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BASIC MATHEMATICAL FOUNDATIONS AND ACADEMIC PERFORMANCE IN GENERAL MATHEMATICS OF GRADE 11 LEARNERS: A CORRELATIONAL STUDY

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Abstract:

This study, titled Basic Mathematical Foundation and Academic Performance in Grade 11 General Mathematics Learners: A Correlational Study, sought to determine the basic mathematical foundation skills of Grade 11 learners, their academic performance in General Mathematics, and the relationship between these variables. A quantitative research design was employed involving 69 Grade 11 learners. Data were collected through a numeracy screening test and their recorded grades in General Mathematics.

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Descriptive statistics were used to describe performance levels, while Pearson's r was applied to test the correlation between numeracy skills and academic achievement. The findings revealed that learners achieved an average level of numeracy with a mean percentage score of 45.91%. In General Mathematics, the majority were rated as "Fairly Satisfactory," while only a small percentage attained "Outstanding" and "Very Satisfactory" levels. The correlation study showed a strong linear relationship ($r = 0.706$, $p < .001$), showing that students with good mathematical foundation skills performed better academically. The results emphasize the significance of numeracy competence in shaping learners' academic performance and highlight the need for intervention programs to strengthen foundational mathematical skills.

Keywords: academic performance, correlation, mathematical operations, senior high school

1. Introduction

General Mathematics is a core subject in Senior High School because mastery of basic mathematical operations underpins success in higher-order math and more abstract concepts. When students lack fluency in addition, subtraction, multiplication, and division, they struggle with advanced mathematics. Proficiency in computation enables students to process quantitative information more efficiently, directly supporting their persistence, accuracy, and working memory in scientific, technological, and linguistic tasks.

At Mabuhay Agro-Industrial High School in Sto. Niño, Mabuhay, Zamboanga Sibugay, Grade 11 learners struggle with complex concepts, especially functions and advanced mathematics. The Mathematics Teacher notes that these difficulties arise not only from the abstractness of higher mathematics but also from students' weak skills in basic operations. When learners lack confidence in simple calculations, they make errors, take longer to solve problems, and feel anxious when facing advanced tasks.

In the context of Mabuhay Agro-Industrial High School, these findings suggest that addressing gaps in basic mathematical operations is key to improving not only mathematics learning but also students' overall academic performance. Understanding the relationship between mastery of basic mathematical operations and overall academic averages will provide evidence for designing effective numeracy interventions that can support Grade 11 learners in overcoming challenges in higher mathematics.

2. Literature Review

This chapter summarizes the research and scholarly works related to the present study on the relationship between learners' performance in basic mathematical operations and their academic performance in General Mathematics.

Basic arithmetic ability is often regarded as a strong predictor of future mathematical accomplishment. Spitzer *et al.* (2024) found that students' success in arithmetic and measurement problems was strongly related to their grasp of fractions and more advanced mathematics, demonstrating how basic skills support future learning. Similarly, Gashaj *et al.* (2023) found that early numeracy abilities were highly associated with overall academic success, even after controlling for home learning circumstances and math anxiety. These findings emphasize the necessity of learning basic operations as a foundation for long-term academic success.

Several studies have investigated the cognitive mechanisms underlying the link between computational fluency and academic achievement. A meta-analysis of 46 studies involving over 11,000 participants found a medium association between working memory (WM) and arithmetic ($r \approx .31$), indicating that automating fact retrieval frees up WM resources for complicated tasks (Zhang & Xin, 2022). Ji *et al.* (2023) went on to explain that activities with higher contextual demands, such as word problems, place a greater cognitive load on working memory, increasing the benefits of fluent arithmetic skills. Together, these findings show that working memory is an important link between basic computing skills and overall academic performance.

