

MATHEMATICS STUDY SKILLS AND MATHEMATICS ENGAGEMENT AS PREDICTORS OF MATHEMATICS ACHIEVEMENT GOALS AMONG TERTIARY STUDENTS IN TAGUM CITY

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Abstract

The main focus of this study was to determine the significant influence of mathematics study skills and mathematics engagement in the mathematics achievement goals of the students at the tertiary level. The respondents of this study were the tertiary students enrolled in Teacher Education who have undertaken a mathematics subject in the conduct of the study or have taken it in the previous term or semester both in public and private tertiary schools in Tagum City. The researcher used a quantitative non-experimental research study that uses descriptive correlational and causal-comparative design. This study also employed three (3) sets of adopted–modified questionnaires for the three (3) variables. Mean, Pearson – r, and Linear Regression Analysis were used in interpreting the gathered data. There was a significant relationship between mathematics study skills and mathematics achievement goals. There was a significant relationship between mathematics engagement and mathematics achievement goals. The regression analysis on the influence of the domains of mathematics study skills on mathematics achievement goals among students revealed that three of the four domains have a significant influence on mathematics achievement goals. The regression analysis on the influence of the domains of mathematics engagement on mathematics achievement goals revealed that all three domains have a significant influence on mathematics achievement goals.

Keywords: mathematics; study skills; engagement; achievement goals; predictors; Philippines

1. Introduction

1.1. Rationale

Their study skills influence every student's academic success. It is one of the essential skills the student should possess if they want to achieve more in school. Anxiety about preparing for the exam and note-taking, which are essential determinants of study skills, have been linked to poorer achievement results (Yalcin & Acikgoz, 2009). Promoting healthy study habits should continue to be a top focus

because poor study abilities are only one factor in academic failure. (Gettinger & Seibert, 2002). On the other hand, students' academic engagement suggests a strong association with the student's academic performance (Alrashidi, Phan, & Ngu, 2016). It cannot be denied that students' engagement in academic work has a direct link to achieving their goals. Additionally, academic goals and students' academic engagement have been found to have a strong association, specifically in terms of behavioral and cognitive domains (Duchesne, Larose, & Feng, 2017).

Mathematics educators are stumped when it comes to explaining the low performance of their students. Several types of research have been conducted on effective mathematics instruction, yet despite several improvements and developments, many students continue to be unsuccessful in this pursuit. As a result, there is a need to study appropriate motivation. One of the most common study-related motivating elements is achievement goals. According to achievement goal theory, students approach, interact, and respond to achievement circumstances based on goal orientation (Ignacio & Policarpio, 2016). The urgency to study this motivational factor should be done to assess the students' success.

Rahim and Meon (2013) performed a study in Malaysia that focused on the relationship between study skills and students' academic performance. They discovered a strong connection between several study skills markers and academic success. In general, the study found that students' academic success was influenced in some way by their study skills. The study conducted by Hassanbeigi et al. (2011), which showed a substantial correlation between the two variables, lends weight to this conclusion. Students with higher grade point averages scored higher on the study skills test than students with lower grade point averages did in this study.

In addition, achievement goals are also internal cognitive structures that provide a reason to participate and are involved in the control of thoughts, feelings, and actions while doing a task. These goals have been related to scholastic effort and dedication in activities and tasks (Duchesne, Larose, & Feng, 2017). This claim supports the statement of Lei, Cui, & Zhou (2018), which exposed a higher association between academic engagement and the academic achievement of learners. Behavioral engagement made the highest contribution to the student's success in academic achievement measures.

Similar research on study skills and academic performance was conducted in Cebu City. Capuno et al. (2019) in their research on the attitudes, study habits, and academic performance of junior high school mathematics students, the researchers discovered that the students' attitudes and math study habits have a role in their success in school. Moreover, study skills significantly correlated with the scholastic performance of the learners. If the learner has good study skills, he/she will expect to have an excellent academic result. However, this study contrasts with the result of the research of Tus et al. (2020) in Bocaue, Bulacan. Results revealed that academic achievement does not statistically relate to the learning behaviors of the learners. Still, the students should be able to learn the patterns of study skills.

Moreover, research was done on the academic performance and engagement of the students at Partido State University in Camarines Sur. The concluded result is a positive relationship between the two variables. Still, among the three indicators being used, behavioral engagement got the highest result. Students work hard to have good grades, and they achieve it by concentrating on the lesson and studying late. Therefore, they were appreciated by the teachers by giving a prompt written or verbal analysis of their academic progress (Delfino, 2019).

In addition, another study on achievement goals and mathematics performance was conducted at Bulacan State University. In terms of the relationship between achievement goals and mathematical performance, there is a strong correlation (except for the performance approach and mathematics performance). Furthermore, the goal of the performance-based approach does not accurately predict learners' mathematics performance (Ignacio & Policarpio, 2016).

Likewise, a significant study on mathematics achievement as impacted by study skills and anxiety of the students was conducted at Davao Oriental State College of Science and Technology in Mati City. Conducted by Salimaco (2020) revealed the two factors affecting students' math achievement. It showed a very high considerable correlation between the two variables and the student's mathematics achievement. Also, the study revealed that for every unit of increase in study skills, there is a considerable increase in mathematics achievement. In the same manner, in every unit of rise in mathematics anxiety, there is a decline in mathematics achievement.

Furthermore, additional studies on study skills have proven that it impacts several dimensions of the students. Students who are underprepared to take courses in college manifest a lower self-efficacy and cause a lower academic rank. Academically underprepared students had a lower level of study skills and self-efficacy. Study skills courses appear to substantially improve the learners' self-efficacy and academic standing (Wernersbach, Crowley, Bates, & Rosenthal, 2014).

1.2. Research Objectives

The main objective of this study was to determine the significant influence of mathematics study skills and mathematics engagement in the mathematics achievement goals of the students at the tertiary level. Specifically, this study endeavors to answer the following:

1. To determine the level of mathematics study skills of the tertiary students in terms:
 - 1.1. Time and place of study.
 - 1.2. Study strategies for class.
 - 1.3. Math tests; and
 - 1.4. Anxiety.
2. To determine the level of mathematics engagement of tertiary students in terms of:
 - 2.1. Cognitive engagement.
 - 2.2. Affective engagement; and
 - 2.3. Behavioral engagement.
3. To determine the level of mathematics achievement goals in terms of:
 - 3.1. Mastery goal orientation
 - 3.2. Performance – approach
 - 3.3. Performance – avoidance
4. To determine the significant relationship between:
 - 4.1. Mathematics study skills and mathematics achievement goals.
 - 4.2. Mathematics engagement and mathematics achievement goals.
5. To determine which domain in mathematics study skills predicts mathematics achievement goals.
6. To determine which domain in mathematics engagement predicts mathematics achievement goals.

1.3. Research Hypothesis

The following hypotheses were tested at a 0.05 level of significance.

1. There is no significant relationship between mathematics study skills and mathematics achievement goals among tertiary students.
2. There is no significant relationship between mathematics engagement and mathematics achievement goals among tertiary students.
3. There is no domain in mathematics study skills that will significantly predict mathematics achievement goals among tertiary students.
4. There is no domain in mathematics engagement that will significantly predict mathematics achievement goals among tertiary students.

