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Analysis of Students' Attitude towards Mathematics and their Learning Difficulties at Elementary Level

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Abstract

Despite a bulk of research in international context investigating the relationship between students' attitude and their self-perceived difficulties in learning mathematics, little work has yet been done in this area in Pakistan specifically at elementary level. This correlational design study was, therefore, conducted to fill this research gap in educational context of Pakistan and to ascertain how the direction and/or strength of this relationship may be mediated by students' gender and their school sector. Data were collected using two adopted and/or adapted scales from 2818 students enrolled in public and private elementary schools. Both the descriptive and inferential statistical techniques (i.e., Mean, SD, Independent samples t-test) along with Pearson's R correlation were performed to analyze the data. Pearson's R correlation indicated positive but weak degree of relationship between students' attitude and their learning difficulties toward mathematics. This study also found significant differences in students' attitude and their learning difficulties based on their gender. This study finally recommends for stakeholders involved in designing plans for improvement of students' attitude that they should carefully think about varied types and manifestations of negative attitude of elementary school students.

1. Introduction

When someone talks about attitude towards mathematics he/she is somehow referring to the affective component of the construct (Geisler et al., 2023, p. 95) that is defined as a "multidimensional construct that stands for students' learned predispositions to respond positively or negatively with regard to mathematics." The evaluation of these attitudes is essential for academic achievement and performance improvement, since the affection or rejection toward mathematics has an impact on the interest and motivation toward mathematics, as indicated by Feregrino et al. (2021). When it comes to the topic of mathematics, a positive mindset indicates a positive psychological disposition, while a negative attitude represents a negative emotional disposition (García et al., 2023). Depending on how individuals evaluate, perceive, and behave, attitudes can be either good or negative and can be either tangible or abstract. Han and Carpenter (2014) define attitudes as the behavioural,

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emotional, and cognitive reactions people exhibit towards a thing or their surroundings in light of their feelings or passions.

The term attitude is the most indispensable concept in contemporary social psychology and science. It is related to emotional and mental entities that drive an individual towards performing a particular task (Perloff, 2016). According to Lin and Huang (2014) attitude is "a learned disposition or tendency on the part of an individual to respond positively or negatively to some object, situation, concept or another person" (p. 551). Attitude can be bi-dimensional, (a person's emotions and beliefs) or multidimensional (affect, behavior, and cognition). Over the last decades, an extensive body of research from different settings and contexts has investigated variables that influence students' attitude towards Science, Technology, Engineering and, Mathematics (STEM) (Arslan et al., 2014).

Attitude towards mathematics may be pronounced as a long-term favorable or unfavorable affective disposition, and pupils may either like or despise mathematics (García et al., 2023; Spencer et al., 2023). It is vital to consider students' attention in mathematics and how they view the relevance of math knowledge in their everyday lives and future jobs. When it comes to mathematics, people's perspective and the vantage point from which they approach mathematical issues are reflected in their belief systems. One's ideas about mathematics may influence a variety of things, including how one decides to approach a problem, which approaches will be used or circumvented, how long and how hard one will effort on it, and other aspects (Özcan & Eren, 2019).

Regarding gender, Galende et al. (2020) reported more positive attitudes toward mathematics in males compared to females. Paechter et al. (2017) found higher levels of math anxiety in females compared to males. Likewise, Ryan et al. (2022) found statistically significant gender differences in the variables of math anxiety, math self-efficacy and perseverance; specifically, it was males who presented higher levels of mathematical self-efficacy and self-concept compared to females, while females presented higher levels of mathematical anxiety compared to males. Farooq and Shah (2008) discovered that there was no discernible difference between male and female students' trust in mathematics at this level. Instead, they discovered that students' attitudes towards the subject matter affected their achievement in math. Borasi (2014) believe that guys excel in mathematics more than girls.

