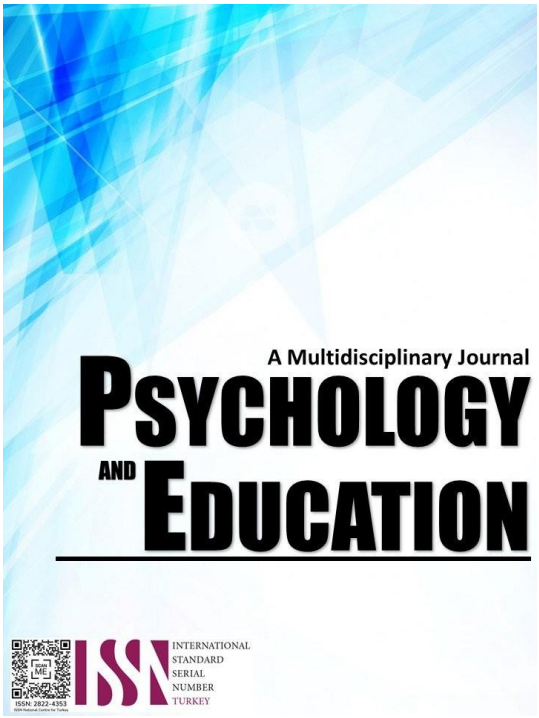
THE IMPACT OF METACOGNITIVE AWARENESS AND ATTITUDE TOWARDS LEARNING MATHEMATICS ON ACADEMIC GRIT OF THE MATHEMATICS MAJOR STUDENT



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Research Article

The Impact of Metacognitive Awareness and Attitude towards Learning Mathematics on Academic Grit of the Mathematics Major Student

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Abstract

The purpose of the study is to determine the impact of metacognitive awareness and attitude towards learning mathematics on the academic grit of the mathematics major students. The study is quantitative research that utilizes descriptive-correlational approach. Using stratified random sampling, a sample of 152 randomly selected mathematics major students that was identified and answered the surveys on the three variables. Utilizing the statistical tool such as mean, pearson-r, and regression, to effectively analyze and interpret the gathered data. Results showed that the level of metacognitive awareness, attitude towards learning mathematics, and academic grit are all high in level. Results also revealed that there is significant relationship between metacognitive awareness and academic grit. Likewise, there is also a significant relationship between attitude towards learning mathematics and academic grit of the students. Moreover, results show that domain of metacognitive awareness, which is planning, can significantly influence academic grit. Finally, it was revealed that domains of attitude towards learning mathematics, which are the interest, option for understanding, and textbooks and classroom learning can significantly academic grit of the respondents. Results imply that the variables are significant in improving the academic grit of mathematics major students.

Keywords: *metacognitive awareness, attitude towards learning mathematics, academic grit, mathematics major students, descriptive-correlational approach*

Introduction

Students' academic grit, marked by persistence and resilience, significantly shapes their math understanding and attitude. Possessing these traits often indicates proficiency in mathematics. However, it proves to be a challenging endeavor to cultivate strong determination. A genuine desire to learn requires active involvement in classroom issues, working hard, and readiness to develop wisdom. A lack of similar attitude makes it difficult for an individual to cultivate resilience through toughness and recovering from the adversity. Metacognitive awareness which is one of the aspects of mental toughness is another critical factor associated with grit. Planning, evaluation, and reviewing will be very necessary when overcoming obstacles, dealing with new circumstances and persevering on target goals in the future (Barshay, 2019).

In Spain, a study of academic grit, 68% of 4, 853 pupils demonstrated low level in terms of their grit towards learning mathematics. They recognized studying is not hugely an interesting activity and does not recognize it as a responsibility, but still most of them and are just hard working but they are not showing any consistency and passion. It concluded that these students' perspective towards academic task could affect how much grit they could offer. The non-grittier students also displayed a poor academic performance which due to the fact that they are easily surrender to academic task that is out of their comprehension. Interventions should be done on the learning programs dealing with grit factors (Postigo et al., 2021).

In the Philippines, the study underscores a notable inadequacy in academic grit among students, as indicated by their performance trailing behind 58 other countries in tests. Research indicates that certain secondary school pupils in the Philippines have a low level of grit despite the government's efforts to improve the quality of education. It was attended that knowing how to learn (knowledge) and attitude towards learning, which has a lasting impact on academic goals over time even in the face of challenges and setbacks (Friala et al., 2023).

Educational capacity of the students will be a key factor not only for the improvement school but also the society by stimulating economic growth by producing a trained population and encouraging innovation. Education encourages civic engagement and environmental stewardship while fostering social cohesiveness, health, and well-being. The results of the study could be basis for curriculum development of educational establishments as well as improving the scope of help initiatives from society groups. This capacity is belief to be attained by the means of the students to persevere with passion towards bombarded academic challenges. This is why it is underscoring possible factors which could influence the grit of the students is necessary to avoid absence of it. Gauging the grit of the students could be helpful to prepare possible measures to fix it.

In connection, the researcher has not come across any studies about the influence of metacognitive awareness and attitudes towards learning mathematics on academic grit in the local setting. There have been studies conducted such as the studies of Mandal (2023), "A study on Metacognitive Awareness and Academic Grit among B.Ed. Trainees"; Mutawa (2018), "Students' Achievement in Math and Science: How Grit and Attitudes Influence?"; and Weisskirch (2018), "Grit, Self-esteem, Learning strategies and Attitudes and Estimated and Achieved Course Grades among College Students ". These studies are different from my own study given the fact that this research study does correlate the influences of metacognitive awareness and attitude towards learning mathematics on academic grit of students. Moreover, the study is being conducted in the Philippines, which primarily interests the college students in the Province

of Davao del Norte.

This work will be presented at educational facilities and through appropriate institutions which could be use as basis in academic conferences aligned with the topic of the study. Having plans of publishing this paper on academic websites and presented it to various conferences. It was also considering to disseminate this paper on the Kapalong College of Agriculture, Sciences, and Technology (KCAST), displaying it to its facilities where other academic researchers can study and find interest towards the topic of the study. This will also undergo on an emphasis is on creating a thoughtful distribution strategy to make sure the knowledge reaches and helps a larger audience.

Research Objectives

The purpose of this study is to determine the significant relationship between metacognitive awareness and attitude towards learning mathematics on academic grit among mathematics major students at Kapalong College of Agriculture, Sciences, and Technology. To be specific, this study seeks answers to the following objectives:

1. To determine the level of metacognitive awareness among mathematics major students at Kapalong College of Agriculture, Sciences, and Technology in terms of:
    1.1. declarative knowledge;
    1.2. procedural knowledge;
    1.3. conditional knowledge;
    1.4. planning;
    1.5. monitoring; and
    1.6. evaluation.
2. To determine the level of attitude towards learning of mathematics of students in terms of:
    2.1. interest;
    2.2. option for understanding;
    2.3. confidence;
    2.4. competence; and
    2.5. textbooks and classroom learning.
3. To determine the level of academic grit in terms of:
    3.1. determination;
    3.2. resilience; and
    3.3. focus;
4. To determine the significant relationship between:
    4.1. metacognitive awareness and academic grit; and
    4.2. attitude towards learning mathematics and academic grit.
5. To determine which domain/s of metacognitive awareness and attitude towards mathematics that can considerably influence the academic grit among mathematics major students at Kapalong College of Agriculture, Sciences, and Technology.

