

EFFECT OF NUMERIC LITERACY ON MATHEMATICS OUTCOMES OF SEVENTH-GRADE STUDENTS OF SMP NEGERI 1 BRINGIN

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ABSTRACT

This study aims to determine how Effect Of Numeric Literacy On Mathematics Outcomes Of Seventh-Grade Students Of SMP Negeri 1 Bringin. The research employs a quantitative method with a design intended to examine the relationship between the variables studied. Data were collected from 32 students of class VII D through a numeracy literacy questionnaire and an analysis of their End-of-Semester Summative Assessment scores. The findings show that numeracy literacy has a very strong and significant relationship with mathematics learning outcomes. This is evidenced by a Pearson correlation value of 0.867 with a significance level of 0.000. The coefficient of determination ($r^2 = 0.751$) indicates that numeracy literacy accounts for approximately 75.1% of the variation in students' mathematics performance. The regression analysis produced the equation $Y = 1.125 + 1.016X$, which suggests that numeracy literacy has a positive and significant effect on students' learning outcomes. These results emphasize the importance of strengthening numeracy literacy, as it helps students better understand concepts, solve problems more effectively, and improve their mathematics achievement. The study recommends implementing contextual and numeracy-based learning approaches to enhance the quality of the learning process.

Keywords: Numeracy Literacy; Learning Outcomes; Mathematics; secondary school.

INTRODUCTION

Mathematics education at the junior high school level plays a pivotal role in cultivating students' logical, critical, and systematic thinking abilities. Within the context of 21st-century learning, numeracy constitutes a fundamental competency essential for equipping students to navigate the increasingly complex challenges of modern life. Numeracy extends beyond mere computational proficiency, it encompasses the aptitude to utilize basic mathematical numbers and symbols to address real-world problems encountered in daily life (OECD, 2008). Furthermore, Kementerian Pendidikan dan Kebudayaan asserts that literacy and numeracy are general fundamental capabilities, as the cognitive application of language and mathematics is requisite across diverse personal, social, and professional contexts (Kemendikbud, 2020).

High proficiency in numeracy is anticipated to enhance student learning outcomes. According to Purwasih et al. (2018) numeracy is defined as an individual's capacity to comprehend, utilize, and apply mathematical concepts across diverse contexts. This competency encompasses mathematical reasoning, as well as the deployment of concepts, procedures, and facts to explain, describe, or predict phenomena. Students possessing strong numeracy skills typically exhibit greater facility in grasping mathematical concepts, demonstrate more effective problem-solving abilities, and display higher confidence in completing academic tasks. Research by Harianti et al. (2023) indicates that instructional approaches incorporating numeracy indicators significantly influence students' mathematical learning outcomes. Additionally, studies by Mahmud & Pratiwi (2019) emphasize that numeracy literacy plays a crucial role in solving unstructured problems, which aligns with real-world mathematical applications. Nevertheless, numeracy proficiency among students in Indonesia remains relatively low, thereby warranting intensified educational attention.

Results from the 2022 Programme for International Student Assessment (PISA) reveal that numeracy proficiency among Indonesian students remains suboptimal. Students achieved a mathematics score of 366, falling significantly below the OECD average of 472 (OECD, 2023). These data highlight that merely 18% of Indonesian students attained the minimum proficiency of Level 2 in mathematics, in stark contrast to the OECD average of 69%. This disparity indicates the persistence of critical deficits in the mastery of numeracy among Indonesian students. Research conducted by Hidayati et al. (2024) identifies that low numeracy literacy among elementary students is attributed to a combination of internal and external determinants. Internal factors encompass low learning motivation, intellectual capability, and a lack of interest in learning. Conversely, external factors comprise constraints in facilities and infrastructure, as well as suboptimal instructional quality. Recent studies in *Algebra: Jurnal Pendidikan, Sosial dan Sains* further support numeracy integration in education; for instance, Anggraini (2025) shows constructivist approaches enhance STEM learning interest through visual and contextual methods, applicable to numeracy development. Similarly, The study by Nursiah (2025) demonstrates that digital transformation in Small and Medium Enterprises (SMEs) influences regional economic growth through the analysis of BPS census data. This finding can be analogized to how numeracy literacy supports the application of contextual mathematics in instruction. Additional evidence from Syawaludin (2024) indicates literacy-numeracy-based learning improves mathematics scores from 56 to 86, achieving 90% mastery, while Fauzan et al. (2024) proves realistic mathematics education (RME) outperforms conventional methods in numeracy enhancement.

