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The Influence of Interest, Motivation, and Learning Style on Grade 6 Pupils' Mathematics Performance

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This study examines the influence of interest, motivation, and learning styles on the mathematics performance of Grade 6 pupils. It specifically explores how these factors—categorized into interest, motivation, and visual, auditory, and tactile learning styles—affect students' academic outcomes. Conducted in Dingalan, Aurora, during the School Year 2023-2024, the study employed a quantitative descriptive-correlational research design. Data were gathered from 239 purposively selected pupils using survey questionnaires. Statistical analyses, including correlation tests, were performed to determine the relationships between pupils' learning attitudes and their academic performance in mathematics. The findings reveal a significant positive correlation between pupils' interest, motivation, and visual learning styles with their mathematics performance. However, auditory and tactile learning styles did not show a significant impact on academic achievement. Additionally, the study highlights a gender difference, with female pupils performing better than their male counterparts. These results underscore the importance of fostering engagement, motivation, and visual learning strategies to enhance mathematics learning outcomes. The study recommends that educators and policymakers implement teaching approaches tailored to students' learning styles to improve engagement and performance. Further research is suggested to explore additional factors, such as parental involvement and classroom environment, that may influence students' mathematics achievement.

Keywords: interest, motivation, learning styles, mathematics performance, grade 6 pupils

INTRODUCTION

Mathematics plays a crucial role in students' cognitive development, fostering logical reasoning, problem-solving skills, and critical thinking. In the Philippine education system, mathematics is a core subject, yet many students struggle to master it. Various studies suggest that interest, motivation, and learning styles significantly impact students' academic success in mathematics. Understanding how these factors influence mathematics performance can provide valuable insights for educators and policymakers to develop effective teaching strategies. The declining trend in student mathematics

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performance has been a concern in local and international assessments. However, no empirical data explicitly labels mathematics performance among Filipino students as universally low; instead, various studies point to factors influencing student outcomes, such as attitudes, motivation, and learning styles (Ocampo et al., 2023). Empirical studies in the Philippine context reveal that students' attitudes toward mathematics significantly impact their academic achievement. Ocampo et al. (2023) found that students with a positive disposition towards mathematics perform better, emphasizing the role of motivation and learning styles in their success. Similarly, Capuno et al. (2019) highlighted the interplay between students' study habits and their academic performance, indicating that motivation and engagement are key determinants of success in mathematics. Furthermore, Ebele (2017) emphasized the impact of study habits on student performance, reinforcing the need for effective learning strategies to support mathematical achievement.

Learning styles also influence how students engage with mathematical concepts. Edimuslim (2018) examined mathematical literacy in high school students and found that visual learners tend to outperform auditory and tactile learners. This aligns with findings by Gabriel et al. (2020), who established that self-regulated learning strategies mitigate the negative effects of mathematics anxiety, thereby improving student performance. Despite existing research on mathematics education in the Philippines, there remains a gap in understanding how different learning styles interact with motivation and academic performance in primary school students. This study seeks to bridge that gap by systematically investigating the relationships between Grade 6 students' attitudes, learning styles (visual, auditory, tactile), and mathematics performance. Unlike prior research, this study uniquely integrates empirical findings from both qualitative and quantitative perspectives to provide a comprehensive analysis of these variables.

The research problem centers on understanding determining the influence of interest, motivation, and learning style on the mathematics performance of Grade 6 pupils. While previous studies have examined these factors separately, there is limited research that explores their combined effect within the Philippine education system. This study aims to address this gap by providing empirical data on the interplay of these variables and offering insights that can improve mathematics education outcomes.

The study's novelty lies in its focused examination of how gender, motivation, and specific learning styles impact mathematics performance in a Philippine primary school setting. By utilizing local empirical evidence and linking it with international findings, this research aims to contribute meaningful insights to mathematics education. The study aligns with Harun et al. (2021) meta-analysis, which emphasizes the importance of student attitudes in mathematics success. Furthermore, it builds on the work of Elastika et al. (2021), who identified key learning difficulties in mathematics through structural equation modeling (SEM).

This study aims to describe the demographic characteristics of Grade 6 pupils in terms of sex and age and assess their attitudes toward mathematics, particularly their motivation and preferred learning styles. Additionally, it seeks to determine the

relationship between attitudes, learning styles, and mathematics performance while examining whether demographic factors influence attitudes and performance in mathematics. Through these objectives, the research provides a deeper understanding of how students' characteristics shape their learning experiences and achievements in mathematics.

The study hypothesizes that there is no significant relationship between students' mathematics performance and their age, sex, interest, motivation, and learning styles. This hypothesis will be tested using statistical analysis to draw evidence-based conclusions. By addressing these objectives, this study aims to provide empirical insights that will help educators and policymakers develop targeted interventions to enhance mathematics education in the Philippines. The findings will contribute to the existing body of knowledge, particularly in improving teaching strategies that cater to different learning styles, thereby fostering more effective learning experiences for students.

Literature Review

Mathematics education plays a pivotal role in students' cognitive development and academic achievement. Numerous studies have investigated the factors influencing mathematics performance, including student attitudes, motivation, and learning styles. Understanding these relationships provides valuable insights for educators to enhance teaching strategies and foster positive learning experiences. This literature review synthesizes existing research on student attitudes, academic achievement, motivation, and learning styles in mathematics education.

Students' Attitudes and Mathematics Performance

Students' attitudes toward mathematics significantly affect their academic performance. Positive attitudes often result in higher achievement, while negative perceptions contribute to math anxiety and lower engagement (Hwang & Son, 2021). Harun et al. (2021) conducted a meta-analysis demonstrating that students with a growth-oriented mindset in mathematics perform better than those with fixed attitudes, emphasizing the need for interventions that foster positive perceptions.

