Original Research Article

Optimizing Math Learning: Teaching Strategies, Students' Interests, and their Impact on Performance

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ABSTRACT

This study assessed the teaching strategies, interests, and performance of first-year college students in Mathematics as a basis for remediation module development. Hence, this descriptive-correlational study utilized 381 randomly selected first-year college students. In gathering the data, the study used three valid and reliable researcher-made questionnaires. First, the Mathematical Teaching Strategies Inventory to assess the teaching strategies of teachers as perceived by the respondents. Second, the Mathematical Interest Survey to look into the level of interest of students in learning Mathematics. Lastly, the Mathematics Achievement Test was utilized to assess students' performance in the subject. In analyzing the data, frequency, and percentage were used to profile the respondents. Also, means to assess the teaching strategies, interests, and performance in Mathematics. Meanwhile, Pearson *r* was used to examine the relationships between these three constructs. Hence, results revealed that the extent of utilization of teaching strategies as perceived by first-year college students and the level of students' interests in Mathematics when taken as a whole and when they were classified according to sex, type of higher education institution, family monthly income, and type of residence were high. In addition, the performance of first-year college students in Mathematics when taken as a whole and when grouped according to the demographics was satisfactory. Finally, significant relationships existed between the utilization of mathematical teaching strategies and students' interests and the students' interests and performance. Meanwhile, no significant relationships were noted between the utilization of mathematical teaching strategies and performance. Given all these findings, various teaching strategies and assessments are encouraged that may help invite students' interests and improve the performance of first-year college students in Mathematics.

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Keywords: Teaching Strategies, Students' Interests, Performance, Descriptive-correlational, and Remediation Module

1. INTRODUCTION

Many students struggle with math, making it one of the most challenging subjects in school (Chinn 2020). On a serious note, Mathematics is important in many fields like science, engineering, and technology (Lee et al. 2020). However, understanding math for students can be difficult, leading to low performance and a lack of interest (Chinn 2020). In addition, studies show that the way teachers explain math problems and formulas plays a big role in how students feel about the subject (Mazana et al. 2019). When teachers use good teaching methods and assessments, students may understand math better and enjoy

learning it more (Baier et al. 2019). Hence, based on these studies, a positive learning experience can help students develop confidence and improve their performance in math (Lugosi & Uribe 2022).

In addition, when students develop an interest in mathematics, they are more likely to perform better and enjoy learning even with the difficult nature of the subject (Mazana et al. 2019). Also, a positive learning experience, influenced by good teaching methods, helps students stay engaged and motivated (Baier et al. 2019). Research suggests that students who see the real-life applications of math find it more meaningful and interesting (Abramovich et al. 2019). Also, interactive activities, such as games and hands-on problem-solving, make math more enjoyable (Elsayed & Aloufi 2023). Meanwhile, students who struggle with math often feel frustrated and lose motivation (Simms 2016). Hence, following the findings of the above studies, encouraging a supportive and engaging learning environment can help students build confidence and develop a lasting interest in the subject (Lugosi & Uribe 2022).

Moreover, students' performance in mathematics is closely linked to their interest and understanding of the subject (Mazana et al. 2019). When students enjoy math, they tend to put in more effort, leading to better grades and problem-solving skills (Van Gog et al. 2020). However, those who find math difficult often experience anxiety and struggle to keep up with lessons (Chinn 2020). Studies show that effective teaching strategies, such as step-by-step explanations and real-world examples, can improve student performance (Szabo et al. 2020; Abramovich et al. 2019). Also, regular practice and a positive learning environment help students develop confidence in their math abilities (Deieso & Fraser 2019). Hence, according to these mentioned studies, by making math engaging and accessible, teachers can support students in achieving better results.

In the Philippines, mathematics remains a challenging subject for many students, affecting both their interests and performance (Capuno et al. 2019). Studies suggest that traditional teaching methods, such as rote memorization and lecture-based instruction, make it harder for students to develop a deep understanding of mathematical concepts (Peteros et al. 2019). To address this, educators in the Philippines are encouraged to use interactive and student-centered approaches, such as problem-based learning and technology integration, to make lessons more engaging (Cruz et al. 2023). Also, when students see the real-life applications of math, they become more interested and motivated to learn the subject (Espartero et al. 2024; Fernando & Bual 2024). Likewise, improved teaching strategies have been linked to higher student achievement, as they help learners grasp difficult topics and build confidence in their skills (Hernandez-de-Menendez et al. 2020; Fernando et al. 2024). Thus, the study suggests by continuously enhancing math instruction, teachers in the Philippines can foster both interest and better performance among students.

In the Philippine context, several studies have examined the interplay between teaching strategies, student interest, and performance in mathematics. Roblon et al. (2022) investigated the impact of teaching strategies in virtual classrooms and found a significant positive relationship between these strategies and students' mathematics performance. Aguhayon et al. (2023) explored the effectiveness of differentiated instruction in addressing learning gaps, concluding that such tailored approaches enhance both student performance and confidence in mathematics. Landas and Alova (2022) demonstrated that localized lesson plans significantly boost pupils' interest and academic performance in mathematics. Saga et al. (2023) conducted a case study of students' lost learning in mathematics on post-remote learning. Meanwhile, these studies underscore the importance of innovative and context-specific teaching methods in enhancing mathematics education in the Philippines. However, there remains a need to examine the teaching strategies, students' interests, and performance of college students in Mathematics gearing toward creating a remediation module. Also, examining the relationship between these constructs. Hence, this is the gap that this study would like to fill in and contribute to the body of knowledge.

