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Student's Attitude and Semantic Knowledge Towards Learning Geometry: Basis for Learning Plan

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Abstract. This research paper analyzes the difference and relationship between attitude and mathematical semantic knowledge of Grade Seven students, as a whole, and according to the profiles, namely, sex, educational attainment of the parents, family monthly income, and gadgets used for learning. The respondents of this study were restricted to seventh-grade students enrolled during the school year 2022-2023 and were selected using a random sampling technique. The study concentrates on the least mastered skills presented in the Most Essential Learning Competency of K-12 Curriculum to assess the learning gap in Geometry, where most studies need to consider a plan that could help educators teach their lessons to the varying needs and interests of the students. The data in this research were obtained using the researcher-made questionnaire that had been validated by the experts and had undergone a reliability test. The result of the study shows that female students have more positive attitudes in learning Geometry than their male counterparts. Other profiles in the study did not affect students' attitudes toward learning Geometry. Regarding mathematical semantic knowledge, it was found that all profiles did not affect the student's performance in the geometry assessment. Moreover, students must meet the required standards in understanding and performance, requiring effective learning plans and immediate interventions to address academic gaps. The result also revealed that males performed slightly higher than females in the Geometry assessment. The Grade Seven students' attitudes significantly affect their Mathematical Semantic Knowledge only slightly. It further shows that as they become more positive towards Mathematics, their Mathematical Semantic Knowledge is more likely to increase moderately.

Keywords: Attitudes; Geometry; Semantic knowledge; Students; Learning plan.

1.0 Introduction

In the 21st Century, the importance of tailored lesson plans and instructional methodologies in facilitating effective mathematics learning for all students cannot be overstated (Sumalinog, 2020). Other studies must consider and recommend ways for teachers to improve their teaching strategies. Mathematics proficiency is a benchmark for students' ability to make informed decisions and judgments, crucial for their engagement as productive citizens in society, as evidenced by the Philippine Program for International Student Assessment (PISA).

However, the Philippines faced a sobering reality in the 2019 PISA assessment, ranking second-to-last among 64 participating countries due to its low level of mathematical literacy (OECD Data, 2020). This deficiency encompasses critical problem-solving skills such as mathematical reasoning, modeling, and symbol interpretation. Despite the increasing awareness and efforts in recent years, there remains a pressing need to elevate the standards

of mathematics education and student achievement to align with global benchmarks such as PISA. Recognizing the significance of geometric symbols and their conceptual understanding, the researcher advocates for a deeper exploration of this domain, building upon prior research findings. Central to this endeavor is understanding students' attitudes towards mathematics and its correlation with their semantic understanding—an inquiry pivotal for effective pedagogical strategies.

This study assesses the level of attitudes and mathematical semantic knowledge of Grade 7 students at Bug-ang National High School. By unraveling students' perceptions and competencies, educators can tailor instruction through learning plans to suit their needs, fostering an environment conducive to mathematical learning. Through this exploration, the researcher aims to unveil potential correlations between students' attitudes and semantic understanding, paving the way for targeted interventions and curriculum enhancements.

2.0 Methodology

2.1 Research Design

The research design used in this study was descriptive-correlational. A descriptive-correlational research design explains the association between two or more variables. It includes collecting and analyzing data on at least two variables to see if a connection is emerging between variables (Baht, 2024). This design was used in this study since it aimed to determine the level of attitude towards learning Geometry and the level of mathematical semantic knowledge, the significant differences among variables, and the significant relationship between Attitude towards learning Geometry and Semantic Knowledge.

2.2 Research Participants

The study's respondents were the Grade Seven students in the District of Toboso and Division of Negros Occidental, participated in the study, both male and female, were enrolled and were taking Mathematics subject during S.Y. 2022-2023. The school offers regular classes and is considered a large school accommodating many populations. Eighty-three (83) male and eighty-five (85) female Grade Seven students who were formally enrolled during the School Year 2022–2023 made up the total of one hundred sixty-eight (168) respondents in the study. The random sampling technique was applied to the data.

2.3 Research Instrument

The researcher utilized the researcher-made mathematical attitude survey and a test compiled from the Department of Education-Region VIs standard Self-Learning Modules and Learning Activity Sheets. The research instrument elicited the participants' responses required to obtain potential solutions to the study's problems. The test created by the researcher was a questionnaire containing mathematical signs and symbols to be matched with their respective names, as well as situations about students' attitudes towards mathematics.