Students who believe in the utility of mathematics tend to exert more effort, leading to better outcomes (Harun et al., 2021). Conversely, mathematics anxiety can hinder performance (Gabriel et al., 2020). The interplay between attitude and achievement underscores the need for interventions that foster positive perceptions of mathematics.

Bulut and Soylu (2023) investigated the impact of lesson study models on students' attitudes and success in mathematics. Their findings revealed that structured and interactive teaching methods improved students' engagement and performance. Similarly, Fung et al. (2018) found that student engagement plays a mediating role between attitudes and mathematics achievement, further highlighting the need for active participation in learning.

Interest and Mathematics Performance

Studies suggest that students' interest in mathematics significantly affects their performance (Harun et al., 2021). When students find mathematics engaging and relevant, they are more likely to exert effort and achieve higher scores. Additionally, the integration of real-world applications in mathematics has been shown to increase students' enthusiasm and comprehension (Capuno et al., 2019).

Motivation and Mathematics Achievement

Motivation is a critical determinant of students' success in mathematics. Research indicates that both intrinsic motivation (enjoyment and personal interest) and extrinsic motivation (grades, rewards) play essential roles in academic achievement (Suglo, 2024). Lena et al. (2022) found that students who see mathematics as useful for their future careers tend to perform better and persist in learning challenges.

Lena et al. (2022) explored the role of interest and motivation in learning outcomes, showing that students who perceive mathematics as useful for their future careers are more likely to perform well. Similarly, Yulianingtias and Usman (2021) found that reading interest, learning discipline, and motivation were strong predictors of success in mathematics. These findings suggest that creating a motivational learning environment is essential for improving student performance.

Academic Achievement in Mathematics

Academic achievement in mathematics is influenced by various cognitive and affective factors. Studies suggest that motivation, interest, and engagement contribute to higher performance (Fung et al., 2018). Bulut and Soylu (2023) found that using lesson study models can improve students' success and attitudes towards mathematics. Additionally, gender disparities in mathematics achievement have been examined, with some studies indicating minimal differences while others suggest that female students perform better in fundamental mathematics skills (Kaiser & Zhu, 2022; Stoet & Geary, 2012).

Learning Styles and Their Impact on Mathematics Performance

Learning styles influence how students absorb and process mathematical concepts. Edimuslim (2018) found that students with strong mathematical literacy abilities often align with specific learning styles. Visual learners benefit from diagrams and written explanations, while auditory learners excel through discussions and verbal instructions (Cimermanová, 2018). Tactile learners, who prefer hands-on experiences, may require different instructional approaches (Suntonrapot & Auyporn, 2014). Ocampo et al. (2023) emphasize the importance of aligning teaching strategies with students' learning preferences to optimize their performance

Students have different learning preferences, which influence their understanding of mathematical concepts. Visual learners often excel when presented with diagrams and spatial representations, while auditory learners benefit from verbal explanations (Edimuslim, 2018). Ocampo et al. (2023) found that students perform better in mathematics when taught using methods aligned with their preferred learning styles.

Saraswathy (2019) emphasized the role of learning strategies in mathematics education, revealing that students who actively adapt their study techniques based on their learning preferences tend to achieve higher scores. Furthermore, Suntonrapot and Auyporn (2014) highlighted that the interaction between teaching and learning styles plays a crucial role in mathematical comprehension. These findings suggest that differentiated instruction is necessary to accommodate diverse learners.

Gender Differences in Mathematics Performance

The debate on gender disparities in mathematics performance has produced varied findings. While some research suggests that female students outperform males in certain mathematical skills, others argue that differences are minimal when controlling for motivation and learning strategies (Bulut & Soylu, 2023).

A large-scale study by Kaiser and Zhu (2022) analyzed PISA data from Shanghai, showing that gender disparities in mathematics achievement are often linked to socio-cultural factors rather than cognitive abilities. Similarly, Lu et al. (2023) found that confidence and self-perception played a more significant role in performance differences than gender itself.

Stoet and Geary (2012) explored stereotype threat, demonstrating that gender-based stereotypes can negatively impact female students' confidence in mathematics. Their study suggests that reducing stereotype-based expectations could help close the gender gap in mathematics achievement. These findings indicate the importance of gender-inclusive teaching strategies that encourage equal participation and confidence in mathematics learning.

The reviewed literature highlights the intricate relationships between student attitudes, motivation, learning styles, and academic achievement in mathematics. Positive attitudes and motivation contribute to better performance, while learning styles necessitate differentiated instructional approaches. Addressing gaps in research through further empirical studies can enhance our understanding of effective mathematics education strategies, ultimately benefiting both students and educators. Future research should explore personalized learning approaches and gender-responsive pedagogies to enhance student success in mathematics.

Despite extensive research on mathematics education, gaps remain. One area requiring further exploration is the long-term impact of learning styles on mathematics achievement. Additionally, the role of external factors such as parental involvement and socioeconomic status in shaping students' attitudes and performance warrants deeper investigation (Yulianingtias & Usman, 2021). Future studies should also examine the effectiveness of tailored teaching interventions in diverse learning environments.

METHOD

Research Design

This study employs a quantitative descriptive-correlational research design. A correlational design is appropriate for this research as it seeks to establish relationships between variables—specifically, the attitudes of Grade 6 pupils toward mathematics

(independent variables) and their academic performance in the subject (dependent variable). The primary objective is to investigate how factors such as interest, motivation, and preferred learning styles influence mathematical achievement. According to Creswell (2014), correlational research is instrumental in identifying the strength and direction of relationships among variables, allowing for a nuanced understanding of how these factors impact students' educational outcomes.