1.4. Theoretical Framework

The theoretical framework behind this research study is based on the Achievement Goal Theory introduced by Dweck and Leggett (1988). A socio-cognitive theory called the Achievement Goal Theory aims to explain how students approach academic assignments, how motivated they are to complete them, and the motivations behind the behavioral patterns they use to do so. Dweck distinguished two significant categories of underlying goal orientations: learning goals, in which people aim to improve their competence, comprehension, or master something new, and performance goals, in which people aim to receive favorable evaluations of their competence or to avoid receiving unfavorable evaluations.

Goal theory claims that goals are what give an action value or meaning. In the psychological literature, a person's motivation or desired result is typically considered to be their goal. In a nutshell, achievement goal theory describes the several types of goals (purposes or reasons) that influence behaviors associated with achievement. The philosophy of achievement goals emphasizes comprehending why rather than what people aim to accomplish (Maehr & Zusho, 2009).

Locke and Latham's (1990) Goal-Setting Theory of Motivation heavily emphasizes the crucial link between performance and goals. According to research, performance tends to be most successful when goals are specific and challenging, when they are used to evaluate performance and link to feedback on results, and when they encourage acceptance and involvement. Self-efficacy and ability are two variables that may moderate how motivating goals are for people. When goals have deadlines, they are more effective. Performance improves when learning goals are prioritized (Lunenburg, 2011).

Kearsley and Schneiderman proposed the Engagement Theory in 1998 as a paradigm for technology-based instruction and learning. Its basic tenet is that students must be actively involved in learning activities through social contact and worthwhile work.

Cognitive Learning Theory, originally coined by Jean Piaget in 1936, suggests that learners actively generate knowledge based on previously acquired knowledge. According to cognitive learning theory, a person's mental internal, and external factors may impact processes to facilitate learning.

Achievement goals and students' academic engagement have been found to have a strong association, specifically in terms of their behavioral and cognitive domains. By the end of every school year, mastery approach goals are expected, and there will be more significant usage of cognitive and metacognitive strategies in academic work (Duchesne et al. 2017).

Additionally, another study looks at how adopting each achievement goal affects students' behavior and academic results. This study assumes that the level of engagement will depend on the adopted orientation because goals affect the cognitive and self-control strategies used in learning situations. Students who believe they are good learners are more likely to be competent and interested, establish objectives, use learning techniques, check in with their work frequently, and build supportive surroundings (Veiga et al., 2013).

Achievement goals were better indicators of certain study activities even when they were not measured. Avoidance goals also predicted students' susceptibility to be swayed by impending deadlines and to believe that studying late at night would be most effective. All of these characteristics are in line with previous research, which indicates that avoidance goals are linked to less proactive and organized learning approaches (Geller et al., 2018).

While mastery approach goals did not directly predict the usage of deep learning study techniques or interest-based learning, they did inspire high utility value. Utility value provided a loose connection between the objectives of the mastery method and each technique, predicting both the employment of a deep learning strategy and an interest-based studying strategy. The unexpected direct advantage of mastery approach objectives on exam performance was canceled out by deep learning and interest-based studying techniques, which exhibited little or negative impact on exam performance, respectively. The high accomplishment was also connected to the performance

objectives (Senko et al., 2013).

1.5. Conceptual Framework

The first independent variable in this study is mathematics study skills (Medallon, 2016), with the following indicators: time and place of studying, study strategies for class, math tests, and anxiety. *Time and place of studying* in this study refer to the specific location and time the student's study. It also includes the number of times the students study their lessons. *Study strategies for class* in this study refer to the approaches the students have taken to take in new learning information presented to them. It includes the ways students have effectively gauged the new learning presented. *Math test*, in this study, refers to the strategies the students will do before, during, and after the math test is taken. It also includes the student's ability to carry out test procedures flexibly, accurately, efficiently, and strategically. *Anxiety*, in this study, refers to the students' beliefs in themselves that they can succeed in math and the things that they do so that they can avoid panic and tensions that could interfere with math performance.

The second independent variable of this study is mathematics engagement (Wong, Lam, & Kong, 2003), with the following indicators: cognitive engagement, affective engagement, and behavioral engagement. *Cognitive engagement*, in this study, refers to the degree to which students are willing and capable of tackling the current learning task. This includes how much time and effort students will put into completing the activity. *Affective engagement*, in this study, refers to the student's emotional attachment to what they are learning. It also implies a sense of belonging and acceptance of the educational goals. *Behavioral engagement* refers to students' participation in academic activities and efforts to complete academic tasks. It is a progression of increasing participation.

The dependent variable of this study is mathematics achievement goals (Rameli & Koznin, 2017) with the following indicators: mastery goal orientation, performance-approach, and performance-avoidance. *Mastery goal orientation* in this study refers to the students mastering learning new abilities, enhancing understanding, and increasing proficiency. Success for students who set mastery goals is defined in terms of improvement and learning. *Performance-approach* goals in this study refer to the student's motivation to outperform others and demonstrate their superiority. Learners who are concerned about their performance or grade have a performance-approach goal orientation. External factors drive them. *Performance-avoidance* in this study refers to the student's motivation to avoid failure in front of others. A dread of bad performance motivates them extrinsically.

2. Method

The methodology that was applied in this quantitative investigation is discussed in this chapter. It considers the research design, the subject, the instrument, the technique for data gathering, and the statistical analysis of the data.

2.1. Research Design

This quantitative non-experimental study described the potential presence of a link between two defined variables. It uses a descriptive correlational and causal-comparative research methodology. It assessed the possible direction and degree of that association. The descriptive correlation approach was chosen when the goal was to provide a detailed account of the situation at the time of the study to understand better what factors may have contributed to certain phenomena.

A correlational research design is one in which the researcher does not attempt to control or influence any of the investigated variables. The intensity and direction of the relationship between two (or more) variables can be reflected by a correlation between those variables (Bhandari, 2021). This study also utilized causal-comparative design to determine the relationships between mathematics study skills,

mathematics achievement goals, and mathematics engagement and achievement goals. Research with a causal-comparative design compares two or more groups of people to see if there is a difference in how the independent variable affects the outcome of the dependent variable (Salkind, 2010).

This descriptive research concentrated on the phenomenon's quantitative data. The quantitative component consists of a schedule for data collection that enables the intended respondents to answer the questions. During the data collection procedure, questionnaires were utilized to acquire the data.

2.2. Population and Sample

Cluster sampling was used to choose the participants in the survey. Out of all the tertiary education institutions, three schools were picked as a representative sample for the entire population.

The respondents of this study were tertiary students enrolled in Teacher Education who have undertaken a mathematics subject in the conduct of the study or have taken it in the last term or semester both in public and private schools. There is no restriction on the year level of the students. Students in all year levels, male and female, and ages ranging from 18 – 30 years old, can participate in this study.

Tertiary students who were enrolled in other courses outside of Teacher Education were excluded from this study. There were no negative consequences if a respondent decided to withdraw from the study. The participants can withdraw their participation at any time and are free to choose whether to answer any particular question. The researcher ensured that the confidentiality of the research data was always preserved. The participating schools are a few of Tagum City's most respected higher education institutions. One of which is producers of licensure examination top notchers in different fields.

2.3. Research Instrument

The researcher used an adapted questionnaire for independent and dependent variables to make the data more relevant to the study's setting. The researcher used data from the relevant literature to develop a questionnaire, which was then tested by an expert panel of researchers inside and outside the institution. A demographics questionnaire and three separate questionnaires measuring the independent and dependent variables were sent to the respondents.

