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Achievement in Indonesian Language and Science as Predictors of Mathematics Achievement Among Eighth-Grade Students

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Abstract

The relationship between achievement in Mathematics, Indonesian language literacy, and Science is important to examine because Mathematics often shows lower achievement and requires verbal comprehension, representation, and quantitative reasoning. However, empirical evidence regarding the simultaneous relationship between the Indonesian Language and science achievement and mathematics learning achievement among junior high school students still needs to be strengthened based on school data. This study aims to describe the distribution of Mathematics, Indonesian Language, and Science achievement among eighth-grade students; analyze the correlation between Indonesian Language and Science achievement and Mathematics learning achievement; and test the ability of these two achievements to predict Mathematics learning achievement simultaneously. The study employed a quantitative correlational-predictive approach with a sample of 33 eighth-grade students. Data were collected through Mathematics, Indonesian Language, and Science test scores, then analyzed using descriptive statistics, Pearson's correlation, ANOVA, and multiple linear regression. The results indicated that Mathematics had the lowest mean and the highest variance compared to Indonesian Language and Science. Indonesian language achievement was positively, moderately, and significantly correlated with mathematics, as was Science. Simultaneously, the Indonesian Language and Science significantly predicted mathematics learning achievement, although the partial contributions of both were not significant. These findings imply that mathematics instruction needs to consider support for academic literacy and scientific contexts without interpreting either as a standalone predictor.

Keywords: Mathematics achievement, Indonesian language achievement, Science achievement, STEM, Correlation, Multiple linear regression.

Introduction

Mathematics learning achievement is a key indicator in secondary education because mathematics is a core component of STEM education and plays a crucial role in developing students' quantitative reasoning and problem-solving skills, as well as preparing them to meet the demands of 21st-century learning (English, 2023; Evans & Field, 2020; Goos et al., 2023). In interdisciplinary STEM education, mathematics serves not only as a standalone subject but also as the conceptual and quantitative foundation that supports learning in

Science, technology, and engineering (Goos et al., 2023; Kelley & Knowles, 2016). A systematic review of developments in STEM research indicates that STEM research continues to evolve and increasingly emphasizes the connections between learning, curriculum, assessment, and interdisciplinary integration (Li et al., 2020). Therefore, mathematics learning achievement should be examined in relation to academic achievements in other subjects that support the STEM learning ecosystem.

The role of mathematics in STEM education still warrants special attention because STEM integration does not always explicitly highlight mathematics as a component. Goos et al. (2023) demonstrate that the role of mathematics in STEM education often appears marginal, necessitating research that clarifies how mathematics contributes to interdisciplinary problem-solving. Makonye and Moodley (2023) emphasize that STEM education requires empirical evidence regarding the contribution of mathematics education to interdisciplinary learning practices. Dare et al. (2019) add that teachers can understand STEM through various integration models, ranging from loose connections to stronger interdisciplinary integration. Thus, analyzing the relationship between mathematics, Science, and general academic literacy is relevant to strengthening the understanding of mathematics's role in STEM-based learning.

One of the subjects that shares conceptual similarities with mathematics within the STEM framework is natural sciences. Both Science and Mathematics require the ability to reason, recognize patterns, use data, understand relationships between quantities, and draw conclusions based on evidence (Fernández-Cézar et al., 2021; Goos et al., 2023; X. S. Wang et al., 2023). In science learning, students frequently encounter measurements, tables, graphs, comparisons, and numerical interpretations that are directly related to mathematical thinking processes (Barnard-Brak et al., 2017; Fernández-Cézar et al., 2021; Goos et al., 2023). Research by Fernández-Cézar et al. (2021) indicates that science achievement and prior mathematics achievement are included in the mathematics achievement prediction model. However, the contribution of the science variable must be interpreted cautiously because its effect size is not strong. Thus, science achievement can be viewed as a relevant academic indicator to be examined in relation to variations in students' mathematics learning achievement in the context of STEM education.