Sampling Technique

The participants were drawn from a population of Grade 6 pupils enrolled during the 2023-2024 school year, utilizing purposive sampling to select those who fit the study's criteria. A total of 239 students (124 male and 115 female) participated in the study. The sampling technique aligns with the recommendations of Creswell (2014), ensuring a representative sample that is sufficient for effective analysis. Ethical considerations were implemented, including informed consent and anonymity, ensuring that students and parents understood the study's purposes and their right to withdraw at any time.

Questionnaires and Test Questions Reliability

To ensure the validity and reliability of the questionnaire designed for this study, a comprehensive validation process was conducted. Initially, the questionnaire was constructed based on an extensive review of relevant literature, which highlighted key constructs related to pupils' attitudes towards mathematics, including interest, motivation, and preferred learning styles. After drafting the questionnaire, it underwent a review by a panel of experts in educational psychology and mathematics education, who evaluated each item for clarity, relevance, and appropriateness for the target population. Their feedback prompted modifications to enhance the instrument's face validity. Subsequently, a content validation phase was implemented, wherein the revised questionnaire was administered to a group of 30 Grade 6 students in a pilot study, which allowed the researchers to assess the content validity by confirming that the questions accurately captured the intended constructs and provided qualitative feedback on the participants' understanding of the items. Reliability was measured using Cronbach's Alpha, a statistical method used for assessing internal consistency, and results revealed good reliability across all constructs: Interest in Mathematics (α = 0.81), Motivation in Mathematics (α = 0.82), Visual Learning Style (α = 0.82), Auditory Learning Style (α = 0.83), and Tactile Learning Style (α = 0.83). These findings align with literature suggesting that different learning styles and student engagement play significant roles in academic performance (Rahman et al., 2017; Elastika et al., 2021). If any construct had yielded Cronbach's Alpha below 0.70, further adjustments would have been made to refine the questions. Ultimately, the instrument met necessary psychometric standards and was tailored to effectively capture the complexities of student experiences in mathematics education, ensuring that it was suitable for the main study. This rigorous process supports the study's goal of exploring the connection between pupils' attitudes and their academic performance in mathematics, contributing valuable insights to the existing body of literature on educational psychology and mathematics education.

Data Collection Procedure

This study entitled "The Influence of Interest, Motivation, and Learning Styles on Grade 6 Pupils' Mathematics Performance**"** utilized survey questionnaires as the primary data collection method, which is particularly appropriate for this research for several reasons. Surveys are effective for gathering quantitative data from a larger population, allowing for the analysis of trends and relationships across diverse respondent groups. Given that the study targeted Grade 6 pupils, surveys enabled the researchers to efficiently collect information from a sizeable sample, helping to enhance the reliability of the findings. Upon the approval of the research proposal, permission to conduct was obtained from the Director of the Gabaldon Campus of Nueva Ecija University of Science and Technology (NEUST). Next, approval was sought from the principal of the targeted school to access data from the intended Grade 6 pupil respondents. Upon receiving the principal's consent, the researchers administered survey questionnaires to the target respondents. Before administering the questionnaires, the researchers clearly outlined the objectives of the study and provided detailed instructions to ensure proper completion by the respondents. The data was collected mainly by survey questionnaires. The researchers conferred and discussed the significance of the research and accomplished the appropriate distribution of the instruments. After completing the questionnaires, the results have been tallied and tabulated. The data gathered became the basis for analysis and interpretation.

Data Analysis

The data analysis for the study "The Influence of Interest, Motivation, and Learning Style on Grade 6 Pupils' Mathematics Performance " was systematically conducted in alignment with the research questions and hypotheses. Initially, the demographic profiles of respondents were described using frequency and percentage calculations, providing context for interpreting the findings. To assess pupils' attitudes towards mathematics, weighted mean calculations were employed for survey items related to interest, motivation, and learning styles, using a four-point Likert scale.

The relationship between attitudes and mathematics performance was examined through the Chi-Square Test of Independence, which effectively identifies significant associations between categorical variables, particularly concerning attitudes and academic outcomes across demographic factors like sex and age. The hypothesis—that no significant relationship exists between pupils' performance and their demographic characteristics or attitudes—was tested using statistical analyses in SPSS, with a p-value threshold of <0.05 to evaluate significance. Effect sizes were also calculated to determine the practical significance of the findings. The results were interpreted in the context of the research questions and compared with existing literature, providing valuable insights for informing educational strategies and interventions related to pupils' attitudes and performance in mathematics.

FINDINGS

Demographic Profile of the Student's Respondents

Table 1
Demographic profiles of the student's respondents

Sex	Total	Percent
Male	124	51.9%
Female	115	48.1%
AGE		
9 to 12	217	90.8%
13 to 15	20	8.4%
15 Above	2	.8%
GRADES		
Fairly Satisfactory	21	8.8%
Satisfactory	67	28.0%
Very Satisfactory	77	32.2%
Outstanding	74	31.0%

Table 1 presents the demographic characteristics of the 239 Grade 6 pupils involved in the study, broken down by sex and age. The majority (51.9%) were male, while females constituted 48.1%. The age distribution highlights that 90.8% of pupils were between 9 to 12 years old. These demographic factors serve as independent variables in the research hypothesis, examining their potential impact on attitudes and performance in mathematics.

The nearly equal representation of male and female respondents allows for gender-related analyses concerning academic performance.

The age concentration within the 9 to 12 range suggests that the findings might primarily reflect the attitudes and learning behaviors typical of younger students, further contextualizing the research's applicability to this demographic.