Emerging empirical evidence supports the critical role of computational fluency and related cognitive skills in both mathematics learning and broader academic achievement. For example, a meta-analysis of nearly 9,000 students found a moderate positive relationship between computational thinking and academic performance, suggesting that students who engage well with logical and arithmetic tasks tend to perform better overall (Lei *et al.*, 2020)

Intervention studies also provide compelling evidence for the importance of fluency in academic attainment. For example, Roy *et al.* (2025) demonstrated that students' speed and accuracy in answering simple arithmetic problems predicted their success on standardized math tests. Similarly, Luu (2024) found that participating in a computer-assisted fact-fluency program dramatically improved addition and subtraction skills, resulting in higher standardized test scores. Post-pandemic implementations, such as taped-problem methods, continue to produce significant fluency increases among difficult students, highlighting the practical efficacy of fluency-focused interventions (Carriaga-Baril, 2025).

Research in the Philippines is consistent with similar international findings. According to the Department of Education (DepEd) e-Saliksik studies, numeracy levels are strongly linked to students' mathematics grades and general achievement, proposing focused remediation in basic operations. Similarly, a study at a Leyte public high school found substantial connections between mathematics proficiency and overall academic success, with differences across gender and grade level serving as important factors in evaluating student outcomes. These local studies emphasize the critical need for remediation programs in core arithmetic skills to enhance students' academic paths in the Philippines.

These findings create a solid framework for the current study, which aims to investigate the relationship between students' performance in basic mathematical operations and academic performance in General Mathematics.

3. Material and Methods

This study employed a quantitative correlational research design to determine whether there is a significant relationship between students' performance in basic mathematical operations and their academic achievement in General Mathematics. The research was conducted at Mabuhay Agro-Industrial High School, located in Sto. Niño, Mabuhay, Zamboanga Sibugay, during the School Year 2025–2026.

The participants in the study were 69 Grade 11 learners selected through convenience sampling. Only officially enrolled students in the first semester were included. Participation was voluntary, and the anonymity of all respondents was ensured by assigning unique identification codes instead of using names. This procedure ensured that all responses and academic records remained confidential and were reported only in aggregate.

The main instrument used in the study was the Numeracy Screening Test**,** an adapted assessment tool from the Department of Education consisting of 88 items: 20 for addition, 20 for subtraction, 20 for multiplication, 20 for division, and 4 word problems (2 points each). In addition to this assessment, learners' First Quarter General Mathematics grades were collected from official school records with the administration's authorization. These grades then served as the indicator of their academic achievement in General Mathematics

The data collection procedure involved several steps. Permission to conduct the study was obtained from the school head and subject teachers. Participants were oriented on the research purpose, and informed consent was secured. The Numeracy Screening test was administered in a controlled classroom under standardized conditions. After testing, the answer sheets were collected, checked, and entered into a secure database. With proper authorization, General Mathematics grades were retrieved from the registrar and matched to each student's test results.

For data analysis, the scores from the Numeracy Screening Test and the General Mathematics grades were analyzed using Jamovi**.** Descriptive statistics, including the mean, standard deviation, and frequency distributions, were computed to provide an overview of the data. To test the hypothesis, Pearson's correlation coefficient was employed to examine the strength and direction of the relationship between performance in basic operations and academic achievement in General Mathematics.

4. Results and Discussion

This part summarizes the findings of the gathered data and their interpretation. The discussion is supported by relevant literature and recent studies to provide a deeper understanding of the results and their implications.

Table 1: Numeracy Screening Test Results of Grade 11 Learners

	N	Mean	MPS	SD	Descriptive Equivalent Level
Numeracy Screening Test	69	40.4	45.91%	23.46	Average

MPS. 96 – 100% = Mastered; 86 – 95% = Closely Approximating Mastery; 66 – 85% = Moving Towards Mastery; 35 – 65% = Average; 15 – 34% = Low; 5 – 14% = Very Low; 0 – 4% = Absolutely No Mastery

Table 1 presents the results of the Numeracy Screening Test for Grade 11 learners. It shows that the Mean score is 40.4, the Mean Percentage Score (MPS) is 45.91%, and the Descriptive Equivalent Level is "Average". This indicates that, as a whole, the learners demonstrated only an average level of mastery in basic mathematical operations, far below the desired mastery standard of 96–100%. The computed standard deviation of 23.46 further indicates a wide variation in students' scores, suggesting that while some learners had relatively stronger numeracy skills, others struggled significantly in this area.

