



Interests and Motivations in Learning Mathematics among Islamic Secondary School Students: Impacts on Counting Proficiency

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Abstract

This study investigates the impact of students' interest in and motivation for mathematics learning on their counting proficiency in the context of Islamic secondary education, namely Madrasah Tsanawiyah (MTs). Despite extensive research on mathematics learning interest and motivation in general education settings, few studies have examined their influence in religious education institutions, where religious studies are often prioritized over general subjects. This study employed a quantitative, correlational research design and involved 161 students from four MTs in Lhokseumawe City, Aceh, Indonesia. Mathematical learning interest and motivation were measured using validated questionnaires, and counting proficiency was measured using a standardized counting proficiency test. Data were analyzed statistically using Pearson correlation and multiple regression analyses. The results showed significant positive correlations between both mathematics learning interest ($r = 0.516$) and motivation ($r = 0.578$) with counting proficiency.

Furthermore, learning motivation had a slightly stronger influence ($B = 0.324$, $p < 0.001$) compared to learning interest ($B = 0.219$, $p < 0.001$). The two variables accounted for 39.9% of the variance in counting proficiency. These findings indicate the essential role of affective factors in mathematics education, particularly in Islamic secondary schools, and highlight the importance of cultivating students' interest and motivation to improve their basic mathematical skills.

Kata Kunci: counting proficiency; Islamic secondary school students; madrasah tsanawiyah students; mathematics learning interest; mathematics learning motivation



INTRODUCTION

Mathematics is widely regarded as a fundamental discipline that supports students' cognitive development and equips them for diverse academic and professional endeavors. Although mathematics plays a fundamental role in education, students' success in the subject often depends on their interest and motivation, two psychological factors that have been shown to significantly affect students' learning outcomes. Empirical studies have consistently reported that interest and motivation in learning mathematics are positively correlated with mathematical performance (Yolanda et al., 2024), conceptual understanding (Sihombing et al., 2021), and independent learning skills (El-Adl & Alkharusi, 2020), while being negatively associated with mathematics anxiety (Li et al., 2021).

Interest and motivation in learning mathematics reflect the extent to which students value mathematical skills, engage in mathematical activities, and are driven to achieve academically in the subject (Wang et al., 2018). Motivation is the most significant influencing factor on student autonomy and academic achievement, surpassing demographic and cognitive factors such as gender and learning styles (Kusuma & Retnawati, 2022). However, current interventions focusing on curriculum redesign (Widodo et al., 2020), digital learning tools (Fadda et al., 2022), and differentiated instruction (Aguhayon et al., 2023; Gervasoni et al., 2021) tend to prioritize external factors related to teaching methods and technological tools, while overlooking the critical role of student-driven factors such as intrinsic motivation and personal interest. These psychological factors are essential to facilitate deeper engagement and stable mathematical performance, especially in faith-based educational environments where conventional reform may be challenging. Thus, there is a need for more student-centered, culturally appropriate approaches that incorporate students' intrinsic motivations.

In recent years, there has been a growing focus on the psychological and affective factors that influence students' mathematical proficiency, especially in diverse educational environments. Nevertheless, the majority of existing studies have focused on general or urban school populations, with minimal exploration of how these factors operate within Islamic secondary schools such as *Madrasah Tsanawiyah* (MTs). MTs are junior secondary institutions regulated by Indonesia's Ministry of Religious Affairs, providing a curriculum that integrates general education with Islamic religious studies, including Qur'an, Hadith, Fiqh, Tawhid, and Islamic history (Nasir, 2015). Despite the alignment of the mathematics curriculum in MTs with that of public schools, the emphasis on religious subjects often leads students to regard mathematics as less significant (Sajiman & Hasbullah, 2021). This distinctive educational environment presents both a challenge and an opportunity to develop more culturally and pedagogically relevant methods of teaching mathematics that incorporate students' intrinsic interest and motivation to learn. This difference is crucial, as counting proficiency not only supports more advanced concepts such as numerical operations, algebra, and problem-solving but also serves as a measurable and early indicator of mathematical readiness.

