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MATHEMATICAL MINDSET AND ACADEMIC GRIT OF MATHEMATICS STUDENTS

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ABSTRACT

This study assessed the levels of mathematical mindset and academic grit of BSE Mathematics students. The respondents were the one hundred (100) BSE Mathematics students in Central Mindanao University during Academic Year 2025–2026. This study utilized the adopted survey questionnaires of Megawanti et. al. (2024) and Clark and Malecki (2019). Descriptive statistics such as mean and standard deviation, and Pearson r correlation were employed for data analysis. Results revealed that the mathematics students possess a very high level of mathematical mindset. Academic grit was also observed at a very high level. This means that students have strong belief in their ability to be better in mathematics and students possess strong will to commit, pursue, and persist through every problem. A generally high level of correlation was also found between mathematical mindset and academic grit. This may suggest that early intervention of growth oriented mathematical mindset will have a lasting impact on the academic grit of students. Based on these findings, the study recommends implementing and fostering a growth oriented and supportive classroom environment for the further improvement of mathematical mindset and academic grit.

Keyword: Mindset, Grit, Mathematics, Correlation, Teaching

1. INTRODUCTION

Academic success has traditionally been linked to intelligence and content knowledge. This has been a topic for more than years but recent researches shows the importance of psychological factors in students' academic success. Among these factors, mathematical mindset and academic grit have emerged as psychological factors that influence performance and long-term success in education. Research in education makes it evident how students' academic success in mathematics is influenced by their mathematical mindset and academic grit.

The foundations of mathematical mindset is based on the growth-oriented belief that mathematical abilities aren't fixed. Practice, effective learning strategies, and learning from mistakes all help to develop the mathematical mindset of students. The concept of mathematical mindset is based on Dweck's (2015) growth mindset theory. It breaks the notion that only students who are naturally gifted excel in mathematics. Students are more inclined to take risks when they learn to value process over performance (Boaler, 2019). Students who possess a strong mathematical mindset see themselves as capable thinkers.

Academic grit, on the other hand, is defined by perseverance and effort. This is true even amid difficulties, failures, or setbacks that students encounters. Academic grit places an importance on sustained intellectual interest and long-term effort. These are two crucial characteristics that support students' commitment and dedication to academic tasks (Park et al., 2020). Researchers believed that grit affects lifelong learning practices and personal growth (Lam & Zhou., 2022; Bazelais et al., 2016).

Although there is global evidence linking mathematical mentality to academic grit. There is a limited study that focuses on university students in the Philippines. One related study at De La Salle University found a uniformly high mathematical mindset and academic grit among BSE Mathematics students. This study hoped to contribute to the research gap by examining the levels of mathematical mindset and academic grit of BSE Mathematics students at Central Mindanao University A.Y. 2025-2026. One hundred (100) BSE Mathematics students involved in the study

as respondents. Analyzing the relationship of mathematical mindset and academic grit helps us better understand how these two interact to influence academic success.

2. OBJECTIVES OF THE STUDY

This study aimed to assess the levels of academic grit and mathematical mindset of BSE Mathematics students in Central Mindanao University A.Y. 2025-2026. Specifically, it aimed to:

1. determine the level of mathematical mindset of BSE Mathematics students.

2. examine the level of academic grit of BSE Mathematics students.

3. ascertain if there is significant relationship between mathematical mindset and academic grit of BSE Mathematics students.

3. METHODOLOGY

3.1. Research Design

The study used descriptive-correlational approach. Its goal was to assess the mathematical mindset and academic grit levels among BSE Mathematics students at Central Mindanao University. This research design combined both elements of descriptive and inferential statistics. This is to create a comprehensive understanding of how these factors affects each other. The combination of the statistical methods was expected to provide insights about the mathematical mindset and academic grit of these students. It also examined the relationships between different variables that affects student outcomes in mathematics.

3.2. Locale of the Study

The primary data of the study was conducted at Central Mindanao University. Located in University Town, Musuan, Maramag, Bukidnon. The data gathering took place in the university where the selected mathematics students were enrolled. The study included the 4th year BSE Mathematics students who were having their field study in other schools. This ensured that the study covered all source of data whether present in the university or not. The mathematics students from the university formed the core respondents of the study.

The survey was administered through Google Forms making it accessible anytime in various locations. This ensured a broad participation and accommodated the mathematics students who are not physically present on the CMU campus.