Methodology

Research Design

In this quantitative, non-experimental study, researchers used a combination descriptive-correlation method. . The major purpose was to understand how the impact of one variable is transmitted to another via intermediary variables. These intermediary elements may include aspects relating to behavior and biology, and psychology, sometimes known as social conceptions. Regression analysis is the statistical technique employed to determine how one variable influences another. (Rincon et al., 2020).

In the context of the study, it employed a quantitative descriptive-correlational technique to investigate how students' attitudes toward studying mathematics and metacognitive awareness connect with academic grit. Through surveys and statistical analysis, the study tried to discover links between these features, thereby giving knowledge for academics and mathematics educators. The study's goal is to help inform mathematics educators' pedagogical approaches and curriculum development. The study clarifies any potential constraints on generalizability by recognizing the limitations of the mathematics students.

Moreover, a descriptive correlation research approach was deemed appropriate when the goal was to present a picture of the current condition of a situation during the study and to analyze the elements contributing to a certain event. Furthermore, the correlation design attempted to create linkages between two or more variables within the same group of high school students and quantify their statistical associations in private school settings (Peteros et al., 2019).

In this study, the decision selecting to use the descriptive-correlational research methodology works well in giving a picture of the current situation in the field. This methodology makes it possible to look at the variables affecting BSED-Mathematics students' academic grit in college school settings. The correlation design offers a quantitative lens to examine the linkages within this educational context by particularly attempting to create statistical links between metacognitive awareness, attitude towards learning mathematics,

and academic grit.

Respondents

The respondents of this study were mathematics students at Kapalong College of Agriculture, Sciences, and Technology (KCAST) during the first semester of A.Y. 2023–2024. They were chosen as the respondents because the study was about the metacognitive awareness and attitude towards learning mathematics on the academic grit of students. Since the study purpose involved academic grit in learning mathematics, choosing mathematics students at Kapalong College of Agriculture, Sciences, and Technology (KCAST) had been fitting and valid. Further, to establish randomness and maintain the element of science in the study, stratified random sampling was chosen.

Stratified random sampling, which divides a bigger population into smaller, more distinct subgroups known as strata, is one of the potential sampling techniques being considered. These strata are created by assembling people who have similar qualities or traits, like income levels or degrees of education. In order to increase the accuracy and reliability of the study's findings, researchers use stratification to guarantee that each subgroup is appropriately represented in the sample. This approach enables a more thorough grasp of the research setting by acknowledging and accounting for the variation within the population, allowing for a more nuanced analysis (Hayes, 2023).

The stratified random sampling was particularly appropriate in this study because the research respondents had been randomly selected based on the strata, which were, in this case, the mathematics major students at Kapalong College of Agriculture, Sciences, and Technology (KCAST). To compute the sample, the researcher first gathered the data on the population of respondents by writing a formal request letter to the college registrar, requesting access to the population of respondents. After getting the data, the researcher sent this information to his statistician to compute the study sample.

Further, Table 1 shows the distribution of the future respondents of this study.

To ensure an accurate distribution of samples, the researcher will use stratified random sampling, utilizing proportional allocation, through Slovin's formula with a margin of error of 0.05. From within each stratum, uniform random sampling is used to select a per-stratum sample. All per-stratum samples are combined to derive the stratified random sample (Nguyen et al., 2020). In this case, the strata are the following four year-levels of mathematics education students in Kapalong College Agriculture Sciences and Technology.

Table 1. *Distribution of Respondents*

Year Level	*Population*	*Sample*	*Percentage*
1st Year	119	74	30.13%
2nd Year	50	31	12.66%
3rd Year	43	27	10.89%
4th Year	33	20	8.36%
Total	245	152	62.4%

Using Slovin's formula, a random sampling method was applied to the population of mathematics students to determine the number of samples needed for each stratum. From a total population of 245 students, 152 samples were required. The distribution of samples per year level was as follows: the first year had 74 samples, accounting for 30.13% of the total; the second year had 31 samples, representing 12.66%; the third year had 27 samples, which was 10.89%; and the fourth year had 20 samples, making up 8.36% of the total.

Instrument

The Likert scale was used as the instrument of the research. People can express their level of agreement or disagreement with a statement using the Likert scale, a five-point scale. It usually offers five different answers to a statement or question, allowing mathematics students to express how strongly they agree or disagree with the statement or question (positively or negatively) (Mcleod, 2011). The study evaluated the participants' metacognitive awareness, attitudes on learning mathematics, and academic grit using a five-point Likert scale. The participants' responses to each statement were scored, and the sum of those scores was used to determine their attitude score. The participants' perceptions of their learning technique, the effectiveness of the instruction, and their mathematical satisfaction could be quantitatively analyzed thanks to this technology. The results obtained from the Likert Scale could be used to determine the participants' academic preferences and the influence of metacognitive awareness.

The researcher adapted three questionnaires from web sources to measure the variables. It used a modified version of Schraw and Dennison's (1994) instrument to gauge students' metacognitive awareness. The instrument, a five-point Likert scale, assesses participants' agreement with various statements. Metacognitive awareness, comprising declarative, procedural, conditional knowledge, planning, monitoring, and evaluation, is evaluated using five items each. To ensure reliability, a Cronbach's alpha analysis was conducted, suggesting consistency among items when correlations exceed 0.3 and the alpha value surpasses 0.7, aligning with established criteria (Hair et al., 2019).

Furthermore, the researcher also utilized a modified version of Wong and Cheng's (1991) instrument to gauge students' metacognitive awareness. Comprising multiple subscales, each with five items measured on a 5-point Likert scale, it assessed aspects such as interest,

preference in understanding, confidence, competence, textbooks/classroom learning, outside-class learning, and learning habits. The questionnaire used in this study had been successfully tested in a setting before ensuring its reliability, Cronbach's alpha analysis was performed, and after adjusting for negatively worded items, the overall reliability score was 0.967 for the pre-test data and 0.963 for the post-test data. These scores are considered reliable and acceptable which leads to acceptable instrument for the study.

In connection, the researcher adapted DeVellis' (2012) instrument to measure students' academic grit, focusing on determination, persistence, and focus as subdimensions. Initially, 16 items were assessed for internal consistency using Cronbach's alpha, which yielded a robust reliability score of α=0.94 for the entire sample, as well as for gender and grade level subsets. To refine the scale and reduce respondent burden, as suggested by DeVellis (2012), additional items were pruned based on their impact on internal consistency, corrected item-total correlations, and overall alignment with language, face validity, and uniqueness criteria. The resulting 15 items underwent further analysis, including descriptive statistics and their contributions to the scale's internal consistency.