SMP Negeri 1 Bringin, as a junior secondary educational institution, confronts a similar challenge in optimizing students' numeracy proficiency, particularly among Grade VII students who are undergoing the transitional phase from primary to secondary education. During this phase, students experience a significant shift in the complexity of mathematical learning materials; consequently, numeracy skills become paramount to supporting their overall academic success. Preliminary observations indicate a heterogeneity in numeracy proficiency among Grade VII students, a factor hypothesized to directly affect their learning outcomes achievement. Furthermore, research by Alfiah et al. (2020) demonstrates a clear correlation between numeracy skills and mathematical problem-solving ability in junior high school students, which ultimately contributes to overall academic achievement.

Based on the background outlined above, the primary objective of this study is to analyze the influence of numeracy proficiency on the mathematics learning outcomes of Grade VII students at SMP Negeri 1 Bringin. The findings of this research are anticipated to provide empirical evidence regarding the correlation between numeracy and mathematics learning outcomes, and to generate strategic recommendations for improving the quality of mathematics instruction at the school.

RESEARCH METHODS

This study uses a quantitative approach with a correlational research type. The purpose of correlational research is to identify the relationship and the degree of association between two variables without manipulating those variables (Fraenkel et al., 2012). In this study, numeracy literacy acts as the independent variable (X) and mathematics learning outcomes as the dependent variable (Y). The quantitative approach is considered appropriate because it allows the researcher to perform measurement and statistical analysis to determine the effect of numeracy literacy on mathematics learning outcomes.

The population in this study is all students of Class VII at SMP Negeri 1 Bringin for the 2025/2026 academic year. Sampling was carried out using the purposive sampling technique, which is a sampling technique with specific considerations (Sugiyono, 2019). The research sample is the students of Class VII D, totaling 32 students. The selection of this class was based on the consideration that Class VII D has the highest academic achievement, thus it is considered representative for examining the effect of numeracy literacy on learning outcomes.

Data collection was carried out through two instruments. First, a numeracy literacy questionnaire structured by referring to the OECD (2025) indicators, which cover four aspects: (1) using mathematical symbols, operations, and concepts; (2) interpreting mathematical information; (3) solving problems in real-life contexts; and (4) communicating mathematical ideas. The questionnaire uses a Likert scale with four choices: Strongly Agree (SS), Agree (S), Disagree (TS), and Strongly Disagree (STS) (Siregar et al., 2021). The questionnaire consists of 20 statements that have been tested for validity and reliability using correlation (Yusup, 2018). The second instrument is the documentation of mathematics learning outcomes scores, taken from the Odd Semester Final Summative Assessment (PSAS) scores of Class VII D for the 2025/2026 academic year. The PSAS scores were chosen because they include a comprehensive assessment of all basic competencies within one semester with valid and reliable assessment standards (Prihadi et al., 2021).

RESULTS AND DISCUSSION

Results

This study involved 32 students from Grade VII D at SMP Negeri 1 Bringin during the 2025/2026 academic year as the research subjects. The data collected comprised the numeracy literacy score as the independent variable (X) and the mathematics learning outcomes score as the dependent variable (Y). Descriptive statistical analysis was utilized to characterize the data distribution, which involved calculating the mean, median, mode, and standard deviation for each respective variable.

Table 1. Results of Descriptive Analysis

	N	Minimum	Maximum	Mean	Std. Deviation
Sum of Variable X	32	23	39	29,62	4,030
Sum of Variable Y	32	24	38	31,19	3,551
Valid N (<i>listwise</i>)	32				

Descriptive analysis of the numeracy literacy variable revealed a mean score (\bar{x}) of 29.62, a median of 29.00, and a mode of 28. The data exhibited a standard deviation (SD) of 3.88, with scores ranging from a minimum of 23 to a maximum of 39, yielding a range of 16. The mathematics learning outcomes variable showed similar characteristics, with a mean (\bar{x}) of 31.19, a median of 30.50, and a mode of 32. The scores had a standard deviation (SD) of 4.15, ranging from a minimum of 24 to a maximum of 38, resulting in a range of 14.

