave the most attributes to students' characteristics, expressing also positive perceptions about their teacher's role in their achievement (Tsanwani, Harding, Engelbrecht, & Maree, 2014). Let's remind us that actual study found statistical differences in opinions between low and high achieving students, very similar to these of LPS and HPS students, but the effect size of the differences resulted in being small. Other studies too have similar results, indicating that teacher characteristics are viewed by students as most important factors for their mathematics achievement (Tsanwani, Harding, Engelbrecht, & Maree, 2014; Al-Agili, Mamat, Abdullah, & Maad, 2012). Yet, despite the evidence that teacher characteristics play a crucial role for student success, there is no final agreement on which teacher characteristics are of the greatest importance for student learning outcomes (Darling-Hammond, 2006; Gustafsson 2006; Hattie, 2009; Rivkin, Hanushek, & Kain, 2005; Scheerens & Blömeke, 2006 as cited in Toropova, Johansson, & Myrberg, 2019).

Recomandations

The final conclusion of the study is that teachers characteristics and students characteristics are suggested by students to be the most important factors for mathematics achievement. As for the Kosovo context, it is obvius that things must be changed in mathematics education, as it does not seem to be in a good shape. Changing things like teaching methods, teacher behaviour in the classroom, homework alocation, student class attendance and student motivation and attitudes, as well as other relevant teacher and student characteristics seems somewhat easier than dealing with other two groups of factors (school environment characteristics and family environment

characteristics). In local context, there is an immediate need for further investigations in terms of identifying factors associated with mathematics achievement and analyzing the relationships between different factors and students' achievement. But there is also a need for juxtaposing the views of students, teachers, and parents on this matter, as the most relevant triangle in schooling.

FUNDING

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Table 1: Data on gender, type of school attended, age, and success in mathematics of student respondents

Variable	Category	N	%
Gender	Female	227	55.4
	Male	183	44.6
Type of school attended	Public	351	85.6
	Private	59	14.4
Age (School grade attended)	Grade 10	76	18.5
	Grade 11	145	35.4
	Grade 12	189	46.1
Success in mathematics	Fail (1)	49	12.0
	Below average (2)	92	22.4
	Good (3)	87	21.2
	Very good (4)	71	17.3
	Excellent (5)	111	27.1

Table 2: The coefficient of internal consistency for the whole questionnaire

Cronbach's alpha	Number of items
0.892	32

Table 3: The coefficient of internal consistency for each group of factors

Group of factors	Cronbach's alpha	Number of items
Student	0.721	9
Teacher	0.802	9
School and classroom environment	0.781	7
Home environment	0.814	7

Table 4: The descriptive statistics of students' responses according to the groups of factors

Group of factors	N	Mean	SD
Student	410	3.45	0.75
Teacher	406	3.78	0.74
School and classroom environment	408	3.18	0.94
Home environment	410	3.16	0.97

Table 5: Independent samples t-test between boys and girls for each group of factors

Group of factors	Girls (n = 227)	Boys (n = 183)	t	Df	P
Student	M = 3.49, SD = 0.76	M = 3.42, SD = 0.75	0.920	408	0.358
Teacher	M = 3.79, SD = 0.72	M = 3.77, SD = 0.77	0.229	404	0.819
School and classroom	M = 3.17, SD = 0.92	M = 3.18, SD = 0.96	-0.052	406	0.959
Home	M = 3.11, SD = 0.94	M = 3.22, SD = 1.01	-1.100	408	0.247

Table 6: Independent samples t-test between public and private-school attendees for each group of factors

Group of factors	Public school (n = 351)	Private school (n = 59)	t	Df	p
Student	M = 3.47, SD = 0.753	M = 3.40, SD = 0.749	0.578	408	0.563
Teacher	M = 3.82, SD = 0.73	M = 3.54, SD = 0.80	2.732	404	0.007
School and classroom	M = 3.19, SD = 0.93	M = 3.07, SD = 0.97	0.936	406	0.350
Home	M = 3.19, SD = 0.96	M = 2.96, SD = 1.03	1.733	408	0.084

Table 7: One-way ANOVA between tenth, eleventh and twelfth graders for each group of factors

Group of factors	Grade 10 (n = 76)	Grade 11 (n = 145)	Grade 12 (n =189)	F	P
Student	M = 3.24, SD = 0.85	M = 3.51, SD = 0.68	M = 3.49, SD = 0.74	3.732	0.025
Teacher	M = 3.73, SD = 0.75	M = 3.81, SD = 0.68	M = 3.78, SD = 0.79	0.257	0.773
School and classroom	M = 3.04, SD = 0.95	M = 3.20, SD = 0.92	M = 3.21, SD = 0.95	1.008	0.366
Home	M = 2.95, SD = 0.98	M = 3.26, SD = 0.90	M = 3.17, SD = 1.01	0.570	0.078

Table 8: One-way ANOVA between students with different success in mathematics, for each group of factors