Procedure

In collecting, the researcher took the following steps:

Questionnaire Development. The researcher extensively reviewed pertinent journal articles and utilized existing questionnaires as templates for adaptation. Questions were thoughtfully selected to ensure clarity and relevance for high school students in private school settings, aligning with the study's specific focus.

Questionnaire Refinement and Validation. After it is formed, a questionnaire is used and submitted to a panel of experts to evaluate and contextualize. The researcher follows the advice of those revision experts until it is approved for use.

Requesting Approval to Carry out the Study. The researcher asked permission to conduct this from the vice president to the academic affairs of the research locale through a formal letter which is signed by the researcher himself and noted by his research adviser and the director for research and development.

Distribution and Retrieval of the Questionnaire. Survey questionnaires in printed forms were distributed individually to the respondents, who were mathematics students roaming around the campus.

Collection and Tabulation of the Data. After the survey, the researcher took and analyzed the research instrument to record the collected data from the respondents. The statistical data were analyzed, and the findings were subsequently interpreted. Based on the final data set, conclusions were drawn, and recommendations were formulated in accordance with the results of the learning assessment.

Data Analysis

The data collected from the questionnaires were processed and analyzed using various statistical tools. These tools were applied to the data to help identify patterns and relationships that could shed light on the study's objectives. The results of this analysis were then used to draw conclusions and make recommendations based on the findings.

Mean. This statistical tool assessed the level of metacognitive awareness, attitude towards mathematics, and academic grit among mathematics major students. Pearson-r. This statistical tool determined the significance of the relationship between metacognitive awareness and academic grit, as well as between attitude towards learning mathematics and academic grit among mathematics major students. Regression. This statistical tool identified the specific area or domain within metacognitive awareness and attitude towards learning mathematics that has a statistically significant impact on the academic grit of students.

Ethical Considerations

The respondents of this study were the mathematics students from local college in the research locale. In this instance, the researcher ensured that the respondents' safety, rights, and reliance on the researcher, as well as the study's goals, would be treated with fairness and righteous action.

Furthermore, researchers must also uphold the highest ethical standards when doing study with humans as participants. This quantitative investigation's main objective is to make sure the study adhered to ethical standards in order to protect the comfort of the human respondents. The researcher talked about how the study followed the recommendations made by Denzin and Lincoln (2011), who emphasized and conflict of interest.

Informed Consent. It is the first fundamental ethical principle to consider. The responders must be given adequate notice of the requirements, the intended use of the data, and any potential consequences. To take part in the study, the respondents must give their explicit, active, and written consent. They must also acknowledge that they have the freedom to change their opinions at any moment and are aware of their right to access their information. When getting informed permission, an agreement between the researcher and the respondents may be taken into consideration (Denzin & Lincoln, 2011).

In this case, in a printed survey form, the researcher includes a question about informed consent that asks the mathematics major students if they are still willing to participate despite the risks. The math majors have the option of declining an offer if they are doubtful of it. We strongly recommend making informed choices and freely engaging in the study. The researcher makes sure that the

mathematics major students in the study is excited about it and ready to take part. When collecting data, it is crucial to base their answers on the surveys that are already available.

The following rights that the mathematics major students have were explained to them during the informed consent process. These math major students were made aware of their ability to revoke their participation at any time and without cause. Additionally, they are free to decline to respond to delicate inquiries. They also have the right to inquire about the study, which is another right. Finally, they have a right to be notified of the findings of the study once it has been completed.

Risk of Harm, Anonymity and Confidentiality. It is required to always keep the respondent's information secret or confidential, and the pledge extends beyond only keeping the respondent's identities out of the public eye. Secrecy and anonymity are crucial elements in protecting people from potential harm (Denzin & Lincoln, 2011).

When the data is cautiously revealed to others, there is a potential danger of harm in terms of social liabilities. As a result, study data must be kept secure and confidential to prevent this happening. The mathematics major students' safety, identification, and personal information would all be maintained, the researcher underscored, and they would value their involvement in the study. The researcher strips identities from the data in order to produce a collection free of errors. Any information that may be used to identify the respondents, such as names or addresses (such information could be kept in separate, safe files elsewhere), is not included in a clean data collection. Three years after the completion of the study, the data must be archived and destroyed.

Conflict of Interest. An ethics committee applicant must disclose any ties or past actions that could create a conflict of interest so that the committee can offer guidance on how to resolve it (Fleming & Zegwaard, 2018). The study's researcher, however, insists that there were no financial or business links that may be construed as a potential conflict of interest during the investigation. This point of view contends that because the respondents and the researcher had no competing interests with the study, the research's conclusions were unaffected by outside circumstances. Only when the researcher has the authority to use coercive methods to force them to participate, such as threats of benefit termination, blackmail, or other forms of punishment (for example, principals threatening to fire teachers or teachers threatening to fail their students if they do not respond to the survey), does a conflict of interest arise.

Thus, the study undergo in an ethical process for analyzing this work in order to avoid any potential conflicts of interest. The researchers also ensure that its participants, mathematics major students, have no conflicts of interest with the study, which maintains the quality of the conclusion by excluding any external circumstances. It assures that no coercive tactics were used to coerce mathematics students to participate, hence preventing any potential conflicts of interest.

Results and Discussion

Presented in the section below are the discussion of the data on metacognitive awareness and attitude towards learning mathematics on academic grit of the mathematics major students in a local college. The chapter presents the data on the following: the level of metacognitive awareness; the level of attitude towards learning mathematics, the level of academic grit among mathematics major students; the significant relationship between metacognitive awareness and academic grit; the significant relationship between attitude towards learning mathematics and academic grit; the significant influence of metacognitive awareness on academic grit; and the significant influence of attitude towards learning mathematics on academic grit. The presentations were done parallel to the research objectives.

Level of Metacognitive Awareness in Terms of Declarative knowledge

The level of metacognitive awareness of the mathematics major students was measured through the survey questionnaire with the indicator, declarative knowledge. The response of the respondents on each indicator were presented and analyzed below.

Table 2. *Level of Metacognitive Awareness Among in Terms of Declarative Knowledge*

Declarative knowledge	*Mean*	*Description*
1. Knowing which information is essential to learn	4.36	Very High
2. Organizing information well	4.05	High
3. Remembering information well	3.95	High
4. Controlling my learning whether I have learned well or not	4.11	High
5. Deciding whether I have understood something well	4.21	High
Overall	4.13	High

Presented in Table 2 is the level of metacognitive awareness of mathematics major students in terms of declarative knowledge. The data revealed that the metacognitive awareness in terms of declarative knowledge had an overall mean of 4.13 which means high. This indicated that the level of metacognitive awareness in residing students in terms of declarative knowledge is oftentimes manifested.

The highest mean is 4.31 which descriptively means very high. This means that the item is always manifested by the respondents. This mean is from the item no. 1 – Knowing which information is essential to learn.

On the other hand, the lowest mean is 3.95 and can be described as high. This means that the item is oftentimes manifested by the

respondents. This mean is from the item no. 3 –Remembering information well.