In addition to science achievement, Indonesian language achievement is also important to examine because general academic literacy serves as the foundation for

understanding information across various subjects, including mathematics and Science. Mathematics instruction is often presented through symbols, terms, instructions, sentences, contexts, and word problems that students need to understand before performing mathematical procedures (Jaffe & Bolger, 2023; Verschaffel et al., 2020). Success in solving text-based Math problems requires students to translate verbal information into appropriate mathematical representations (Jaffe & Bolger, 2023; Vessonen et al., 2024). Meta-analytic evidence indicates that reading ability and mathematics achievement are significantly related through overlapping general cognitive processes and academic competencies (Ünal et al., 2023). Therefore, Indonesian language achievement can be positioned as a representation of general academic literacy that has the potential to support students in understanding mathematical problems and science contexts.

The connection between literacy, Science, and mathematics becomes increasingly important when students encounter context-based academic tasks. Mathematics and science problems require not only computational skills but also the ability to interpret situations, select relevant information, understand relationships between variables, and convert verbal information into quantitative representations (Pongsakdi et al., 2020; Spencer et al., 2020). Studies on word problems in Mathematics indicate that student performance is influenced by task characteristics, text comprehension, arithmetic skills, and language skills that support the process of forming problem representations (Lariviere et al., 2025; Pongsakdi et al., 2020; Vessonen et al., 2024). In STEM learning, these abilities form the foundation for interdisciplinary problem-solving because students need to integrate Language, scientific concepts, and mathematical representations (English, 2023; Roehrig et al., 2021). Thus, the relationship between achievements in Indonesian, Science, and mathematics needs to be analyzed to understand how general academic literacy and science achievement relate to students' mathematics learning achievement.

In the Indonesian context, STEM-based studies in mathematics and science education have also developed, but still require further validation through empirical school data. Afriana et al. (2016) demonstrated that integrated STEM project-based learning can be used to improve science literacy among junior high school students. Kahar et al. (2022) demonstrated that STEM education improves science literacy among junior high school students. Sumarni and Kadarwati (2020) found that project-based learning with an ethno-STEM approach impacts students' critical and creative thinking skills. Purwaningsih et al.

(2020) demonstrated that STEM-PjBL can improve students' problem-solving skills more effectively than discovery-based learning on science topics. Thus, studies linking achievements in mathematics, Science, and general academic literacy are relevant to the development of STEM education in Indonesia.

In addition to extending prior studies on literacy and mathematics achievement, this study contributes contextual evidence from Indonesian school-based assessment data. The Indonesian educational context is important because Indonesian Language achievement represents not only reading literacy but also students' ability to understand academic instructions, contextual information, and verbal representations frequently used in mathematics and science learning. Therefore, this study contributes practical and contextual evidence for interdisciplinary STEM-related learning using authentic classroom assessment data from Indonesian junior high school students.

Although the relationship between literacy, Science, and mathematics has been extensively discussed in the international literature, studies based on school test data remain important because such data are closely aligned with teachers' assessment practices in the classroom. School test data can provide an initial picture of patterns in student academic achievement and help teachers identify contextual connections between subject areas (Wang et al., 2023). Margot & Kettler (2019) demonstrate that the implementation of STEM in schools is also linked to teachers' perceptions, readiness, and the challenges they face. Nursyahidah and Mulyaningrum (2022) emphasize that the implementation of STEM in mathematics and science education in Indonesia is still relatively new and requires support from appropriate instructional strategies. Therefore, this study aims to examine the contribution of the Indonesian language and science achievement to the mathematics learning achievement of eighth-grade students as preliminary evidence based on school data.

Based on the above discussion, this study aims to analyze the relationship and predictive contribution of the Indonesian language and science achievement to the mathematics learning achievement of eighth-grade students. This study treats mathematics learning achievement as the dependent variable, while Indonesian language and science achievement serve as predictor variables. Conceptually, this study positions Mathematics and Science as part of the STEM domain. In contrast, Indonesian is positioned as an indicator of general academic literacy that supports the understanding of information in cross-disciplinary learning. The research questions are: (1) What is the distribution of data on the

Mathematics, Indonesian Language, and Science achievement of eighth-grade students?; (2) Are Indonesian Language and Science achievements significantly correlated with Mathematics learning achievement?; and (3) can Indonesian Language and Science achievements simultaneously predict the Mathematics learning achievement of eighth-grade students?