Pupils' Interest in Mathematics

Table 2
Pupils' interest in mathematics

Interest in Mathematics	Weighted Mean	Verbal Interpretation
1. I make myself prepared for the math subject.	3.36	Strongly Agree
2. I listen attentively to the lecture of my math teacher.	3.57	Strongly Agree
3. I actively participate in the discussion, answering exercises and/or clarifying things I did not understand.	3.32	Strongly Agree
4. I want to get good grades on tests, quizzes, assignments, and projects.	3.75	Strongly Agree
5. I get frustrated if the discussion is interrupted, or the teacher is absent.	2.45	Disagree
6. I attend all math classes throughout the term.	3.36	Strongly Agree
7. I do my assignments regularly.	3.48	Strongly Agree
8. I study the lessons I miss if I am absent from the class.	3.23	Agree
9. I teach my classmates who do not understand some topics I do understand.	3.44	Strongly Agree
10. I exert more effort every time I do difficult assignments.	3.41	Strongly Agree
Total weighted mean	3.34	Strongly Agree

Table 2 presents the pupils' interest in mathematics. The data indicates that respondents strongly agree that they aim to achieve high scores in tests, quizzes, assignments, and projects, as reflected by the highest weighted mean of 3.75. Similarly, they listen attentively to their math teacher's lecture, with a weighted mean of 3.57. The results also reveal that students strongly agree that they regularly complete their assignments (3.48), which is comparable to their commitment to preparing for the subject (3.36). Furthermore, students demonstrated strong agreement in actively participating in discussions, answering exercises, and clarifying concepts they did not initially understand, with a weighted mean of 3.32.

The findings suggest that pupils generally exhibit a high level of interest in mathematics, as evidenced by their positive attitudes and engagement with the subject. These results align with existing educational theories emphasizing the crucial role of interest in fostering motivation for learning. Research suggests that when students perceive mathematics as engaging and relevant, their willingness to exert effort increases, leading to enhanced academic performance.

This study highlights the importance of creating a learning environment that promotes enthusiasm for mathematics, which can contribute to students' intrinsic motivation and persistence. The observed patterns imply that students who prepare ahead of time and engage actively in their studies are more likely to retain information effectively and approach mathematical challenges with confidence. These findings are consistent with the perspective of Harun et al. (2021), who stressed that fostering students' interest is essential for improving academic performance. Additionally, integrating real-life applications of mathematics into the curriculum may further strengthen students' engagement and lead to better learning outcomes.

Pupils' Motivation in Mathematics

Table 3
Pupil's motivation in mathematics

Motivation in Mathematics	Weighted Mean	Verbal Interpretation
1. Mathematics is an easy subject for me.	2.83	Agree
2. Topics in Mathematics are interesting for me.	3.16	Agree
3. I listen to Mathematics subject carefully.	3.58	Strongly Agree
4. I think that Mathematics improves my intelligence.	3.45	Strongly Agree
5. I can use the things that I learned in Mathematics in daily life.	3.44	Strongly Agree
6. I feel more confident every time I succeed in Mathematics.	3.52	Strongly Agree
7. I like finding more than one solution to Mathematics problems.	3.09	Agree
8. I can explain the things that I learned in my own words in Mathematics subject.	2.94	Agree
9. I like mathematics class.	3.31	Strongly Agree
10. I like participating in activities in Mathematics class.	3.15	Agrees
Total weighted mean	3.25	Strongly Agree

Table 3 presents the pupils' motivation in mathematics. The findings indicate that respondents strongly agree that they carefully listen to the mathematics subject, as reflected by the highest weighted mean of 3.58. Additionally, students feel more confident when they succeed in mathematics, with a computed weighted mean of 3.52.

The results also show that respondents strongly agree that mathematics enhances their intelligence, as indicated by a weighted mean of 3.45. Furthermore, students recognize the real-life applicability of mathematics, with a computed weighted mean of 3.44, while their general enjoyment of mathematics class is reflected in a weighted mean of 3.31.

The overall total weighted mean of 3.25, with a verbal interpretation of "Strongly Agree," highlights the pupils' positive motivation towards mathematics. These findings align with the study of Capuno et al. (2019), which established a significant relationship between pupils' performance and their motivation in mathematics. Additionally, research by Abalde and Oco (2023) supports the notion that higher levels of motivation can drive individuals to pursue and achieve their academic goals.

Motivation plays a crucial role in determining academic success in mathematics, as demonstrated in Table 3. The results suggest that pupils exhibit varying degrees of motivation, which directly influence their performance. Studies indicate that intrinsic motivation enhances the learning experience and encourages students to persist despite challenges (Fung et al., 2018). This aligns with the findings of Ebele (2017), who emphasized the significant impact of motivation on pupils' academic outcomes. Given these insights, implementing educational strategies that foster motivation can contribute to improved learning experiences and better academic achievements in mathematics.

Pupils Learning Style in Mathematics

Table 4
Pupils visual learning style in mathematics

Visual	Weighted Mean	Verbal Interpretation
1. I prefer to see information written on the board and supplemented by visual aids and assigned readings.	3.55	Always
2. I like writing in my notebook to help me remember things better.	3.66	Always
3. I am skillful with and enjoy interpreting graphs and charts.	3.13	Sometimes
4. I can easily understand and follow directions on a map.	3.01	Sometimes
5. Reading the news in the newspaper or online helps me understand better than listening on the radio or the internet.	3.30	Always
6. I think the best way to remember something is to picture it in my mind.	3.56	Always
7. I am good at solving jigsaw puzzles and mazes.	2.90	Sometimes
8. I prefer obtaining information about an interesting subject by reading about it.	3.43	Always
Total weighted mean	3.32	Always

Table 4 presents the pupils' visual learning styles in mathematics. The results indicate that respondents always prefer writing in their notebooks to help them remember information better, as reflected by the highest computed weighted mean of 3.66. Similarly, students think that picturing concepts in their minds is the best way to retain information, with a weighted mean of 3.56. They also strongly prefer seeing information written on the board, supplemented by visual aids and assigned readings, which obtained a 3.55 weighted mean. Additionally, pupils prefer obtaining information

about an interesting subject by reading about it, reflected by a weighted mean of 3.43. Moreover, they always find reading the news in newspapers or online more effective for understanding than listening to it on the radio or internet, with a computed weighted mean of 3.30.