The findings imply that the numeracy skills of Grade 11 learners are generally underdeveloped and insufficiently mastered. With an overall average performance, students may encounter difficulties in applying higher-order mathematical concepts, which rely heavily on proficiency in fundamental operations. The substantial variability in scores also highlights the heterogeneous nature of learners' abilities, underscoring the need for differentiated instruction and targeted interventions to address individual gaps. Strengthening foundational numeracy skills is essential, as poor mastery at this level could hinder students' overall mathematics performance and academic achievement in other subject areas.

Table 2: Academic Achievement of Grade 11 Learners in General Mathematics

General Mathematics Grade	Frequency (f)	Descriptive Equivalent Level
90-100	3	Outstanding
85-89	15	Very Satisfactory
80-84	11	Satisfactory
75-79	20	Fairly Satisfactory
Below 75	20	Did Not Meet Expectation

Grading Scale: 90- 100 = Outstanding; 85-89 = Very Satisfactory; 80-84 = Satisfactory; 75-79 = Fairly Satisfactory; Below 75 = Did Not Meet Expectation

Table 2 presents the academic achievement of Grade 11 learners in General Mathematics. The results reveal that of 69 learners, only 3 (4.35%) achieved an "Outstanding" level **(**90–100), while 15 (21.74%) achieved a "Very Satisfactory" level (85–89). A total of 11 students (15.94%) were rated "Satisfactory" (80–84), whereas a larger proportion, 20 students

(28.99%), were rated "Fairly Satisfactory" (75–79). Notably, another 20 students (28.99%) did not meet expectations, with grades below 75, indicating a considerable number of learners struggling in General Mathematics. These findings highlight that while a small group of learners excel, a significant portion either barely meets or fails to meet the required proficiency level.

This distribution suggests that many students enter senior high school with an inadequate mathematical foundation, consistent with the earlier Numeracy Screening Test results, in which the majority demonstrated only average mastery. As Cabuquin and Abocejo (2023) emphasized, mathematics performance is a strong predictor of overall academic achievement, which means that these gaps in performance could hinder learners' success across other subjects. Furthermore, Yang, Maeda, and Gentry (2024) observed that mathematical confidence significantly correlates with mathematics achievement, implying that students with low confidence in their skills may be more prone to underperformance. Similarly, Abenoja *et al.* (2025) noted that although many students show interest in mathematics, this does not always translate into higher achievement, stressing the importance of competence and consistent practice.

The results also support Pizon and Ytoc's (2021) assertion that mathematics performance is shaped by multiple factors, including teaching strategies, motivation, and learning environment. The relatively large number of learners did not reach the expectations, suggesting a need for targeted interventions such as remedial instruction, differentiated teaching strategies, and strengthened learner support. Without these measures, the gap between high-performing and low-performing students may further widen, negatively affecting their readiness for higher-level mathematics and other academic areas.

Table 3: Test of Correlation between Numeracy Screening Test and Academic Performance in General Mathematics

Variables	r-value	Remarks	p-value	Remarks
Numeracy Screening Test Academic Performance in General Mathematics	0.706	Strong Linear Relationship	<.001	With Significant Relationship

Pearson r.		
0 – ± 0.29	=	No Linear Relationship
± 0.30 – ± 0.49	=	Weak Linear Relationship
± 0.50 – ± 0.69	=	Moderate Linear Relationship
± 0.70 – ± 0.99	=	Strong Linear Relationship
± 1	=	Perfect Linear Relationship