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Thus, this study aimed to determine the utilization of teaching strategies, students' interests, and performance of first-year college students in Mathematics in the Central Philippines, for the school year 2021-2022 when taken as a whole and grouped according to sex, type of higher education institutions, family monthly income, and the type of residence. Likewise, it identified the relationships between teaching strategies, students' interests, and the respondents' performance in Mathematics. Hence, the study's findings may serve as a basis for a remediation module development to enhance the student's interest and performance in Mathematics subjects.

The study theoretically assumes that the perceived teaching strategies, interests, and performance of college students in mathematics vary based on their sex, type of higher education institution, family monthly income, and type of residence. Hence, based on these assumptions, the study was anchored on the theory of behaviorism by B.F. skinner (1985). This theory posits that students' learning is shaped by their responses to external stimuli, including instructional strategies and environmental factors. It underscores the role of reinforcement—both positive and negative—in influencing students' engagement, motivation, and academic performance. In this context, the study considers how students' varying backgrounds and experiences impact their responsiveness to different teaching strategies and their overall success in mathematics.

2. METHODOLOGY

This study made use of a descriptive-correlational research design. The chosen methodology statistically measured a set of variables to answer the theory-guided research questions or problems and hypotheses (Creswell & Creswell 2017). On one hand, the descriptive approach assessed the level of utilization of teaching strategies, interests, and performance among first-year college students in Mathematics when taken as a whole and grouped according to the demographics. On the other hand, the correlational approach determined the relationships between teaching strategies, interests, and performance of students in the subject. Meanwhile, the respondents of the study were 381 randomly selected first-year college students during 2021-2022 in two private colleges and one state university in Central Philippines.

Table 1. Demographic Profile of the Respondents

Variables	f	%
Sex		
Male	182	48
Female	199	52
Total	381	100
Type of HEI		
Public	337	88
Private	44	12
Total	381	100
Family Monthly Income		
Low (Below Php20,000)	355	93
High (Php20,000 & above)	26	7
Total	381	100
Type of Residence		
Owned	287	75
Rented	19	5
Not Rented (Living With Relatives)	75	20
Total	**381**	**100**

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This study utilized three researcher-made questionnaires. These instruments underwent validity tests. The acceptability of each item was determined using the agreement ratio (AR) based on the ratings given by the subject experts. Items having an agreement ratio of 80% and above were included. For the reliability test, the two instruments used in this study, particularly the Mathematical Teaching Strategies Inventory and Mathematical Interest Survey, generated a Cronbach alpha coefficient of 0.945 and 0.912, respectively which was interpreted as “very reliable.” On the other hand, a reliability coefficient of 0.94 showed that the Mathematics Achievement Test has a “very high reliability”.

The Mathematical Teaching Strategies Inventory was used to determine the extent of utilization of mathematical teaching strategies among teachers as perceived by first-year college students. To answer the instrument, the respondents were required to indicate their perception of the extent of utilization of the various teaching strategies of their mathematics teachers using a scale of 1- Not at all to 4- Always. Also, the Mathematical Interest Survey was utilized to determine the level of students’ interest in mathematics using a 4-point response format ranging from 1-Strongly Disagree to 4- Strongly Agree. In addition, to gather the data for performance, the respondents were given an achievement test and were required to select the correct answer from available choices.

In data analysis, descriptive and inferential analyses were employed. Specifically, the mean analyzed the teaching strategies, interests, and performance of the respondents in Mathematics. Also, the frequency count and percentage distribution profiled the respondents. Meanwhile, the Pearson r correlation was used to analyze the relationships between the three constructs. Lastly, this study adhered to the Philippine Health Research Ethics Board (PHREB) ethical guidelines and addressed the general principles of respect for persons, non-maleficence, beneficence, and justice to ensure the ethical soundness of the study. Specifically, it addressed the respondents’ vulnerability, the anonymity of their identity, and the confidentiality of the data.

3. RESULTS AND DISCUSSION

3.1 Extent of Teaching Strategies by the Teachers as Assessed by First-Year College Students

Many students struggle with math, making it one of the most challenging subjects in school (Chinn 2020). Table 2 presents the utilization of mathematical teaching strategies by the teachers as assessed by first-year college students when taken as a whole. In general, the extent of utilization of mathematical teaching strategies by the teachers is high (M=2.90). It was shown that the items in the questionnaire that got the highest mean were noted in real-life applications (M=3.20), meaningful assignment (M=3.20), and use of mathematical language/communication (M=3.14) described as high. On the other hand, the items of the questionnaire that got the lowest mean were noted in a film showing (M=2.61), use of games (M=2.66), and modeling (M=2.76) described also as high. This result means that Mathematics teachers are utilizing mathematical teaching strategies most of the time to ensure that their students will learn effectively the competencies in their Mathematics course.

These findings are supported by Quander (2016), who espoused that mathematics teachers must employ varied instructional strategies to bring about better learning. A UNESCO publication (as cited in Jackson, 2019) emphasized that in mathematics teaching, students must be made capable of modeling, exploring, conjecturing, testing, representing, and formulating – using specific vocabulary-arguing and proving, developing methods, working out and connecting concepts within structured spaces, exchanging and communicating. Also, Sogillo, et.al (2016) have cited Demirel (2012) who pointed out that the quality of the teaching-learning process is defined as the extent to which materials to be learned are presented, explained, and devised appropriately for student learning. For his part,

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Cheng (2017) summed up the importance of teachers in the learning of vital Mathematics skills by saying that the quality of education that teachers provide to students is highly dependent upon what teachers do in the classroom.