Although there is a broad consensus that counting proficiency is a fundamental component of mathematical literacy (Holenstein et al., 2021), little research has explored the relationship between intrinsic factors, such as motivation and interest, and this skill in the context of Islamic secondary schools such as MTs. This is a significant gap, as enhancing counting proficiency is not only essential for mathematical development but also serves as an early indicator of academic readiness and self-efficacy.

Many researchers have suggested various interventions to enhance student performance in mathematics, including curriculum redesign (Widodo et al., 2020), digital learning tools (Fadda et al., 2022), and differentiated instruction (Aguhayon et al., 2023; Gervasoni et al., 2021). These approaches may be promising, but they often overlook student-driven factors such as motivation and interest. Therefore, a more student-centered approach that emphasizes intrinsic motivation rather than external, conventional interventions may provide a more relevant solution. Faith-based educational institutions, such as MTs, offer distinctive opportunities to enhance students' motivation and engagement in learning, which are sometimes overlooked in traditional educational reforms.

This study investigates the influence of interest and motivation on mathematics learning among MT students, specifically regarding their effect on counting proficiency. This study is necessary to guide the development of teaching strategies that are both culturally relevant and empirically grounded. Thus,

the aims of this research are: (1) to describe the levels of interest and motivation in learning mathematics among students at MTs; and (2) to analyze their relationship with students' counting proficiency.

METHOD

This study employed a quantitative research approach to describe students' interest and motivation in learning mathematics and to investigate the effects of these variables on their counting proficiency. The methodology was carefully designed to ensure robust and reliable findings.

Participants

The study population involved all 7th through 9th graders of Madrasah Tsanawiyah (MTs) in Lhokseumawe City, Aceh Province, Indonesia. There were 20 institutions classified as Islamic secondary schools in the city, with a total of 3,454 students. These institutions were further categorized into 2 public schools and 18 private schools. A stratified proportional sampling technique was applied to ensure a representative sample across school types and locations. As a result, four MTs were selected, comprising two public and two private, with a total of 161 students participating in the study. The two private schools were Islamic boarding schools, known as *Pesantren*-based MTs. The distribution of participants is presented in Table 1.

Table 1. *Study sample*

No	Name of Schools	Sub-District	Total Sample		Total
			Male	Female	
1	MTs Negeri 1 Kota Lhokseumawe	Banda Sakti	27	29	56
2	MTs Negeri 2 Kota Lhokseumawe	Blang Mangat	21	25	46
3	MTs Swasta Ulumuddin	Muara Dua	0	20	20
4	MTs Swasta Ihya'aussunnah	Banda Sakti	0	39	39
Total			48	113	161

Instruments

There were three instruments used in this study to measure the three variables, i.e., (1) the mathematics learning interest questionnaire, (2) the mathematics learning motivation questionnaire, and (3) the assessment of counting proficiency. The learning interest and learning motivation questionnaires have been developed and validated in previous studies. At the same time, the counting proficiency assessment was adapted from the numerical section of the National Assessment of Academic Potential (*Tes Potensi Akademik*).

Data Analyses

The data were analyzed using SPSS for Mac Version 25.0. The analyses included descriptive and inferential statistics to address the research objectives. Descriptive analysis was used to explore the distribution and variability of students' interest in learning mathematics, their motivation, and their counting proficiency. The analyses began by displaying the data distribution across school types using histograms and boxplots, followed by summarizing the distribution patterns with measures of central tendency and dispersion.

Inferential statistical analyses were further applied to examine the relationships between variables. The analyses included Pearson correlation to identify the strength and direction of the relationships among learning interest, learning motivation, and counting proficiency. The analyses were continued using multiple regression to determine the extent to which learning interest and learning motivation predict students' counting proficiency.

Prior to conducting the regression analysis, several assumption tests were carried out to ensure the robustness of the regression model, i.e., normality of the residuals, linearity of the relationship between the independent and dependent variables, and the absence of multicollinearity among the independent variables.