The questionnaire has three sections. The Personal Data Sheet, Part 1, was created to gather information about the participant's profile. This included their optional name, sex, parent's/guardian's highest educational attainment, parent's/guardian's monthly income, and devices readily available from them. Part 2 is a survey of mathematical attitudes crafted by the researcher to concentrate primarily on Geometry and include situations relating to a student's possible attitudes toward mathematics. A study of mathematical attitudes is not a test. This survey merely seeks to determine how students feel about learning Geometry. There are twenty attitudes regarding mathematics. Each statement has four alternatives. Part 3 is a 30-item test containing the semantic knowledge of the signs and symbols in Geometry. The mathematical signs and symbols included in the items covered the lessons of Grade 7 taken from the standardized Self-Learning Modules and Learning Activity Sheets of the Department of Education- Region 6. The participants must write a letter containing the correct answer to the question. Experts validated the researcher-made questionnaire used in this study and has undergone a reliability test.

2.4 Data Gathering Procedure

The researcher secured a letter to the school principal asking for permission to survey Grade Seven students. Upon receiving permission, the researcher went to the respective rooms of the chosen participants and distributed enough questionnaires to the study participants following strict safety protocols- strict observance of the wearing of masks and 2 meters of physical distancing away from each student as set by the Department of Health. After all the participants received the questionnaires, a short orientation was conducted. The participants were

instructed to either write their names or not, as it is optional, and to check the space provided for their sex, that is, male or female, likewise to the parent's/guardian's highest educational attainment, the monthly salary, and the gadgets available at their respective homes. During the questionnaire administration, the researcher monitors the participants and answers all their queries related to the research instrument, following strict observance of the safety protocols set by the Department of Health. The participants are given ample time to answer the questionnaire, and after that, the questionnaires are collected for data analysis.

2.5 Data Analysis

The researcher processed the data using the following descriptive and inferential statistics. The profile of Grade 7 students, when grouped in terms of sex, parent's highest education attainment, family monthly income, and gadgets used for learning, were assessed using frequency, mean, and standard deviation. The student attitude towards Geometry, when taken as a whole and grouped by profile in terms of sex, parent's highest education attainment, family monthly income, and gadgets used for learning were assessed using mean and standard deviation. The level of mathematical semantic knowledge, taken as a whole and when grouped in terms of sex, parent's highest education attainment, family monthly income, and gadgets used for learning, was assessed using mean and standard deviation. The researcher used the scale based on the DepEd Grading System. The significant difference between the attitudes of Grade Seven students towards geometry when grouped in terms of their profile characteristics was assessed using the T-T-test for sex and ANOVA for other profile characteristics. A T-test was used to determine whether there is a significant difference in students' mathematical semantic knowledge when grouped by sex, and ANOVA was used for other profile characteristics. The significant relationship between the attitude of Grade Seven students and their mathematical semantic knowledge was assessed using Pearson R Correlation.

2.6 Ethical Considerations

All respondents in this study were granted the right to privacy, and the researcher kept any information gathered strictly confidential.

3.0 Results and Discussion

3.1 Profile of the Respondents

Table 1 displays the distribution of the respondents' profiles based on the variables presented.

Table 1. Descriptive statistics of the profile of the respondents

Variables	Frequency	Percentage
Sex		
Male	83	49.4
Female	85	50.6
Parents' Educational Attainment		
No Formal Schooling	3	1.8
No formal schooling but able to read and write	5	3
Elementary Level	29	17.3
Elementary Graduate	37	22
High School Level	47	28
High School Graduate	34	20.2
After High School	13	7.7
Parents' Monthly Income		
below 5000	92	54.8
5000-10000	50	29.8
11000-15000	11	6.5
16000-20000	6	3.6
21000 above	9	5.4
Gadgets Used for Learning		
Cable TV	17	10.1
Non-Cable TV	19	11.3
Basic Cellphone	24	14.3
Smart Phone	16	9.5
Tablet	22	13.1
Radio	29	17.3
Desktop Computer	20	11.9
Laptop	21	12.5
Total	**168**	**100**

