# Academic Grit and Perceived Teacher Support as Predictors of Mathematics Engagement among Junior High School Students

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**Abstract**

Low student engagement continues to undermine mathematics education. With this, academic grit and perceived teacher support were examined as predictors of mathematics engagement. Using a predictive design involving 282 junior high school students who were selected through stratified proportional random sampling, the results showed that academic grit and perceived teacher support significantly predicted mathematics engagement at a strong level, affirming Social Learning Theory. Future studies may examine additional variables that could explain the remaining 36.2% of the variance in mathematics engagement, explore emerging predictors through qualitative research, and encourage the Department of Education to develop school-based programs that strengthen students' academic grit and teacher support systems.

*Keywords: Academic grit; perceived teacher support; predictors of mathematics engagement; junior high school students*

## 1. Introduction

Despite decades of curriculum initiatives and reforms, poor student engagement in mathematics has persisted across diverse educational systems worldwide (Murphy & Ingram, 2023). In fact, numerous international studies have consistently documented that this disengagement is highly evident across both developed and developing countries, reflecting its global prevalence (Nia et al., 2023). In addition, international assessment reports, such as the UNESCO Global Education Monitoring Report (2024), have consistently recognized this as a significant educational concern in mathematics. Taken together, these ongoing findings underscore the enduring nature of low engagement in mathematics as a central concern in academic discussions.

Recent international studies have highlighted poor classroom engagement in mathematics as a recurring issue across many learning contexts. In Australia, Finland, France, and the USA, Cevikbas and Kaiser (2021) reported that a large number of students are becoming disengaged in mathematics as they transition from primary to upper secondary level. Similarly, in Ireland, Ryan et al. (2021) noted a significant decline in learning engagement in mathematics among secondary students. In the same vein, Lee et al. (2023) recently identified a gradual decline in students' engagement with mathematics in South Korea, showing a decrease in their interest and positive attitude as they progress through secondary school.

This international concern was compounded by prevailing circumstances in the Philippines, where the Programme for International Student Assessment (PISA) highlighted that students continue to demonstrate low engagement performance in mathematics (OECD, 2022). In Davao City, this issue was also evident, as college students showed low classroom engagement in the Mathematics of the Modern World subject in a blended learning environment (Torrejos, 2024).

Low classroom engagement in mathematics threatens educational quality by limiting the development of essential 21st-century skills such as problem-solving and critical thinking (Cajandig & Ledesma, 2025; Sen, 2022). Students who are not actively engaged tend to show lower academic performance and weaker understanding of fundamental mathematical concepts (Maamin et al., 2021). Despite the profound implications of this concern, existing studies have provided minimal exploration of the multifaceted nature of student engagement in mathematics, particularly among junior high school students (Yue, 2023). Hence, this study was conducted.

The findings of this study support the promotion of United Nations Sustainable Development Goal No. 4 on quality education. These may serve as a basis for educational institutions in developing evidence-based programs and interventions that enhance students' perseverance, motivation, and engagement in mathematics. For Holy Cross of Davao College, the results may contribute to the implementation of its vision and mission by promoting holistic student development, fostering meaningful teacher–student relationships, and supporting quality, learner-centered education. The findings may also guide educators in designing effective instructional strategies and provide insights for future researchers seeking to improve mathematics learning and student development.

The study determined the significance of academic grit and perceived teacher support as predictors of mathematics engagement among junior high school students. Specifically, it pursued the following objectives: 1.) to determine the levels of academic grit in terms of determination, resilience, and focus; perceived teacher support in terms of instrumental, emotional, informational, and appraisal support; and mathematics engagement in terms of behavioral, cognitive, emotional, and social engagement; 2.) to determine the significance of the correlation between academic grit and perceived teacher support, and the mathematics engagement; and 3.) to determine the significance of the model for mathematics engagement with academic grit and perceived teacher support as predictors.

## 2. Methodology

### *2.1. Research Design*

The study employed a predictive research design. According to McCombes (2023), this design focuses on forecasting future outcomes or behaviors by examining relationships among variables using multiple linear regression. In this study, a predictive research design was employed to determine how academic grit and perceived teacher support predict students' engagement in mathematics. Through this approach, the researcher analyzed the extent to which these predictive variables predict the criterion variable.