Group of factors	Fail (1) (n = 49)	Below average (2) (n = 92)	Good (3) (n =189)	Very good (4) (n = 71)	Excellent (5) (n = 111)	F	P
Student	M = 3.07 SD = 0.89	M = 3.16 SD = 0.86	M = 3.49 SD = 0.74	M = 3.62 SD = 0.60	M = 3.72 SD = 0.61	12.140	0.000
Teacher	M = 3.61 SD = 0.94	M = 3.60 SD = 0.91	M = 3.78 SD = 0.79	M = 3.93 SD = 0.52	M = 3.82 SD = 0.66	3.279	0.012
School and classroom	M = 3.04 SD = 0.93	M = 3.26 SD = 1.08	M = 3.21 SD = 0.95	M = 3.03 SD = 0.96	M = 3.18 SD = 0.97	1.170	0.324
Home	M = 3.20 SD = 1.04	M = 3.30 SD = 1.09	M = 3.17 SD = 1.01	M = 3.02 SD = 0.93	M = 2.99 SD = 0.97	2.315	0.057

References

Adamuti-Trache, M., Bluman, G., & Tiedje, T. (2013). Student Success in First-Year University Physics and Mathematics Courses: Does the high-school attended make a difference?. International Journal of Science Education, 35(17), 2905-2927.Ajuonuma, J. J., & Oguguo, B. C. (2020). Prediction of students' financial accounting performance by their family background variables. Journal Of The Nigerian Academy Of Education, 16(2).

Al-Agili, M. Z., Mamat, M. B., Abdullah, L., & Maad, H. A. (2012). The Factors Influence Students' Achievement in Mathematics: A Case for Libyan's Students. World Applied Sciences Journal, 17(9), 1224-1230.

Altun, H., & Serin, O. (2019). Determination of learning styles and achievements of talented students in the fields of science and mathematics. Cypriot Journal of Educational Sciences, 14(1), 80-89.

Brezavšček, A., Jerebic, J., Rus, G., & Žnidaršič, A. (2020). Factors influencing mathematics achievement of university students of social sciences. Mathematics, 8(12), 2134.

Chiu, M. M. (2010). Effects of inequality, family and school on mathematics achievement: Country and student differences. Social Forces, 88(4), 1645-1676.

Choudhury, R., & Das, D. K. (2012). Influence of attitude towards mathematics and study habit on the achievement in mathematics at the secondary stage. International Journal of Engineering Research and Applications (IJERA), 2(6), 192-196.

Damrongpanit, S. (2019). From modern teaching to mathematics achievement: The mediating role of mathematics attitude, achievement motivation, and self-efficacy. European Journal of Educational Research, 8(3), 713-727.

De Paola, M., Ponzo, M., & Scoppa, V. (2013). Class size effects on student achievement: heterogeneity across abilities and fields. Education Economics, 21(2), 135-153.

Den Brok, P., Brekelmans, M., & Wubbels, T. (2004). Interpersonal teacher behaviour and student outcomes. School effectiveness and school improvement, 15(3-4), 407-442.

Engelhard G (2001). Math anxiety, mother's education, and the mathematics performance of adolescent boys and girls: Evidence from the United States and Thailand. J. Psychol. 124(3):289–298.

EscardĆbul, J. O., & Mora, T. (2013). Teacher Gender and Student Performance in Mathematics. Evidence from Catalonia (Spain). Journal of Education and Training Studies, 1(1), 39-46.

Eshiwani G, 2001. Mathematics Education Around the World, Bridging Policy and Practice: The Role of Algebra in the Middle and Secondary Mathematics Curriculum. A paper presented at an International Seminar in Park City Mathematics Institute, Utah USA, 19th -23rd July.

Farooq, M. S., Chaudhry, A. H., Shafiq, M., & Berhanu, G. (2011). Factors affecting students' quality of academic performance: a case of secondary school level. Journal of quality and technology management, 7(2), 1-14.

Fernández-Alonso, R., Álvarez-Díaz, M., Suárez-Álvarez, J., & Muñiz, J. (2017). Students' achievement and homework assignment strategies. Frontiers in Psychology, 8, 286.

Geary, D. C. (2011). Consequences, characteristics, and causes of mathematical learning disabilities and persistent low achievement in mathematics. Journal of Developmental & Behavioral Pediatrics, 32(3), 250-263.

Gruber, C. D., & Onwuegbuzie, A. J. (2001). Effects of block scheduling on academic achievement among high school students. The High School Journal, 84(4), 32-42.

He, Y., Zhang, Y., Ma, X., & Wang, L. (2021). Does private supplementary tutoring matter? The effect of private supplementary tutoring on mathematics achievement. International Journal of Educational Development, 84, 102402.

Jameel, H. T., Ali, H. H., & Phil, M. (2016). Causes of poor performance in mathematics from teachers, parents and student's perspective. American Scientific Research Journal for Engineering, Technology, and Sciences, 15(1), 122-136.