Most respondents were female, with 85 frequency count, and 83 were male students. 29 of the 168 respondents' parents had an elementary-level education, the lowest level available. It was apparent that 37 had completed elementary school, and 34 had completed high school. Also, 13 of the parents were either college or technical vocational graduates. It is also noted that three individuals and 5 participants did not attend formal schooling but could read and write. Regarding parents' monthly income, out of 168, 92 respondents were below 5000, while 50 were in the bracket of 5,000 – 10,000. Also, 11 were in the bracket of 11,000-15,000, 6 were in 16,000-20,000, and 9 were in the bracket of 21,000 and above. Regarding gadgets used for learning, of the 168 respondents, 17 have used cable T.V. for learning, 19 used non-cable T.V., and 24 used basic cell phones. On the other hand, 14 were using smartphones, 22 were using tablets, 29 were still using radio, and 20 of them were using desktop computers, while 21 of them were using laptops.

3.2 Student's Attitude towards Geometry

Table 2 demonstrates the degree of student attitude toward geometry when viewed as a whole and grouped by sex, the parents' highest educational attainment, the family's monthly income, and the use of learning aids. When taken as a whole, the respondents obtained a mean of 3.35 with an SD of 0.58, described as a Neutral level.

Table 2. Descriptive statistics of the student's attitude towards Geometry

Variables	Mean	SD	Description
Sex			
Male	3.18	0.66	Neutral
Female	3.41	0.59	Positive
Total	3.35	0.58	Neutral
Parents' Educational Attainment			
No Formal Schooling	3.00	0.00	Neutral
No formal schooling but able to read and write	3.20	0.45	Neutral
Elementary Level	3.48	0.51	Positive
Elementary Graduate	3.46	0.51	Positive
High School Level	3.19	0.65	Neutral
High School Graduate	3.35	0.60	Neutral
After High School	3.38	0.65	Neutral
Total	3.35	0.58	Neutral
Parents' Monthly Income			
below 5000	3.33	0.58	Neutral
5000-10000	3.48	0.61	Positive
11000-15000	3.00	0.45	Neutral
16000-20000	3.17	0.41	Neutral
21000 above	3.33	0.50	Neutral
Total	3.35	0.58	Neutral
Gadgets Used for Learning			
Cable TV	3.35	0.61	Neutral
Non-Cable TV	3.37	0.50	Neutral
Basic Cellphone	3.25	0.74	Neutral
Smart Phone	3.38	0.50	Neutral
Tablet	3.45	0.51	Positive
Radio	3.41	0.63	Positive
Desktop Computer	3.25	0.64	Neutral
Laptop	3.29	0.46	Neutral
Total	3.35	0.58	Neutral

Note: 4.21-5.00 Highly Positive, 3.41-4.20 Positive, 2.61-3.40 Neutral, 1.81-2.60 Negative, 1.00-1.80 Highly Negative

When the respondents were grouped according to sex, females obtained a mean of 3.41 with a standard deviation of 0.59, described as a positive level, higher than men, who only obtained a mean of 3.18 with a standard deviation of 0.66, described as neutral. When grouped according to Parent's Educational Attainment, the elementary level graduated with the highest Mean score of 3.48 with an SD of 0.51. It was acknowledged for their positive attitude towards the subject. High school level was of neutral level (mean = 3.19, SD = 0.72), and high school graduates with mean scores of 3.35 and an SD of 0.60. When grouped according to the parent's monthly income bracket, 5,000 – 10,000 obtained the highest mean of 3.48 and had the only positive attitude. The rest were neutral, followed by below 5,000 and 21,000 and above with a mean of 3.33, 16,000 – 20,000 with a mean of 3.17, and the least obtained mean was the 11,000 – 5,000 bracket. When grouped according to gadgets used for learning, the use of a tablet came in first with a Mean score of 3.45 and an SD of 0.51, then the use of a radio with a Mean score of 3.41

and an SD of 0.63, which both were described as positive and the rest were neutral. It was followed using a smartphone with a Mean score of 3.38 and an SD of 0.50, non-cable T.V. (Mean = 3.37) then cable T.V. (Mean = 3.35), laptop (Mean = 3.29) and the least obtained mean score of basic cellphone and desktop computer (Mean = 3.25)

It implies that the Grade 7 students of Bug-ang National High School have a neutral attitude towards Geometry when taken as a whole. It further shows that students exhibit a neutral attitude towards Mathematics, with varying engagement levels that may benefit from occasional encouragement. When grouped according to sex, female students are more positive towards the subject than males. In other words, female students generally have a positive attitude towards mathematics, demonstrating interest in and practical application of concepts compared to their male counterparts. Also, when grouped according to parents' Educational Attainment, students with parents who were elementary school graduates have the most positive attitude toward Geometry. Still, those with no formal schooling and high school graduate ranges find it neutral. Thus, those learners with parents who were elementary school graduates generally have a positive attitude towards Mathematics, demonstrating interest and practical application of concepts than other groups in which they only exhibit a neutral attitude towards Mathematics, with varying engagement levels that may benefit from occasional encouragement.