At elementary school level girls are time and again disappointed from their mathematical activities. Therefore, girls are not comfortable with mathematics at high school years and at university level girls often drop this subject. Wasiche (2006) describes attitude as a feeling towards anything that is reflected in a peoples' behavior. Attitude mostly depends on someone's personal experience in the learning environment. He also added that mathematical abilities are not natural but these are acquired by a person. He further told some have natural characteristics and can develop mathematical abilities, though, he is not completely denying the genetic factor. It has already been recognized that many learners think mathematics as a boring subject for them (Brown et al., 2008). Moreover, Martin (2003) and Watt (2007) claims that there appears to be differences regarding gender in relation to attitudes towards mathematics and future aims. Mata et al. (2012) has inspected the outcome of individual and social support factors on attitudes towards mathematics in their research and found that, in overall, students thought positive attitudes towards mathematics. They also emphasized on grade and math achievement has effects on

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attitudes towards mathematics. Gender has no effect on these attitudes. Though, the girls showed a continuous weakening in attitudes as they proceeded in school. Ifamuyiwa and Akinsola (2008) has also examined moderating effects of locus of control and gender on senior secondary level students' attitude towards mathematics and found no significant main effects of gender on the participants' attitude towards mathematics. According to Farooq and Shah (2008) students' attitudes also influence the rate of response during the class lessons. They further told that positive attitude affect achievement positively.

In their elementary years, girls are frequently discouraged from pursuing math careers. They thus abandon it in significantly bigger percentages than males at high grade levels. As a result, there are fewer ladies working in industries that need arithmetic skills (Arnot et al., 1996). Because the difference between male and female math students is closing every day, their success levels are practically identical. However, research suggests that this distinction still holds true in some contexts of challenging mathematical problems. According to Mullis et al. (2001), attitudes are based on values and beliefs as well as varied levels of factual information. Because there are so many supplementary factors that stimulus accomplishment, the results on gender disparities in mathematics are still inconclusive (Leder & Taylor, 1995). Poor attitude towards math has frequently been named as a factor in the decreased involvement and achievement of ladies in math (Willis, 1996). The unique determinants for students' engagement and achievement in the topic are their attitude and interest in it.

Zakaria et al. (2010) stated that some boys prefer learning mathematics to girls. However, he argued that both male and female continue to study mathematics if the learning environment the teacher creates is helpful. The attitudes that students develop as they interrelate in school have an impact on how they learn mathematics. Students should be able to acquire mathematics with understanding so that they may apply mathematical concepts later in life, even though learning mathematics at Elementary level is not required for career choice or development (Stanic, 1995). Farooq and Shah (2008) stated that a student's learning in mathematics depends on the student's attitude towards mathematics. Attitudes on the road to mathematics play an important role in mathematics teaching and wisdom process. Educational methods, school structure support, and family attitudes toward school affect student's mathematics learning.

Marchis (2011) stated that' students' actual and perceived learning challenges in mathematics and educational endeavor's success is significantly influenced by how students perceive learning, and it is undeniable that when learning challenges are encountered, success is satisfied. The difficulty level of a course or subject is thus a crucial issue that any educational plan should address. Any course's or subject's objectives must be met by having content that is both challenging and appropriate for the students enrolled. In a landmark study on learning disabilities, students' attitude towards learning environment has a major impact on learning difficulties (Udousoro, 2011). Teaching qualities such as teachers' eagerness and devotion, and level of information delivered all have an impact on learning issues. In addition, it has been reported that factors like work overload, students' perceptions of the content's relevance, assessment procedures that require and a lack of opportunities for self-management affect surface learning difficulties.

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Various researches show interest and attention of students towards mathematics. Students at various academic levels may therefore have a positive or negative attitude towards mathematics for a variety of distinctly different causes. Students' attitude towards mathematics plays a serious role in determining students learning and future career opportunity. However, many elementary school students develop negative attitude towards mathematics and perceive it as challenging subject. It is aim to conduct an in depth analysis of students' attitude towards mathematics studies and their self-perceived learning difficulties. By exploring factors to gain insights to ensure students' positive attitude towards mathematics and to decrease learning difficulties of mathematics. This study will be helpful in assisting the decision makers, elementary school teachers and parents in improving students' attitude towards mathematics. It may be fruitful for elementary school students to ease self-perceived learning in mathematics (Wakhata et al., 2022).