The descriptive statistical data indicate that both variables exhibit a relatively favorable and controlled score distribution. The relatively small standard deviation (SD) compared to the mean (\bar{x}) suggests that the data are sufficiently homogeneous and concentrated around the central tendency. Consequently, the numeracy proficiency and mathematics learning outcomes of Grade VII D students tend to be relatively uniform, with no substantial differences observed across the student population.

Prior to performing hypothesis testing using simple linear regression analysis, the researcher first conducted the prerequisite analysis testing, encompassing the normality test and the linearity test. These prerequisite tests are crucial for ensuring that the research data satisfy the parametric assumptions necessary for inferential statistical analysis.

Table 2. Results of Normality Test using the Shapiro-Wilk Test

	Shapiro-Wilk		
	Statistic	df	Sig.
Sum of Variable X	0,952	32	0,163
Sum of Variable Y	0,969	32	0,473

The Shapiro-Wilk Test for normality was conducted to verify whether the distribution of the research data satisfied the assumption of normality, a prerequisite for parametric analysis. Testing revealed that the numeracy literacy variable yielded a Shapiro-Wilk statistic of 0.952 (where 1.0 indicates a perfect normal distribution). Crucially, the test produced a significance value (p) of 0.163, which substantially exceeds the critical alpha level (α), thereby confirming a normal data distribution for this variable. For the mathematics learning outcomes variable, a statistic of 0.969 was obtained with a significance level (p) of 0.473, demonstrating an even higher degree of normality and strong evidence supporting the normality assumption. Since both significance values ($p = 0.163$ and $p = 0.473$) are well above the threshold of α , it can be concluded that the normality assumption is satisfied with a high degree of confidence. Therefore, the simple linear regression analysis can proceed validly using a parametric approach.

Table 3. Results of Linearity Test

		Sum of Squares	df	Mean Square	F	Sig.	
Sum of Variable X *	Between Groups	(Combined)	492,315	15	35,165	3,848	0,007
		Linearity	472,815	1	472,815	84,532	0,000
Sum of Variable Y		Deviation from Linearity	19,500	15	1,500	1,145	0,373
	Within Groups		137,583	16	9,143	-	-
Total			390,875	31	-	-	-

Based on the table above, the linearity test yielded an F-value of 84.532 with a significance level (p) of 0.000 in the Linearity row. Since this value is lower than the critical alpha level (α) it affirms the presence of a significant linear relationship between numeracy proficiency and mathematics learning outcomes. Conversely, the F-value in the Deviation from Linearity row reached 1.145 with a significance level (p) of 0.373. As this p -value exceeds α , it indicates the absence of significant deviation from the linear pattern. Thus, the linearity assumption is fully met. Therefore, simple linear regression analysis is appropriate to test the research hypothesis and accurately model the predictive relationship between the variables.

Table 4. Results of Pearson Correlation Analysis

Correlation	Coefficient	Interpretation
Pearson Correlation (r)	0,867	Highly Significant
Coefficient of Determination (r^2)	0,751	75,1%
Sig. (2-tailed)	0,000	Significant
N	32	-

The correlation coefficient (r) value of 0.867 demonstrates a very strong relationship between the numeracy literacy variable and mathematics learning outcomes, as this value falls within the 0.80–1.00 strength category. Furthermore, the significance value (p) of 0.000, which is less than the critical alpha level of 0.05, indicates that the relationship between the two variables is statistically significant. Additionally, the coefficient of determination (r^2) of 0.751 (or 75.1%) suggests that 75.1% of the total variance in mathematics learning outcomes can be accounted for by numeracy literacy, while the remaining 24.9% is influenced by other factors not addressed in this study.

Table 5. Results of Simple Linear Regression Analysis

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.
	B	Std. Error	Beta	
(Constant)	1,125	3,287	-	0,342
Numeracy Literacy	1,016	0,110	0,867	9,194

Simple linear regression analysis was employed to identify the influence of numeracy proficiency on mathematics learning outcomes and to formulate a regression model capable of predicting mathematics learning outcomes based on numeracy literacy scores. Based on the analysis, the regression equation was determined as $Y = 1.125 + 1.016X$, where Y represents Mathematics Learning Outcomes and X denotes Numeracy Literacy. The constant value (intercept) of 1.125 indicates that

when numeracy literacy is zero, the estimated mathematics learning outcome is 1.125. Furthermore, the regression coefficient of 1.016 signifies that every one-point increase in the numeracy literacy score is associated with an expected increase of 1.016 points in mathematics learning outcomes. The positive value of this regression coefficient confirms a positive influence of numeracy literacy on mathematics learning outcomes.