### *2.2. Locale of the Study*

The study was conducted in the public junior high schools of Clusters 2 and 3 in the Division of Davao City, Region XI. Over the years, these selected schools have established a reputation for providing quality education and producing students who excel in inter-school mathematics competitions at the district and regional levels, making them a good locale for collecting data on students' engagement in mathematics. In addition, given its large population, the researcher selected a diverse, representative sample of respondents to examine how personal and environmental factors, such as academic grit and perceived teacher support, can shape mathematics engagement. These characteristics made the institutions an ideal setting for the study.

*2.3. Sample and Sampling*

The respondents in this study were 282 currently enrolled junior high school students. These students were specifically chosen, as junior high marks a critical stage in academic development, making it a pivotal time to examine psychological and contextual factors, such as academic grit and perceived teacher support, that affect their engagement in mathematics. Students who had dropped out and were not enrolled in the 2025-2026 academic year were automatically excluded from the respondent group. Also, gender representation was not considered a requirement of this study.

Furthermore, the researcher used a stratified proportional random sampling method to select respondents from three public junior high schools. The population was divided equally into strata by school and grade level to ensure the chosen sample was adequately represented (Iliyasu & Etikan, 2021). With that, the respondents comprised junior high school students selected proportionally across all schools and grade levels. Finally, by encoding the total recorded population of 1056 students in Raosoft with a 95% confidence level, a 5% margin of error, and a 50% response distribution, the sample size was determined to be at least 282, which aligned with the desirable sample size suggested by Julious (2023).

*2.4. Data Gathering Technique*

To quantify the three constructs of the study, the researcher utilized modified survey questionnaires to collect the data. The academic grit questionnaire was adapted from Clark and Malecki (2019) with indicators of determination, resilience, and focus. It contained 30 items and was tested for reliability, yielding a Cronbach's alpha of 0.904. Additionally, the perceived teacher support questionnaire was adapted from Wu et al. (2024) with indicators of instrumental, emotional, informational, and appraisal support. It consisted of 25 items and underwent reliability testing, yielding a Cronbach's alpha of 0.945. Lastly, the mathematics engagement measure was adapted from Wang et al. (2016) with indicators of behavioral, cognitive, emotional, and social engagement. It consisted of 33 items and was subjected to reliability testing, obtaining a Cronbach's alpha of 0.929.

*2.5. Data Analysis Technique*

In this research, descriptive, correlation, and regression analyses were utilized to examine and interpret the data. In descriptive analysis, the mean and standard deviation were employed. The mean determined the level of the variables, while the standard deviation measured the extent of variation or dispersion in the respondents' answers. Moreover, in the correlation analysis, the Pearson Product–Moment Correlation Coefficient was used to assess the strength and direction of the relationship between the variables. Ultimately, in regression analysis, multiple linear regression was utilized to examine the predictive power of academic grit and perceived teacher support on students' mathematics engagement, particularly through the interpretation of the Beta (β) coefficient strength.

*2.6. Ethical Considerations*

As this study involved human participation, ethical considerations were held in place to safeguard the rights, dignity, and welfare of all participants from any form of harm. Before data collection, informed assent and informed consent from their parents or guardians were obtained from all participants, ensuring their voluntary participation and the confidentiality of their responses. Further, to ensure the protection of respondents, the integrity of the research process, and the validity of the findings, the researcher strictly adhered to the ethical guidelines outlined by the Holy Cross of Davao College – Society for Moral Integrity

and Legal Ethics (HCDC-SMILE). This body reviewed and approved the study, including its research instruments, before implementation. Finally, permission from the Department of Education was formally secured to conduct the study within public schools under its jurisdiction.

## 3. Results and Discussions

### *3.1 Descriptive Analysis*

Table 1 comprehensively presents the descriptive statistics of the study variables, namely: academic grit, perceived teacher support, and mathematics engagement with their respective indicators. It also contained the number of samples, computed means, and standard deviations, and corresponding descriptive interpretations.