Method

This study employs a quantitative approach with a correlational-predictive design, in which correlation is used to measure linear relationships and regression estimates linear relationships between predictor variables and dependent variables or achievement (Wang et al., 2024; Zou et al., 2003). A correlational design is used to observe and describe the relationship between two or more variables without direct manipulation (MacDonald et al., 2015; Sullivan, 2024). This design was chosen because the study aims to analyze the relationship between the Indonesian language and science achievement and mathematics learning achievement, as well as to test the ability of these two variables to predict mathematics learning achievement. This study does not provide specific instructional treatments to students but analyzes existing test data. Thus, this study focuses on the patterns of academic relationships between general literacy, science achievement, and mathematics learning achievement.

Ethical considerations were addressed by obtaining permission from the school to use anonymized student achievement data for research purposes. Student identities were not disclosed in the study, and all data were analyzed in aggregate form to maintain confidentiality. The study participants consisted of a class of 33 eighth-grade students at a junior high school in Padang, West Sumatra, Indonesia. All participants had complete data for three subjects: mathematics, Indonesian Language, and Science. The data analyzed consisted of numerical scores from the students' midterm exams in these three subjects. Mathematics achievement was positioned as the dependent variable, that is, the variable representing the outcome, effect, or result that the researcher sought to predict (Vetter & Schober, 2018). Learning achievement in Indonesian Language and Science were positioned as predictor variables, namely independent variables used in the regression model to explain the relationship with the dependent variable (Hope, 2019; Skiera et al., 2021).

The participants were selected using convenience sampling because the researcher had access to one intact classroom with complete academic records for the three subjects analyzed. The school is a junior high school located in Padang, West Sumatra, Indonesia. The achievement data were obtained from teacher-made midterm examinations administered under school assessment procedures. Before analysis, the researchers confirmed with subject teachers that the examinations were developed based on the curriculum objectives and learning indicators used at the school.

Data analysis was conducted in several stages. The first stage involved descriptive statistics to describe the distribution of eighth-grade students' scores in Mathematics, Indonesian Language, and Science. The descriptive statistics used included the number of data points, range, minimum value, maximum value, mean, standard deviation, and variance. The second stage involved a normality test using the Shapiro-Wilk test, as it is the best normality test for small sample sizes compared to other tests (Ahad et al., 2011). If the Sig. value is > 0.05, the data is considered normally distributed (Manik et al., 2023). The third stage is a correlation analysis to test the relationship between Mathematics, Indonesian Language, and Science. Pearson's correlation is used when the assumptions of normality and homoscedasticity are met (Aslami et al., 2026), or Spearman's correlation when the data are not normally distributed (Schober et al., 2018). If the Sig. value (2-tailed) < 0.05, the correlation is considered significant (Ashel & Riandi, 2022). If the correlation coefficient (r) = 0, there is no correlation; it is considered weak if the value is between ±0.1 and ±0.3, moderate if between ±0.4 and ±0.6, strong if between ±0.7 and ±0.9, and perfect if the correlation is 1 (Akoglu, 2018).

Before conducting the regression analysis, scatterplots between predictor variables and the dependent variable were visually examined to confirm the assumption of linearity. The fourth stage is multiple linear regression to test the simultaneous contribution of the Indonesian language and science achievement to mathematics learning achievement. Multiple linear regression is used because it estimates the linear relationship between one dependent variable and several independent variables (Guo et al., 2024; Hu et al., 2019). In the regression test results, the coefficient of determination (is used to indicate the proportion of variation in the dependent variable that can be explained by the independent variables in the regression model (Miles, 2005), with values close to 0.25 categorized as weak variation, moderate if close to 0.50, and high if close to ±0.75 (Su & Cheng, 2019). Before interpreting

the regression results, the regression assumptions were examined. Residual normality was assessed using a Normal P-P Plot (Ben & Yohai, 2004), indications of extreme outliers were examined via standardized residuals (Martin & Roberts, 2006), homoscedasticity was examined via a scatterplot between the standardized predicted value and the standardized residual (Niu & Zhao, 2022), and multicollinearity was examined via the tolerance value, variance inflation factor, and collinearity diagnostics (Bansal & Singh, 2023; Soemartojo et al., 2018).