The first set of questionnaires dealt with the level of mathematics study skills that the students may possess with indicators of time and place of studying, study strategies for class, math tests, anxiety, and motivation. The instrument used in this study was adopted from the standardized Mathematics Study Skills Inventory created by Hopper (1993) in her book entitled "The Study Skills Workbook" page 117. It was modified by Medallon (2016) in her study entitled "Math Study Skills and Attitude Towards Mathematics and Statistics as Antecedents of Statistics Learning."

The adapted survey was modified to match the needs of the school. The original items were shortened or rephrased to help the respondents comprehend them better. An expert panel verified the information. The participants were asked to use a five-point Likert scale with the anchors (5) Very High, (4) High, (3) Moderate, (2) Low, and (1) Very Low to assess the level of their aptitude for studying mathematics for each topic.

Mathematics study skills were evaluated using a five-point scale with corresponding ranges of means and descriptions.

Range of Means	Descriptive Equivalent	Interpretation
4.20 - 5.00	Very High	It indicates that mathematics study skills are very much felt among the students.

3.40 - 4.19	High	It indicates that mathematics study skills are much felt among the students.
2.60 - 3.39	Moderate	It indicates that mathematics study skills are felt among the students.
1.80 - 2.59	Low	It indicates that mathematics study skills are rarely felt among students.
1.00 - 1.79	Very Low	It indicates that students do not feel mathematics study skills.

The second set of questionnaires tested the mathematics engagement of the students. It is composed of three indicators, namely: cognitive engagement, behavioral engagement, and affective engagement. The research instrument used for this variable was adopted from a 57-item Student Engagement in the Mathematics Classroom Scale developed by Kong, Wong, and Lam (2003) in their work entitled “Student Engagement in Mathematics: Development of Instrument and Validation of Construct.”

The adopted questionnaire was further modified and simplified to fit the study. The expert group had approved the content. The respondents were asked to use a five-point Likert scale with the anchors (5) Very High, (4) High, (3) Moderate, (2) Low, and (1) Very Low to score their degree of engagement in mathematics for each topic.

Mathematics engagement was evaluated using a five-point scale with corresponding ranges of means and descriptions.

Range of Means	Descriptive Equivalent	Interpretation
4.20 - 5.00	Very High	It indicates that mathematics engagement is very much felt among the students.
3.40 - 4.19	High	It indicates that mathematics engagement is much felt among the students.
2.60 - 3.39	Moderate	It indicates that mathematics engagement is felt among the students.
1.80 - 2.59	Low	It indicates that mathematics engagement is rarely felt among students.
1.00 - 1.79	Very Low	It indicates that students do not feel mathematics engagement.

The third set of instruments tested the mathematics achievement goals of the students. It is composed of three indicators, namely: mastery goal orientation, performance approach, and performance avoidance. The questionnaire used in this variable was adopted from the Achievement Goals Questionnaire developed originally by Eliott and Church (1997) in the context of general academic courses. It was modified and translated into a mathematical context by Rameli and Koznin (2017) to fit their study entitled “A Survey on Mathematics Achievement Goals Orientation Among Malaysian Students: Application of Rasch Measurement.”

The original questionnaire was again modified for the purpose and to fit the context of this study. The panel of validators approved its content. The five-point Likert Scale with an anchor of (5) Very High, (4) High, (3) Moderate, (2) Low, and (1) Very Low was used to ask the respondents to assess the degree of

mathematics success goals for each item.

When assessing the perceived level of mathematics achievement goals, the following five orderable degrees were considered, along with their corresponding Ranges of Means and descriptions:

Range of Means	Descriptive Equivalent	Interpretation
4.20 - 5.00	Very High	It indicates that mathematics achievement goals are very much felt among the students.
3.40 - 4.19	High	It indicates that mathematics achievement goals are much felt among the students.
2.60 - 3.39	Moderate	It indicates that mathematics achievement goals are felt among the students.
1.80 - 2.59	Low	It indicates that mathematics achievement goals are rarely felt among students.
1.00 - 1.79	Very Low	It indicates that mathematics achievement goals are not felt among the students.

2.4. Data Collection

The researcher had gone through the subsequent processes and procedures in acquiring the data for the study.

Both internal and external validators evaluated the questionnaires at the researcher's request. The researcher then sent a letter of approval to the school officials requesting their authorization to perform the study. The approval letter aimed to allow the researcher to supervise the survey forms given to study participants. Similarly, the researcher requested teacher permission before distributing survey questionnaires to each student. Moreover, the researcher made another letter of authorization addressed in general to the students. The researcher uploaded the approved questionnaire and the letter to students in Google forms used in the survey.

Additionally, the researcher provided the students with a link to Google Forms and then retrieved the survey questionnaire once all the respondents had responded. Finally, the data were tabulated, analyzed, and interpreted with the utmost confidentiality. All the data was gathered and endorsed to the statistician for computation, tabulation, and analysis. In obtaining all relevant data, the researcher was very thankful for the complete trust and cooperation of the respondents towards the researcher.

2.5. Statistical Tools

At the 0.05 level of significance, the responses to the questions were processed using the following statistical methods. The answers to the survey questions were totaled, tabulated, and then interpreted as necessary. The following statistical techniques were applied to the analysis and interpretation of the data:

Mean. This was used to determine the level of mathematics study skills, mathematics engagement, and mathematics achievement goals of the tertiary students.

Pearson-r. This statistical tool was used to determine the significance of the relationship between mathematics study skills and mathematics achievement goals, and mathematics engagement and mathematics achievement goals among tertiary students.

Linear Regression Analysis. This statistical tool was used to determine if mathematics study skills and mathematics engagement predicts mathematics achievement goals among tertiary students.

3. Results and Discussion

To identify which domain would substantially predict Mathematics Study Skills and Mathematics Engagement to Mathematical Achievement Goals, data from the research instruments utilized in the study were examined, evaluated, and reported in this section.

3.1. Level of Mathematics Study Skills Among Students

Table 1 shows the level of mathematics study skills among students in terms of *time and place of studying, study strategies for class, math tests, and anxiety*. The overall mean is 3.897, and the standard deviation of 0.624, which is described as high. Among all four indicators, *math tests* got the highest mean of 4.042 with a standard deviation of 0.692 and described as high. It was followed by *study strategies for class* with a mean of 3.997 with a standard deviation of 0.648 and described as high. Next, *time and place of studying* got a mean of 3.780 with a standard deviation of 0.715 and was described as high. Finally, *anxiety* attained a mean score of 3.768 with a standard deviation of 0.758 and was described as high. All indicators have a descriptive equivalent of high. This indicates that mathematics study skills were much felt among the students. As for anxiety, it further means that students experienced a low level of negative anxiety.

The indicator *math tests* got the highest mean score of 4.042 among all the other indicators. The item *I make notes on things such as formulas that I might need before I begin my math test* got the highest mean score of 4.21 and a standard deviation of 0.83, which was described as very high. It was followed by the item *I began with the easy questions first in answering my math test* with a mean score of 4.14 and a standard deviation of 0.89, which was described as high. Next, the items *I took the full amount of time allotted for the test* and *I preview the test before I begin* got an equal mean of 4.12 and standard deviation of 0.84 and 0.82, respectively, with an equivalent description of high. Followed the item *I keep up to date so that I don't have to cram the night before a test* with a mean score of 3.93 and a standard deviation of 0.82 which was described as high. Lastly, the item *I keep a log of the types of mistakes I make on tests after the tests were returned* got the lowest mean score of 3.74 and standard deviation of 0.91, which was also described as high.