3.3. Respondents and Sampling

The BSE Mathematics students of Central Mindanao University was the primary respondents of the study. The selection of this specific group was based on their relevance to the research objectives. This population provided insights into the mathematical mindset and academic grit in the educational process as these students are preparing for roles in the educational setting. One hundred (100) BSE Mathematics students were listed as respondents. The researcher employed stratified random sampling where the population is divided into strata according to year level (1st year, 2nd year, 3rd year, and 4th year). Twenty-five (25) BSE Mathematics students were randomly selected from each year level that summed up into one hundred (100) respondents.

3.4. Research Instrument

This study used two adopted questionnaires. The first was the Mathematical Mindset Scale (MMS), developed by Megawanti et al. (2024), which measures how much people believe that mathematical ability fosters through effort and persistence. The MMS is based on the concept of a growth mindset which consisted of 11 items rated on a five-point Likert scale. It was previously used by Aransado and Prudente (2024). Confirmatory Factor Analysis (CFA) was used to check its suitability for education students. The second questionnaire was the Academic Grit Scale (AGS) developed by Clark and Malecki (2019). This tool assesses students' determination and perseverance in academic settings. The AGS includes 10 questions that assess the academic grit of BSE Mathematics students. Aransado and Prudente (2024) also used this questionnaire and found it to be highly reliable to their study. With a Cronbach's alpha of 0.92, this level indicates its strong suitability for use.

3.5. Data Gathering Procedure

The primary data for the study was collected through a survey questionnaire. The researcher adopted two (2) survey questionnaires from another study that is related and appropriate for

this study. The researcher sought permission from the original developer of the questionnaire through an email that contains formal request consent. Following this, the researcher sent a letter of permission, signed by the research adviser, to the college dean for request approval to proceed with the study. Once the approval was granted, the researcher coordinated with the block representative of BSE Mathematics. The researcher sent a version of the survey using Google Forms. This method allowed greater flexibility that ensures the off-campus respondents were able to engage with the study and contribute to the research.

3.6. Statistical Analysis

The analysis of the data involved several statistical techniques, including mean, standard deviation, and Pearson r correlation. The following analysis provided a comprehensive understanding of the respondents' levels of academic grit and mathematical mindset. Shapiro-Wilk test of normality was initially conducted. This determined whether the data is normally distributed. The results indicated that the data is normally distributed.

Descriptive statistics, such mean and standard deviation determined the levels of academic and mathematical mindset among the respondents. The standard deviation was calculated to examine the spread or dispersion of the data. This allowed the researcher to assess whether the participants exhibit a consistent pattern or if there is considerable diversity in their responses. In addition to these descriptive statistics, Pearson r correlation was employed to assess the relationship between the levels of mathematical mindset and academic grit of the selected respondents.

4. RESULTS ANDS DISCUSSIONS

The data was statistically analysed using descriptive statistics such as the mean, and standard deviation in determining the math students' level of mathematical mindset and academic grit.

4.1. Mathematical Mindset

Table 1 shows the levels of mathematical mindset of mathematics students. The findings revealed the following results:

Indicators	Mean	Qualitative Interpretation
No matter how much math intelligence I have, I will be able to improve it	4.26	Very high
If other people can master mathematics, then I can too	4.32	Very high
I am aware that I do not have talent in mathematics, but I will do everything I can to become an expert in mathematics.	4.19	High
Even though the lecturer thinks my effort will be useless, I still want to prove that mathematics is a science that anyone can master	4.21	Very high
I will keep asking anyone until I can really understand mathematics.	4.41	Very high
Even though my friends say that studying without having mathematical talent will be useless, I think otherwise.	4.24	Very high
Mastering mathematics is not an easy job, but there are opportunities to learn and understand it little by little	4.60	Very high
Even though I've been told I'm not intelligent many times, I will keep asking questions until I finally understand mathematics.	4.45	Very high
The mathematics lecturer's criticism of me challenged me to prove that I could be better	4.30	Very high
A bad grade in mathematics challenges me to continue to master it	4.48	Very high
Even though my teacher said that I had no hope in mathematics, I wanted to keep trying.	4.28	Very high
	4.34	Very high

Legend:

4.20 – 5.00	Very High
3.40 – 4.19	High
2.60 – 3.39	Moderate
1.80 – 2.59	Slightly Poor
1.00 – 1.79	Poor

Data presented in table 1 indicated the levels of mathematical mindset among mathematics students. It showed that the mathematics students demonstrate a very high level of mathematical mindset as supported by the mean score across various indicators. The highest mean score was recorded in "Mastering mathematics is not an easy job, but there are opportunities to learn and understand it little by little" with a mean score of 4.60 and interpreted as very high level of mathematical mindset. This suggests that the mathematics students are fully aware of the difficulty and is ready to take any opportunity to learn better.