Table 2. Teaching Strategies by the Teachers as Assessed by First-Year College Students when Taken as a Whole

Category	Mean	Description
Symposia, seminars, workshops, professional lectures	2.88	High
Educational tours/learning visits/other co-curricular activities	2.91	High
Peer teaching/cooperative learning	3.10	High
Computer-assisted instruction (CAI)/computer-assisted learning (CAL)	2.89	High
Film-showing	2.61	High
Simulations	2.77	High
Brain-storming	2.85	High
Interactive learning	2.99	High
Team teaching	2.88	High
Problem-Solving	3.01	High
Reporting	2.65	High
Focus Group Discussion	2.84	High
Individualized Instruction	2.90	High
Meaningful Assignment	3.20	High
Real-life applications	3.20	High
Think-Pair-Share method	2.99	High
Jigsaw method	2.81	High
Use of Games	2.66	High
Modelling	2.76	High
Use of mathematical language/communication	3.14	High
Total Mean	**2.90**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Moderate; 1.00–1.75 Low

Table 3 presents the utilization of mathematical teaching strategies by the teachers as assessed by first-year college students when classified to sex. Both male and female first-year college students assessed the utilization of mathematical teaching strategies of their teachers as high with obtained mean scores of (M=2.88) and (M=2.92), respectively. It was presented that the highest mean for the male respondents was noted in real-life applications (M=3.19) while the second and third highest means were noted in meaningful assignments (M=3.16) and use of mathematical language/communication (M=3.08) described as high. On the contrary, the lowest means were noted in film-showing (M=2.63), use of games (M=2.67), and reporting (M=2.69) which is also described as high.

On the other hand, the highest mean for the female respondents was noted in a meaningful assignment (M=3.23), real-life applications (M=3.21), and use of mathematical language/communication (M=3.19) described as high. On the contrary, the lowest mean was noted in film-showing (M=2.60), reporting (M=2.62), and use of games (M=2.65) which are also described as high. The above findings indicate that both male and female first-year college students believe that their teachers are utilizing mathematical teaching strategies most of the time to facilitate effective Mathematics teaching and learning. This is done by giving meaningful assignments, relating the lessons to real-life applications, and appropriate use of mathematical language or communication.

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Table 3. Teaching Strategies by the Teachers as Assessed by First-Year College Students when Classified to Sex

Category	Male	Description	Female	Description
Symposia, seminars, workshops, professional lectures	2.87	High	2.90	High
Educational tours/learning visits/other co-curricular activities	2.85	High	2.97	High
Peer teaching/cooperative learning	3.01	High	3.18	High
Computer-assisted instruction (CAI)/computer -assisted learning (CAL)	2.86	High	2.91	High
Film-showing	2.63	High	2.60	High
Simulations	2.79	High	2.76	High
Brain-storming	2.84	High	2.86	High
Interactive learning	2.93	High	3.06	High
Team teaching	2.85	High	2.91	High
Problem-Solving	2.97	High	3.05	High
Reporting	2.69	High	2.62	High
Focus Group Discussion	2.82	High	2.85	High
Individualized Instruction	2.92	High	2.88	High
Meaningful Assignment	3.16	High	3.23	High
Real-life applications	3.19	High	3.21	High
Think-Pair-Share method	2.96	High	3.02	High
Jigsaw method	2.82	High	2.79	High
Use of Games	2.67	High	2.65	High
Modelling	2.73	High	2.78	High
Use of mathematical language/communication	3.08	High	3.19	High
Total Mean	**2.88**	**High**	**2.92**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Moderate; 1.00–1.75 Low

Table 4 presents the utilization of mathematical teaching strategies by the teachers as assessed by first-year college students when classified as to type of HEI. First-year college students who came from both public and private HEI assessed the utilization of mathematical teaching strategies of their teachers as high with obtained mean scores of (M=2.91) and (M=2.84), respectively. Hence, after examining their responses to the questionnaire, it was found that the highest mean for the respondents who came from public HEI was noted in meaningful assignments (M=3.20), real-life applications (M=3.19), and use of mathematical language/communications (M=3.14) described as high. On the contrary, the lowest mean was noted in film-showing (M=2.61), reporting (M=2.67), and use of games (M=2.67) which are also described as high.

On the other hand, the highest mean for the respondents who came from private HEI was noted in real-life applications (M=3.27) described as very high, meaningful assignments (M=3.23), and use of mathematical language/communications (M=3.11) described as high. On the contrary, the lowest mean was noted in reporting (M=2.55), simulations (M=2.67), and use of games (M=2.59) which are also described as high. These results indicate that regardless of the type of HEI, first-year college students believe that their mathematics teachers are utilizing mathematical teaching strategies most of the time to ensure effective teaching of Mathematics to their learners. This is indicated by giving their

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learners meaningful assignments, relating the lessons to real-life applications, and appropriate use of mathematical language or communications.

Table 4. Teaching Strategies by the Teachers as Assessed by First-Year College Students when Classified to Type of HEI

Category	Public	Description	Private	Description
Symposia, seminars, workshops, professional lectures	2.89	High	2.84	High
Educational tours/learning visits/other co-curricular activities	2.93	High	2.77	High
Peer teaching/cooperative learning	3.09	High	3.11	High
Computer-assisted instruction (CAI)/computer-assisted learning (CAL)	2.89	High	2.89	High
Film-showing	2.61	High	2.59	High
Simulations	2.80	High	2.57	High
Brain-storming	2.85	High	2.82	High
Interactive learning	2.98	High	3.09	High
Team teaching	2.88	High	2.89	High
Problem-Solving	3.03	High	2.89	High
Reporting	2.67	High	2.55	High
Focus Group Discussion	2.87	High	2.64	High
Individualized Instruction	2.92	High	2.75	High
Meaningful Assignment	3.20	High	3.23	High
Real-life applications	3.19	High	3.27	Very High
Think-Pair-Share method	3.02	High	2.75	High
Jigsaw method	2.82	High	2.66	High
Use of Games	2.67	High	2.59	High
Modelling	2.75	High	2.77	High
Use of mathematical language/communication	3.14	High	3.11	High
Total Mean	**2.91**	**High**	**2.84**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Moderate; 1.00–1.75 Low

Table 5 presents the utilization of mathematical teaching strategies by the teachers as assessed by first-year college students when classified according to family monthly income. When classified as family monthly income, both first-year college students with high and low family monthly income assessed the utilization of mathematical teaching strategies of their teachers as high with obtained mean scores of (M=3.05) and (M=2.89), respectively. However, after examining their responses to the questionnaire, it was found that the highest mean for the respondents with high family monthly income was noted in real-life situations (M=3.35), meaningful assignments (M=3.27), and use of mathematical language/communication (M=3.19) described as very high. On the contrary, the lowest mean was noted in reporting (M=2.85), film-showing (M=2.85), and team teaching (M=2.92) which is also described as high.