Level of Metacognitive Awareness in Terms of Procedural knowledge

The level of metacognitive awareness of the mathematics major students was measured through the survey questionnaire with the indicator procedural knowledge. It was collected following specific guidelines and processes attaining the essential instrument for gathering the data. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 3 is the level of metacognitive awareness of mathematics major students in terms of procedural knowledge. The data revealed that the metacognitive awareness of the students in terms of procedural knowledge had an overall mean of 4.17 which means high. This indicated that the level of metacognitive awareness in students in terms of procedural knowledge is oftentimes manifested.

The highest mean is 4.27 which descriptively means very high. This means that the item is always manifested by the respondents. This mean is from the item no. 1 – Trying to use strategies that have worked previously.

However, the lowest mean is 4.07 and can be described as high. This means that the item is oftentimes manifested by respondents. This mean is from the item no. 4 – Finding myself using appropriate strategies spontaneously

Table 3. *Level of Metacognitive Awareness in Terms of Procedural Knowledge*

Procedural knowledge	*Mean*	*Description*
1. Trying to use strategies that have worked previously	4.27	Very High
2. Having a specific purpose for each strategy I use	4.21	High
3. Realizing and learning the type of strategy used	4.18	High
4. Finding myself using appropriate strategies spontaneously	4.07	High
5. Solving effectively problems and perform any task	4.10	High
Overall	4.17	High

Level of Metacognitive Awareness in Terms of Conditional knowledge

The level of metacognitive awareness in terms of conditional knowledge of the mathematics major students was measured through the survey questionnaire with the indicator conditional knowledge.

It was collected following specific guidelines and processes attaining the essential instrument for gathering the data. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 4 is the level of metacognitive awareness of mathematics major students in terms of conditional knowledge. The data revealed that the metacognitive awareness in terms of conditional knowledge had an overall mean of 4.22 which means high. This indicated that the level of metacognitive awareness of mathematics major students in terms of conditional knowledge is oftentimes manifested.

The highest mean is 4.43 which descriptively means very high. This means that the item is always manifested by the respondents. This mean is from the item no. 1 – Learning better when I know something about the topic.

In contrary, the lowest mean is 4.10 and can be described as high. This means that the item is oftentimes manifested by the respondents. This mean is from the items no. 4 – Using intellectual strength to balance my weaknesses.

Table 4. *Level of Metacognitive Awareness in Terms of Conditional Knowledge*

Conditional knowledge	*Mean*	*Description*
1. Learning better when I know something about the topic	4.43	Very High
2. Using different strategies depending on the situation of the given question	4.14	High
3. Motivating myself to study if necessary	4.26	Very High
4. Using intellectual strength to balance my weaknesses	4.10	High
5. Knowing the strategy, I use is effective	4.16	High
Overall	4.22	High

Level of Metacognitive Awareness in Terms of Planning

The level of metacognitive awareness of the mathematics major students was measured through the survey questionnaire with the indicator planning. It was collected following specific guidelines and processes attaining the essential instrument for gathering the data. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 5 is the level of metacognitive awareness of mathematics major students in terms of planning. The data revealed

that the metacognitive awareness of the mathematics major students in terms of planning had an overall mean of 4.25 which means high. The high level of mean of metacognitive awareness in terms of planning indicated that the level of mathematics major students in terms of planninng is oftentimes manifested.

The highest mean is 4.34 which descriptively means very high. This means that the item is always manifested by the mathematics major students. The statistical mean being referred to is specifically associated with item number 4. – Reading the instructions carefully before starting the task.

Nevertheless, the lowest mean is 4.16 and can be described as high. This means that the item is oftentimes manifested by the respondents. The statistical mean being referred to is specifically associated with item number 5 – Managing my time as best I can to achieve my goals.

Table 5. *Level of Metacognitive Awareness in Terms of Planning*

Planning	*Mean*	*Description*
1. Thinking about what I have learned before starting an assignment	4.27	Very High
2. Setting certain information before starting a task.	4.21	High
3. Willing choose the best way to solve the problem	4.28	Very High
4. Reading the instructions carefully before starting the task	4.34	Very High
5. Managing my time as best I can to achieve my goals	4.16	High
Overall	4.25	High

Level of Metacognitive Awareness in Terms of Monitoring

The level of metacognitive awareness of the mathematics major students was measured through the survey questionnaire with the indicator monitoring. It was collected following specific guidelines and processes attaining the essential instrument for gathering the data. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 6 is the level of metacognitive awareness of mathematics major students in terms of monitoring. The data revealed that the metacognitive awareness in terms of monitoring of the mathematics major students had an overall mean of 4.09 which means high. This indicated that the level of metacognitive awareness in mathematics major students in terms of monitoring is oftentimes manifested.

The highest mean is 4.24 which descriptively means high. This means that the item is oftentimes manifested by the respondents. The statistical mean being referred to is specifically associated with item number 1 – Asking myself if I have achieved the learning goal.

Table 6. *Level of Metacognitive Awareness in Terms of Monitoring*

Monitoring *As a student, I..*	*Mean*	*Description*
1. Asking myself if I have achieved the learning goal	4.24	High
2. Exploring numerous possibilities, before responding into a situation	4.08	High
3. Questioning whether I have examined all possible techniques for accomplishing the task	4.07	High
4. Learning and reviewing periodically to help myself understand the essential connections of information	4.03	High
5. Finding that I always pause to reflect on my understanding	4.07	High
Overall	4.09	High

However, the lowest mean is 4.03 and can be described as high. This means that the item is oftentimes manifested by the respondents. The statistical mean being referred to is specifically associated with item number 4– Learning and reviewing periodically to help myself understand the essential connections of information.

Level of Metacognitive Awareness in Terms of Evaluation

The level of metacognitive awareness of the mathematics major students was measured through the survey questionnaire with the indicator evaluation. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 7 is the level of metacognitive awareness of mathematics major students in terms of evaluation. The data revealed that the metacognitive awareness in terms of evaluation monitoring had an overall mean of 4.09 which means high. This indicated that the level of metacognitive awareness in mathematics major students in terms of evaluation is oftentimes manifested.

The highest mean is 4.24 which descriptively means high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 1 – Knowing the extent of self- achievement after completing a test. In contrast, the lowest mean is 4.13 and can be described as high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 4 –

Introspecting and evaluating how much progress I've made towards my goals upon task completion.

Table 7. *Level of Metacognitive Awareness in Terms of Evaluation*

Evaluation	*Mean*	*Description*
1. Knowing the extent of self- achievement after completing a test	4.24	High
2. Reflecting and questioning if there might have been simpler solution to complete it	4.16	High
3. Recapping and consolidating my learnings once I've finished a task	4.21	High
4. Introspecting and evaluating how much progress I've made towards my goals upon task completion	4.13	High
5. Inquiring within myself whether I've gained any new knowledge or insights upon finishing an assignment	4.21	High
Overall	4.19	High

Summary on the Level of Metacognitive Awareness

Presented in Table 8 is the overall level of metacognitive awareness of mathematics major students in terms of declarative knowledge, procedural knowledge, conditional knowledge, planning, monitoring, and evaluation. The data revealed that the level of metacognitive awareness of students has a total mean of 4.18 with the descriptive equivalent of high. This indicated that the level of metacognitive awareness of students is oftentimes manifested.