*Table 1: Descriptive Table (n = 282)*

| Variables | Standard Deviation | Mean | Descriptive Level |
|---|---|---|---|
| **Academic Grit** | **0.40** | **3.13** | **High** |
| *Determination* | *0.42* | *3.24* | *High* |
| *Resilience* | *0.46* | *3.24* | *High* |
| *Focus* | *0.51* | *2.91* | *High* |
| **Perceived Teacher Support** | **0.42** | **3.29** | **Very High** |
| *Instrumental Support* | *0.48* | *3.22* | *High* |
| *Emotional Support* | *0.47* | *3.37* | *Very High* |
| *Informational Support* | *0.47* | *3.28* | *Very High* |
| *Appraisal Support* | *0.51* | *3.30* | *Very High* |
| **Mathematics Engagement** | **0.41** | **3.14** | **High** |
| *Cognitive Engagement* | *0.43* | *3.20* | *High* |
| *Behavioral Engagement* | *0.48* | *3.16* | *High* |
| *Emotional Engagement* | *0.53* | *3.02* | *High* |
| *Social Engagement* | *0.45* | *3.22* | *High* |

The academic grit variable yielded a mean score of 3.13, interpreted as high, indicating that students demonstrated strong academic grit. All of its indicators also obtained a high descriptive level. The standard deviation of 0.40 obtained indicated highly consistent responses.

Moreover, the perceived teacher support variable had a mean score of 3.29, classified as very high, suggesting that students' support from their teacher was very good. In addition, three indicators obtained a very high descriptive level, while the other indicator obtained a high level. The standard deviation of 0.42 obtained indicated highly consistent responses.

Finally, the mathematics engagement variable obtained a mean score of 3.14, described as high, demonstrating that the student's engagement in mathematics was good. All of its indicators also achieved a high descriptive level. The standard deviation of 0.41 obtained indicated highly consistent responses.

### *3.2 Correlation Analysis*

Table 2 is the correlation table. It explicitly contains the two predictive variables, namely, academic grit and perceived teacher support, and the criterion variable, which was mathematics engagement. The table presents data on the r-value, p-value, the decision on the null hypothesis, and its corresponding interpretation.

*Table 2: Correlation Table (n = 282)*

| Variables | Mathematics Engagement | | | |
|---|---|---|---|---|
| | r-value | p-value | Decision | Interpretation |
| Academic Grit | 0.722 | 0.000 | Rejected | Moderately high positive, significant correlation |
| Perceived Teacher Support | 0.732 | 0.000 | Rejected | Moderately high positive, significant correlation |

*Level of Significance: 0.05*
*Decision Rule: Reject $H_0$ if $p < 0.05$*

Specifically, the correlation between academic grit and mathematics engagement obtained a p-value of 0.000, which was less than the 0.05 level of significance. Hence, the null hypothesis was rejected. This result indicated a statistically significant correlation. With an r-value of 0.722, this correlation was considered moderately high.

Furthermore, the correlation between perceived teacher support and academic grit obtained a p-value of 0.000, which was less than the 0.05 level of significance. Hence, the null hypothesis was rejected. This result indicated a statistically significant correlation. The obtained r-value of 0.732 signifies that their correlation was also moderately high.

### *3.3 Regression Analysis*

Table 3 presents the results of the multiple linear regression analysis. The table includes the predictors and the criterion variable. The standardized and unstandardized beta coefficients, standard errors (SE), t-values, p-values, decision on null hypothesis, and interpretations are also shown. Moreover, it presented the regression summary, including the R, $R^2$, F-value, p-value, and the regression model equation.

*Table 3: Regression Table (n = 282)*

| Predictors | *Mathematics Engagement* | | | | | | |
|---|---|---|---|---|---|---|---|
| | Unstand. Coefficients B | SE | Stand. Coefficients β | t | p | Decision | Interpretation |
| Constant | 0.358 | 0.126 | —— | 2.84 | —— | —— | —— |
| Academic Grit | 0.431 | 0.049 | 0.424 | 8.88 | 0.000 | Rejected | Significant, Influence |
| Perceived Teacher Support | 0.436 | 0.046 | 0.454 | 9.50 | 0.000 | Rejected | Significant, Influence |

*Model Summary: R = 0.799 | $R^2$ = 0.638 | F (2,279) = 246 | p = 0.000*
*Level of Significance: 0.05*
*Decision Rule: Reject $H_0$ if p < 0.05*
***ME = 0.431AG + 0.436PTS + 0.358***

Specifically, the table shows that the predictive model for mathematics engagement, with academic grit and perceived teacher support as predictors, is ME = 0.431AG + 0.436PTS + 0.358. It revealed that the model was significant, as the obtained p-value of 0.000 was lower than the 0.05 significance level. The result suggests that for every unit change in academic grit, mathematics engagement increases by 0.431 units. In the same way, for every unit changed in perceived teacher support, there is a 0.436 unit change in the criterion.