In order to optimize problem-solving abilities and mitigate learning challenges among students, it is important to cultivate motivation, as evidenced by the association between students' attitudes towards Mathematics and their mathematical performance (Nicolaidou & Philippou, 2003). The motivation of students is significantly correlated with their perceptions of the practicality of mathematics in their future endeavors (Marchis, 2011), as well as their level of engagement in solving specific mathematical problems. The attitude of teachers towards Mathematics has been found to have an impact on the attitude of learners (Ford, 1994). Therefore, it is crucial to cultivate a favorable disposition towards Mathematics among pre-service teachers.

2. The Current Study

This study was primarily conducted to examine the extent of relationship between students' attitude and their self-perceived learning difficulties towards mathematics at elementary level in Pakistan. Following four research questions guided this study.

1. What is students' perceived attitude and their learning difficulties towards mathematics at elementary level?
2. Is there any relationship between students' attitude towards mathematics and their self-perceived learning difficulties at elementary level?
3. Are there any school sector based differences in students' attitude and their learning difficulties towards mathematics?
4. Are there any gender based differences in students' attitude and their learning difficulties towards mathematics?

3. Material and Methods

Following research methodology were applied to complete the current study.

3.1 Research Design and Participants

This quantitative study used correlational research design. This design quantitatively analyzed two or more variables and in this study it was used to analyze the relation between students' attitude towards mathematics and their self-perceived learning difficulties at elementary level. Information on the direction, form, and magnitude of the link between two variables were supplied via correlational study design (Creswell, 2011). In co-relational research design, researcher involves observing two variables to establish statistical corresponding relationship between two variables and/or to see if they impact each other (Ketner et al., 1997). This design also allows the researcher to predict an outcome (Anderson & Keith, 1997). This

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research design is also a non-experimental research design which is used to measure two variables (Akca, 2011). Co-relational research purpose is, to identify variables which have some kind of relationship in such sequence that, a change in one creates some change in the other (Atram & A. A., 2015). Proportional stratified random selection technique was used due to the miscellaneous nature of population. Stratified random sampling allowed obtaining a sample that will best represent the entire population. It also provided more accurate, diverse and more manageable data. The sample was comprised 2818 students out of 61312 students from both public and private elementary schools in district Jhang, Pakistan. Sample for this study was confirmed with the help of the table prepared by (Krejcie & Morgan, 1970) for defining sample size.

3.2 Instrumentation and Data Collection

Researcher used 16 items of Attitude Towards Mathematics Scale (ATMS) developed by (Basco et al., 2022). Researcher also used 17 items of Students' Perception of Mathematics Difficult Questionnaire Scale (SPMDCQ) developed by (Udousoro, 2011). Each questionnaire was separated into two parts. First part of student questionnaire described the demographic information of the participants and section two contained the questions to analysis of students' attitude towards mathematics and their self-perceived learning difficulties in mathematics. The questionnaire protocol was developed based on research objectives, relevant literature and suggestions of experts and worthy supervisor. It was suggested that if research tool is not reliable and authentic then the outcomes of the data will be poor. On the basis of these suggestions, researcher adapt well establish and reliable scales for study. Researcher used 5-point Likert scale in this study ranging from 1- Strongly Disagree, 2- Disagree, 3- Neutral, 4- Agree, 5- Strongly Agree. All the items of questionnaire were adapted with minor modifications to make them well-suited with the consent of Pakistani culture. For better understanding of native non English speaking Pakistani students, Urdu translation was given with each item. To measure students' gender and their school sector, two questions/items were added in demographic section as a dichotomous categorical variable (male/female, public/private).