Further, the highest mean is 4.25 with the descriptive equivalent of high. This indicates that the level of metacognitive awareness in terms of planning is oftentimes manifested.

However, the lowest is monitoring obtained a mean of 4.09 with a descriptive equivalent of high. This indicates that the level of metacognitive awareness in terms of monitoring is manifested oftentimes.

Moreover, declarative knowledge obtained a mean of 4.13 with a descriptive equivalent of high. This indicates that the level of metacognitive awareness in terms of declarative knowledge is oftentimes manifested.

On the other hand, conditional knowledge obtained a mean of 4.22 with a descriptive equivalent of high. This indicates that the level of metacognitive awareness in terms of conditional knowledge is oftentimes manifested.

Table 8. *Summary on the Level of Metacognitive Awareness*

Indicators	*Mean*	*Description*
Declarative Knowledge	4.13	High
Procedural Knowledge	4.17	High
Conditional Knowledge	4.22	High
Planning	4.25	High
Monitoring	4.09	High
Evaluation	4.18	High
Overall	4.18	High

Subsequently, procedural knowledge obtained a mean of 4.17 with a descriptive equivalent of high. This indicates that the level of metacognitive awareness in terms of procedural knowledge is oftentimes manifested.

Lastly, evaluation obtained a mean of 4.18 with a descriptive equivalent of high. This indicates that the level of metacognitive awareness in terms of evaluation is oftentimes manifested.

Level of Attitude Towards Learning of Mathematics of Students in Terms of Interest

The level of attitude towards learning mathematics of the mathematics major students was measured through the survey questionnaire with the indicator interest. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 9 is the level attitude towards learning mathematics of the mathematics major students in terms of interest. The data revealed that the level of attitude towards learning mathematics in terms of interest had an overall mean of 4.23 with a descriptive equivalent of high. This indicated that the level of attitude towards learning mathematics of the students in terms of interest is oftentimes manifested.

The highest mean is 4.33 which descriptively means very high. This means that the item is of always manifested by the respondents. This mean is from the item no. 3 – Having interest in mathematical calculations.

On the other hand, the lowest mean is 3.99 and can be described as high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 4 – Trying those problems not required by the teacher.

Table 9. *Level of Attitude Towards Learning of Mathematics of Students in Terms of Interest*

Interest	*Mean*	*Description*
1. Loving solving mathematical problems	4.30	Very High
2. Having high interest in attending mathematics classes	4.24	High
3. Having interest in mathematical calculations	4.33	Very High
4. Trying those problems not required by the teacher	3.99	High
5. Engaging with the topic and find pleasure in learning by doing it	4.30	Very High
Overall	4.23	High

Level of Attitude Towards Learning of Mathematics of Students in Terms of Option for Understanding

The level of attitude towards learning mathematics of the mathematics major students was measured through the survey questionnaire with the indicator option for understanding. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 10 is the level attitude towards learning mathematics of the mathematics major students in terms of option for understanding. The data revealed that the level of attitude towards learning mathematics in terms of option for understanding had an overall mean of 4.23 with a descriptive equivalent of high. This indicated that the level of attitude towards learning mathematics of the students in terms of option for understanding is oftentimes manifested.

The highest mean is 4.20 which descriptively means high. This means that the item is of oftentimes manifested by the respondents. This mean is from the item no. 1 – Thinking reading the explanations in the textbook is necessary, and we can learn also by reading the formulas.

On the other hand, the lowest mean is 4.03 and can be described as high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 5 – Finding a means to calculate the problems understand the concept.

Table 10. *Level of Attitude Towards Learning of Mathematics of Students in Terms of option for understanding*

Option for Understanding	*Mean*	*Description*
1. Thinking read the explanations in the textbook is necessary, and we can learn also by reading the formulas	4.20	High
2. Wishing that the teacher could tell us the formula right away and not ask us to discover when learning a new topic	4.07	High
3. Wishing that I could think for it first and not having the teacher telling me everything when learning a new topic	4.06	High
4. Thinking understanding the content is important, knowing how to calculate suffices in coping with examinations	4.23	High
5. Finding a means to calculate the problems understand the concept concerned	4.03	High
Overall	4.12	High

Level of Attitude Towards Learning of Mathematics of Students in Terms of Confidence

Presented in Table 11 is the level attitude towards learning mathematics of the mathematics major students in terms of confidence. The data revealed that the level of attitude towards learning mathematics in terms of confidence had an overall mean of 3.90 with a descriptive equivalent of high. This indicated that the level of attitude towards learning mathematics of the students in terms of confidence is oftentimes manifested.

Table 11. *Level of Attitude Towards Learning of Mathematics of Students in Terms of Confidence*

Confidence	*Mean*	*Description*
1. Having confidence in problems that involve substituting numbers into formulas	4.03	High
2. Having confidence in purely numerical computations	3.93	High
3. Having confidence in solving word problems	3.84	High
4. Havingconfidence to use, apply and interpret mathematic	3.84	High
5. Havingconfidence in handling different kinds of mathematics problem	3.90	High
Overall	3.90	High

The level of attitude towards learning mathematics of the mathematics major students was measured through the survey questionnaire with the indicator confidence. The response of the respondents on each indicator were presented and analyzed below.

The highest mean is 4.03 which descriptively means high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 1 – Having confidence in problems that involve substituting numbers into formulas.

Despite the fact, the lowest means are 4.03 and can be described as high. This means that these items are oftentimes manifested by the respondents. This means are from the items no. 3 and 4 – Having confidence in solving word problems and having confidence to use, apply and interpret mathematics.

Level of Attitude Towards Learning of Mathematics of Students in Terms of Competence

The level of attitude towards learning mathematics of the mathematics major students in terms of competence was measured through the survey questionnaire. The response of the respondents that was gathered on each indicator were presented and analyzed below. This process involved scrutinizing each indicator to derive meaningful insights into the students' perspectives on their mathematical abilities and their approach to learning the subject.

Presented in Table 12 is the level attitude towards learning mathematics of the mathematics major students in terms of competence. The data revealed that the level of attitude towards learning mathematics of the following respondents which is the mathematics major students in terms of competence had an overall mean of 3.89 with a descriptive equivalent of high. This indicated that the level of attitude towards learning mathematic of the mathematics major students in terms of competence is oftentimes manifested.

Table 12. *Level of Attitude Towards Learning of Mathematics of Students in Terms of Competence*

Competence	*Mean*	*Description*
1. Understanding the content in the mathematics class	3.86	High
2. Understanding word problems	3.95	High
3. Having no difficulty in solving word problems	3.84	High
4. Knowing how to calculate, sometimes I don't know why this is	3.91	High
5. Having capacity to operate with mathematical notions on concrete problem	3.89	High
Overall	3.89	High

The highest mean is 3.95 which descriptively means high. This means that the item is of oftentimes manifested by the respondents. This mean is from the item no. 2 – Understanding word problems.