On the other hand, the highest mean for the respondents with low family monthly income was noted in real-life applications (M=3.20), meaningful assignments (M=3.19), and use of mathematical language/communication (M=3.14) described as high. On the contrary, the lowest mean was noted in the use of film-showing (M=2.59), use of games (M=2.63), and reporting (M=2.64) which is also described as high. The above findings indicate that regardless

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of family monthly income, first-year college students believe that their teachers are utilizing mathematical teaching strategies most of the time to facilitate effective learning of Mathematics among their students. This is indicated by their giving of meaningful assignments and relating the lessons to real-life applications.

Table 5. Teaching Strategies by the Teachers as Assessed by First-Year College Students when Classified as to Family Monthly Income

Category	High	Description	Low	Description
Symposia, seminars, workshops, professional lectures	2.96	High	2.88	High
Educational tours/learning visits/other co-curricular activities	3.12	High	2.90	High
Peer teaching/cooperative learning	3.19	High	3.09	High
Computer-assisted instruction (CAI)/computer-assisted learning (CAL)	3.00	High	2.88	High
Film-showing	2.88	High	2.59	High
Simulations	3.04	High	2.75	High
Brain-storming	3.00	High	2.84	High
Interactive learning	3.12	High	2.99	High
Team teaching	2.92	High	2.88	High
Problem-Solving	3.04	High	3.01	High
Reporting	2.85	High	2.64	High
Focus Group Discussion	2.92	High	2.83	High
Individualized Instruction	3.08	High	2.89	High
Meaningful Assignment	3.27	Very High	3.19	High
Real-life applications	3.35	Very High	3.20	High
Think-Pair-Share method	2.96	High	2.99	High
Jigsaw method	3.00	High	2.79	High
Use of Games	3.04	High	2.63	High
Modelling	3.00	High	2.74	High
Use of mathematical language/communication	3.19	High	3.14	High
Total Mean	**3.05**	**High**	**2.89**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Moderate; 1.00–1.75 Low

Table 6 presents the utilization of mathematical teaching strategies by the teachers as assessed by first-year college students when classified as a type of residence. First-year college students with owned, rented, and not rented residences assessed the utilization of mathematical teaching strategies of their teachers as high with obtained mean scores of (M=2.86), (M=3.18), and (M=2.98), respectively. A scrutiny of the individual respondents in the questionnaire, it was found that the highest mean for the respondents with owned residence was noted in meaningful assignments (M=3.17), real-life situations (M=3.15), and use of mathematical language/communication (M=3.11) described as high. On the contrary, the lowest mean was noted in film showing (M=2.56), reporting (M=2.57), and use of games (M=2.62) which are also described as high.

On the other hand, the highest mean for the respondents with rented residence was noted in meaningful assignments (M=3.63), real-life applications (M=3.53), and peer teaching/cooperative learning (M=3.42) described as very high. On the contrary, the lowest mean was noted in the use of games (M=2.87), film-showing (M=2.89), and brainstorming (M=2.89) which are also described as high. Finally, the highest mean for the respondents with no rented residence was noted in real-life applications (M=3.30) described as very high,

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meaningful assignments (M=3.20), and use of mathematical language/communication (M=3.19) described as high. On the contrary, the lowest mean was noted in the use of games (M=2.74), modeling (M=2.75), and simulations (M=2.82) which is also described as high. The above findings indicate that regardless of the type of residence, first-year college students believe that their teachers are utilizing mathematical teaching strategies most of the time to facilitate effective learning of Mathematics among their students. This is also indicated by their giving of meaningful assignments and relating lessons to real-life applications.

Table 6. Teaching Strategies by the Teachers as Assessed by First-Year College Students when Classified to Type of Residence

Category	Owned	Description	Rented	Description	Not Rented	Description
Symposia, seminars, workshops, professional lectures	2.88	High	2.95	High	2.86	High
Educational tours/learning visits/other co-curricular activities	2.85	High	3.26	Very High	3.05	High
Peer teaching/cooperative learning	3.05	High	3.42	Very High	3.19	High
Computer-assisted instruction (CAI)/computer-assisted learning (CAL)	2.81	High	3.16	High	3.08	High
Film-showing	2.56	High	2.89	High	2.68	High
Simulations	2.73	High	3.11	High	2.82	High
Brain-storming	2.84	High	2.89	High	2.86	High
Interactive learning	2.93	High	3.37	Very High	3.11	High
Team teaching	2.83	High	3.21	High	2.95	High
Problem-Solving	2.98	High	3.32	Very High	3.03	High
Reporting	2.57	High	3.11	High	2.81	High
Focus Group Discussion	2.77	High	2.89	High	3.05	High
Individualized Instruction	2.87	High	3.32	Very High	2.89	High
Meaningful Assignment	3.17	High	3.63	Very High	3.20	High
Real-life applications	3.15	High	3.53	Very High	3.30	Very High
Think-Pair-Share method	2.94	High	3.26	Very High	3.10	High
Jigsaw method	2.77	High	3.11	High	2.84	High
Use of Games	2.62	High	2.87	High	2.74	High
Modelling	2.74	High	3.05	High	2.75	High
Use of mathematical language/communication	3.11	High	3.32	Very High	3.19	High
Total Mean	**2.86**	**High**	**3.18**	**High**	**2.98**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Moderate; 1.00–1.75 Low