Kim, J. I., & Chung, H. (2012). The role of family orientation in predicting Korean boys' and girls' achievement motivation to learn mathematics. Learning and Individual Differences, 22(1), 133-138.

Kiwanuka H. N., Van Damme J., Van Den Noortgate W., Anumendem D. N., & Namusisi S., (2015), Factors affecting Mathematics achievement of first-year secondary school students in Central Uganda, South African Journal of Education, Volume 35, Number 3, doi: 10.15700/saje.v35n3a1106

Leder, G., & Grootenboer, P. (2005). Affect and mathematics education. Mathematics Education Research Journal, 17(2), 1-8.

Liang, X. (2010). Assessment use, self-efficacy, and mathematics achievement: comparative analysis of PISA 2003 data of Finland, Canada and the USA. Evaluation & Research in Education, 23(3), 213-229.

Maat S. M., Zakaria E., Nordin N. M., & Meerah T. S. M. (2011). Confirmatory factor analysis of the mathematics teachers'

teaching practices instrument. World Appl. Sci. J. 12(11): 2092-2096

Mason, L. (2003). High school students' beliefs about maths, mathematical problem solving, and their achievement in maths: A cross-sectional study. Educational psychology, 23(1), 73-85.

Mata, M. D. L., Monteiro, V., & Peixoto, F. (2012). Attitudes towards mathematics: Effects of individual, motivational, and social support factors. Child development research, 2012.

Mazana, M. Y., Montero, C. S., & Casmir, R. O. (2020). Assessing students' performance in mathematics in Tanzania: the teacher's perspective. International Electronic Journal of Mathematics Education, 15(3), em0589.

Mohammadpour, E. (2012). Factors accounting for mathematics achievement of Singaporean eighth-graders. The Asia-Pacific Education Researcher, 21(3), 507-518.

Mullis, I. V., & Martin, M. O. (2017). TIMSS 2019 Assessment Frameworks. International Association for the Evaluation of Educational Achievement. Herengracht 487, Amsterdam, 1017 BT, The Netherlands.

OECD (2016). PISA 2015 Assessment and Analytical Framework: Science, Reading, Mathematic and Financial Literacy, PISA. OECD Publishing, Paris.

Ran, H., Kasli, M., & Secada, W. G. (2021). A meta-analysis on computer technology intervention effects on mathematics achievement for low-performing students in K-12 classrooms. Journal of Educational Computing Research, 59(1), 119-153.

Sirin, S. R. (2005). Socioeconomic status and academic achievement: A meta-analytic review of research. Review of educational research, 75(3), 417-453.

Tatar, E., & Dikici, R. (2009). The effect of the 4MAT method (learning styles and brain hemispheres) of instruction on achievement in mathematics. International Journal of Mathematical Education in Science and Technology, 40(8), 1027-1036.

Toropova, A., Johansson, S., & Myrberg, E. (2019). The role of teacher characteristics for student achievement in mathematics and student perceptions of instructional quality. Education Inquiry, 10(4), 275-299.

Thien, L. M., & Ong, M. Y. (2015). Malaysian and Singaporean students' affective characteristics and mathematics performance: evidence from PISA 2012. SpringerPlus, 4(1), 1-14.

Törnroos, J. (2005). Mathematics textbooks, opportunity to learn and student achievement. Studies in educational evaluation, 31(4), 315-327.

Tsanwani, A., Engelbrecht, J. C., Harding, A., & Maree, J. G. (2013). Factors that facilitate learners' performance in Mathematics in disadvantaged communities: a quantitative study. Journal of Educational Studies, 12(2), 35-55.

Tsanwani, A., Harding, A., Engelbrecht, J., & Maree, K. (2014). Perceptions of teachers and learners about factors that facilitate learners' performance in mathematics in South Africa. African Journal of Research in Mathematics, Science and Technology Education, 18(1), 40-51.

Van Dijk, W., Gage, N. A., & Grasley-Boy, N. (2019). The relation between classroom management and mathematics achievement: A multilevel structural equation model. Psychology in the Schools, 56(7), 1173-1186.

Wang, L., Li, X., & Li, N. (2014). Socio-economic status and mathematics achievement in China: a review. Zdm, 46(7), 1051-1060.

Wilder S., (2014). Effects of parental involvement on academic achievement: a meta-synthesis, Educational Review, 66:3, 377-397, DOI: 10.1080/00131911.2013.780009

Zakaria, E., Solfitri, T., Daud, Y., & Abidin, Z. Z. (2013). Effect of cooperative learning on secondary school students' mathematics achievement. Creative education, 4(2), 98-100.

Zakaria, E., Solfitri, T., Daud, Y., & Abidin, Z. Z. (2013). Effect of cooperative learning on secondary school students' mathematics achievement. Creative education, 4(2), 98-100.

Zhao, N., Valcke, M., Desoete, A., Zhu, C., Sang, G., & Verhaeghe, J. (2014). A holistic model to infer mathematics performance: the interrelated impact of student, family and school context variables. Scandinavian Journal of Educational Research, 58(1), 1-20