In contrary, the lowest mean is 3.84 and can be described as high. This means that the item is oftentimes manifested by the respondents. high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 5 – Having capacity to operate with mathematical notions on concrete problem.

Level of Attitude Towards Learning of Mathematics of Students in Terms of Textbooks and classroom learning

The level of attitude towards learning mathematics of the mathematics major students were measured through the survey questionnaire with the indicator textbooks and classroom learning. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 13 is the level attitude towards learning mathematics of the mathematics major students in terms of textbooks and classroom learning. The data revealed that the level of attitude towards learning mathematics in terms of textbooks and classroom learning had an overall mean of 3.89 with a descriptive equivalent of high. This indicated that the level of attitude towards learning mathematics of the students in terms of textbooks and classroom learning is oftentimes manifested.

Table 13. *Level of Attitude Towards Learning of Mathematics of Students in Terms of Textbooks and Classroom Learning*

Textbooks and classroom learning	*Mean*	*Description*
1. Confining to reading the formulas of the textbook and the explanations in it	3.93	High
2. Thinking teachers often ask us to read the explanation in the textbooks	3.80	High
3. Thinking that reading the textbook is redundant, the teacher will explain everything	3.72	High
4. Hoping that the textbook could have more pictures, so that I can understand better	3.91	High
5. Hoping that I could have more homework	3.60	High
Overall	3.79	High

The highest mean is 3.93 which descriptively means high. This means that the item is of oftentimes manifested by the respondents. This mean is from the item no. 1 – Confining to reading the formulas of the textbook and the explanations in it.

On the other hand, the lowest mean is 3.60 and can be described as high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 5 – Hoping that I could have more homework.

Summary on the Level of Attitude Towards Learning of Mathematics of Student

Presented in Table 14 is the overall level of attitude towards learning mathematics of mathematics major students in terms of interest, option for understanding, confidence, competence, and textbooks and classroom learning. The data revealed that the level of attitude towards learning mathematics of students had an overall of 3.68 with the descriptive equivalent of high. This indicated that the level of attitude towards learning mathematics of students is oftentimes manifested.

Further, the highest mean is 4.23 with the descriptive equivalent of high. This indicates that the level of attitude towards learning mathematics in terms of interest is oftentimes manifested.

However, the lowest is textbooks and classroom learning obtained a mean of 3.79 with a descriptive equivalent of high. This indicates that the level of attitude towards learning mathematics in terms of interest is oftentimes manifested.

Table 14. *Level of Attitude towards Learning Mathematics*

Indicators	*Mean*	*Description*
Interest	4.23	High
Option for Understanding	4.12	High
Confidence	3.90	High
Competence	3.89	High
Textbooks and Classroom Learning	3.79	High
Overall	3.99	High

Moreover, option for understanding obtained a mean of 4.12 with a descriptive equivalent of high. This indicates that the level of attitude towards learning mathematics in terms of option for understanding is oftentimes manifested.

In addition, confidence obtained a mean of 3.90 which means high. This indicates that the level of attitude towards learning mathematics in terms of confidence is oftentimes manifested.

Lastly, competence obtained a mean of 3.89 which means high. This indicates that the level of attitude towards learning mathematics in terms of competence is oftentimes manifested.

Level of Academic Grit in Terms of Determination

The level of academic grit of the mathematics major students was measured through the survey questionnaire with the indicator determination. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 15 is the level of academic grit of the mathematics major students in terms of determination. The data revealed that the level of academic grit in terms of determination had an overall mean of 4.35 with a descriptive equivalent of very high. This indicated that the level of academic grit of the students in terms of determination is always manifested. The highest mean is 4.368 which descriptively means very high. This means that the item is of always manifested by the respondents. This mean is from the item no. 1 – Determining to give my best effort.

On the other hand, the lowest means are 4.33 and can be described as very high. This means that these items are oftentimes manifested by the following mathematics major students. These means are from the items no. 3 and 4 – Setting long-term goals for myself and thinking it is important to me that I challenge myself as a student.

Table 15. *Level of Academic Grit in Terms of Determination*

Determination	*Mean*	*Description*
1. Pushing myself to do my personal best	4.36	Very High
2. Determining to give my best effort	4.38	Very High
3. Setting long-term goals for myself	4.33	Very High
4. Thinking it is important to me that I challenge myself as a student	4.33	Very High
5. Putting very great effort in learning mathematics	4.35	Very High
Overall	4.35	Very High

Level of Academic Grit in Terms of Resilience

The level of academic grit of the mathematics major students was measured through the survey questionnaire with the indicator resilience. It was collected following specific guidelines and processes attaining the essential instrument for gathering the data. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 16 is the level of academic grit of the mathematics major students in terms of resilience. The data revealed that the level of academic grit in terms of resilience had an overall mean of 4.34 with a descriptive equivalent of very high. This indicated that the level of academic grit of the mathematics major students in terms of resilience is always manifested.

The highest mean is 4.39 which descriptively means very high. This means that the item is of always manifested by the respondents. The statistical mean being referred to is specifically associated with item number 4 – Trying to never give up on academic goals when it takes a long time to reach.

On the other hand, the lowest mean is 4.24 and can be described as high. This means that the item is oftentimes manifested by the respondents. The statistical mean being referred to is specifically associated with item number 1– Working toward my academic goals no matter how long they take to reach.

Table 16. *Level of Academic Grit in Terms of Resilience*

Resilience	*Mean*	*Description*
1. Working toward my academic goals no matter how long they take to reach	4.24	High
2. Trying to overcome any challenges that arise once I set goal	4.31	Very High
3. Trying my best, even I'm struggling	4.41	Very High
4. Trying to never give up on academic goals when it takes a long time to reach them	4.39	Very High
5. Trying to never give up on a goal, even if I am not making progress toward it	4.34	Very High
Overall	4.34	Very High

Level of Academic Grit in Terms of Focus

The level of academic grit of the mathematics major students was measured through the survey questionnaire with the indicator focus. It was collected following specific guidelines and processes attaining the essential instrument for gathering the data. The response of the respondents on each indicator were presented and analyzed below.

Presented in Table 17 is the level of academic grit of the mathematics major students in terms of focus. The data revealed that the level of academic grit in terms of focus an overall mean of 4.61 with a descriptive equivalent of very high. This indicated that the level of academic grit of the students in terms of focus is always manifested.

The highest mean is 4.73 which descriptively means very high. This means that the item is of always manifested by the respondents. The statistical mean being referred to is specifically associated with item number 3 – Thinking other interests distract me from working hard.

On the other hand, the lowest mean is 4.58 and can be described as very high. This means that the item is oftentimes manifested by the respondents. This mean is from the item no. 1 – Balancing working hard with my other hobbies and interests.