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3.2 Interest of First-Year College Students in Mathematics

Table 7 presents the interest of first-year college students in mathematics when taken as a whole. The level of interest of first-year college students in Mathematics is high (M= 3.02). It was shown that the item in the questionnaire which got the highest mean was noted as Pay attention when the teacher solves mathematical problems (M=3.38), Don't fear failure in mathematical examination (M=3.31), and Believed that logical power increases by studying mathematics (M=3.26) described as very high. On the other hand, the item of the questionnaire which got the lowest mean was noted as Feel happy when the mathematics

teacher is present (M=2.67), Feel happy as soon as the mathematics class starts (M=2.77), and Get challenged when the youngsters ask me to solve mathematical problems (M=2.77) described as high. The above findings mean that the first-year college students are very interested in learning Mathematics subject. This is because they always pay attention to their teachers every time mathematical problems are solved.

These findings were supported by Illiyas and Charles (2017), Wong and Wong (2019), and Peteros et al. (2019) who found in their studies that high school students had a high level of interest towards learning Mathematics. Kilborn (2016) added that knowledge about students' existing interests will assist teachers in designing class programs and promoting ongoing activities in which there are opportunities for interest development along multiple pathways. The above findings, however, contradict Moore's (2015) observation that underachievement in mathematics is an ongoing universal issue among schools. Many students, beginning at the elementary level, are not motivated in mathematics and thus perform poorly.

Table 7. Interest of First-Year College Students Towards Mathematics When Taken as a Whole

Category	Mean	Description
I like mathematics very much.	3.06	High
Feel happy as soon as the mathematics class starts.	2.77	High
Feel confident in the mathematics class.	2.95	High
Pay attention when the teacher solves mathematical problems.	3.38	Very High
Feel easy in solving mathematical problems.	3.07	High
Always get prepared before attending the mathematics class.	3.08	High
Feel secure in the mathematics class.	2.83	High
Can get along with the brilliant students of mathematics.	3.00	High
Try myself to solve the difficult problems of mathematics rather than seeking others help.	3.10	High
Spend more time studying mathematics than other subject.	2.92	High
Like to play oral mathematical games during leisure time.	2.90	High
Take much interest in solving the mathematical puzzles printed in newspapers and magazines.	3.02	High
Get challenged when the youngsters ask me to solve mathematical problems.	2.77	High
Believe that logical power increases by studying mathematics.	3.26	Very High
Don't fear failure in mathematical examination.	3.31	Very High
Like the teacher to teach more complex problems of mathematics.	3.22	High
Feel happy to get more marks in mathematics than other subjects.	3.13	High
Feel happy when the mathematics teacher	2.67	

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is present.		High
Feel confident in concentrating my mind on solving mathematical problems.	3.05	High
Total Mean	**3.02**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Low; 1.00–1.75 Very Low

Table 8 presents the interest of first-year college students in mathematics when classified by sex. When classified according to sex, both male and female first-year college students have a high level of interest in Mathematics with obtained mean scores of (M=3.03) and (M=3.02), respectively. It was presented that the highest mean for the male respondents was noted in Don't fear failure in mathematical examination (M=3.31), Pay attention when the teacher solves mathematical problems (M=3.16), described as very high, and Believe that logical power increases by studying mathematics (M=3.24) described as high. On the contrary, the lowest mean was noted in Feel happy when the mathematics teacher is present (M=2.72), Get challenged when the youngsters ask me to solve mathematical problems (M=2.77) and Feel secure in the mathematics class (M=2.82) which is also described as high.

On the other hand, the highest mean for the female respondents was noted in Pay attention when the teacher solves mathematical problems (M=3.46), Don't fear failure in mathematical examination (M=3.31), and Believe that logical power increases by studying mathematics (M=3.28) described as very high. On the contrary, the lowest mean was noted in Feel happy when the Mathematics teacher is present (M=2.62), Feel happy as soon as the mathematics class starts (M=2.73), and Feel secure in the Mathematics class (M=2.83) which are also described as high. The above findings indicate that regardless of sex, first-year college students are very interested in learning Mathematics subject as shown by their strong desire to solve mathematical problems and their confidence in passing the mathematical examination.

Table 8. Interest of First-Year College Students in Mathematics When Classified to Sex

Category	Male	Description	Female	Description
I like mathematics very much.	3.02	High	3.10	High
Feel happy as soon as the mathematics class starts.	2.81	High	2.73	High
Feel confident in the mathematics class.	2.99	High	2.92	High
Pay attention when the teacher solves mathematical problems.	3.29	Very High	3.46	Very High
Feel easy in solving mathematical problems.	3.10	High	3.05	High
Always get prepared before attending the mathematics class.	3.04	High	3.13	High
Feel secure in the mathematics class.	2.82	High	2.83	High
Can get along with the brilliant students of mathematics.	3.04	High	2.96	High
Try myself to solve the difficult problems of mathematics rather than seeking others help.	3.11	High	3.10	High
Spend more time studying mathematics than other subject.	2.93	High	2.90	High
I like to play oral mathematical games during my leisure time.	2.88	High	2.92	High
Take much interest in solving the mathematical puzzles printed in newspapers and magazines.	3.06	High	2.98	High
Get challenged when the youngsters ask me to solve mathematical problems.	2.77	High	2.78	High