When grouped according to parents' Monthly Income, students with Parents earning 5,000 – 10,000 per month have the most positive attitude, but those with other income brackets above find the subject neutral. Thus, those students with parents earning 5,000 – 10,000 per month demonstrate more interest and effective application of concepts than those with other income brackets in which they have varying engagement levels working only with occasional encouragement. When grouped according to gadgets used for learning, those with tablets and radio found the subject positive, and the rest were neutral, smartphone, non-cable T.V., cable T.V., laptop, basic cellphone, and basic computer. Thus, those with tablets and radio demonstrate more interest and effective application of concepts than other groups. This means that students with access to technology are more driven and eager to learn and study because of the wide range of knowledge available.

The results of this study were in concordance with the following research. When taken as a whole, the results were the same as Kroeun's (2023). This revealed that secondary Lower Students have a positive attitude towards Mathematics. Also, the variable sex results in concord with Anggoro (2020). He asserts that male students often do not love mathematics despite data demonstrating that male students perform at the highest levels and have excellent mathematical IQs. They viewed it as a complex and dull subject. About Parent Educational Attainment, the study by Lara (2019) states that because parental academic status is strongly related to how most pupils learn, failure in school mathematics is partially linked to parental interference with students' learning.

Additionally, according to Novriani (2020), children's ability to solve problems and respond to mathematical concepts is influenced by how their parents treat them at home. The assistance students need to comprehend concepts, connections between ideas, and connections between concepts and other topics influence how well they respond to their schooling. In this instance, the family's financial position directly affects parental attitudes toward encouraging learning; poor facilitating skills, on the other hand, are comparable to families with poor monthly incomes (Abel, 2019). This is done to ensure that students may learn to the best of their ability, even when doing so at home and without the aid of a teacher or a school (Dutton & Mohapatra, 2020).

The study results concurred with the following when grouped according to Gadgets used at home. Changing from the traditional classroom atmosphere to the home learning environment presents another challenge for students. Students who do not have access to a private physical study space online may become distracted by noise and other factors (Eviyanti & Surya, 2019). Additionally, pedagogical changes were implemented. Students must learn certain portions of the course material on their own. Due to the student's ability to understand and study the modules during asynchronous sessions, online learners experience difficulties. These challenges have been shown to make effective adoption of online learning challenging. These factors have a considerable impact on the students' perceptions of their capacity to study mathematics online, according to Beckman et al. (2019). The results affect how students react to math-related tasks and activities in the classroom. Their responses on learning mathematics indicated that keeping students on task and having them complete their tasks were the most

challenging aspects of teaching. Schools and teachers must also have clear guidelines and make sure that parental involvement is fostered if they are to encourage learning.

3.3 Student's Mathematical Semantic Knowledge

Table 3 explains the breadth of mathematics semantic knowledge when viewed collectively and grouped according to sex, parent's highest level of education, family monthly income, and learning aids used. When taken as a whole, the Grade 7 students' semantic knowledge is of Did Not Meet Expectations, with a mean of 29.76 (SD = 3.27). When grouped according to sex, males scored higher on mathematics semantic knowledge, as evidenced by their mean score of 30.08 with an SD of 3.08, than females, who had an average mean score of 29.45 with an SD of 3.27. When grouped according to Parent's Educational Attainment, all the students obtained a Did Not Meet Expectations rating. The highest obtained mean was 31.47 from high school graduates, but it was only slightly higher than the rest. It was followed by Elementary Graduate (Mean = 30.72), High School Level (Mean = 29.93), After High School (Mean = 28.97), Elementary Level (Mean = 28.16), No Formal Schooling (Mean = 25.56) and the lowest obtained mean of 23.33 was from No Formal Schooling but able to read and write.