Results and Discussion

The descriptive statistics in Figure 1 show that mathematics achievement had the lowest mean compared to Indonesian Language and Science, with a mean of 38.0945. In contrast, the Indonesian Language had a mean of 40.9518, and Science had a mean of 41.9055. This finding is consistent with the observation that mathematics often yields lower achievement scores than other subjects (Alpaslan & Ulubey, 2021; Joshi et al., 2022). In addition, Mathematics also has the highest standard deviation and variance, namely SD = 16.18940 and variance = 262.097, so that students' Mathematics achievement appears to vary more compared to the other two subjects.

Descriptive Statistics

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Indonesian	33	40.00	20.00	60.00	40.9518	9.91431	98.294
Mathematics	33	62.86	11.43	74.29	38.0945	16.18940	262.097
Science	33	48.57	22.86	71.43	41.9055	11.77270	138.596
Valid N (listwise)	33						

Figure 1. Distribution of Test Scores in Mathematics, Indonesian Language, and Science

These findings indicate that mathematics is a relatively more challenging subject for students in this study sample. This aligns with the findings of Li and Schoenfeld (2019) that mathematics is often perceived as a difficult subject by students. In some educational contexts, mathematics achievement is reported to be lower than in other subjects. Therefore, these descriptive results reinforce the need to analyze the relationship between mathematics achievement and the Indonesian Language as a measure of general academic literacy and Science as a measure of science achievement.

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Indonesian	.139	33	.106	.974	33	.611
Mathematics	.146	33	.071	.947	33	.106
Natural Science	.134	33	.138	.941	33	.074

a. Lilliefors Significance Correction

Figure 2. Results of the Normality Test

Figure 2 shows that the test scores for Mathematics, Indonesian Language, and Science are normally distributed. The Shapiro-Wilk significance values for Indonesian Language are 0.611, for Mathematics 0.106, and for Science 0.074. All three significance values are greater than 0.05, so the assumption of data normality is met. Thus, Pearson correlation analysis and multiple linear regression can be used for further analysis.

Correlations

		Indonesian	Mathematics	Science
Indonesian	Pearson Correlation	1	.488**	.557**
	Sig. (2-tailed)		.004	<,001
	N	33	33	33
Mathematics	Pearson Correlation	.488**	1	.515**
	Sig. (2-tailed)	.004		.002
	N	33	33	33
Science	Pearson Correlation	.557**	.515**	1
	Sig. (2-tailed)	<,001	.002	
	N	33	33	33

**. Correlation is significant at the 0.01 level (2-tailed).

Figure 3. Results of the Pearson Correlation Test Between Variables

Figure 3 shows that Indonesian language achievement has a positive, moderate, and significant correlation with mathematics learning achievement, $r = 0.488$, Sig. (2-tailed) = 0.004. Science achievement also has a positive, moderate, and significant correlation with mathematics learning achievement, $r = 0.515$, Sig. (2-tailed) = 0.002. Additionally, Indonesian Language and Science have a positive, moderate, and significant correlation, with $r = 0.557$, Sig. (2-tailed) < 0.001. These findings indicate that students with higher

Indonesian Language and Science achievement tend to have higher Mathematics learning achievement.

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.569[a]	.324	.279	13.74571	.324	7.195	2	30	.003	1.214

a. Predictors: (Constant), Science, Indonesian

b. Dependent Variable: Mathematics

Figure 4. Summary of Multiple Linear Regression Models

Figure 4 shows that students' performance in Indonesian and Science simultaneously and significantly predicts their mathematics learning achievement. The value of $R^2 = 0.569$ indicates a moderate-strength simultaneous relationship between the two predictors and mathematics learning achievement. The value of $R^2 = 0.324$ (moderate category) indicates that Indonesian language and science achievement together account for 32.4% of the variation in mathematics learning achievement. After adjusting for the number of predictors and sample size, the adjusted value of $R^2 = 0.279$ indicates that the model still accounts for 27.9% of the variation in mathematics learning achievement.