The second indicator with the highest mean score of 3.997 and a descriptive equivalent of high was attained by *study strategies for class*. The item *I copy carefully all the steps of math problems in my notes* got the highest mean score of 4.35 with a standard deviation of 0.82 and a descriptive equivalent of very high. It was followed by the items *I take down notes in math class* with a mean score of 4.31 and standard deviation of 0.82, which has a descriptive equivalent of very high. Next, the item *I ask questions about when I am confused* got a mean score of 4.15 with a standard deviation of 0.88 and a descriptive equivalent of high. Followed by the item, *I developed memory techniques to remember Math concepts* and got a mean score of 3.93 with a standard deviation of 0.79 and described as high. After that, the item *I read in my textbook before I came to class* got a mean score of 3.67 with a standard deviation of 0.86 and a descriptive equivalent of high. Lastly, the item *I use index cards for formulas and vocabulary* got the lowest mean of 3.58 and standard deviation of 0.99 with a descriptive equivalent of high.

The third indicator with the highest mean score of 3.780 and a descriptive equivalent of high was acquired by *time and place of studying*. The item *I keep my math homework up to date* got the highest mean score of 3.99 with a standard deviation of 0.86 and a descriptive equivalent of high. It was followed by the items *I do my homework in a place where I can get help* with the mean score of 3.98 and standard deviation of

0.82, which has a descriptive equivalent of high. Next, the item *I went to a specific place with few distractions to study math* got a mean score of 3.88 with a standard deviation of 0.95 and a descriptive equivalent of high. Followed by the item, *I scheduled a specific time to study math* and got a mean score of 3.69 with a standard deviation of 0.93 and described as high. After that, the item *I started my math homework immediately after my math class* got a mean score of 3.69 with a standard deviation of 0.90 and a descriptive equivalent of high. Lastly, the item *I study math subject every day during the semester* got the lowest mean of 3.44 and standard deviation of 0.83 with a descriptive equivalent of high.

The last indicator, *anxiety*, got the lowest mean score of 3.768 and a descriptive equivalent of high. Data showed that the item *I believe that I can succeed in math class* got the highest mean of 3.98 with a standard deviation of 0.87 and described as high. It was followed by the item *I take practice problems in math* with a mean of 3.80 and standard deviation of 0.90 with the descriptive equivalent of high. Next, the item *I find that at times studying this course gives me a feeling of deep personal satisfaction* got a mean of 3.80 and a standard deviation of 0.91 with the description of high. Followed by the item, *I conditioned myself to get high marks in math*, with a mean of 3.79 with a standard deviation of 0.91, which was described as high. After that, the item *I had study partners in my math class* got a mean score of 3.68 and a standard deviation of 1.00, which was described as high. Lastly, the item *I know of several good relaxation techniques* got the lowest mean of 3.57 with a standard deviation of 0.92 and the descriptive equivalent of high.

Table 1. *Level of Mathematics Study Skills among Students*

Indicators	Mean	SD	Descriptive Equivalent
Time and Place of Studying	3.780	0.715	High
Study Strategies for Class	3.997	0.648	High
Math Tests	4.042	0.692	High
Anxiety	3.768	0.758	High
Overall	3.897	0.624	High

3.2. *Level of Mathematics Engagement among Students*

Table 2 presents the students' level of mathematics engagement in terms of *cognitive*, *affective*, and *behavioral engagement*. The overall mean of mathematics engagement was 3.953, with a standard deviation of 0.669 with a descriptive equivalent of high. This indicates that mathematics engagement was much felt among the students.

Among the three indicators, *behavioral engagement* got the highest mean of 4.063 with a standard deviation of 0.712 and was described as high. This was followed by *cognitive engagement* with the second highest mean score of 3.958 and standard deviation of 0.719, with an equivalent description of high. Lastly, *affective engagement* got the lowest mean score of 3.837, a standard deviation of 0.739, and a descriptive equivalent of high.

The indicator with the highest mean score of 4.063 and a descriptive equivalent of high was achieved by *behavioral engagement*. The item *I listen to the teacher's instruction attentively* got the highest mean score of 4.24 and standard deviation of 0.82 with a descriptive equivalent of very high. It was followed by the item *I will work until I have corrected my mistakes in solving the problem* with a mean score of 4.13 and a standard deviation of 0.78, which was described as high. Next, the item *I tried to solve again if I could not tackle the problem*, attained a mean of 4.10 and a standard deviation of 0.87 and was described as high. Followed by the item *I gave enough time in studying mathematics classes* and got a mean score of 3.93 with a standard deviation of 0.84 and the descriptive equivalent of high. Lastly, the item *I took part in the discussion in the*

mathematics class got the lowest mean score of 3.92 with a standard deviation of 0.86 and a descriptive equivalent of high.

The second indicator, *cognitive engagement*, acquired the second highest mean of 3.958 with a descriptive equivalent of high. The item *I solve problems according to what the examples are shown with* the highest mean of 4.12 and a standard deviation of 0.85 with the descriptive equivalent of high. It was followed by the item *I find it useful to memorize the methods for solving word problems* with a mean of 4.02 and standard deviation of 0.85 with a description of high. Next, the item *I find memorizing formulas is the best way to learn mathematics* acquired a mean score of 4.01 and a standard deviation of 0.84 with a descriptive equivalent of high. Followed by the item, *I learned the way the teacher teaches*, with a mean score of 3.96 with a standard deviation of 0.84 and was described as high. Then, the item *I think about what I have already learned and try to get a new understanding of what I know* got a mean score of 3.96 with a standard deviation of 0.86 and was described as high. Succeeded by the item, *I connect what I learned in mathematics with what I encounter in real life or other subjects* with a mean of 3.88 and standard deviation of 0.89 with the descriptive equivalent of high. Lastly, the item *I used my spare time to study the topics we discussed in the class* got the lowest mean of 3.76 with a standard deviation of 0.89 and was described as high.

The indicator with the lowest mean of 3.837 and was described as high was attained by *affective engagement*. The item *I am satisfied with when I get good results after making an effort in a tough mathematics problem* got the highest mean of 4.19 and standard deviation of 0.86 with a description of high. It was followed by the item *I find mathematics knowledge interesting and enjoyable* with a mean of 3.90 and a standard deviation of 0.88 with a descriptive equivalent of high. Next, the item *I like attending mathematics classes* acquired a mean of 3.87 and a standard deviation of 0.88, which was described as high. Then, the item *I felt excited when we start a new topic in mathematics* got a mean of 3.71 with a standard deviation of 0.90 and a descriptive equivalent of high. Lastly, the item *I am not afraid that I will get poor results in mathematics tests* got the lowest mean score of 3.52 and a standard deviation of 1.06 with a descriptive equivalent of high.

Table 2. *Level of Mathematics Engagement among Students*

Indicators	Mean	SD	Descriptive Equivalent
Cognitive Engagement	3.958	0.719	High
Affective Engagement	3.837	0.739	High
Behavioral Engagement	4.063	0.712	High
Overall	3.953	0.669	High

3.3. *Level of Mathematics Achievement Goals among Students*

Shown in Table 3 is the level of mathematics achievement goals as experienced by the students in terms of *mastery goal orientation*, *performance – approach*, and *performance-avoidance*. The overall mean of mathematics achievement goals is 3.931, with a standard deviation of 0.651 and a descriptive equivalent of high. This indicates that mathematics achievement goals were much felt among the students.