Following this, the second highest mean score was recorded in "A bad grade in mathematics challenges me to continue to master it" with a mean score of 4.48 and interpreted as very high level of mathematical mindset. This demonstrates the mathematics students' motivation for growth. For them, a bad grade in mathematics is not a liability but an opportunity to grow.

Meanwhile, the lowest mean score was observed in "I am aware that I do not have talent in mathematics, but I will do everything I can to become an expert in mathematics" with a mean score of 4.19 interpreted as high level and "Even though the lecturer thinks my effort will be useless, I still want to prove that mathematics is a science that anyone can master" with a mean score of 4.21 interpreted as very high level of mathematical mindset. Although these statements had the lowest mean scores among indicators, it is still within a high level of mathematical mindset. This could imply that some mathematics students are still in denial and not fully aware of their capability to become an expert in mathematics.

Taken together, the findings revealed that the mathematics students generally possess a very high level of mathematical mindset. This indicates their strong will to embrace challenges, persists through every problem, and view mistakes as opportunity to become better in mathematics. Providing more opportunities and meaningful experiences is essential in maintaining the generally very high level of mathematical mindset. Engage mathematics students in thought provoking situations which challenges their critical thinking and problem-solving abilities. This allows self-awareness to come out. Hence, improving the mathematical mindset of the mathematics students.

This result is consistent with the result of the local study of Aransado and Prudente (2024) who emphasized that mathematics students with high level of mathematical mindset is committed in understanding the field despite facing difficulties and challenges. Several researches also highlighted implications which aligns with the findings of this study. Mindset accounts for a significant proportion of the variance in mathematics achievement (Jumangit & Miranda, 2025). Students who believe in their potential are more likely to handle difficult problems, employ strategic thinking, and maintain perseverance which supports higher performance. Students who combined a mindset with intrinsic motivation achieved superior mathematics outcomes compared to those with mindset alone (Bravo & Nobles, 2023). Similarly, cultivating positive norms in mathematics instruction strengthens growth-oriented beliefs (Im & Park, 2023). These findings indicate that mindset and motivation operate together to guide students' goal setting, persistence, and adaptive learning behaviors.

4.2. Academic Grit

Table 2 shows the levels of academic grit of mathematics students. The findings revealed the following results

Indicators	Mean	Qualitative Interpretation
I push myself to do my personal best in school.	4.46	Very high
I work toward my academic goals no matter how long they take to reach	4.49	Very high
Even when I could do something more fun, I give schoolwork my best effort.	4.35	Very high
I complete my schoolwork no matter how difficult it is.	4.43	Very high
I am determined to give my best effort in schoolwork.	4.38	Very high
Once I set a goal in school, I try to overcome any challenges that arise.	4.42	Very high
I am able to balance working hard in school with my other hobbies and interests.	4.15	High
Even if I am struggling in school, I keep trying my best	4.47	Very high
When it comes to completing work in school, I always try my hardest.	4.31	Very high
In school, I work hard to achieve challenging goals	4.44	Very high
	4.39	Very high

Legend:

4.20 – 5.00	Very High
3.40 – 4.19	High
2.60 – 3.39	Moderate
1.80 – 2.59	Slightly Poor
1.00 – 1.79	Poor

Table 2 presents the level of academic grit of mathematics students. Results revealed that the mathematics students generally exhibited a very high level of academic grit with most mean scores falling under the very high category. The highest mean was recorded in "I work toward my academic goals no matter how long they take to reach" with a mean score of 4.49 and interpreted as very high level of academic grit. This means that most mathematics students are driven by their academic goals in life no matter how long it takes.

Moreover, "Even if I am struggling in school, I keep trying my best" got the second highest mean score with a mean score of 4.47 and interpreted as very high. This could imply that even though

there are instances in which these students are struggling, they do not give up easily. This shows the persistent they have in continuing their studies and improving their selves in the academic field.

On the other hand, "I am able to balance working hard in school with my other hobbies and interests" with a mean score of 4.15 which interpreted as high and "When it comes to completing work in school, I always try my hardest" with a mean score of 4..31 which interpreted as very high got the lowest mean score among the indicators. This could mean that the mathematics students are still not proficient in balancing their studies and their own hobbies.