Table 6. Results of ANOVA Test (F-Test)

Model	Sum Of Squares	df	Mean Square	F	Sig.
Regression	472,815	1	472,815	84,532	0,000
Residual	156,652	30	5,595	-	-
Total	629,467	31	-	-	-

The significance of the regression model was assessed using the F-test (ANOVA) to determine if the obtained model possesses statistical significance. The analysis results indicate an F-calculated value (F_{calc}) of 84.532 with a significance level (p) of 0.000. Since the significance value ($p=0.000$) is less than the critical alpha level of 0.05 ($\alpha < 0.05$), it is concluded that the regression model is statistically significant. This confirms that numeracy proficiency has a substantial influence in predicting mathematics learning outcomes.

Based on the ANOVA results, the Sum of Squares (SS) for Regression was 472.815 and the SS for Residual was 156.652, yielding a Total Sum of Squares of 629.467. The Mean Square (MS) value for Regression was recorded as 472.815, while the MS for Residual was 5.595. The comparison between the Mean Square Regression and the Mean Square Residual resulted in a high calculated F-value (F_{calc}). This indicates that the variance in mathematics learning outcomes explained by the regression model is substantially larger than the variance that remains unexplained by the model.

The significance of the regression coefficients was assessed using the t-test to determine the influence of numeracy proficiency on mathematics learning outcomes. Analysis results indicate that the constant (intercept) yielded a t-calculated value (t_{calc}) of 0.342 with a significance level (p) of 0.735. Since the significance value ($p = 0.735$) is greater than 0.05 (α threshold), the constant is declared not statistically significant. However, this condition does not pose an issue, as the primary focus lies on the significance of the independent variable's regression coefficient.

For the numeracy literacy variable, a t-calculated value (t_{calc}) of 9.194 was obtained with a significance level (p) of 0.000. This p -value is smaller than the α threshold (0.05), demonstrating that the regression coefficient is statistically significant. This result indicates that numeracy literacy has a positive and significant influence on mathematics learning outcomes. Consequently, the null hypothesis (H_0), which states that there is no influence of numeracy literacy on mathematics learning outcomes, is rejected. Conversely, the alternative hypothesis (H_1) which asserts that an influence exists, is accepted.

Table 7. Summary of Hypothesis Test Results

Aspect	Result	Conclusion
Correlation Coefficient (r)	0,867	Very Strong Relationship
Coefficient of Determination (r^2)	0,751	75,1% of Variance Explained
Regression Equation	$Y=1,125+1,016X$	Positive Predictive Model
F-Calculated	84,532	Model is Statistically Significant
t-Calculated	9,194	Coefficient is Statistically Significant
Sig. (p -value)	0,000	$P < 0,05$
Decision	H_0 is Rejected, H_1 is Accepted	Significant Influence Exists

Based on the analysis results presented in Table 7, it is established that numeracy literacy exerts a positive and significant influence on the mathematics learning outcomes of Grade VII D students at SMP Negeri 1 Bringin, with a contribution magnitude of 75.1%.

Discussion

The findings of this study indicate that numeracy literacy exerts a positive and significant influence on the mathematics learning outcomes of Grade VII D students at SMP Negeri 1 Bringin. These results are consistent with the research conducted by Harianti et al. (2023) which demonstrated that instructional processes incorporating numeracy literacy indicators significantly impact students' mathematics learning outcomes. Robust numeracy proficiency provides a solid foundation for students, thereby facilitating the comprehension of more complex mathematical concepts. This finding is further supported by research from Syawaludin (2024) who found that

literacy and numeracy-based learning effectively improved mathematics learning outcomes among vocational high school students, with learning completeness reaching 90% in the second cycle.

The magnitude of influence of numeracy literacy on mathematics learning outcomes reached 75.1%, signifying that numeracy proficiency is a dominant determinant of student success in mathematics instruction. This finding reinforces the argument put forth by the OECD (2008) that numeracy literacy is not merely about calculation ability: rather, it encompasses the skills needed to utilize basic numbers and mathematical symbols to resolve real-world problems encountered in daily life. Research by Perdana & Suswandari (2021) emphasizes that numeracy literacy in thematic learning for upper elementary grades serves as a fundamental foundation that must be strengthened to support students' understanding across various subjects, not limited to mathematics alone.