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2718.752	2	1359.376	7.195	.003[b]
	Residual	5668.339	30	188.945		
	Total	8387.091	32			

a. Dependent Variable: Mathematics

b. Predictors: (Constant), Science, Indonesian

Figure 5. ANOVA Results for the Regression Model

Figure 5 presents the results of the ANOVA test, which indicate that the regression model is statistically significant, F = 7.195, Sig. (2-tailed) = 0.003. These results suggest that achievement in Indonesian and Science can be used simultaneously to predict the mathematics learning achievement of eighth-grade students. Thus, the constructed regression model is statistically valid for explaining the joint contribution of the two predictors (Indonesian Language and Science learning achievement) to Mathematics learning achievement.

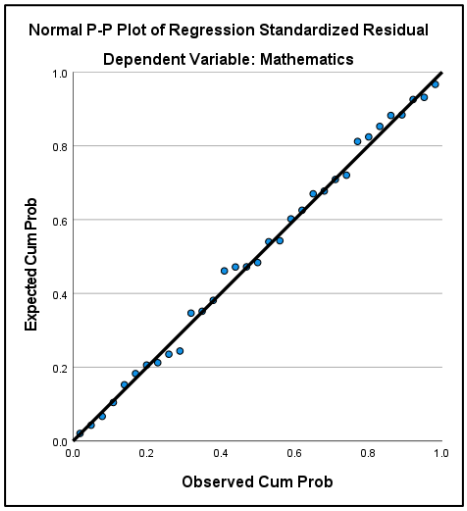
Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-1.755	10.957		-.160	.874					
	Indonesian	.478	.295	.292	1.619	.116	.488	.283	.243	.690	1.449
	Science	.484	.248	.352	1.949	.061	.515	.335	.293	.690	1.449

a. Dependent Variable: Mathematics

Figure 6. Regression Coefficient

Figure 6, which presents the results of the regression coefficient analysis, shows that Indonesian has a positive coefficient, B = 0.478, SE = 0.295, β = 0.292, but is not significant in a partial analysis, Sig. (2-tailed) = 0.116. Science also has a positive coefficient, B = 0.484, SE = 0.248, β = 0.352, but is not yet significant, Sig. (2-tailed) = 0.061. Based on the standardized beta values, Science shows a relatively greater contribution than Indonesian, but the partial contributions of both predictors are not yet statistically significant.



(a)

Residuals Statistics[a]

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	23.0154	61.4882	38.0945	9.21743	33
Residual	-28.03812	25.19426	.00000	13.30923	33
Std. Predicted Value	-1.636	2.538	.000	1.000	33
Std. Residual	-2.040	1.833	.000	.968	33

a. Dependent Variable: Mathematics

(b)

Figure 7. Residual Statistics of Regression Models in Mathematics

A check of the regression assumptions indicates that the model meets the necessary basic criteria. Figure 7(a) shows that the standardized residuals follow the diagonal line, indicating that the assumption of residual normality is met, and Figure 7(b) shows that the standardized residual values fall within the range of -2.040 to 1.833, indicating no extreme outliers. Based on Figure 6, the tolerance values for Indonesian and Science are 0.690, respectively, while the VIF values for both are 1.449. These values indicate that the model does not suffer from multicollinearity because the tolerance is greater than 0.10 and the VIF is less than 1.449.

Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions (Constant)	Indonesian	Science
1	1	2.939	1.000	.01	.00	.01
	2	.036	9.008	.63	.00	.71
	3	.025	10.888	.37	.99	.29

a. Dependent Variable: Mathematics

Figure 8. Results of the Multicollinearity Test for the Regression Model

The results of the multicollinearity test for the regression model with Mathematics as the dependent variable in Figure 8 also show that the highest condition index is 10.888, indicating that there is no evidence of serious multicollinearity. These findings, based on Figures 7 and 8, suggest that the regression model used exhibits a relatively reasonable residual pattern and is suitable for further interpretation.