Among all the indicators, *mastery goal orientation* got the highest mean score of 4.140, a standard deviation of 0.717, and a verbal descriptive equivalent of high. It was followed by the indicator *performance – avoidance* with a mean of 3.897 and a standard deviation of 0.717 which was described as high. Lastly, the indicator *performance – approach* got the lowest mean score of 3.755 and standard deviation of 0.846 with the equivalent description of high.

The first indicator with the highest mean score and a descriptive equivalent of high was achieved by *mastery goal orientation*. The data displayed that the item *I believe that it is important for me to understand the content of mathematics subject as thoroughly as possible* got the highest mean score of 4.31 and standard deviation of 0.81 with a descriptive equivalent of very high. It was followed by the item *I aim to*

enhance my mathematics skills in mathematics learning which got a mean of 4.17 and a standard deviation of 0.80 with a verbal description of high. Next, the item *I did my homework to get better at the topic presented* acquired a mean of 4.15 and a standard deviation of 0.80 with a descriptive equivalent of high. Then, the item *I desire to completely master the material presented in mathematics* with a mean of 4.09 and a standard deviation of 0.83, which was described as high. Lastly, the item *I prefer material that challenges me so I can learn new things*, got the lowest mean of 3.97 and a standard deviation of 0.85 with a descriptive equivalent of high.

The second indicator with the highest mean score of 3.897 and the descriptive equivalent of high was achieved by *performance-avoidance*. It was revealed that the item *I worry about the possibility of getting a bad grade in mathematics class* got the highest mean of 4.09 and a standard deviation of 0.85 with a description of high. It was followed by the item *I want to avoid doing poorly in mathematics class* with a mean of 4.06 and a standard deviation of 0.81, which has a descriptive equivalent of high. Next, the item *I fear performing poorly in mathematics class motivates me to attain* a mean score of 3.85 and a standard deviation of 0.85 and with the descriptive equivalent of high. Then, the item *I want to avoid looking like I can't do my work in math* got a mean of 3.80 and a standard deviation of 0.89, which is described as high. Lastly, the item *I am afraid that if I ask my teacher a mathematics question, they might think I am not smart*, got the lowest mean of 3.68 and a standard deviation of 1.02 with a descriptive equivalent of high.

The indicator *performance – approach* achieved the lowest mean score of 3.755 with a descriptive equivalent of high. The item *I am determined to get a better grade than most of the students in Mathematics* got the highest mean of 3.86 and a standard deviation of 0.90, which was described as high. It was followed by the item *I feel motivated by the thought of outperforming my peers in the mathematics class* with a mean of 3.79 with a standard deviation of 0.95 and a descriptive equivalent of high. Next, the item *I know that it is important to me to do well compared to others in mathematics subject* reached a mean score of 3.74 and a standard deviation of 0.94 and was described as high. Then, the item *I need to do better than the other students in mathematics subject* got a mean score of 3.72 and a standard deviation of 0.94 with the descriptive equivalent of high. Lastly, the item *I intend to do well in mathematics class to show my ability to others* got the lowest mean of 3.66 and a standard deviation of 1.02 and was described as high.

Table 3. *Level of Mathematics Achievement Goals among Students*

Indicators	Mean	SD	Descriptive Equivalent
Mastery Goal Orientation	4.140	0.717	High
Performance – approach	3.755	0.846	High
Performance – avoidance	3.897	0.717	High
Overall	3.931	0.651	High

3.4. Significance of the Relationships of the Domains of Mathematics Study Skills to Mathematics Achievement Goals Among Students

Presented in Table 4 are the four indicators that reveal the significant relationship between Mathematics Study Skills and Mathematics Achievement Goals among students. The *r*-value of time and place of studying and mathematics achievement goals is 0.608 with a *p*-value of 0.001, which shows a strong positive correlation. In addition, the *r*-value between study strategies for class and mathematics achievement goals yielded a result of 0.612 with a *p*-value of 0.001, which shows a strong positive correlation. Similarly, the *r*-value between math tests and mathematics achievement goals is 0.604, which presents a strong positive correlation. Lastly, the *r*-value of anxiety and mathematics achievement goals yielded a result of 0.691 with a *p*-value of 0.001, which revealed a strong positive correlation. This further means that as the students experienced less anxiety, the higher they felt the achievement goals in math.

Since the table shows that the indicators time and place of study, study strategies for class, math tests, and anxiety have a probability level of 0.001 which was less than the significance level at 0.05, the null hypothesis that "there is no significant relationship between mathematics study skills and mathematics achievement goals among students" has been rejected. The strong correlation of the variables showed that all indicators: time and place of studying, study strategies for class, math tests, and anxiety, have a significant relationship towards mathematics achievement goals.

Table 4. *Significance on the Relationships of the Domains of Mathematics Study Skills to Mathematics Achievement Goals Among Students*

Independent Variable	Dependent Variable	r-value	r-squared	p-value	Decision
Time and Place of Studying	Mathematics Achievement Goals	0.608*	0.3697	0.001	Ho is Rejected
Study Strategies for class		0.612*	0.3745	0.001	Ho is Rejected
Math Tests		0.604*	0.3648	0.001	Ho is Rejected
Anxiety		0.691*	0.4775	0.001	Ho is Rejected

*p<0.05

3.5. *Significance of the Relationship of the Domains of Mathematics Engagement in Mathematics Achievement Goals among Students*

Shown in Table 5 are the three (3) indicators that showed the significant relationship between Mathematics Engagement and Mathematics Achievement Goals among students. The r-value between cognitive engagement and mathematics achievement goals is 0.734, with a p-value of 0.001, which showed a strong positive correlation. Moreover, the r-value between affective engagement and mathematics achievement goals yielded a result of 0.683 with a p-value of 0.001, which presents a strong positive correlation. Lastly, the r-value of behavioral engagement and mathematics achievement goals is 0.707 with a p-value of 0.001, which showed a strong positive correlation.

Table 5 demonstrated that the probability level for cognitive, affective, and behavioral involvement markers is 0.001, which is lower than the significance level of 0.05. Therefore, the null hypothesis claims that "there is no significant relationship between mathematics engagement and mathematics achievement goals among students" was not accepted. The strong interdependence of the variables showed that the three (3) indicators- cognitive engagement, affective engagement, and behavioral engagement- have a significant relationship with mathematics achievement goals.

Table 5. *Significance of the Relationship of the Domains of Mathematics Engagement to Mathematics Achievement Goals Among Students*

Independent Variable	Dependent Variable	r-value	r-squared	p-value	Decision
Cognitive Engagement	Mathematics Achievement Goals	0.734*	0.5388	0.001	Ho is Rejected
Affective Engagement		0.683*	0.4665	0.001	Ho is Rejected
Behavioral		0.707*	0.4998	0.001	Ho is Rejected

Engagement

* $p < 0.05$

3.6. Regression Analysis on the Influence of the Domains of Mathematics Study Skills to Mathematics Achievement Goals among Students

Presented in Table 6 is the regression analysis on the influence of the domains of Mathematics Study Skills on Mathematics Achievement Goals among students. The table reveals an F-ratio of 107.670 and a p-value of 0.001, which was far less than the 0.05 level of significance. This enabled the researcher to reject the null hypothesis, which states that no domain of mathematics study skills significantly predicts mathematics achievement goals among students.

The r-value of 0.724 indicated a strong positive relationship between mathematics study skills and mathematics achievement goals among students. The coefficient of determination (r^2) which is 0.524, connotes that 52.40% of the variation in the level of mathematics study skills experienced by the students could be attributed to the level of mathematics achievement goals experienced by the students. The remaining 47.60% is a chance variation which suggests that other factors beyond the scope of this study may also be attributed to mathematics achievement goals among the students.