The expert opinion and pilot testing was used to validate the questionnaire. The content and face validity of research tool was constructed under guidance of experts and supervision of worthy supervisor. All the experts and supervisor independently evaluated the questionnaire items and then provided their suggestions. All experts were opinioned that 5-point Likert scale was very easy to understand and all the items were related to research topic. All of the experts' feedback on the questionnaire's design, language, and phrasing was welcomed. The research tool was validated by pilot testing and it was done on small sample of 30 students of elementary level to get feedback and to make more improvement. The primary benefit of pilot testing is to identify problems before implementing the full survey. The purpose of this procedure is to measure the feasibility, time, risk and performance of the research tool. The purpose of pilot testing was to evaluate each question's validity. Whether the question is gathering the data it is supposed to measure is what matters. Participants, who spoke for both male and female students, were asked to report any difficulties they had comprehending the questionnaire's language. The finalized questionnaire took into consideration the advice of specialists and the feedback from participants in the pilot research.

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Cronbach's alpha coefficient was used for reliability of research tool. The reliability coefficient was calculated for each section of the questionnaire. The reliability was measure from scale through Cronbach's Alpha was found 0.803 .The reliability value at 0.6 was considered appropriate. Overall scale reliability value of this study was calculated 0.95. These reliability values interpreted that this scale was reliable. Final version of the questionnaire was distributed to all 2818 participants through self-visit after getting authorized permission from concerned respective Chief Executive Officers (CEOs), all the heads of public and private elementary schools of both male and female for the questionnaire as well as consent from participants. Finally, 1538 (55 %) sample participants responded. Specifically, among all the 1538 valid responses, 46.1 % were male and 53.9 % female as well as 37.6 % responses were from public school and 62.4 % from private school.

4. Data Analysis and Results

Both the descriptive and inferential statistical techniques (i.e., Mean, SD and Independent samples t-test) were applied by researchers to analyze students' attitude and their self-perceived learning difficulties towards mathematics at elementary level as well as to calculate gender and sector-based differences. Furthermore, Pearson's R correlations were performed to establish strength of relationship between students' attitude and their self-perceived learning difficulties towards mathematics at elementary level. Table 1 to Table 4 portrays the results.

Table 1: *Descriptive analysis of students' attitude and learning difficulty towards mathematics*

Variable	Mean	SD
Students' Attitude	2.91	1.44
Students' Learning Difficulties	3.98	1.23

Table 1 shows an independent sample t-test that was applied to students' attitude and learning difficulty towards mathematics. The overall mean value for 16 items of students' attitude was 2.91 and the overall mean of SD was 1.44. This value of mean showed that more students were agreed with the most of the statements. The overall mean value for 17 items of self-perceived learning difficulties was 3.98 and the overall mean of SD was 1.24. This high mean value shows that majority of students were agreed with the most of the statements.

Table 2: *Relationship between the students' attitude and learning difficulties towards mathematics*

Variable	Correlation	(SA)	(SLD)
Students' Attitude (SA)	Pearson Correlation	1	.155
	Sig. (2-tailed)		.000
Students' Learning Difficulties (SLD)	Pearson Correlation	.155	1
	Sig. (2-tailed)	.000	

Table 2 shows the results of correlation between students' attitude and students' learning difficulties toward mathematics that was calculated by using Pearson's R correlation coefficient method. The value of 'r' for all cases were between (.155 and .000) which indicated weak degree of relationship between students' attitude and students' learning difficulties toward mathematics. There was a positive relationship between these two variables. This means that increase in

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students' positive attitude decrease students' self-perceived learning difficulties towards mathematics at elementary level. It can, therefore, be concluded from the coefficient values of 'r' that students' attitude and students' learning difficulties toward mathematics to be positively associated.

Table 3: *Independent sample t-test of students' attitude and learning difficulty on the basis of school sector*

Variable	School Sector	N	Mean	SD	Df	t-value	p- value
Students' Attitude	Public	579	44.77	7.96	1536	5.62	.000
	Private	959	47.75	11.14			
Students' Learning Difficulties	Public	579	68.32	10.14	1536	1.99	.046
	Private	959	67.13	11.96			