Table 3 shows the results of the correlation test between the numeracy screening test and academic performance. It revealed an r-value of 0.706 and a p-value <.001, indicating a

strong, significant positive relationship between the Numeracy Screening Test and students' academic achievement in General Mathematics. This means that students who performed well in basic mathematical operations also tended to achieve higher in General Mathematics. The significant relationship suggests that proficiency in numeracy skills plays a crucial role in determining learners' success in higher-level mathematics and, by extension, their overall academic performance. In other words, students' mastery of basic operations provides a strong foundation that directly influences their ability to understand and apply mathematical concepts in more complex contexts.

These findings are consistent with the study by Cabuquin and Abocejo (2023), which reported a strong, highly significant correlation ($r = .750$, $p < .001$) between mathematics learners' performance and their overall academic achievement among junior high school students in Leyte, Philippines. Similarly, Yang, Maeda, and Gentry (2024) emphasized that mathematics self-efficacy is a robust predictor of math achievement across multiple grade levels, explaining a substantial portion of performance variance. This supports the notion that competence in numeracy skills can significantly predict success in mathematics and other academic areas. On the other hand, Abenoja *et al.* (2025) found no significant relationship between interest in mathematics and academic performance among pre-service teachers, highlighting that at higher education levels, interest alone may not directly influence achievement. However, in the context of secondary education, as shown in the present study, skills rather than interest strongly drive performance outcomes. Furthermore, Pizon and Ytoc (2021) pointed out that learners' attitudes, learning styles, and teaching strategies also affect mathematics achievement, suggesting that while numeracy skills are essential, affective and instructional factors also contribute to academic success.

Overall, the results of this study indicate the significance of strengthening learners' basic mathematical foundation to improve their academic performance. Given the strong, significant correlation, educators may consider designing interventions to enhance foundational numeracy skills, as this may serve as a gateway to improving performance not only in mathematics but also in other academic subjects.

5. Recommendations

Based on the findings, it is recommended that schools should reinforce the Basic Mathematical Foundation by conducting remediation for the identified enumerative learners. Teachers should apply differentiated, student–centered strategies to meet learners' needs and encourage active participation in class.

In addition, the use of technology in the lesson is recommended to enhance learners' learning experience. By integrating educational applications, interactive simulations can provide tailored practice and immediate feedback. Furthermore, regular diagnostic and formative assessments should be used to closely monitor learners' progress and steer instructional changes. Parents and communities are also urged to play an active part in

fostering numeracy development through home-based activities and extracurricular projects that build on classroom learning. Finally, teachers should be provided with ongoing professional development opportunities focused on novel pedagogical approaches in mathematics, ensuring they are prepared to address students' diverse competencies. Future researchers may also examine other characteristics, such as motivation, study habits, and learning methodologies, to gain a more comprehensive understanding of students' performance.

6. Conclusion

The study found that Grade 11 learners have an average level of Basic Mathematical Foundation, as indicated by a Mean Percentage Score (MPS) of 45.91% in the numeracy screening test. It implies that, while learners have a Basic Mathematical Foundation, many are still far from mastery. In terms of academic achievement in General Mathematics, the distribution of grades revealed that only 3 or 4.35% of learners reached the “Outstanding”, 15 or 21.74% of learners with “Very Satisfactory” levels, 11 or 15.94% of learners with “Satisfactory” levels, while the majority were classified as “Fairly Satisfactory” or “Did Not Meet Expectations.”

Thus, the correlation study showed a strong, significant linear relationship ($r = 0.706$, $p < .001$) between students’ numeracy screening performance and their academic performance in General Mathematics. This suggests that learners with higher numerical ability perform better in mathematics, whereas those with weaker fundamental skills are more likely to struggle academically. The findings underscore the critical role of numeracy competence as a foundation for success in higher-level mathematical learning and overall academic performance.

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Conflict of Interest Statement
The authors declare no conflicts of interest.

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