Mathematics students have a very high level of academic grit. This implies that most mathematics students are committed to their long-term goals. Students are also willing to persevere but it's important to also reflect on mistakes and setback that they have encountered. This opens the door for improvement and more learning experiences. Encourage students to do self-reflection and explore areas of interest as this eliminates the possibility of academic fatigue. Early assessment is also needed to lessen their problems that can affect their strong will to commit and persevere. Conversely, the low mean scores in some areas suggests that some mathematics students might still holding back instead of being at their best in their studies. Offering more meaningful and goal driven activities may be able to rekindle the passion and avoid the burnout.

These implications are aligned with several implications from other research studies related to academic grit. Academic grit was believed to predict achievement most effectively when combined with conscientiousness (Bazelais et al., 2018). This indicates that persistence works best alongside structured habits and a sense of responsibility. Furthermore, students who plan, monitor, and manage their study habits are more capable of sustaining effort across demanding coursework (Lam & Zhou, 2022). Additionally, students with higher levels of academic grit demonstrate greater persistence and retention which is critical in programs where failure in one concept affects mastery of future topics (Bazelais, Lemay, & Doleck, 2016).

4.3. Mathematical Mindset and Academic Grit

Table 3 shows the relationship between mathematical mindset and academic grit of mathematics students.

Variables	Correlation Coefficient (r)	Probability (p)
Mathematical Mindset – Academic Grit	0.785	.001*

* Correlation is significant at the 0.05 level (2-tailed)

It can be observed that there is a high positive correlation between mathematical mindset and academic grit with a computed r-value of 0.785 and a p value of .001 which is less than 0.05. This means that we reject the null hypothesis. Thus, there is a significant relationship between mathematical mindset and academic grit of mathematics students in Central Mindanao University.

The strong level of correlation between mathematical mindset and academic grit indicates that students with high level of mathematical mindset tend to exhibit a greater level of academic grit in mathematics. The interplay between mathematical mindset and academic grit suggests that fostering the mathematical mindset play a crucial role in enhancing students' resilience, persistence, and perseverance. Furthermore, cultivating a mathematical mindset and academic grit is believed to serve as effective strategy in improving the overall academic performance of students in mathematics.

A growth-oriented mindset allows learners to perceive mathematics as a subject that can be mastered through effort, reflection, and strategic practice rather than an innate talent that one might possess or lacks. When mathematical mindset is paired with academic grit, students are more likely to persist through any challenges, maintain sustained focus, and develop adaptive strategies for solving complex problems (Dweck, 2015). Kotrotsiou and Papadopoulou (2023) added that students who believed in their ability to improve required sustained effort to translate this belief into measurable academic performance.

Moreover, the positive correlation of mathematical mindset and academic grit was supported by several studies including the works of Aransado and Prudente (2024), Waheed et. al (2025) and Kotrotsiou and Papadopoulou (2023).

5. CONCLUSION

Based on the results the following conclusions were drawn.

The level of mathematical mindset among BSE mathematics students in Central Mindanao University is very high. This means that students highly believe in their ability to become better in mathematics.

A very high level of academic grit was also observed among mathematics students. This shows that the mathematics students are strong willed, passionate, and persisting type of students.

Furthermore, a positive relationship between mathematical mindset and academic grit was found out. This implies that there is a connection between mathematical mindset and academic grit of mathematics students. In conclusion, both mathematical mindset and academic grit are found to have a significant role in developing each other in mathematics students.

6. RECOMMENDATION

The findings and conclusions of the study led to the following recommendations.

Educators may continue to foster a growth oriented mathematical mindset in the classroom that encourages persistence and positive attitudes towards learning. Integrate activities that promote self-reflection can further strengthen the mindset and grit of the students. Constructive feedbacking and praising efforts are also highly encouraged. This eliminates the doubt that students might feel while learning mathematics.

The school stakeholders may also implement programs, seminars, or workshops that promote the academic grit of students. Mentorship programs that connect the successful mathematics students to the struggling can be implemented. This may reignite the passion that the students might have lost while learning mathematics.

Parents play a vital role in shaping students' mathematical mindset and academic grit while learning. Parents are encouraged to nurture a supportive learning environment that values effort and learning. Help students cultivate a mindset that mathematical ability can be developed through hard work and dedication. Lastly, offer valuable advice and motivation through a conversation which ensures the mathematical students of the parental support while learning.

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