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Believe that logical power increases by studying mathematics.	3.24	High	3.28	Very High
Don't fear failure in mathematical examination.	3.31	Very High	3.31	Very High
Like the teacher to teach more complex problems of mathematics.	3.18	High	3.25	High
Mathematics period seems short to me.	3.00	High	2.96	High
Feel happy to get more marks in mathematics than other subjects.	3.12	High	3.14	High
Feel happy when the mathematics teacher is present.	2.72	High	2.62	High
Feel confident in concentrating my mind on solving mathematical problems.	3.21	High	2.91	High
Total Mean	**3.03**	**High**	**3.02**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Low; 1.00–1.75 Very Low

Table 9 presents the interest of first-year college students in Mathematics when classified by type of HEI. The first-year college students who came from both public and private HEI have a high level of interest in Mathematics with obtained mean scores of (M=3.01) and (M=3.13), respectively. Hence, after examining their responses to the questionnaire, it was found that the highest mean for the respondents who came from public HEI was noted in Pay attention when the teacher solves mathematical problems (M=3.36), Don't fear of failure in mathematical examination (M=3.28), and Believe that logical power increases by studying mathematics (M=3.26) described as very high. On the contrary, the lowest mean was noted in Feel happy when the mathematics teacher is present (M=2.63), Get challenged when the youngsters ask me to solve mathematical problems (M=2.73), and Feel secure in the mathematics class (M=2.80) which is described as high.

On the other hand, the highest mean for the respondents who came from private HEI was noted in Pay attention when the teacher solves mathematical problems (M=3.48), Don't fear of failure in mathematical examination (M=3.45) described as very high, and Believe that logical power increases by studying mathematics (M=3.25) described as high. On the contrary, the lowest mean was noted in the Mathematics period seems short to me (M=2.91), Feel happy when the mathematics teacher is present (M=2.95), and Like mathematics very much (M=2.98) which is described as high. The findings indicated that regardless of the type of HEI, first-year college students are very interested in learning Mathematics. This is shown by their strong desire to solve mathematical problems and their confidence in passing the mathematical examination.

Table 9. Interest of First-Year College Students in Mathematics When Classified to Type of HEI

Category	Public	Description	Private	Description
I like mathematics very much.	3.07	High	2.98	High
Feel happy as soon as the mathematics class starts.	2.74	High	2.98	High
Feel confident in the mathematics class.	2.91	High	3.25	High
Pay attention when the teacher solves mathematical problems.	3.36	Very High	3.48	Very High
Feel easy in solving mathematical problems.	3.08	High	3.02	High
Always get prepared before attending the mathematics class.	3.08	High	3.09	High
Feel secure in the mathematics class.	2.80	High	3.07	High
Can get along with the brilliant students of mathematics.	2.96	High	3.27	High

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Try myself to solve the difficult problems of mathematics rather than seeking others help.	3.09	High	3.18	High
Spend more time studying mathematics than other subject.	2.90	High	3.07	High
I like to play oral mathematical games during my leisure time.	2.89	High	2.98	High
Take much interest in solving the mathematical puzzles printed in newspapers and magazines.	2.99	High	3.20	High
Get challenged when the youngsters ask me to solve mathematical problems.	2.73	High	3.09	High
Believe that logical power increases by studying mathematics.	3.26	Very High	3.25	High
Don't fear failure in mathematical examination.	3.28	Very High	3.45	Very High
Like the teacher to teach more complex problems of mathematics.	3.23	High	3.14	High
Mathematics period seems short to me.	2.99	High	2.91	High
Feel happy to get more marks in mathematics than other subjects.	3.12	High	3.23	High
Feel happy when the mathematics teacher is present.	2.63	High	2.95	High
Feel confident in concentrating my mind on solving mathematical problems.	3.06	High	3.02	High
Overall Mean	**3.01**	**High**	**3.13**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Low; 1.00–1.75 Very Low

Table 10 presents the interest of first-year college students in Mathematics when classified to family monthly income. Both first-year college students with high and low family monthly income have high levels of interest in Mathematics with obtained mean scores of (M=2.98) and (M=3.02), respectively. However, after examining their responses to the questionnaire, it was found that the highest mean for the respondents with high family monthly income was noted in Don't fear of failure in mathematical examination (M=3.35) described as very high, Pay attention when the teacher solves mathematical problems (M=3.23), and Believe that logical power increases by studying mathematics (M=3.23) described as high. On the contrary, the lowest mean was noted in Get challenged when the youngsters ask me to solve mathematical problems (M=2.69), Feel happy when the mathematics teacher is present (M=2.76), and Feel happy as soon as the mathematics class starts (M=2.77) described as high.

On the other hand, the highest mean for the respondents with low family monthly income was noted in Pay attention when the teacher solves mathematical problems (M=3.39), Don't fear failure in mathematical examination (M=3.30), and Believe that logical power increases by studying mathematics (M=3.26) described as very high. On the contrary, the lowest mean was noted in the use of Feel happy when the mathematics teacher is present (M=2.66), Feel happy as soon as the mathematics class starts (M=2.77), and Get challenged when the youngsters ask me to solve mathematical problems (M=2.78) which is described as high. These findings indicate that regardless of family monthly income, first-year college students are very interested in learning Mathematics as shown by their strong desire to solve mathematical problems as well as their confidence in passing mathematics examinations.