Table 3. Descriptive statistics of the level of mathematical semantic knowledge

Variables	Mean	SD	Description
Sex Male	30.08	3.28	Did Not Meet Expectations
Female	29.45	3.27	Did Not Meet Expectations
Total	29.76	3.27	Did Not Meet Expectations
Parents' Educational Attainment			
No Formal Schooling	25.56	3.21	Did Not Meet Expectations
No formal schooling but able to read and write	23.33	4.53	Did Not Meet Expectations
Elementary Level	28.16	2.16	Did Not Meet Expectations
Elementary Graduate	30.72	2.93	Did Not Meet Expectations
High School Level	29.93	3.31	Did Not Meet Expectations
High School Graduate	31.47	3.78	Did Not Meet Expectations
After High School	28.97	4.27	Did Not Meet Expectations
Total	29.76	3.27	Did Not Meet Expectations
Parents' Monthly Income			
below 5000	28.95	2.73	Did Not Meet Expectations
5000-10000	30.67	3.73	Did Not Meet Expectations
11000-15000	29.09	3.77	Did Not Meet Expectations
16000-20000	25.56	5.28	Did Not Meet Expectations
21000 above	36.67	3.20	Did Not Meet Expectations
Total	29.76	3.27	Did Not Meet Expectations
Gadgets Used for Learning			
Cable TV	30.39	4.15	Did Not Meet Expectations
Non-Cable TV	30.35	2.75	Did Not Meet Expectations
Basic Cellphone	30.00	3.69	Did Not Meet Expectations
Smart Phone	30.83	2.49	Did Not Meet Expectations
Tablet	30.61	2.65	Did Not Meet Expectations
Radio	29.77	3.20	Do Not Meet Expectations
Desktop Computer	27.50	3.61	Did Not Meet Expectations
Laptop	28.89	3.65	Did Not Meet Expectations
Total	29.76	3.27	Did Not Meet Expectations

Note: 90 – 100 Outstandin, 85 – 89 Very Satisfactory, 80 – 84 Satisfactory, 75 – 79 Fairly Satisfactory, Below 75 Did Not Meet Expectations

When grouped according to Parent's Monthly Income, all students only reached the Did Not Meet Expectations rating. Moreover, Students with 21,000 above-income parents obtained the highest mean of 36.67, followed by 5,000 – 10,000 with a mean of 30.67, 11,000 – 15,000 with a mean of 29.09, below 5,000 with a mean of 28.95 and 16, 000 – 20,000 obtained the lowest mean of 25.56. When grouped according to the Gadgets used at home, all students also obtained a Did Not Meet Expectations rating. The highest obtained mean was from Smart Phone (Mean = 30.83, followed by Table (Mean = 30.61), then Cable T.V. (Mean = 30.39), Non-cable TV (Mean = 30.35), Basic phones (Mean = 30.00), Radio (Mean = 29.77, Laptop (Mean = 28.89) and the least Desktop Computer (Mean = 27.50).

This implies that Grade 7 Students of Bug-ang National High School have a Did Not Meet Expectations academic performance rating in Geometry assessment in all profiles presented as a whole and in groups. Thus, the students

fall short of required standards and have significant challenges in understanding and performance, requiring immediate interventions to address academic gaps effectively. They struggle consistently with grasping essential concepts and completing tasks proficiently. The following research supported the results of this study. A study revealed that a large percentage of male students had a positive self-concept and, therefore, performed better in Mathematics than females. (Bong & Skaalvik, 2018).

Cohen's research (2021) negated the results of parents' educational attainment. It amplifies that parents with high educational attainment are more likely to help their children in Mathematics and thus increase their academic performance. However, those with lower educational attainment are more likely to neglect whatever performance their children will reach in Math, thus not helping them. This determines their academic performance in Mathematics (Pajares & Miler, 2019). Also, when the data were grouped according to Parent's Monthly Income, the results of Pajares & Miller (2019) were in support. While online learning adds additional financial strain for the family due to the connection to the internet and increased electricity use, distant learning reduces the family's spending priority in terms of the child's daily budget. The family's ability to spend money can help or hurt pupils' participation in learning activities and performance challenges (Cohen & Kupferschmidt, 2020).