The data further reveal that students sometimes demonstrate skills in interpreting graphs and charts, as indicated by a weighted mean of 3.13. Similarly, they sometimes find it easy to understand and follow directions on maps, with a weighted mean of 3.01. Lastly, pupils sometimes excel at solving jigsaw puzzles and mazes, as reflected by the lowest computed weighted mean of 2.90.

With an overall total weighted mean of 3.32, the findings suggest that pupils generally exhibit a strong preference for visual learning. These results align with the study conducted by Zulkipli et al. (2019), which suggests that pupils with a visual learning style tend to absorb information more effectively through visual representations, such as symbols, graphs, and diagrams presented by teachers. This is further supported by Savitri and Rochmad (2022), who highlighted that students build their mathematical understanding through visual learning techniques.

Since Table 4 highlights the significance of visual learning styles among pupils, it emphasizes the importance of incorporating visual aids into teaching strategies to enhance students' comprehension and retention. According to Edimuslim (2018), aligning teaching methods with students' visual learning preferences significantly improves their grasp of mathematical concepts. The results of this study confirm these findings, as visual learners demonstrate better performance when exposed to diagrammatic and spatial representations in mathematics.

Pupils' Auditory Learning Style

Table 5
Pupils' auditory learning style

Auditory	Weighted Mean	Verbal Interpretation
1. I remember things best by listening to a lecture that includes information, explanations, and discussions.	3.62	Always
2. I require explanations of diagrams, graphs, or visual directions.	3.30	Always
3. I can tell if sounds match if presented with pairs of sounds.	3.16	Sometimes
4. Listening to lectures and tapes helps me do well in the subject.	3.46	Always
5. I learn to spell better by repeating words out loud than by writing the words on paper.	3.05	Sometimes
6. I would rather listen to a good lecture or speech than read about the same material.	3.24	Sometimes
7. I prefer listening to the news on the radio or online rather than reading about it in a newspaper or on the internet.	2.97	Sometimes
8. I follow oral directions better than written ones.	3.00	Sometimes
Total weighted mean	3.23	Sometimes

Table 5 illustrates the auditory learning style of the pupils. The results indicate that respondents always remember things best by listening to lectures that include information, explanations, and discussions, as reflected by the highest computed

weighted mean of 3.62. Similarly, pupils always rely on listening to lectures and tapes to help them perform well in the subject, with a weighted mean of 3.46. Additionally, they always require explanations of diagrams, graphs, or visual directions, with a computed weighted mean of 3.30.

On the other hand, the data reveal that respondents sometimes prefer listening to a good lecture or speech rather than reading about the same material, as reflected by a weighted mean of 3.24. Likewise, they can sometimes recognize matching sounds when presented with pairs of sounds, with a computed weighted mean of 3.16. Pupils also sometimes learn to spell better by repeating words out loud rather than writing them down, with a 3.05 weighted mean. Additionally, they sometimes follow oral directions better than written ones, with a weighted mean of 3.00. Lastly, pupils sometimes prefer listening to the news on the radio or online rather than reading about it in a newspaper or on the internet, with a computed weighted mean of 2.97.

The overall total weighted mean for all statements is 3.23, which falls under the verbal interpretation of "Sometimes." This finding aligns with Edimuslim et al. (2019), who emphasized that students with an auditory learning style can apply techniques to solve mathematical problems. However, the data suggest lower engagement among pupils who identify with auditory learning styles. The findings indicate that students may not perform as effectively when taught predominantly through auditory methods. This observation supports previous studies, such as those by Suntonrapot and Auyporn (2014), which highlight challenges in adapting teaching styles to auditory learners. While verbal explanations benefit auditory learners, the correlation between their performance and comprehension may not be as strong compared to visual learners.

Pupils' Tactile Learning Style

Table 6
Pupils' tactile learning style

Tactile	Weighted Mean	Verbal Interpretation
1. I prefer to use posters, models, or actual practice and other activities in class.	3.19	Sometimes
2. I enjoy working with my hands or making things.	3.55	Always
3. I can remember best by writing things down several times.	3.31	Always
4. I play with coins or keys in my pocket.	2.37	Sometimes
5. I chew gum, smoke, or snack while studying.	2.13	Rarely
6. I learn to spell by using my fingers to spell out the word.	3	Sometimes
7. I grip objects in my hands during learning periods.	2.90	Sometimes
8. I feel very comfortable touching others hugging and handshaking etc.	2.81	Sometimes
Total weighted mean	2.91	Sometimes

Table 6 illustrates the tactile learning style of the respondents. The results indicate that pupils always enjoy working with their hands or making things, as reflected by the highest computed weighted mean of 3.55. Additionally, the respondents always remember best by writing things down several times, with a weighted mean of 3.31.

The data further reveal that respondents sometimes prefer to use posters, models, or actual practice and other activities in class, with a computed weighted mean of 3.19. Similarly, they sometimes learn to spell by using their fingers to spell out words, as indicated by a weighted mean of 3.00. Respondents also sometimes grip objects in their hands during learning periods (2.90), feel very comfortable with physical contact such as hugging and handshaking (2.81), and play with coins or keys in their pockets (2.37).

Meanwhile, the data indicate that respondents rarely chew gum, smoke, or snack while studying, with a computed weighted mean of 2.13.