Substantively, the results of this study indicate that achievement in Indonesian and Science has a positive relationship with mathematics learning achievement. The positive relationship between Indonesian and mathematics aligns with the findings of Ünal et al. (2023), which show that reading ability and mathematics achievement have a significant relationship based on two meta-analyses. These findings are further supported by Jaffe and Bolger (2023), who explain that successfully solving word problems in Mathematics requires the process of translating verbal information into arithmetic or symbolic representations. Lariviere et al. (2025) also demonstrate that general language skills and Mathematics-specific language skills can predict performance on word problems among students struggling with Mathematics. In the context of this study, Indonesian can be understood as a representation of general academic literacy that helps students understand instructions, problem contexts, known information, and the demands of solving mathematical problems.

The findings of this study are also consistent with those of Aziz and Septriyanti (2023), who reported a positive correlation between Indonesian language literacy and mathematical numeracy among eighth-grade students in solving mathematics problems. In that study, the Spearman correlation coefficient between Indonesian language literacy and mathematical numeracy was reported to be 0.953, indicating a strong and positive relationship in the context of solving mathematical problems. Although the variables used

in that study differ from those in this study, both demonstrate that aspects of language literacy are associated with students' achievement or performance in the mathematics domain.

The results of this study are also consistent with the findings of Pongsakdi et al. (2020), which showed that text comprehension and arithmetic skills are related to student performance in solving word problems in mathematics. These findings are reinforced by Vessonen et al. (2024), who demonstrated that linguistic and numerical characteristics in word problems are related to students' problem-solving performance. Spencer et al. (2020) also demonstrated that language skills are associated with the ability to solve arithmetic word problems longitudinally. Therefore, the positive correlation between Indonesian and Mathematics in this study can be interpreted as an indication that general academic literacy supports the understanding of mathematical problems, particularly when problems are presented in verbal or contextual forms.

The finding of a correlation between Science and Mathematics also has a strong conceptual basis within the STEM framework. In this study, Science showed a positive and significant correlation with Mathematics, $r = 0.515$, Sig. (2-tailed) = 0.002, a value slightly higher than the correlation between Indonesian Language and Mathematics, $r = 0.488$, Sig. (2-tailed) = 0.004. The finding of a correlation between Science and Mathematics aligns with Fernández-Cézar et al. (2021), who demonstrated a link between science achievement and mathematics achievement in a mathematics achievement prediction model. However, this relationship cannot be interpreted as evidence that science achievement alone is a strong predictor. Conceptually, the relationship between Science and Mathematics can be explained because both require quantitative reasoning, data interpretation, the use of representations, and evidence-based conclusion-drawing.

From a STEM education perspective, these results support the argument by Goos et al. (2023) that Mathematics plays a crucial role in interdisciplinary STEM learning. Mathematics functions not only as a standalone subject but also as a tool for understanding scientific phenomena, modeling situations, and developing data-based reasoning. English (2023) emphasizes the importance of various modes of thinking in STEM-based problem-solving, including critical thinking, mathematical modeling, systems thinking, and design-based thinking. Makonye and Moodley (2023) assert that the contribution of mathematics to STEM education needs to be demonstrated empirically in interdisciplinary learning practices.

Thus, the positive relationship between Science and mathematics in this study indicates that science achievement can reflect some of the competencies also required in mathematics learning.

The results of the multiple linear regression shown in Figure 5 indicate that Indonesian Language and Science simultaneously and significantly predict mathematics achievement, F = 7.195, Sig. (two-tailed) = 0.003. The value of R^2 = 0.324 indicates that these two predictors together explain 32.4% of the variation in mathematics achievement. This finding supports the study by Wang et al. (2023), which indicates that mathematics achievement is influenced by various factors at the individual, family, school, educational system, and macro-context levels. Breit et al. (2025) also demonstrated that mathematics achievement is associated with various student characteristics, including language variables, prior knowledge, intelligence, specific mathematical abilities, mathematical self-concept, self-regulation, metacognition, and executive functions. In this study, the two academic factors analyzed—general literacy through Indonesian language and science achievement through natural Sciences—were found to have a significant simultaneous contribution to the variation in Mathematics learning achievement.