Table 3 shows an independent sample t-test that was applied to students' attitude and learning difficulty on the basis of school sector scores. With respect to school sector, statistically there was a significant difference for students' attitude of public school (Mean=44.77, SD=7.96) and private schools (Mean=47.75, SD=11.14), t=5.62, p=.000 (two tailed). It was found that school sector analysis on students' attitude towards mathematics, an independent samples t-test found findings (df= 1536, t = 5.62, sig. value .000 < 0.05) where the students' attitude of public school found to be higher (Mean = 44.77) in comparison to private school (Mean = 44.75). There was also a significant difference in results for students learning difficulties of public school (Mean=68.32, SD=10.14) and private schools (Mean=67.13, SD=11.96), t=1.99, p=.046 (two tailed). It was found that school sector analysis on students' learning difficulties towards mathematics, an independent samples t-test found findings (df= 1536, t = 1.99, sig. value .046 < 0.05) where the students' learning difficulties of public school found to be higher (Mean = 68.32) in comparison to private school (Mean = 67.13).

Table 4: *Independent sample t-test of students' attitude and learning difficulty on the basis of gender*

Variable	Gender	N	Mean	SD	Df	t-value	p- value
Students' Attitude	Male	709	45.34	8.71	1536	4.63	.000
	Female	829	47.73	11.14			
Students' Learning Difficulties	Male	709	66.50	10.09	1536	3.45	.001
	Female	829	68.49	12.21			

Table 4 shows an independent sample t-test that was applied to students' attitude and learning difficulty on the basis of gender scores. As regards with gender, statistically there was a significant difference in results for students' attitude of male students (Mean=45.34, SD=8.71) and female students (Mean=47.73, SD=11.14), t=4.63, p=.000 (two tailed). It was found that gender analysis on students' attitude towards mathematics, an independent samples t-test found findings (df= 1536, t = 4.63, sig. value .000 < 0.05) where the students' attitude of female found to be higher (Mean = 47.73) in comparison to male (Mean = 45.34). There was also a significant difference in results for students learning difficulties of male students (Mean=66.50,

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SD=10.09) and female students (Mean=68.49, SD=12.21), t=3.45, p=.001 (two tailed). It was found that gender analysis on students' learning difficulties towards mathematics, an independent samples t-test found findings (df= 1536, t = 3.45, sig. value .001 < 0.05) where the students' learning difficulties of female found to be higher (Mean = 68.49) in comparison to male (Mean = 66.50).

5. Discussion

The findings of this study align with previous research that emphasizes the significant role of students' attitude in their learning difficulties towards mathematics in elementary school. This research study shows weak relationship between students' attitude towards mathematics and their learning difficulties towards mathematics in elementary school in Pakistani educational context. Hwang and Son (2021) also stated that there is relationship between students' attitude towards mathematics and their learning difficulties towards mathematics. In this study, students seemed to be uncertain about their attitude and learning difficulties towards mathematics. Mamolo and Sugano (2020) supported that there is relationship between students' attitude and their learning difficulties towards mathematics in elementary school.

This study found that students' attitude and their learning difficulties towards mathematics in elementary school receive the attention from public and private school affects students' attitude and their learning difficulties towards mathematics. This study relates with the findings of (Wijaya, 2019) that there is significant difference in students' attitude and their learning difficulties towards mathematics on the basis of school sector.

The finding of this study has accordance with (Wijaya, 2019) findings that there is gender based significance difference students' attitude and their learning difficulties towards mathematics in elementary school receive the attention from public and private school affects students' attitude and their learning difficulties towards mathematics. This study also relates with the findings of (Wakhata et al., 2022) that there is significant difference in students' attitude and their learning difficulties towards mathematics on the basis of gender.

Overall, this study contributes to the existing literature by highlighting the positive relationship between students' attitude towards mathematics and their learning difficulties towards mathematics in elementary school in the Pakistani educational context.

6. Conclusion and Recommendation

The results of this study clearly suggest that a higher reported students' attitude towards mathematics score is linked with students' self-perceived learning difficulties score in elementary school on the basis of school sector and gender. To be specific, following four main conclusions were drawn in this study. First, this study revealed it was concluded that there is a significant difference with reference to school sector in students' attitude and their learning difficulties towards mathematics. Second, it was concluded that there is a significant difference with reference to gender in students' attitude and their learning difficulties towards mathematics. Third, Pearson's R correlation indicated that weak degree of relationship between students' attitude and students' learning difficulties toward mathematics. This study recommends for educational psychologists involved in designing and delivery of students' attitude as well as treatment that they should carefully think about varied "types" and manifestations of negative attitude of elementary school students and

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avoid presumptions that targeting students' attitude itself will certainly result in an decrease in students' self-perceived learning difficulties**.**

References

Akca, F. (2011). The relationship between test anxiety and learned helplessness. Social Behavior and Personality: An International Journal, 39 (1), 101-111.