The regression coefficient of 1.016 demonstrates that every one-point increase in the numeracy literacy score is associated with a corresponding increase of 1.016 points in mathematics learning outcomes. This finding indicates a nearly proportional relationship between numeracy literacy and mathematics learning outcomes. Students exhibiting strong numeracy proficiency tend to be better able to grasp mathematical concepts, solve various types of problems more effectively, and possess higher levels of confidence when engaging in academic activities.

This study also confirms the findings of Alfiah et al. (2020) who established a correlation between numeracy proficiency and mathematical problem-solving ability in junior high school students, ultimately contributing to an overall increase in learning outcomes. The core aspects of numeracy literacy-which encompass utilizing mathematical symbols and operations, interpreting mathematical information, solving problems in real-world contexts, and communicating mathematical ideas-provide a significant contribution to student success in solving various types of mathematics problems.

Nevertheless, 24.9% of the variance in mathematics learning outcomes is still influenced by other factors beyond numeracy literacy. These factors may include learning motivation, learning style, the learning environment, quality of instruction, parental support, and other psychological factors. This aligns with the findings of Hidayati et al. (2024) who suggested that students numeracy proficiency is influenced by internal factors (such as motivation, intellectual ability, and learning interest) as well as external factors (such as the availability of educational facilities and infrastructure). Research by Rohim (2021) on the concept of Minimum Competency Assessment (AKM) to improve numeracy literacy skills in elementary school students highlights the importance of comprehensive assessment systems that consider multiple factors affecting student learning outcomes.

The practical implications of this research highlight the critical importance of reinforcing numeracy literacy as an integral component of mathematics instruction at the junior high school (SMP) level. Teachers are expected to design learning activities that not only emphasize the mastery of procedures and algorithms, but also encourage students' ability to apply mathematical concepts to solve real-world problems encountered in daily life. These efforts can be realized through the implementation of teaching strategies that integrate numeracy literacy, such as the use of contextual problems, project-based approaches, and the utilization of technology for the visualization and exploration of mathematical concepts.

It is essential for schools to conduct periodic numeracy literacy assessments to identify students who require specific intervention. Remedial or enrichment programs should be tailored to students' numeracy proficiency levels, thereby helping to enhance overall mathematics learning outcomes. Furthermore, collaboration between mathematics teachers and other subject teachers is necessary to integrate numeracy literacy across various learning contexts, enabling students to perceive the relevance of mathematics in daily life.

Several limitations inherent to this study must be acknowledged. First, the research sample encompassed only one class with a relatively small number of respondents. Consequently, the findings should be generalized cautiously. Second, the measurement of mathematics learning outcomes was solely based on PSAS scores (written summative tests), and thus did not encompass aspects of students' skills or attitudes during the mathematics learning process. Third, the study is correlational in nature, which means it can only demonstrate relationships between variables without being able to establish definitive causal links.

Future research is recommended to involve a larger and more diverse sample size, encompassing various grade levels and different schools. Experimental studies should also be conducted to test the effectiveness of various teaching strategies in enhancing numeracy literacy and mathematics learning

outcomes. Furthermore, qualitative approaches can be utilized to gain a deeper understanding of how the numeracy literacy process contributes to students' mastery of mathematical concepts.

CONCLUSIONS

The results of the study indicate that numerical literacy has a positive and significant effect on the mathematics learning outcomes of seventh-grade students at SMP Negeri 1 Bringin. This finding confirms that the ability of numerical literacy contributes significantly to students' academic success in mathematics. The coefficient of determination (r^2) value reached 75.1%, meaning that the majority of the variation in learning outcomes can be explained by the students' level of numerical literacy, while the remainder is influenced by other factors outside of this research. This study affirms the importance of numerical literacy as a fundamental competence that needs to be developed in the mathematics learning process. Efforts to strengthen numerical literacy can be undertaken through the use of contextual problems, the integration of project-based learning, and the utilization of technology to aid in concept visualization. Furthermore, schools and teachers need to conduct routine numerical literacy assessments to identify students' learning needs more accurately. Although this study provides an important overview of the relationship between the two variables, there are limitations such as the limited sample size and the use of PSAS scores as the sole indicator of learning outcomes. Therefore, future research is recommended to use a broader sample, diverse evaluation methods, and experimental or qualitative approaches to gain a deeper understanding of the role of numerical literacy in mathematics learning.

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