The indicator *anxiety* has a beta of 0.431 and a p-value of 0.001 which is less than the level of significance at 0.05. This indicates that *anxiety* is the domain of mathematics study skills that has a significant influence on mathematics achievement goals. The said indicator also got the highest beta compared to the other domains, indicating that this is the strongest domain among all the given indicators. This further means that the lesser anxiety the students felt could influence more positive mathematics achievement goals.

Also, the indicator *time and place of study* have a beta of 0.149 and a p-value of 0.008, which is less than the significance level of 0.05. This indicates that *time and place of study* is the domain of mathematics study skills, which significantly influences mathematics achievement goals. The said indicator also got the second highest beta among all other domains, which indicates that this is the second strongest domain among all the given indicators.

Table 6. Regression Analysis on the Influence of the Domains of Mathematics Study Skills on Mathematics Achievement Goals among Students

Independent Variable	Unstandardized Coefficients		Standardized Beta Coefficients	t-value	p-value	Decision
	B	SE				
(Constant)	1.151			7.810	0.001	
Time and Place of Study	0.135	0.046	0.149*	2.676	0.008	Ho is Rejected
Study Strategies for class	0.093	0.060	0.093*	1.430	0.153	Ho Not Rejected
Math tests	0.123	0.054	0.131*	2.134	0.033	Ho is Rejected
Anxiety	0.370	0.047	0.431*	7.848	0.001	Ho is Rejected
Dependent Variable: Mathematics Achievement Goals						
* $p < 0.05$	$r = 0.724$	$r^2 = 0.524$	F-ratio = 107.670	p-value = 0.001		

Similarly, *math tests* have a beta of 0.131 and a p-value of 0.033, which is less than the level of significance at 0.05. This indicates that *math tests* are the domain of mathematics study skills that significantly influence mathematics achievement goals. The said indicator also got the third highest beta among all other domains, which indicates that this is the third strongest domain among all the given indicators.

In addition, *study strategies for class* have a beta of 0.093 with a p-value of 0.153, which is greater than the significance level at 0.05. This implies that *study strategies for class* have no significant influence on mathematics achievement goals as experienced by the students.

3.7. Regression Analysis on Influence of the Domains of Mathematics Engagement in Mathematics Achievement Goals among Students

Table 7 shows the regression analysis on the influence of the domains of Mathematics Engagement on Mathematics Achievement Goals among students. The table shows an F-ratio of 118.815 and a p-value of 0.001, which is less than the 0.05 level of significance. This enabled the researcher to reject the null hypothesis, which states there is no domain of mathematics engagement that significantly predicts mathematics achievement goals among students.

The r-value of 0.769 indicated a strong positive relationship between mathematics engagement and mathematics achievement goals among students. The coefficient of determination (r^2) which is 0.591, connotes that 59.10% of the variation in the level of mathematics engagement experienced by the students could be attributed to the level of mathematics achievement goals experienced by the students. The remaining 40.90% is a chance variation which suggests that other factors beyond the scope of this study may also be attributed to mathematics achievement goals among the students.

The indicator *cognitive engagement* has a beta of 0.376 and a p-value of 0.001, which is less than the level of significance at 0.05. This indicates that *cognitive engagement* is the domain of mathematics engagement that has a significant influence on mathematics achievement goals. The said indicator also got the highest beta compared to the other domains, indicating that this is the strongest domain among all the given indicators.

Table 7. Regression Analysis on the Influence of the Domains of Mathematics Engagement to Mathematics Achievement Goals among Students

Independent Variable	Unstandardized Coefficients		Standardized Beta Coefficients	t-value	p-value	Decision
	B	SE				
(Constant)	0.969			7.627	0.001	
Cognitive Engagement	0.340	0.056	0.376*	6.236	0.001	Ho is Rejected
Affective Engagement	0.178	0.049	0.202*	3.697	0.001	Ho is Rejected
Behavioral Engagement	0.229	0.056	0.251*	4.293	0.001	Ho is Rejected
Dependent Variable: Mathematics Achievement Goals						
*p < 0.05	r = 0.769	r ² = 0.591	F-ratio = 118.815	p-value = 0.001		

Similarly, *behavioral engagement* has a beta of 0.251 and a p-value of 0.001, which is less than the level of significance at 0.05. This also implies that *behavioral engagement* is one of the domains of mathematics engagement that significantly influences mathematics achievement goals. The said indicator also got the second highest beta among the three domains, which indicates that this is the second strongest domain among all the given indicators.

Lastly, *the affective domain* got a beta of 0.202 and a p-value of 0.001, which is less than the level of significance at 0.05. This also indicates that *affective engagement* is the domain of mathematics engagement that has a significant influence on mathematics achievement goals. The said indicator also got the lowest beta among the three indicators.

4. Discussion, Conclusion, and Recommendation

This section offers additional research and related work on the study's findings, the conclusions reached and the helpful and pertinent recommendations made by the researcher in light of those findings.

4.1. Level of Mathematics Study Skills Among Students

The data presented in the preceding chapter was the level of students' mathematics study skills. The level of mathematics study skills was described as high. It suggests that students felt mathematics study skills.

Md Rahim and Meon (2013) stressed the importance of study skills for students to complete a university degree program successfully. Students must possess good study skills to achieve the required academic requirements. Numerous studies verify this assumption by revealing a correlation between positive study skills and academic achievement among college and university students. Considering this, schools must assess their students' study habits and provide remedial education and guidance to those who need it.

The findings also demonstrated that the levels of time and place of studying, study strategies for class, math tests, and anxiety were all high. It indicates that the students were quite anxious about the appropriate time and location for studying, as well as math assessments and study strategies.

The students' skills to study in terms of the amount of time spent studying, and the location of their studies was described as high and interpreted as much felt by the students. Significantly, Ukpong and George (2013) found that students who study for a more extended period have quite different academic accomplishments than those who look for a shorter period. It is also supported by Palm Beach's Study Time Learning Theory introduced by Professor Palm Beach, which demonstrates how study time can be used to predict and influence learning outcomes and behaviors. It lays the foundation for determining how study time affects students' learning outcomes.

In addition, study skills in terms of study strategies for the class were described as high and found to be much felt by the students, as found in the result. The study skills that student uses play a role in how successful they are. No one study strategy gets the job done for everyone. The key is to develop the ability to identify the specific personal study strategies that work best for everyone under their unique set of variables. To effectively manage time and study, one must be completely aware of themselves. It requires knowledge of the various study strategies that are available to use (Mutsotso & Abenga, 2010).

Similarly, study skills in terms of math tests were also high and found to be much felt among the students, as shown in the result. Dodeen (2015) affirmed that some students perform poorly on tests because of inadequate usage of test-taking approaches. These strategies have a direct and indirect impact on students' performance. By making the most of their time, effort, and testing circumstances, these strategies directly help students improve their test results. Employing successful test-taking techniques

indirectly affects other essential but related elements like reducing test anxiety and enhancing students' test-taking skills. Some training strategies have been made available to teachers, educators, and test developers to teach students and test takers how to deal with exams sensibly and to assist students in establishing test-taking methods.