Al-Atram, A. A. (2015). The relationship between parental approach and anxiety. Arch Depress Anxiety, 1 (1), 6-9.

Anderson, E. S., & Keith, T. Z. (1997). A longitudinal test of a model of academic success for at-risk high school students. Journal of Educational Research, 90, 259–266.

Arnot, M., David, M. E., & Weiner, G. (1996). *Educational reforms and gender equality in schools*.Equal Opportunities Commission.

Arslan C., Yavuz G., & Deringol-Karatas Y. (2014). Attitudes of Elementary School Students towards Solving Mathematics Problems. *Procedia—Social and Behavioral Sciences*, 152, 557–562.

Basco, P. D., Karunanidhi, S., & Sasikala, S. (2022). Construction And Validation Of Attitude Towards Mathematics Scale (Atms). *Journal of Positive School Psychology*, 1676-1685.

Brown, M., Brown, P., & Bibby, T. (2008). "I would rather die": reasons given by 16 year-olds for not continuing their study of mathematics. Research in Mathematics Education, 10(1), 3-18.

Creswell, J. W. (2011). Best practices for mixed methods research in the health sciences." Bethesda,*National Institutes of Health.*

Farooq, M. S. and Shah, S. Z. U. (2008).Students' attitude toward Mathematics.*Pakistan Economic and Social Review*, 48(1), 75-83

Feregrino, G. R., López, J. A. J., and Gómez, O. L. F. (2021). Importancia del estudio de las actitudes para el aprendizaje de las matemáticas. RD-ICUAP 7, 148–157.

Ford, M. I. (1994). Teachers' beliefs about mathematical problem solving in the elementary school. *School Science and Mathematics*, *94*(6), 314-322.

Galende, N., Arrivillaga, A. R., and Madariaga, J. M. (2020). Attitudes towards mathematics in secondary school students. Personal and family factors (las actitudes hacia las matemáticas del alumnado de secundaria. Factores personales yfamiliares). Cult. Educ. 32, 529–555. doi: 10.1080/11356405.2020.1785156

García-Suárez, J., Guzmán-Martínez, M., and Monje-Parrilla, F. J. (2023). Estudio descriptivo de la ansiedad matemática en estudiantes mexicanos de ingeniería. IE Revist. Investig. Educ. REDIECH 14:e1619. doi: 10.33010/ie_rie_rediech.v14i0.1619

Geisler, S., Rach, S., and Rolka, K. (2023). The relation between attitudes towards mathematics and dropout from university mathematics—the mediating role of satisfaction and achievement. Educ. Stud. Math. 112, 359–381. doi: 10.1007/ s10649-022-10198-6

Han, S., & Carpenter, D. (2014). Construct validation of student attitude toward science, technology, engineering and mathematics project-based learning: The case of Korean middle grade students. *Middle Grades Research Journal*, 9(3), 27-41.

ISSN Online: 2709-7625
ISSN Print: 2709-7615

Hwang, S., & Son, T. (2021).Students' Attitude toward Mathematics and Its Relationship with Mathematics Achievement.*Journal of Education and e-Learning Research*, 8(3), 272-280.

Ifamuyiwa, S. A., & Akinsola, M. K. (2008). Improving senior secondary school students' attitude towards mathematics through self and cooperative-instructional strategies. International journal of mathematical education in science and technology, 39(5), 569-585.

Ketner, C. S., Smith, K. E., & Parnell, M. K. (1997). Relationship between teacher theoretical orientation to reading and endorsement of developmentally appropriate practice. Journal of Educational Research, 90, 212–220.

Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.