However, the results of this study also indicate that Indonesian and Science are not yet significant partial predictors at the 0.05 level. Indonesian has β = 0,292 with Sig. (2-tailed) = 0.116, while Science has β = 0.352 with Sig. (2-tailed) = 0.061. This pattern suggests that both variables have a joint contribution, but their individual unique contributions are not yet strong enough when analyzed within a single model. One possible explanation is the presence of a moderate correlation between Indonesian and Science, r = 0.557, Sig. (2-tailed) < 0.001, meaning that some of their predictive information overlaps. Thus, the results of this study should not be interpreted to mean that Indonesian Language and Science each independently have a significant effect on Mathematics; rather, it is more accurate to interpret that both are simultaneously associated with variations in Mathematics learning achievement.

These findings are consistent with trends in the literature on predictors of mathematics achievement, which indicate that a single variable rarely determines mathematics learning achievement. Abín et al. (2020) demonstrate that mathematics achievement is associated with a combination of cognitive, motivational, and emotional variables. Wang et al. (2023) also noted that predictors of mathematics achievement exhibit

complex patterns and may vary depending on context, educational level, and characteristics of the educational system. Therefore, the value of $R^2 = 0.324$ in this study can be viewed as a fairly significant contribution for a school-based data study. However, it still leaves 67.6% of the variation in mathematics learning achievement explained by other factors outside the model.

The findings of this study can be conceptually linked to Barnard-Brak et al. (2017), who demonstrated that reading and mathematics achievement both play a role in science achievement. Although the direction of the variables in that study differs from this one, these findings reinforce the view that literacy, Science, and mathematics are interrelated academic domains. In a school context, proficiency in Indonesian, Science, and mathematics can form a network of mutually supportive academic competencies, particularly when students are engaged in tasks based on context, data, and representations.

In the Indonesian context, these findings align with the study by Afriana et al. (2016), which demonstrated that integrated STEM project-based learning can enhance science literacy among junior high school students. Khaeroningtyas et al. (2016) also demonstrated that STEM learning in science content can improve junior high school students' science literacy. Sumarni and Kadarwati (2020) showed that project-based learning using an ethno-STEM approach can enhance students' critical and creative thinking skills. Purwaningsih et al. (2020) found that STEM-PjBL can improve students' problem-solving skills in science learning. These findings support the interpretation that junior high school students' mathematics achievement needs to be understood in relation to academic literacy and science achievement.

Pedagogically, the results of this study indicate that mathematics teachers need to consider literacy and science aspects in mathematics instruction. Teachers can assist students by helping them develop strategies for reading problems, identifying key information, writing down known and unknown information, and transforming verbal information into mathematical representations. Teachers can also develop mathematics problems connected to science contexts, such as measurements, experimental data, graphs, comparisons, and the interpretation of natural phenomena. These strategies do not mean turning mathematics instruction into Indonesian language or science instruction, but rather strengthening the role of mathematics as part of the STEM learning ecosystem, which requires literacy and scientific reasoning.

Conclusion

Based on the research findings, the distribution of eighth-grade students' achievement scores indicate that Mathematics has the lowest average compared to Indonesian Language and Science, while also exhibiting the highest variation in achievement. This suggests that Mathematics learning achievement in this study sample are relatively lower and more varied than those of the other two subjects. The results of the normality test indicate that the data for all three variables are normally distributed, making Pearson correlation analysis and multiple linear regression appropriate for use.

The research findings also show that Indonesian Language and Science achievement are positively, moderately, and significantly correlated with Mathematics learning achievement. This means that students with higher Indonesian Language and Science achievement tend to have higher Mathematics learning achievement. Simultaneously, Indonesian Language and Science were found to significantly predict eighth-grade students' Mathematics learning achievement, contributing 32.4% to the variation in Mathematics learning achievement. However, when analyzed individually, Indonesian and Science were not significant predictors at the 0.05 level; thus, these findings should be interpreted as the combined contribution of both variables rather than the independent influence of each variable on mathematics learning achievement. Pedagogically, these results underscore the importance of considering aspects of academic literacy and scientific context in mathematics instruction, particularly in tasks that require verbal comprehension, representation, quantitative reasoning, and contextual problem-solving. This study has several limitations. The sample size was relatively small and limited to one classroom from a single school, which restricts the external validity and generalizability of the findings. In addition, the study relied on school-based assessment data, which may reflect contextual classroom conditions and teacher assessment practices. Future studies are encouraged to involve larger and more diverse samples across multiple schools and regions.

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