Table 17. *Level of Academic Grit in Terms of Focus*

Focus	*Mean*	*Description*
1. Balancing working hard with my other hobbies and interests	4.58	Very High
2. Giving up other activities I enjoy, so that I can focus my effort	4.59	Very High
3. Thinking other interests distract me from working hard	4.73	Very High
4. Focusing on working hard when other activities sound more fun	4.56	Very High
5. Paying attention in class even when I would rather daydream	4.59	Very High
Overall	4.61	Very High

Summary on the Level of Academic grit

Presented in Table 18 is the overall level of academic grit of mathematics major students in terms of determination, resilience, and focus. The data revealed that the level of academic grit of students has a total mean of 4.24 with the descriptive equivalent of high. This indicated that the level of academic grit of students is oftentimes manifested.

Further, the highest mean is 4.35 with the descriptive equivalent of very high. This indicates that the level of academic grit in terms of determination, is always manifested.

However, the lowest is focus obtained mean of 4.02 and can be described as high. This indicates that the level in terms of focus is oftentimes manifested.

Lastly, resilience obtained a mean of 4.34 and can be described as very high. This indicates that the level in terms of resilience is always manifested

Table 18. *Level of Academic Grit*

Indicators	*Mean*	*Description*
Determination	4.35	Very High
Resilience	4.34	Very High
Focus	4.02	High
Overall	4.24	High

Significant Relationship Between Metacognitive Awareness and Academic Grit

Presented in Table 19 was the relationship between metacognitive awareness and academic grit, r(150) = .780, p <.001. Since the probability value is less than (0.05), the null hypothesis is rejected. Thus, there is a positive and significant relationship between metacognitive awareness and academic grit.

Table 19. *Significant Relationship Between Metacognitive Awareness and Academic Grit*

Variable	*Mean*	*R-Value*	*P-Value*	*Decision @=0.05*
Metacognitive Awareness	4.18			
		.780	<.001	Ho Rejected
Academic Grit	4.24			

Significant Relationship Between Attitude Towards Learning Mathematics and Academic Grit

Presented in Table 20 was the relationship between metacognitive awareness and academic grit, r(150) = .738, p <.001. Since the probability value is less than (0.05), the null hypothesis is rejected. Thus, there is a positive and significant relationship between the two variables.

Table 20. *Significant Relationship Between Metacognitive Awareness and Academic Grit*

Variable	*Mean*	*R-Value*	*P-Value*	*Decision @=0.05*
Attitude Towards Learning	3.99			
Mathematics Academic Grit		.738	<.001	Ho Rejected
	4.24			

Domain/s of Metacognitive Awareness that can Considerably Influence the Academic Grit Among Mathematics Major Students

Presented in Table 21 are the domains of metacognitive awareness that can considerably influence the level of academic grit of mathematics education students. The results showed that only planning (β=212, p=.015), is the domain of metacognitive awareness that appears to be statistically significant predictors of academic grit. At 0.05 level of significance, the null hypothesis is rejected. Thus, there is a domain of metacognitive awareness significantly influence the academic grit of the mathematics major students. The beta value indicates that for every one unit increase of planning, the level of academic grit by 0.21

Table 21. *Domain/s of Metacognitive Awareness that can Considerably Influence the Academic Grit Among*

Independent Variables	*Unstandardized Coefficients*		*Standardized Coefficients*	*P- Value*	*Decision @=0.05*
	Beta	*Std. Error*	*Beta*		
(Constant)	4.236	0.044			
Declarative Knowledge	0.093	0.091	0.1	.309	Ho Accepted
Procedural Knowledge	0.104	0.096	0.113	.284	Ho Accepted
Conditional Knowledge	0.176	0.092	0.192	.058	Ho Accepted
Planning	0.212	0.086	0.215	.015	Ho Rejected
Monitoring	0.094	0.091	0.104	.302	Ho Accepted
Evaluation	0.139	0.096	0.159	.148	Ho Accepted
Dependent Variable: Academic Grit					

Note: R= 0.783, R2=0.613, F-ratio= 38.238 P-value= < .001 2 units.

Furthermore, the p-values for the remaining domains, declarative knowledge (β=0.093 p=.309), procedural knowledge (β=0.104, p=.284), conditional knowledge (β=0.176, p=.058), monitoring (β=0.094, p=.302), and evaluation (β=0.139, p=.148) appeared to be not statistically significant predictors of academic grit of mathematics education students. At 0.05 level of significance, the p-values of declarative knowledge, procedural knowledge, conditional knowledge, monitoring, and evaluation exceeded 0.05. This means that the

domains are not likely to have any effect on the academic grit of students.

Moreover, metacognitive awareness explained a significant amount proportion of variance in academic grit, *R*2= 0.613, F= 38.238, p<.001. The *R*2 of 0.613 shows that the model predicts 61.3% of the statistical variation observed in the level of student's academic grit among the respondents. The coefficient of alienation which 38.7 points to the extent at which other indicators or domains not included in the study may explain the variance observed in the level of students' academic grit among the respondents.

Domain/s of Attitude Towards Learning in Mathematics that can Considerably Influence the Academic Grit

Presented in Table 22 are the domains of attitude towards learning mathematics that can considerably influence the level of academic grit of mathematics education students. The results showed that interest (β=0.18, p=.014), option for understanding (β=.291, p=.001), and textbooks and classroom learning (β=.178, p=.003) are the domains of attitude towards learning mathematics that appear to be statistically significant predictors of academic grit. At 0.05 level of significance, the null hypothesis is rejected. Thus, there is a domain of attitude towards learning mathematics significantly influences the academic grit of the students. The beta value indicates that for every one unit increase of interest, the level of academic grit will also increase by 0.231 unit, for every one unit increase of option for understanding, the level of academic grit also increase for 0.291 unit, and for every one unit increase of textbooks and classroom learning, the level of academic grit will also increase by 0.178 unit.

Table 22. *Domain/s of Attitude Towards Learning in Mathematics that can Considerably Influence the Academic Grit*

Independent Variables	*Unstandardized Coefficients*		*Standardized Coefficients*	*P- Value*	*Decision @=0.05*
	Beta	*Std. Error*	*Beta*		
(Constant)	4.236	0.044			
Interest	0.18	0.072	0.194	.014	Ho Rejected
Option for Understanding	0.291	0.067	0.326	.001	Ho Rejected
Confidence	0.116	0.078	0.133	.137	Ho Accepted
Competence	0.043	0.082	0.046	.602	Ho Accepted
Textbooks and Classroom Learning	0.178	0.06	0.22	.003	Ho Rejected
Dependent Variable: Academic Grit					

Note: R= 0.750, R2=0.563, F-ratio= 137.566 P-value= < .001

However, the p-values for the remaining two domains are confidence (β=0.116, p=.137) and competence (β=0.043, p=.602) appeared to be not statistically significant predictors of academic grit. At 0.05 level of significance, the p-values of the two domains exceeded 0.05. This suggest that these domains do not have significant influences on students' academic grit.

Lastly, attitude towards learning mathematics explained a significant proportion of variance in academic grit, *R*2= 0.563, F= 137.566, p<.001. The *R*2 of 0.563 shows that the model predicts 56.3% of the statistical variation observed in the level of students' academic grit among the respondents. The coefficient of alienation which 43.7 points to the extent at which other indicators or domains not included.