Furthermore, the table specifically reports an $R^2$ of 0.638, indicating that the model's ability to predict mathematics engagement is strong. Thus, the predictive model was significant, indicating that academic grit and perceived teacher support were important predictors of students' mathematics engagement, and that the model strongly explained variations in engagement.

*3.4 Correlation between Academic Grit and Mathematics Engagement*

The result shows a moderately high correlation between academic grit and mathematics engagement among junior high school students. This finding aligns with the study of Datu et al. (2023), which documented that academic grit was positively associated with higher levels of student engagement in mathematics, leading to greater cognitive, behavioral, and emotional involvement in the learning process. Similarly, this current result corroborates the finding of Buencosejo et al. (2025), which reported that grit was significantly associated with increased students' behavioral, emotional, and cognitive engagement, enabling them to actively participate, sustain their effort, and maintain emotional interest in learning mathematics.

Conversely, the result shows a correlation between academic grit and mathematics engagement, which contrasts with Obeng et al. (2025), who claimed that academic grit alone was not strongly associated with engagement, noting that its effect depends on factors such as self-regulated learning and academic motivation. This difference is explained by the smaller sample size of 190 respondents compared with the larger sample of 282 respondents in the present study, which provided more robust statistical evidence of the relationship between academic grit and mathematics engagement.

*3.5 Correlation between Perceived Teacher Support and Mathematics Engagement*

The result shows a moderately high correlation between perceived teacher support and mathematics engagement. In fact, this finding supported the latent profile analysis of Zhou et al. (2025), which found that students with higher perceived teacher support showed stronger correlations with greater behavioral, cognitive, and emotional engagement in learning mathematics than those with lower perceived teacher support. Likewise, this study confirms Gan and Pheng's (2024) assertion that when teachers offer instructional guidance, establish strong rapport, and show an utmost genuine concern for students' learning, learners are more likely to appreciate and value mathematics, thereby strengthening their interest in learning from it.

Nevertheless, this finding contradicts Alrashidi and Alshammari (2024), who argued that teacher support does not directly translate into student engagement, as its effect operates indirectly through other variables, such as self-efficacy and academic emotions. With only 201 sample respondents in their study, compared with the 282 in the current study, the larger sample size in the present study further strengthened the statistical evidence for the direct relationship between perceived teacher support and mathematics engagement.

*3.6 Mathematics Engagement as Predicted by Academic Grit and Perceived Teacher Support*

The finding uncovers that academic grit is a significant predictor of mathematics engagement. Consistent with this finding, Datu et al. (2021) reported that academic grit dimensions, with adaptability as the strongest predictor, significantly predicted students' engagement in mathematics. Additionally, this study validates the concept of Wu et al. (2026), which posits that gritty students develop stronger self-regulation and achievement motivation, which, in turn, strengthen their engagement and commitment to mastering mathematics. However, the predictive power of academic grit may not always be direct, as Oriol et al. (2017) noted that its effect on engagement is mediated by motivation regulation and self-control.

Moreover, perceived teacher support predicts mathematics engagement, suggesting that students with adequate teacher support are more likely to engage in mathematics learning. This finding substantiates the claim of Yang et al. (2023), who assert that teacher support predicts students' engagement by fostering self-confidence and goal-directedness. Likewise, Alrajeh and Shindel (2020) affirm the current finding, identifying that instructional assistance, a form of teacher guidance, significantly predicts mathematics engagement regardless of students' profiles. In particular, this support enhanced students' conceptual understanding in mathematics, thereby fostering their sustained engagement and confidence. However, the finding that perceived teacher support predicts mathematics engagement contradicts Xu et al. (2023), suggesting that teacher support alone may not be sufficient to sustain students' engagement without internal motivational drives, such as learning motivation.

## 4. Conclusion

Based on the findings, it is concluded that the model predicting mathematics engagement, with academic grit and perceived teacher support as predictors, is significant at 63.8% strong level. This result affirms Social Learning Theory, which posits that personal, behavioral, and environmental factors influence an individual's psychosocial functioning.

## 5. Recommendation

Based on the conclusion, it is recommended that further studies be undertaken to examine other variables not covered in this study and identify potential factors that may account for the remaining 36.2% of the variance in mathematics engagement. Future research may focus on qualitative studies to explore emerging themes that could serve as additional predictors of mathematics engagement. Finally, the Department of Education is encouraged to initiate and design additional school-based programs, such as the Mathematics Enrichment and Remediation Program, that strengthen students' academic grit and enhance teacher support systems to promote holistic engagement in mathematics.

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