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Table 10. Interest of First-Year College Students in Mathematics When Classified to Family Monthly Income

Category	High	Description	Low	Description
I like mathematics very much.	3.04	High	3.06	High
Feel happy as soon as the mathematics class starts.	2.77	High	2.77	High
Feel confident in the mathematics class.	3.08	High	2.94	High
Pay attention when the teacher solves mathematical problems.	3.23	High	3.39	Very High
Feel easy in solving mathematical problems.	3.04	High	3.07	High
Always get prepared before attending the mathematics class.	3.00	High	3.09	High
Feel secure in the mathematics class.	2.81	High	2.83	High
Can get along with the brilliant students of mathematics.	3.19	High	2.99	High
Try myself to solve the difficult problems of mathematics rather than seeking others help.	2.96	High	3.11	High
Spend more time studying mathematics than other subject.	2.81	High	2.93	High
Like to play oral mathematical games during leisure time.	2.88	High	2.90	High
Take much interest in solving the mathematical puzzles printed in newspapers and magazines.	3.12	High	3.01	High
Get challenged when the youngsters ask me to solve mathematical problems.	2.69	High	2.78	High
Believe that logical power increases by studying mathematics.	3.23	High	3.26	Very High
Don't fear failure in mathematical examination.	3.35	Very High	3.30	Very High
Like the teacher to teach more complex problems of mathematics.	3.00	High	3.23	High
Mathematics period seems short to me.	2.81	High	2.99	High
Feel happy to get more marks in mathematics than other subjects.	3.00	High	3.14	High
Feel happy when the mathematics teacher is present.	2.76	High	2.66	High
Feel confident in concentrating my mind on solving mathematical problems.	2.85	High	2.98	High
Total Mean	**2.98**	**High**	**3.02**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Low; 1.00–1.75 Very Low

Table 11 presents the interest of first-year college students in Mathematics when classified by type of residence. When classified as to type of residence, first-year college students with owned, rented, and not rented residence have a high level of interest in Mathematics with obtained mean scores of (M=3.01), (M=2.96), and (M=3.07), respectively. A scrutiny of the individual respondents in the questionnaire, it was found that the highest mean for the respondents with owned residence was noted in Pay attention when the teacher solves mathematical problems (M=3.37), Don't fear of failure in mathematical examination (M=3.32), and Believe that logical power increases by studying mathematics (M=3.26) described as very high. On the contrary, the lowest mean was noted in Feel happy when the mathematics teacher is present (M=2.63), Feel happy as soon as the mathematics starts (M=2.74), and Get challenged when the youngsters ask me to solve mathematical problems (M=2.75) which are described as high.

On the other hand, the highest mean for the respondents with rented residence was noted in Pay attention when the teacher solves mathematical problems (M=3.32), Believe that logical power increases by studying mathematics (M=3.31) described as very high, and

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Don't fear of failure in mathematical examination (M=3.11). On the contrary, the lowest mean was noted in Feel happy when the mathematics teacher is present (M=2.63), Get challenged when the youngsters ask me to solve mathematical problems (M=2.63), and Like to play oral mathematical games during leisure time (M=2.68), which are described as high. Finally, the highest mean for the respondents with no rented residence was noted as Pay attention when the teacher solves mathematical problems (M=3.40) Like the teacher to teach more complex problems of mathematics (M=3.31), and Don't fear failure in mathematical examination (M=3.26), described as very high. On the contrary, the lowest mean was noted in Feel happy when the mathematics teacher is present (M=2.84), Feel happy as soon as the mathematics class starts (M=2.85), and Get challenged when the youngsters ask me to solve mathematical problems (M=2.91) which are also described as high.

The findings above indicate that regardless of type of residence, first year college students are very much interested in learning Mathematics. This is manifested by their strong desire to solve mathematical problems and confidence in passing mathematical examinations.

Table 11. Interest of First-Year College Students Towards Mathematics When Classified as to Type of Residence

Category	Owned	Description	Rented	Description	Not Rented	Description
I like mathematics very much.	3.05	High	3.05	High	3.13	High
Feel happy as soon as the mathematics class starts.	2.74	High	2.84	High	2.85	High
Feel confident in the mathematics class.	2.96	High	2.84	High	2.96	High
Pay attention when the teacher solves mathematical problems.	3.37	Very High	3.32	Very High	3.40	Very High
Feel easy in solving mathematical problems.	3.07	High	3.00	High	3.09	High
Always get prepared before attending the mathematics class.	3.12	High	2.89	High	3.00	High
Feel secure in the mathematics class.	2.79	High	3.11	High	2.92	High
Can get along with the brilliant students of mathematics.	3.00	High	2.89	High	3.03	High
Try myself to solve the difficult	3.12	High	2.84	High	3.11	High

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problems of mathematics rather than seeking others help.						
Spend more time studying mathematics than other subject.	2.92	High	2.84	High	2.95	High
Like to play oral mathematical games during leisure time.	2.89	High	2.68	High	3.00	High
Take much interest in solving the mathematical puzzles printed in newspapers and magazines.	3.01	High	2.95	High	3.07	High
Get challenged when the youngsters ask me to solve mathematical problems.	2.75	High	2.63	High	2.91	High
Believe that logical power increases by studying mathematics.	3.26	Very High	3.31	Very High	3.26	Very High
Don't fear failure in mathematical examination.	3.32	Very High	3.11	High	3.31	Very High
Like the teacher to teach more complex problems of mathematics.	3.21	High	3.11	High	3.27	Very High
Mathematics period seems short to me.	2.97	High	3.11	High	2.97	High
Feel happy to get more marks in mathematics than other subjects.	3.09	High	3.05	High	3.29	High
Feel happy when the mathematics teacher is present.	2.63	High	2.63	High	2.84	High
Feel confident in concentrating my mind on solving mathematical problems.	2.97	High	3.05	High	2.97	High
Overall Mean	**3.01**	**High**	**2.96**	**High**	**3.07**	**High**

Scale of Means: 3.26–4.00 Very High; 2.51–3.25 High; 1.76–2.50 Low; 1.00–1.75 Very Low

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Table 12 presents the performance of first-year college students in Mathematics. The performance of first-year college students in Mathematics when taken as a whole is satisfactory (M=22.96). When classified as to sex, both male (M=22.95) and female first-year college students (M=22.98) have satisfactory performance in Mathematics. When classified as to type of HEI, both first-year college students who came from the public (M=22.64) and private HEIs (M=23.11) have satisfactory performance in Mathematics. When classified as family monthly income, first-year college students with low (M=22.85) and high (M=24.58) family monthly income have satisfactory performance in Mathematics. When classified as to type of residence, first-year college students with owned (M=23.06), rented (M=20.95) and not rented (M=23.11) have satisfactory performance in Mathematics.