Ginting and Surya (2019) supported this when grouped according to Gadgets at home. Their study examined the face-to-face learning environment, where students can ask teachers or their peers for instant learning interventions. Students faced difficulties abruptly switching from in-person instruction to online learning environments. Access to laptops, smartphones, televisions, the Internet, and physical learning spaces, wherein transitioning to an online learning environment requires a strong habit of learner autonomy. Device ownership is a recurring barrier to the successful deployment of online learning because of the digital divide (Eviyanti & Surya, 2019).

3.4 Difference in the Attitude of Grade Seven Students towards Geometry when Grouped According to Profile Characteristics

Table 4 shows the significant difference in the level of attitude of Grade 7 Seven students towards geometry when grouped in terms of their profile characteristics. The results showed a significant difference in the student's attitude level when grouped according to sex, with a t-value of 2.668 and a p-value of 0.008. However, there is no significant difference among parents' Educational Attainment, with a t-value of 7.300 and a p-value of 0.294, among those with different Monthly income Parents with an f-value of 6.950 and a p-value of 0.139. Also, those with different gadgets used for learning, with a t-value of 2.446 and a p-value of 0.931, all show a statistically insignificant result at the significance leve l at alpha = 0.05.

Table 4. Analysis of the difference in the attitude of grade seven students toward geometry

Variables	t-value	p-value	Interpretation
Sex	2.668	0.008	Significant
Parent's Educational Attainment	7.300	0.294	Not Significant
Monthly Income	6.950	0.139	Not Significant
Gadgets Used for Learning	2.446	0.931	Not Significant

Note: Level of Significance at alpha = 0.05

This implies that when the data were grouped according to sex, the difference in the scores was significant. Therefore, female students are more positive towards Geometry than their male counterparts. However, Parents' educational Attainment, Monthly Income, and the Gadgets used for learning have the same attitude towards Geometry. Various research, however, showed a different result. Therefore, other factors should be considered when determining the level of attitude of Grade 7 students. Research on the attitude towards mathematics among secondary students has consistently found significant gender differences. Bashir (2023) and Khan (2021) both reported that female students tend to have a more positive attitude towards mathematics, while male students experience more anxiety and fear. This trend is also observed in primary school students, with girls showing a more positive attitude towards mathematics as they grow older (Ayuso,2021). Also, research consistently shows that parental involvement and attitudes significantly impact students' mathematical achievements and attitudes. Alreshidi (2021) found that students with parents with university degrees achieved higher scores in mathematics. Learning highlighted the correlation between students' attitudes and self-efficacy in mathematics, with parental education being a significant factor.

Additionally, the variable of the parent's monthly income was consistent with the following research. Aytekin (2018) found a significant effect of parental income on parents' expectations of mathematics education. Yaşar (2016) reported a meaningful difference in students' attitudes based on their fathers' education levels and income. Research on students' attitudes towards mathematics with different learning gadgets has shown mixed results. Lu'luilmaknun (2021) found that while students generally responded positively to technology learning media, there were concerns about its difficulty, impact on textbook use, and potential health risks. A significant improvement in primary school students' attitudes towards mathematics was reported when computer games were used as teaching tools. Hacıömeroğlu (2019) discovered a negative relationship between students' attitudes toward learning mathematics with technology and math anxiety. Marpa (2020) found that mathematics teachers generally had positive attitudes toward using technology in teaching, with male teachers exhibiting better attitudes than female teachers.
These studies suggest that the use of technology in mathematics education can positively and negatively affect students' attitudes and that individual and contextual factors may influence these effects.

3.5 Difference in the Mathematical Semantic Knowledge of Students when Grouped According to their Profile Characteristics

Table 5 shows the significant difference in the level of mathematical semantic knowledge of Grade 7 Seven students toward geometry when grouped in terms of their profile characteristics. The results showed that there is no significant difference in the level of mathematical semantic knowledge of the students when grouped according to Sex with a t-value of – 0.142 and a p-value of 0.887, also among Parent's Educational Attainment with a t-value of 1.915 and a p-value of 0.927, also among those with different Monthly income Parents with a t-value of 4.449 and a p-value of 0.349 and those with different gadgets used for learning with a t-value of 2.301 and a p-value of 0.941 all show a statistically insignificant result at a significance level at alpha = 0.05.