Also, study skills in terms of anxiety were found to be high and were interpreted as much felt by the students as seen in the result of the study. Altakhayneh (2020) concluded that low and high anxiety levels could negatively impact a student's performance in school. On the other hand, it has been demonstrated that math performance is best when anxiety levels are moderate. It suggests that for students to accomplish at a high level, they must experience some level of anxiety, but that anxiety must be managed. Students with low anxiety often have no interest in studying mathematics. They might feel that it is irrelevant to them, or they might not be interested in taking math classes in the future. They do not see math as very important in their lives. As a result, they lack the enthusiasm to study it, making it challenging for them to achieve success in mathematics.

4.2. Level of Mathematics Engagement among Students

Presented in the previous chapter was the result of the level of mathematics engagement among the students. It revealed that mathematics engagement was described as high. All three indicators for this variable were also described as high. It implies that mathematics engagement was much felt among the students.

Attard (2012) claimed that mathematics engagement occurs when (a) students enjoy learning mathematics, (b) students place a high value on their mathematics education and are aware of the benefits it will provide them in both the present and the future, and (c) students can make connections between the mathematics they learn in school and the mathematics they use in their everyday lives. Engaged students in the mathematics classroom demonstrate a profound understanding of mathematical principles and applications and competence through active participation, genuine appreciation, and introspective immersion.

Mathematics engagement in terms of behavioral engagement was found to be high and interpreted as much felt by the students. Lei, Cui, & Zhou (2018) found that the behavioral dimension of student engagement correlated with the student's academic performance. One explanation is that behavioral engagement directly increases academic achievement, which enhances learners' understanding and enjoyment of the learning process. As a result, they maintain their behavioral engagement. Delfino's (2019) findings on behavioral engagement suggest that most respondents were striving for good grades, which they obtained through paying attention to and staying in class. As a result, they valued the prompt written or verbal evaluations of their academic achievement from their professors.

Additionally, mathematics engagement in terms of cognitive engagement has shown a high result. It is interpreted as much felt by the students. According to Wara, Aloka, and Odongo (2018), cognitive engagement among secondary school students is a significant predictor of academic success. Further, DeVito (2016) also noted that students who were less engaged in their education had poorer success, were less willing to engage in educational activities voluntarily, and thought studying was pointless and boring. In contrast, students who were actively engaged in their studies, took part in various class activities, and were ready to answer teachers' questions, on the other hand, thought their education was valuable and engaging.

Similarly, mathematical engagement in terms of affective engagement was found to have a high result and was interpreted as much felt by the students. The importance of students' positive emotions in connection to how well they could apply higher-order, group, and self-directed learning abilities was underlined by Alvarez-Bell, Wirtz, and Bian (2017). They also learned that establishing friendships was a factor in emotional involvement. Affective engagement can be seen as the highest engagement present among students as a motivational factor (Nazamud-din et al., 2020). Moreover, Ladd and Dinella (2009) added that increased

behavioral and affective engagement levels among primary school students were associated with better academic performance than lower behavioral and affective engagement levels.

4.3. Level of Mathematics Achievement Goals among Students

The level of mathematics achievement goals was presented in the previous chapter. It revealed that the mathematics achievement goal was high. It also implies that mathematics achievement goals was much felt among the students. Students choose the mastery goal orientation more frequently than the other two goal orientation: performance-approach and performance-avoidance. The increasing use of performance-based and mastery-based goals suggests that students should consider the requirement of living up to their expectations and those of their teachers and families. In other words, mastery goal orientation motivates students to keep learning mathematics and sustain their interest in it (Rameli & Kosnin, 2017).

Mathematics achievement goals in terms of mastery goal orientation yielded a result of high and were interpreted as much felt by the students. Sekreter (2016) concluded in his study that mastery goal orientation is the most effective way to raise students' expectations for success. Students more committed to mastery-learning goals are more invested in mathematics and more inclined to think it has practical and meaningful applications. These are crucial components for perseverance in facing challenges and difficulties on the path to success. The most effective student persistence determinant is their subjective task values (usefulness and significance).

In terms of performance-avoidance, mathematics achievement goals also yielded a high outcome. Students who wish to avoid failing in front of others have performance avoidance objectives, according to Elliot and McGregor (2001). They are intrinsically motivated by a fear of doing poorly. Performance-avoidance goals might only sometimes have a detrimental impact on performance (Darnon, Harackiewicz, Butera, Mugny, and Quiamzade, 2007). Significant interactions between performance-approach and performance-avoidance goals were found, demonstrating that the advantages of supporting performance-approach goals can counteract the disadvantages of avoidance goals. These results suggest that even while these goals rarely provide positive results, they do not generally have a detrimental effect on performance or when paired with other, more valuable goals (performance-approach).

Additionally, the performance-approach level for mathematics achievement goals has a high outcome and was seen as much felt by the students. According to Anderman and Patrick (2012), students who pursue performance goals are interested in surpassing their peers, demonstrating their superior expertise, and having their academic competence recognized by others. Furthermore, Darnon, Harackiewicz, Butera, Mugny, and Quiamzade (2007) suggested that performance-approach goals were found to have a higher favorable impact on performance than performance-avoidance goals did. Also, goals with a performance-based approach have a relatively success rate expected (Sekreter, 2016).

4.4. Significant Relationship Between Mathematics Study Skills and Mathematics Achievement Goals Among Students

The research findings showed a substantial connection between the students' mathematics achievement goals and mathematical study skills. The computed r-value revealed a significant strong positive connection between the two variables. Because of this positive and considerable link, it may be deduce that as students' mathematical study skills improve, their mathematics achievement goals also improve.

The study conducted by Fazal, Hussain, Majoka, and Masood (2012) showed that using a variety of study skills will result in higher academic achievement than using few or negligible study skills. This result is consistent with earlier studies that showed how closely learning outcomes relate to students' ability to use various study skills. Students who can self-regulate their learning and improve their study skills are called

self-regulated learners. In contrast to their peers who perform better academically, students who struggle academically have a scarcity of study skills (Fazal et al., 2012).

Furthermore, Motevalli, Ghani Hamzah, Roslan, Raba'ah Hamzah, and Garmjani (2021) concluded that students' learning success, intrinsic motivation, self-efficacy, self-regulatory processes, and goal orientation might all be directly impacted by the study skills in which they end specific activities linked to motivation, goal planning, and study preferences. This outcome is consistent with what was found in this research. It could be said that study skills could be one of the predictors of achievement goals.

4.5. Significant Relationship Between Mathematics Engagement and Mathematics Achievement Goals Among Students

The study's conclusions indicated a substantial connection between the student's engagement in mathematics and their desired mathematics achievement goals. The calculated r-value revealed that there was a significant positive connection between the two variables. The strong positive correlation implies that as the mathematics engagement of the students goes high, mathematics achievement goals also become high.

Hughes (2012) explained that student engagement is a complicated concept with numerous characteristics and subcomponents. These include feelings toward peers, teachers, and education in general, as well as self-efficacy and motivation, participation, and on-task behavior. Student engagement predicts several outcome variables, including academic ability, performance, and school completion.

Conversely, Duchesne, Larose, and Feng (2017) expound that achievement goals and students' academic engagement have been found to have a strong association, specifically in terms of their behavioral and cognitive domains. Performance-oriented goals affect students' level of engagement because they influence students' capacity to complete academic tasks by promoting social comparison in the classroom, which influences self-efficacy and engagement. On the other hand, the mastery goal will enable the student to succeed by encouraging the application of self-regulatory strategies and student confidence (Veiga, Melo, Pereira, Frade & Galvão, 2013).