The above findings indicate that regardless of the profile of the first-year college students, they performed better in Mathematics subject. These findings were consistent with the finding of Illiyas and Charles (2017) that high school students had satisfactory performance in Mathematics. Also, this satisfactory mathematics performance of the participants can be attributed to their high level of interest in the subject. Related studies reviewed corroborate this notion. Among which are those of Wong and Wong (2019), Heinze et al. (2020), Lazarides and Ittel (2020), and Scheifele et.al (2019). However, in his study c Der Wal (2017) reported that even if students have high mathematics achievement, they have indicated low interest in the subject.

Table 12. Performance of First-Year College Students in Mathematics

Category	Mean	Description
As a Whole	22.96	Satisfactory
Sex		
Male	22.95	Satisfactory
Female	22.98	Satisfactory
Total	22.96	Satisfactory
Type of HEI		
Public	22.64	Satisfactory
Private	23.11	Satisfactory
Total	22.88	Satisfactory
Family Monthly Income		
Low (Below Php20,000)	22.85	Satisfactory
High (Php20,000 & above)	24.58	Satisfactory
Total	23.72	Satisfactory
Type of Residence		
Owned	23.06	Satisfactory
Rented	20.95	Satisfactory
Not Rented (Living with relatives)	23.11	Satisfactory
Total	22.37	Satisfactory

Scale of Means: 41 – 50 Outstanding; 31-40 Very Satisfactory; 21-30 Satisfactory; 11-20, Unsatisfactory; Below 10 Poor

3.3 Relationships of Teaching Strategies, Interests, and Performance of First-Year College Students in Mathematics

Table 13 presents the relationships between teaching strategies, interests, and performance of first-year college students in Mathematics. Results of Pearson r showed that no significant relationship existed between teaching strategies and the performance of first-year college students ($r = .035$, $p > .05$) with a very weak extent of the relationship. Thus, the

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null hypothesis which states that there are no significant relationships between teaching strategies and the performance of first-year college students was not rejected. This finding indicates that the performance of first-year college students in Mathematics is not significantly influenced by teaching strategies utilized by their teachers. The above finding was consistent with the study of Rubio (2024) and Zaim et al. (2019) that there is no significant relationship between teaching strategies and mathematical performance.

On the other hand, a significant relationship existed between the utilization of mathematical teaching strategies and student interest ($r = .255$, $p < .05$) with a weak extent of the relationship. Thus, the null hypothesis which states that there are no significant relationships between the utilization of mathematical teaching strategies and student interest was rejected. This finding indicates that the interest of first-year college students towards Mathematics is significantly influenced by mathematical teaching strategies utilized by their teachers. This finding was supported by Anigbo (2018) who stated that instructional strategy is one of the effective factors that predict secondary school students' interest in learning mathematics.

Finally, a significant relationship existed between student interest and performance ($r = .106$, $p < .05$). Thus, the null hypothesis which states that there are no significant relationships between student interest and performance was rejected. This finding indicates that the performance of first college students in Mathematics is significantly influenced by their interest in learning the subject.T his finding was supported by Köller et al. (2001), Krapp (2018), Wong and Wong (2019), and Peteros et al. (2019) that there was a significant relationship between interest and mathematics performance.

Table 13. Relationships Among Teaching Strategies, Students' Interest and Performance

		Utilization of Mathematical Teaching Strategies	Student Interest	Performance
Utilization of Mathematical Teaching Strategies	Pearson Correlation	1	.255	.035
	Sig.(2-tailed)		.000	.501
	N	381	381	381
Student Interest	Pearson Correlation	.255	1	.106
	Sig.(2-tailed)	.000		.039
	N	381	381	381
Performance	Pearson Correlation	.035	.106	1
	Sig.(2-tailed)	.501	.039	
	N	381	381	

p<.05, Significant
p>.05, Not Significant

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4. CONCLUSION

Based on the findings, first-year college students believe that their teachers utilize most of the time mathematical teaching strategies to ensure that they will learn Mathematics subject. These teaching strategies include relating the lessons to real-life applications and giving meaningful assignments. Hence, the Math Program Heads may develop a monitoring tool or technique that can help strengthen the teaching of Mathematics at the college level to enhance students' interest in the subject and enhance students' performance in

Mathematics. Likewise, Mathematics teachers may intensify the teaching of Mathematics subject by utilizing the most appropriate teaching strategies suited to their learners. They may find techniques or strategies that can elicit students' interest in learning the subject as well as elevate their students' present satisfactory performance to outstanding.

Meanwhile, the study recognizes diverse limitations: This study focused only on the utilization of mathematical teaching strategies, students' interest, and performance of first-year college students in Central Philippines for the School year 2021-2022. This study was conducted from August to November 2022 involving 381 randomly selected first-year college students from two private colleges and one state university. Data for this study were gathered using the researcher-formulated instruments. To further validate the present findings, this study can be replicated by other researchers in private and public HEIs in other provinces or regions to come up with wider perspectives about the relationships among utilization of mathematical teaching strategies, students' interest, and performance in Mathematics.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

The author hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

The author has declared that no competing interests exist.

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