Table 5. Analysis of the difference in the mathematical semantic knowledge of students

Variables	t/f-value	p-value	Interpretation
Sex	- 0.142	0.887	Not Significant
Parent's Educational Attainment	1.915	0.927	Not Significant
Monthly Income	4.449	0.349	Not Significant
Gadgets Used for Learning	2.301	0.941	Not Significant

Note: Level of Significance at alpha = 0.05

This implies that when the data was grouped according to sex, male and female students performed equally in Mathematical Semantic Knowledge. Also, the parent's educational attainment, monthly income, and the gadgets used for learning have the same effect on students' mathematical semantic knowledge. However, various research shows otherwise. Therefore, other factors should be considered when dealing with students' mathematical semantic knowledge performance. The results of this study were found to be supported by the following research. Research on the mathematical semantic knowledge of high school students has shown some gender differences. Lanya (2020) found that female students demonstrated more vital cognitive skills and better problem-solving abilities in written math problems. Subrahmanyam (2021) also noted that females showed more interest in the subject and applied better cognitive strategies.

Moreover, research has consistently shown a significant difference in mathematical semantic knowledge among high school students based on their parents' educational attainment. The parent's education level, mainly the mother's, positively and statistically significantly influences reading comprehension and mathematics (Alejandro, 2019). This is further supported by Vowles (2022), who found that children with higher-educated parents have a significant advantage in math growth. Additionally, research has consistently shown a significant relationship between parents' monthly income and their children's mathematical semantic knowledge. Ibañez (2021) found that higher monthly family income was associated with better mathematical problem-solving abilities among potential elementary teachers. Moreover, research on the use of technology in high school mathematics education reveals mixed results. Dorner (2022) found no significant correlation between the frequency of technology use and procedural knowledge, while Albert (2021) reported positive effects of instructional videos on mathematical competence. Fitriani (2020) highlighted the need for learning devices that link to real-life problems and facilitate concept development. Skrodzki (2019) demonstrated the positive influence of gesture-based controllers on the perception of mathematical
content.

3.6 Relationship between the Attitude of Grade Seven Students and their Mathematical Semantic Knowledge

Table 6 shows the significant relationship between the attitude of Grade Seven students towards Mathematics and their mathematical semantic knowledge.

Table 6. Analysis of the relationship between the attitude of grade seven students and their mathematical semantic knowledge

Variables	N	ρ	p-value	Interpretation
Attitudes Towards Mathematics - Semantic Knowledge	168	.171*	0.027	Significant

The result showed a significant relationship between the students' attitudes toward Mathematics and their Mathematical Semantic Knowledge with an R-value of 0.171 and a p-value of 0.027, a statistically significant level of significance alpha = 0.05. Furthermore, the r-value of 0.171 indicates a negligible positive correlation between the two variables. This implies that the attitudes of the Grade Seven students towards mathematics significantly affect their mathematical semantic knowledge, but only slightly positively. It further shows that as they become more positive towards Mathematics, their Mathematical Semantic Knowledge is more likely to increase moderately. Research consistently shows a significant relationship between students' attitudes toward mathematics and their mathematical semantic knowledge (Kempa, 2020). Positive attitudes, such as interest, persistence, and motivation, are associated with higher levels of mathematical semantic knowledge (Mahajan, 2021). This relationship is further supported by the finding that students' mathematical bias strongly correlates with their preference for specific modes of presenting mathematical information (Kempa, 2020). Additionally, the beliefs and knowledge of future teachers play a crucial role in shaping students' mathematical literacy (Zeljić, 2020).

4.0 Conclusion

The result of the study shows that female students have a more positive attitude toward learning Geometry than their male counterparts. Other profiles in the study did not affect attitudes toward learning Geometry. Regarding mathematical semantic knowledge, it was found that all profiles did not affect students' performance in the Geometry assessment. Moreover, students fall short of the required standards in understanding and performance, requiring effective learning plans and immediate interventions to address academic gaps. The result revealed that males performed slightly higher than females in the assessment. Grade Seven's attitudes significantly affect their mathematical semantic knowledge, but only slightly. It further shows that as they become more positive towards Mathematics, their Mathematical Semantic Knowledge is more likely to increase moderately. This study highlights the need for further exploration into the factors influencing attitudes toward mathematics and their impact on mathematical performance. Understanding these dynamics is crucial for developing educational strategies and interventions to enhance learning outcomes.

5.0 Contributions of Authors

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