Conclusions

Based on the study's findings, conclusions were reached in response to the concerns posed in the previous chapter. It discussed the interpretations based on the levels achieved for the variables and domains. It will also cover the rejected and accepted hypotheses, the determined relationship between variables, and the significant domains of independent variable that influence the dependent variable.

The respondents reported a high level of metacognitive awareness which means that the variable is oftentimes observed by the students. This is parallel in attitude towards learning mathematics of mathematics major students, it can be also drawn that the level of mathematics curiosity among students was in high. This meansthat the students oftentimes manifested the variable.

Moreover, based on the results in academic grit of the mathematics major students, it can be also drawn that the level of academic grit of the students was in high. Also, this means that the students oftentimes manifested the variable.

Overall correlation of two variables reveals a significant relationship between the two variables which was metacognitive awareness and academic grit of the mathematics major students. The study shows that the metacognitive awareness has a high, positive, and significant relationship with academic grit of the students, which means that the first null hypothesis proposed in the study is rejected.

Overall correlation of two variables reveals a significant relationship between the two variables which was attitude towards learning mathematics and academic grit of the mathematics major students. The study shows that the attitude towards learning mathematics has a high, positive, and significant relationship with academic grit of the students, which means that the first null hypothesis proposed in the study is rejected. Based on the result of regression analysis, one domain has shown significant influence to the metacognitive

awareness. This means that the domain – planning – is the significant predictor of academic grit of the mathematics major students. This also indicates the rejection of the second null hypothesis proposed in the study. Accordingly, the model describes 61.3% of the statistical variation in the level of metacognitive awareness of the respondents, while the remaining 38.7% refers to other variables that have not been included in the study that also affect the academic grit of the respondents.

Furthermore, based on the result of regression analysis, three domains have shown significant influence to the attitude towards learning mathematics. This means that the three domains – interest, option for understanding and textbooks and classroom learning – is the significant predictor of academic grit of the mathematics major students. This also indicates the rejection of the second null hypothesis proposed in the study. Accordingly, the model describes 56.3% of the statistical variation in the level of attitude towards learning mathematics of the respondents, while the remaining 58.7% refers to other variables that have not been included in the study that also affect the academic grit of the respondents.

Also, the findings from this study reaffirm the significance of metacognitive awareness and attitude towards learning mathematics on grit, supporting Heider's Attribution Theory, showing student's awareness on their metacognition hones their grittiness towards academic journey. Additionally, the results align with Allport's Trait Theory, highlighting how certain attitudes that could be a hinder or help in grittiness. Moreover, Roger's Humanistic Theories which propose that someone's personality depends heavily on what they think of themselves a person's perception of themselves, including their beliefs, values, and self-image, when dealing mathematics plays a pivotal role in determining their behavior, emotions, and overall well-being in their learning journey. Based on the results, this study firmly anchors the theories of Heider, Allport and Roger, in the context of learning, reinforcing the importance of metacognitive awareness and attitude towards learning mathematics on academic grit in education.

Based from the results, every variable attained various level, as well as drawn different kind strengths of relationship between the correlations. Recommendation will be discussed to suggest what actions should be taken either to imply on the negative and positive results. This is to address the relationships of metacognitive awareness and attitude towards learning mathematics on the academic grit of the students.

The result of academic grit in terms of focus is lowest, it is hereby recommended that the teacher to instruct pupils on time management techniques, priority setting, and avoiding procrastination. These abilities which is may not be easy to attain but are necessary to stay focused and accomplish long-term objectives.

Moreover, because the result of metacognitive awareness in terms of monitoring is lowest, it is hereby recommended to the teachers to establish a proactive monitoring system to take advantage of the frequently displayed trait and guarantee an active and adaptable learning environment. This entails monitoring pupils' development on a regular basis, figuring out their areas of strength and weakness, and acting quickly to help when necessary. By implementing formative evaluations, consistent feedback mechanisms, and individualized learning methodologies, teachers can adjust their teaching methods to meet the individual needs of every student.

In addition, the result of the attitude towards learning mathematics in terms of textbooks and classroom learning is lowest, it is hereby recommended to the schools not to focus primarily on its textbooks and classroom, instead paying more attention to the adapting its learning materials to the interest of the students as it will help more honing the attitude of the students learning mathematics

However, it was shown that there is significant relationship of the metacognitive awareness and attitude on learning mathematics on the academic grit of the mathematics students. It is requested to take consideration on the metacognitive awareness and attitude towards learning when aiming on improving the academic grit of the students as well as considering all the domains that has influence on the academic grit.

Since the result of the metacognitive awareness is high, it is hereby recommended that teaching metacognition as well as subject content rather than running separate 'learning to learn' or thinking skills classes. The sessions are unproductive since it is not easy for students to link general advice with subject-specific learning.

Since the result of attitude towards learning mathematics is high, it is hereby recommended to that the teacher may consider creating a welcoming and inclusive learning atmosphere in the classroom that encourages curiosity and a development mindset while highlighting the idea that math intelligence can be acquired with hard work and persistence.

Since the result of academic grit is high, it is hereby recommended that the institution may consider providing recreational activities, counseling services, and mentorship programs to help with psychological and academic difficulties. In addition, encouraging a cooperative and collaborative learning environment motivates students to help one another, which strengthens the bonds of community.

Overall, it can be seen that there is a correlation between metacognitive awareness and academic grit of mathematics major students. it is hereby recommended that the school institution and teachers putting in place an organized plan that incorporates curriculum-based education on explicit metacognitive strategies. In addition to giving students a practical example of methodical problem-solving, this modeling highlights the value of introspective thinking. Additionally, assist students in establishing clear, attainable learning objectives by highlighting the significance of creating comprehensive plans to achieve these goals. Encourage students to evaluate the effectiveness of their tactics and pinpoint areas in which they need to improve by including reflective inquiry into the teaching process.

Moreover, it can be seen that there is a correlation between attitude towards learning mathematics and academic grit of mathematics major students. it is hereby recommended that the school institution and teachers to stress the useful applications of mathematics in a variety of professions and daily life. Make the subject more interesting and relevant by relating mathematical ideas to real-world issues. This will help students have a more optimistic outlook. Develop a growth mindset by valuing effort, perseverance, and the learning process rather than just getting the answers right. Teach kids that overcoming obstacles in mathematics is a normal aspect of learning. Assist them in realizing that intellect and mathematical skills can be increased with commitment and practice. Promote a constructive approach to problem-solving in pupils by assisting them in seeing barriers as chances for personal development rather than as insurmountable hurdles.

In addition, future researchers may consider various confounding variables can impact the association between metacognitive awareness and academic grit which is only having significant domain despite having a strong relationship. These include prior academic achievement, parental involvement, personality traits, environmental factors like socioeconomic status and school culture, and peer influences which could be factor in terms of learning mathematics. These factors can affect students' motivation, self-efficacy, resilience, and access to resources, making it challenging to isolate the specific contributions of metacognitive skills and grit to academic success. It is recommended for future researchers to explore the same topic using various methodologies, such as mixed methods, qualitative approaches, or case studies, in order to provide a more comprehensive understanding of the importance of the relationships between the variables.

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