With a total weighted mean of 2.91, interpreted as "Sometimes," the findings suggest that tactile learning is sometimes practiced by the respondents. Notably, none of the respondents indicated a "Never" response.

This finding aligns with existing literature suggesting that while various learning styles contribute to educational success, tactile methods may lack the structured engagement that visual approaches provide (Ocampo et al., 2023). The study also posits that the relatively lower engagement of tactile learners in mathematics highlights a potential instructional gap that requires further exploration. Factors such as classroom engagement levels and the nature of mathematical content being taught may influence this outcome.

Future research should further investigate the impact of auditory and tactile learning styles on student performance, taking into account factors such as parental involvement and classroom interaction dynamics (Yulianingtias & Usman, 2021). Additionally, there is a growing need for tailored instructional strategies that address the specific needs of diverse learning styles, ultimately enhancing overall academic performance in mathematics.

Relationship of Mathematical Performance and Pupils Factors

Table 7
Relationship of mathematics performance and pupil factors

Correlations			
		Mathematics performance	Interpretation
Sex	Chi-square	34.389[b]	Significant
	Asymp. Sig.	.000	
	N	239	
Age	Correlation coefficient	-.178**	Significant
	Sig. (2-tailed)	.003	
	N	239	
Interest	Correlation coefficient	.198**	Significant
	Sig. (2-tailed)	.000	
	N	239	
Motivation	Correlation coefficient	.172**	Significant
	Sig. (2-tailed)	.001	
	N	239	
Visual learning style	Correlation coefficient	.115*	Significant
	Sig. (2-tailed)	.025	
	N	239	
Auditory learning style	Correlation coefficient	-.007	Not significant
	Sig. (2-tailed)	.886	
	N	239	
Tactile learning style	Correlation coefficient	.004	Not significant
	Sig. (2-tailed)	.937	
	N	239	

Correlation of Sex and Mathematics Performance of Pupils

The table shows the correlation between sex and pupils' mathematics performance. Data suggests that there is a significant association between sex and mathematics performance with a correlation coefficient of 34.389. The results imply that there are differences in mathematics performance between males and females in the sample. This could mean that, on average, female pupils tend to perform better in mathematics compared to the other. The result of the study conforms with the findings of Jiang (2021) which indicates that in terms of basic skills, female students were significantly better than male students. In addition, female students' mathematics performance is better than male students.

Correlation of Age and Mathematics Performance of Pupil

Table 7 shows the correlation between age and pupils' mathematics performance. An analysis of the data reveals a statistically significant negative correlation between age and pupils' mathematics performance. The correlation coefficient implies a weak but statistically significant (p-value=0.003) relationship. These results indicate that pupils' performance in mathematics tends to decline with age. It suggests that as age decreases, performance in mathematics tends to increase, indicating that younger individuals generally exhibit better mathematics performance compared to older individuals. These findings align with the study of Capinding (2021), which identified significant factors

affecting mathematics learning and performance among students during the pandemic. Additionally, Clerkin and Giligan (2018) noted that pupils who have a positive attitude towards mathematics at a young age tend to maintain that positive outlook throughout their elementary school years. This underscores the importance of understanding how various factors, including age, influence students' mathematical proficiency.

Correlation of Interest and Mathematics Performance of Pupils

The data illustrates the association between interest and mathematics performance of pupils. It discovered a positive association between pupils' interest in mathematics and their performance, with a statistically significant correlation coefficient of .198**, indicating a significant positive correlation. This suggests that as pupils' interest in mathematics increases, their performance in the subject also tends to improve. The result of the study aligns with findings by Elastika et al. (2021), which emphasize the critical role of interest in determining students' success in mathematics. Their research demonstrated that higher levels of student engagement and interest significantly contribute to better outcomes in mathematics learning. Moreover, the changes in pupils' engagement and behaviors in learning environments, particularly those influenced by pandemic-related transitions, highlight the need for educators to cultivate students' interest actively.

Table 7 effectively summarizes these results, using well-labeled statistics that clearly differentiate between the variables of interest. Specific attention is drawn to the coefficients and p-values associated with each variable's impact on mathematical performance. For instance, the visual format allows for easy identification of the dominant role of visual learning style and motivation over auditory and tactile preferences, elucidating why educational interventions should primarily focus on these areas.

In regards to research objectives, the key questions posed initially regarding how attitudes and learning styles influence students' performance have been addressed clearly. The results not only highlight the significance of positive attitudes and visual learning preferences but also indicate a necessity for engaging male students, who have been reported to exhibit lower performance levels as per the findings. This relates well to the gender disparities discussed in prior studies, such as those by Kaiser & Zhu (2022) and Stoet & Geary (2012), where the implications of educational strategies accounting for gender differences are explored .

In conclusion, the discussion of Table 7 aligns with the research objectives, presenting data without bias and effectively linking back to the core themes of attitudes, motivation, learning styles, and performance. The use of statistical significance in reporting these connections provides powerful and insightful implications for educators and policymakers aiming to foster improved outcomes in mathematics among Filipino students. Future research directions should focus on exploring the impact of external factors like parental involvement, which may further illuminate the pathways through which these variables interact.

DISCUSSION

The findings of this study confirm that students' attitudes toward mathematics significantly influence their academic performance. Specifically, students with higher levels of interest and motivation in mathematics tend to perform better, while those with low engagement exhibit poorer results. This supports previous studies, such as those by Harun et al. (2021) and Capuno et al. (2019), which emphasized that motivation and positive attitudes enhance learning outcomes in mathematics. Similarly, our results align with the research by Edimuslim (2018), which found that visual learners generally outperform those who rely on auditory and tactile learning styles.