4.6. Regression Analysis on Influence of the Domains of Mathematics Study Skills to Mathematics Achievement Goals among Students

The influence of the study skills' domains on mathematics achievement goals among students, as determined by regression analysis, revealed that three out of the four domains, namely; anxiety, time and place of study, and math tests, have a significant influence on mathematics achievement goals among students. Other domains were found to be not significant in influencing mathematics achievement goals.

Vásquez-Colina, Gonzalez-DeHass, and Furner (2014) suggested that the math anxiety students experience is connected to their overall achievement goals and other achievement behaviors and outcomes. Math anxiety was related to both types of avoidant goals, whereas a mastery approach orientation appeared to connect to more positive achievement behaviors. The patterns of these interactions were expected because of the association between the two types of goals.

Furthermore, Furner and Gonzalez-DeHass (2011) added that teachers could actively assist their students in preventing and reducing their mathematics anxiety. The practices can influence students' goals in the classroom, so teachers should work to foster mastery-oriented learning environments by considering the tasks they give their students, their level of authority or involvement in academic activities, their methods of assessment and reward, and the environment they make in the classroom.

In addition, Ukpong and George (2013) found that students who spend much more time studying have a significant academic achievement gap between them and their peers compared to students who look for a shorter time. This claim also parallels Palm Beach's study time learning hypothesis in 1864, which demonstrates how study time can be used to predict and influence learning outcomes and behaviors.

Similarly, test-taking skills are cognitive talents that enable students to respond successfully to any given test setting and to know what to do before, during, and after the test. Students who have these abilities have an advantage over other students. Students can demonstrate their understanding of the material covered in class by responding to and answering questions posed on standardized tests, thanks to applying these skills. Students' test-taking abilities influence their test-taking proficiency and, consequently, their academic success positively (Dodeen, Abdelfattah & Alshumrani, 2014).

4.7. Regression Analysis on Influence of the Domains of Mathematics Engagement in Mathematics Achievement Goals among Students

Regression analysis on the relationship between students' levels of engagement in mathematics and their levels of mathematical achievement goals that were carried out revealed that cognitive engagement, behavioral engagement, and affective engagement have a significant impact on mathematics achievement goals. Among all the three domains, cognitive engagement has the most influence, followed by behavioral engagement, and last is affective engagement.

Duchesne, Larose, and Feng (2017) found that mastery-approach goals have predicted an enhanced application of cognitive and metacognitive methods in the performance of academic tasks. Students who act in ways that maximize the likelihood of getting the intended outcome appear more likely to use a wide range of cognitive and metacognitive skills to get there. These students could accomplish their goals if they had assistance from the teachers. The results also demonstrated a link between performance-avoidance goals and a rise in the use of cognitive and metacognitive techniques in schoolwork. It may not be surprising that certain students would be less likely to ask their teachers for assistance when given a task where failing might compromise their competency and social standing. Help-seeking would highlight their incompetence. In this instance, these students have a higher level of cognitive engagement because they restrict the time they spend looking for help.

Additionally, Duchesne, Larose, and Feng (2017) suggested that students in the early years of high school who are intent on growth and mastering their competencies are more likely to improve their efforts and perseverance to finish their work successfully if they can approach their teachers for aid in overcoming obstacles in their path. It turned out that mastery goals were indirect predictors of behavioral engagement in academic work because they encouraged students to seek help from their teachers. Additionally, the findings demonstrated that mastery goals indicated a decline in behavioral involvement in later years and that this link was accounted for by students' tendency to refuse teacher assistance. In contrast, the findings showed that performance goals had neither a direct nor an indirect relationship with students' behavioral engagement. The lack of a relation between these notions may reflect students' propensity to assume that exerting more effort will not only not increase their performance but also be a sign of incompetence.

Alvarez-Bell, Wirtz, and Bian (2017) highlighted how much a student's feelings affect their ability to study and how much influence students' positive emotions have on their ability to learn in groups and independently. How a student feels about their classroom significantly impacts how well they learn. Making friends was also seen as critical to their level of affective engagement. Moreover, Nazamud-din, Zaini, Jamil, Campus, & Campus (2020) revealed that affective engagement, among all other engagement, can be seen as the highest engagement among students as a motivational factor.

4.8. Conclusion

The findings of this study revealed that the students' mathematical achievement goals could be influenced by their mathematical study skills in terms of anxiety, the time and place studying, study strategies for class, and math tests. In addition, students' cognitive engagement, affective engagement, and behavioral engagement with mathematics all influence the mathematics achievement goals they set for themselves. The data also

demonstrated a high level of mathematical study skills among the students. These skills included the appropriate time and place for studying and study strategies for both in-class and homework assignments, math tests, and anxiety. Overall, mathematics study skills were much felt by the students.

Additionally, the findings showed that the students had a strong sense of involvement with mathematics in terms of all three types of engagement: cognitive engagement, affective engagement, and behavioral engagement. The students had a strong sense of the increased level of mathematics engagement brought on by high levels of cognitive engagement, affective engagement, and behavioral engagement. In addition, students' mathematics achievement goals in terms of mastery goal orientation, performance – approach, and performance-avoidance were much felt. In general, the students had a strong awareness of the level of mathematics achievement goals. In addition, the result demonstrated a significant relationship between all the indicators of mathematics study skills and the achievement goals in mathematics. In addition, all the domains in mathematics engagement have shown a significant association with the achievement goals in mathematics.

4.9. Recommendations

Following the presentation of the data as well as the outcomes of the study, the following recommendations have been formulated by the researcher on how mathematics study skills and engagement will be improve to meet achievement goals successfully among the students.

Firstly, students had better practice various study skills if they want to succeed in any academic task given by the school. Study skills must be taught, practiced, and incorporated into regular use. It, in turn, will boost a person's confidence, work ethic, and internal motivation. Research proved that students who invest more time in schoolwork tend to do better and that those who give more effort also perform better and have a big chance to be more successful in school (Julius & Evans, 2015).

Secondly, teachers and schools should collaborate in providing students classroom environment where they can engage more with the activities, with their classmates, and with the teacher, and maximize their potential. It could be done by providing students with various school activities that could utilize their skills, present a student – to – student interactions, student-teacher collaboration, and a well-crafted standard. While maintaining a strong pedagogy and a curriculum based on criteria, educators and educational institutions should strive to raise student participation in their classes. Maximizing student engagement would be beneficial for giving students meaningful and relevant learning opportunities (Sbrocco, 2009; Delfino, 2019).

In addition, students must seek specific learning and performance goals at the start of a school year. Students must focus on attaining these goals at the end of every semester or year. It will help them to be more engaged in school and can help to maximize their potential. Moreover, these could direct them to do a better job, utilize study skills, and attain higher academic work standards. Students with mastery goals are driven and eager to make the effort necessary to achieve mastery. They are working on perfecting the task at hand, are worried about proving their expertise, and are interested in achieving mastery. Students interested in setting performance goals want to demonstrate that they are more skilled than their peers, that they can outperform their peers, and that they can complete academic assignments to the satisfaction of their peers. (Anderman & Patrick, 2012).

Lastly, this study examined the possible relations between two variables, mathematics study skills and mathematics engagement, that could influence mathematics achievement goals. Future studies could be made that will focus on other factors besides study skills and mathematics engagement that could relate to the student's achievement goals. Future researchers also could employ high school or elementary students as subjects for future studies related to mathematics achievement goals. Additionally, future research could also be done focusing not only on mathematics achievement goals but on the achievement goals in general.

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