Leder, G. C., & Taylor, P. (1995). Gender and mathematics performance: A question of testing. *Gender and Mathematics Education: An ICMI Study in Stifsgarden, Akersberg, Hoor, Sweden*, 271-280.

Lin S., & Huang Y. (2014). Development and application of a Chinese version of the short attitudes toward mathematics inventory, *International Journal of Science and Mathematics Education*, 14(1), 193–216.

Mamolo, L. A., & Sugano, S. G. C. (2020).Self-perceived and actual competencies of senior high school students in General Mathematics. *Cogent Education*, *7*(1), 1779505.

Marchis, I. (2011). Factors that influence secondary school students' attitude to mathematics. *Procedia-Social and Behavioral Sciences*, *29*, 786-793.

Martin, A. J. (2003). Enhancing the educational outcomes of boys: Findings from the ACT investigation into boys' education. Youth Studies Australia, 22(4), 27-36.

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

Mullis, I. V. S., M. O. Martin, E. J. Gonzalez, K. M. Conner, S. J. Chrostowski, K. D. Gregory, R. A. Garden and T. A. Smith (2001), Mathematics Benchmarking Report.

Nicolaidou, M., & Philippou, G. (2003).Attitudes towards mathematics, self-efficacy and achievement in problem solving. *European research in mathematics education III*, *1*(11).

Özcan, Z. Ç., and Eren Gümüş, A. (2019). A modeling study to explain mathematical problem-solving performance through metacognition, self-efficacy, motivation, and anxiety. Aust. J. Educ. 63, 116–134. doi: 10.1177/0004944119840073

Paechter, M., Macher, D., Martskvishvili, K., Wimmer, S., and Papousek, I. (2017). Mathematics anxiety and statistics anxiety. Shared but also unshared components and antagonistic contributions to performance in statistics. Front. Psychol. 8:1196. doi: 10.3389/fpsyg.2017.01196

Perloff, R.M., 2016. The Dynamics of Persuasion: Communication and Attitudes in the Twenty-First Century. Routledge, London.

Ryan, V., Fitzmaurice, O., and O'Donoghue, J. (2022). Student interest and engagement in mathematics after the first year of secondary education. Eur. J. Sci. Math. Educ. 10, 436–454. doi: 10.30935/scimath/12180

ISSN Online: 2709-7625
ISSN Print: 2709-7615

Spencer, D., Griffith, E., Briska, K., Post, J., and Willis, C. (2023). The role of noncognitive factors in the introductory statistics classroom. Stat. Educ. Res. J. 22, 1–16. doi: 10.52041/serj.v22i1.77

Stanic, G. M., & Hart, L. E. (1995). Attitudes, persistence, and mathematics achievement: Qualifying race and sex differences. *New directions for equity in mathematics education*, *2*, 258-276.

Udousoro, U. J. (2011).Perceived and actual learning difficulties of students in secondary school mathematics.*African Research Review*, 5(5), 357-366.

Wakhata, R., Mutarutinya, V., &Balimuttajjo, S. (2022).Relationship between Students' Attitude towards, and Performance in Mathematics Word Problems. *bioRxiv*, 2022-11.

Wasiche, J. L. (2006). Teaching Techniques That Enhance Students Performance in Mathematics in Selected Public secondary schools in Butere-Mumias District. Kenya. Unpublished M. Ed Thesis. Kenyatta University.

Watt, H. M. G. (2007). A trickle from the pipeline: Why girls under participate in maths. Professional Educator, 6(3), 36-41.

Wijaya, A., Retnawati, H., Setyaningrum, W., & Aoyama, K. (2019).Diagnosing Students' Learning Difficulties in the Eyes of Indonesian Mathematics Teachers.*Journal on Mathematics Education*, 10(3), 357-364.

Willis, S. (1996). Gender justice and the mathematics curriculum: Four perspectives. In *Gender, science and mathematics: Shortening the shadow* (pp. 41-51). Dordrecht: Springer Netherlands.

Zakaria, E., Chin, L. C., & Daud, M. Y. (2010).The effects of cooperative learning on students' mathematics achievement and attitude towards mathematics. *Journal of social sciences*, 6(2), 272-275.