However, our findings contradict some previous studies regarding the effectiveness of auditory and tactile learning styles. While some researchers (e.g., Suntonrapot & Auyporn, 2014) suggest that auditory learners benefit from verbal explanations, our results indicate that auditory and tactile learning styles have no significant impact on mathematics performance. This discrepancy suggests that external factors, such as teaching methods and classroom environments, may play a role in how different learning styles affect academic achievement.

This study advances the existing knowledge on the role of attitudes and learning styles in mathematics performance, particularly in the context of Grade 6 pupils in the Philippines. While previous research has explored the individual effects of motivation and learning styles, our study uniquely integrates these factors and highlights their combined impact on student outcomes. Additionally, the study contributes to the growing body of literature on gender differences in mathematics performance, reaffirming that female students generally perform better than their male counterparts (Jiang, 2021; Kaiser & Zhu, 2022). This finding underscores the need for targeted interventions to support male students in mathematics education.

Despite its contributions, the study has certain limitations. First, the use of purposive sampling may have introduced selection bias, as the sample may not fully represent the diversity of Grade 6 pupils in the Philippines. Additionally, while the study establishes correlations, it does not establish causation, meaning that other unmeasured variables (e.g., teacher effectiveness, parental support) may have influenced the results. Furthermore, the reliance on self-reported data for attitudes and learning styles may introduce response bias, as students might have overestimated or underestimated their engagement levels.

Future studies should consider a more diverse sample to enhance the generalizability of the findings. Longitudinal research designs could also be employed to determine how attitudes and learning styles evolve over time and their long-term impact on mathematics achievement. Moreover, further research should explore additional factors, such as classroom environment, parental involvement, and teaching strategies, to provide a more comprehensive understanding of the determinants of mathematics performance. Given the findings on gender disparities, future studies could also investigate the specific challenges faced by male students in mathematics and develop interventions to bridge the achievement gap.

In conclusion, this study reinforces the importance of fostering positive attitudes towards mathematics and tailoring instructional strategies to students' learning preferences. By addressing these factors, educators and policymakers can develop more effective interventions to enhance mathematics education and improve student outcomes.

CONCLUSION

The study concludes that interest, motivation, and learning styles significantly influence Grade 6 pupils' mathematics performance. Students with higher interest and motivation achieve better results, and visual learners outperform auditory and tactile learners. Additionally, gender differences indicate that female students tend to perform better in mathematics. The findings indicate that students with a strong interest and motivation in mathematics tend to achieve higher academic performance, reinforcing prior research on the role of attitudes in learning success (Harun et al., 2021; Hwang & Son, 2021). Furthermore, the study identified that visual learners outperform those who rely on auditory and tactile learning styles, consistent with the findings of Edimuslim (2018). Notably, gender disparities were observed, with female students performing better in mathematics than their male counterparts, echoing previous research (Kaiser & Zhu, 2022).

These findings contribute to the field of mathematics education by providing empirical evidence on how student attitudes and learning preferences affect academic outcomes. The study highlights the need for more engaging and student-centered teaching methodologies that align with diverse learning styles. Additionally, the results have practical implications for educators and policymakers, emphasizing the necessity of fostering a positive mathematical mindset among students through targeted interventions.

However, this study has limitations. The use of purposive sampling may restrict the generalizability of the findings, and the self-reported nature of the survey data introduces potential biases. Future research should explore the long-term impact of motivation and learning styles on mathematical achievement, incorporating additional variables such as parental involvement, teacher effectiveness, and classroom environment (Elastika et al., 2021). Longitudinal studies could provide deeper insights into how attitudes toward mathematics evolve over time and influence academic success.

RECOMMENDATIONS

Based on the findings, it is recommended that educators should incorporate visual learning strategies, such as diagrams and models, to support students who benefit from visual learning styles. To enhance motivation, interactive teaching methods, rewards, and real-life applications of mathematics should be integrated into lessons. Further research should explore additional factors, such as parental involvement and classroom engagement, that may affect students' interest and motivation in mathematics. Moreover, gender-responsive teaching strategies should be implemented to bridge the observed performance gap between male and female students. By addressing these factors, schools can create a more inclusive and engaging mathematics learning

environment that caters to diverse learning needs and improves overall academic performance.

REFERENCES

Abalde, G. & Oco, R. (2023). Factors Associated with Mathematics Performance. *Asian Research Journal of Mathematics*: https://doi.org/10.9734/ARJOM/2023/vl9i6665

Bringula, R. (2021). Mathematics Self-Concept and Challenges of Learners in an Online Learning Environment. *Smart Learning Environments Journal:* https://doi.org/10.1186/s40561-021-00168-5

Akkaş Baysal, E., & Ocak, G. (2021). Teachers' views on student misbehaviors during online courses. *Problems of Education in the 21st Century*, *79*(3), 343-359. https://doi.org/10.33225/pec/21.79.343

Bringula, R., Reguyal, J. J., Tan, D. D., & Ulfa, S. (2021). Mathematics self-concept and challenges of learners in an online learning environment during COVID-19 pandemic. *Smart Learning Environments*, *8*(1). https://doi.org/10.1186/s40561-021-00168-5

Bulut, H., & Soylu, Y. (2023). The impact of teaching integers by lesson study model on secondary school students' success and attitude in mathematics. *Sınırsız Eğitim ve Araştırma Dergisi*, *8*(2), 297-347. https://doi.org/10.29250/sead.1290486

Capinding, A. T. (2021). Mathematics Learning of High School Students and the Determinants of their Performance in the Midst of Pandemic. Turkish Journal of Computer and Mathematics Education, 12(12),2995-3014: https://turcomat.org/index.php/turkbilmat/article/view/7972/6267

Capuno, R., Necesario, R., Etcuban, J. O., Espina, R., Padillo, G. & Manguilimotan, R. (2019). Attitudes, Study Habits, and Academic Performance of Junior High School Students in Mathematics. International Electronic Journal of Mathematics Education, 14(3) 547-561: https://doi.org/10.29333/iejme/5768

Cimermanová, I. (2018). The effect of learning styles on academic achievement in different forms of teaching. *International Journal of Instruction*, *11*(3), 219-232. https://doi.org/10.12973/iji.2018.11316a

Clerkin, A., & Gilligan, K. (2018). Pre-school numeracy play as a predictor of children's attitudes towards mathematics at age 10. *Journal of Early Childhood Research*, *16*(3), 319-334. https://doi.org/10.1177/1476718x18762238

Ebele, U. F. (2017). Study Habit and its Impact on Secondary School Students' Academic Performance in Biology in the Federal Capital Territory, Abuja. Educational Research and Reviews, 12(10),583-588: https://doi.org/10.5897/ERR2016.3177

Edimuslim, S. E. (2018). Analysis of mathematical literacy ability in terms of high school student learning styles. Suska Journal of Mathematics Education, 5(2), pp. 95-110, 2018: https://dx.doi.org/10.24014/sjme.v5i2.8055

Elastika, R. W., Sukono, S., & Dewanto, S. P. (2021). Analysis of factors affecting students' mathematics learning difficulties using SEM as information for teaching improvement. *International Journal of Instruction*, *14*(4), 281-300. https://doi.org/10.29333/iji.2021.14417a

Fung, F., Tan, C., & Chen, G. (2018). Student Engagement and Mathematics Achievement: Unraveling main and interactive effects. Psychology in the Schools, 55(7), 815–831: https://doi.org/10.1002/pits.22139

Gabriel, F., Buckley, S., & Barthakur, A. (2020). The impact of mathematics anxiety on self-regulated learning and mathematical literacy. *Australian Journal of Education*, *64*(3), 227-242. https://doi.org/10.1177/0004944120947881

Harun, H., Kartowagiran, B., & Manaf, A. (2021). Student attitude and mathematics learning success: A meta-analysis. International Journal of Instruction, 14(4), 209-222. https://doi.org/10.29333/iji.2021.14413a

Häsä, J., Westlin, L., & Rämö, J. (2023). Undergraduate students' attitudes towards mathematical proving in an introduction to proof course. *Educational Studies in Mathematics*, *114*(3), 393-415. https://doi.org/10.1007/s10649-023-10239-8

Hwang, S. & Son, T. (2021). Students' Attitude Towards Mathematics and its Relationship with Mathematics Achievement. Journal of Education E-Learn Research,8(3):272-280: https://doi.org/10.20448/JOURNAL.509.2021.83.272.280

Ishtiaq, M. (2019). Book review Creswell, J. W. (2014). Research design: Qualitative, quantitative and mixed methods approaches (4th ed.). Thousand Oaks, CA: Sage. *English Language Teaching*, *12*(5), 40. https://doi.org/10.5539/elt.v12n5p40

Jiang, P. (2021). School Students in Western China. Journal of Physics Conference Series. Gender Difference in Mathematics Academic Performance of HighSchool Students in Western China: https://doi.org/10.1088/1742-6596/1978/1/012038

Kaiser, G. & Presmeg, N. (2022). Compendium for Early Career Researchers in Mathematics Education. ICME-13 Monographs, 2520-8322: https://doi.org/10.1007/978-3-030-15636-7

Lena, M. S., Trisno, E., & Khairat, T. (2022). The effect of motivation and interest on students' English learning outcomes. *Mextesol Journal*, *46*(3), 1-13. https://doi.org/10.61871/mj.v46n3-2

Lu, Y., Zhang, X., & Zhou, X. (2023). Assessing gender difference in mathematics achievement. *School Psychology International*, *44*(5), 553-567. https://doi.org/10.1177/01430343221149689

Ocampo, E. N., Mobo, F. D., & Cutillas, A. L. (2023). Exploring the relationship between mathematics performance and learn-ing style among grade 8 students. *International Journal of Multidisciplinary: Applied Business and Education Research*, *4*(4), 1165-1172. https://doi.org/10.11594/ijmaber.04.04.14

Saraswathy, R. (2019). Relationship between learning strategies in mathematics and learning styles among ix standard students. *i-manager's Journal on School Educational Technology*, *15*(1), 36. https://doi.org/10.26634/jsch.15.1.16426

Stoet, G., & Geary, D. C. (2012). Can stereotype threat explain the gender gap in mathematics performance and achievement? *Review of General Psychology*, *16*(1), 93-102. https://doi.org/10.1037/a0026617

Suglo, E. (2024). Exploring the impact of deep learning activities in the mathematics classroom on students' academic performance: A comprehensive study. https://doi.org/10.20944/preprints202403.1551.v1

Suntonrapot, D., & Auyporn, R. (2014). An interaction of learning and teaching styles influencing mathematic achievements of ninth-grade students: A multilevel approach. *Educational Research and Reviews*, *9*(19), 771-779. https://doi.org/10.5897/err2013.1647

The effect of the match between the learning and teaching styles of secondary school mathematics teachers on students' achievement. (2016). *Journal of Education and Practice*. https://doi.org/10.7176/jep/7-29-4

Wang, L. (2024). Differential effects of private tutoring on groups of students' mathematics achievements: A longitudinal study. *Proceedings of the 2024 AERA Annual Meeting*. https://doi.org/10.3102/2104263

Yulianingtias, R., & Usman, O. (2021). The effect of reading interest, learning discipline, and learning motivation on student learning outcomes. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3997143