RESULTS

Students' Learning Interest, Learning Motivation, and Counting Proficiency

The histograms for the three variables—mathematics learning interest (a), mathematics learning motivation (b), and counting proficiency (c)—demonstrate approximately normal distributions. The bell-shaped curves fitted to the histograms indicate that the data for each variable are symmetrically distributed, with most values concentrated around the mean and fewer observations at the extreme ends. For mathematics learning interest and learning motivation (a and b), the histograms show well-centered distributions with minimal skewness, suggesting that most students have moderate to high levels of interest and motivation in learning mathematics. Similarly, counting proficiency (c) follows a normal distribution, but it appears slightly wider, which may indicate greater variability in students' counting abilities. These patterns suggest that the data for all three variables are appropriately distributed for further statistical analyses, such as correlation or regression, that assume normality.

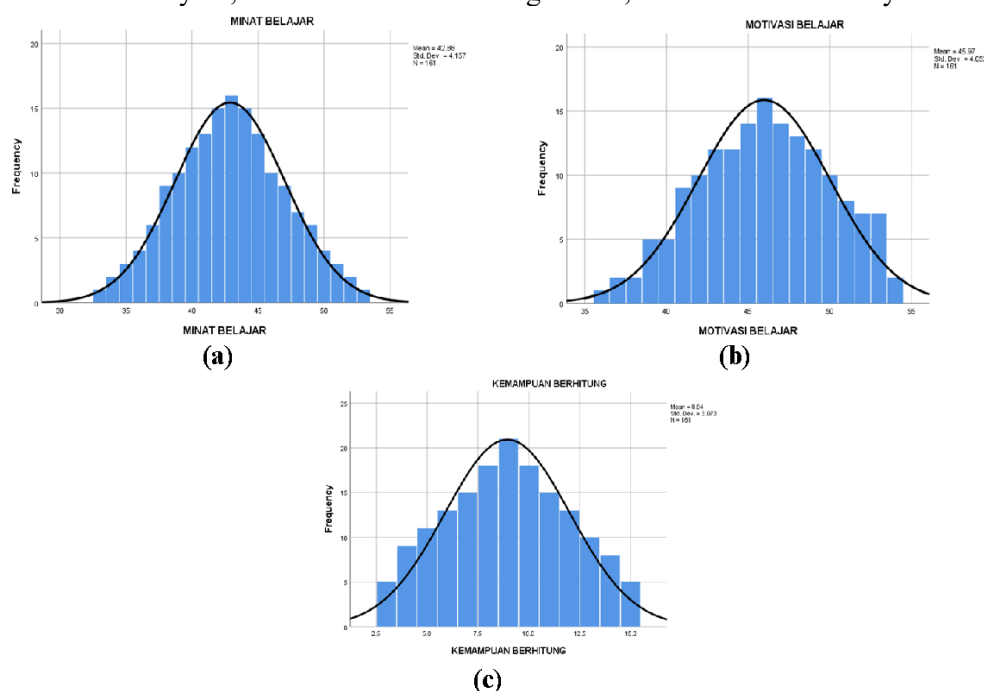


Figure 1. Distribution of: (a) Mathematics Learning Interest; (b) Mathematics Learning Motivation; and (c) Counting Proficiency

In order to obtain a more valid conclusion about the form of distribution of score data for the three variables, a formal normality test was then carried out, the Kolmogorov-Smirnov test, because the total sample was medium in size ($50 < n < 300$) (Kim, 2013). From the results of this normality test, the three variables were normally distributed because the significance values for each variable were > 0.05 (Table 2).

Table 2. Normality test for study variables

Variable	Shapiro-Wilk		
	Statistic	df	Sig.
Learning Interest	0.991	161	0.425
Learning Motivation	0.984	161	0.063
Counting Proficiency	0.975	161	0.055

Table 3 presents the descriptive statistics for the three variables: mathematics learning interest, mathematics learning motivation, and counting proficiency of students in this study. The students' interest and motivation scores were not very different, but the mean scores for both variables were below

50%. Meanwhile, students' counting proficiency had a mean SD of 59.6 and a standard deviation ($s = 21$), indicating that the data deviated substantially from the mean. This can also be seen from a quite large data range: a minimum value of 13.3% and a maximum of 100%.

Table 3. *Descriptive statistics of the study variables*

Variable	N	Max	Min	Mean	Standard Deviation
Learning interest	161	88.3	55	42.88	4.16
Learning Motivation	161	90	60	45.97	4.05
Counting Proficiency	161	100	13.3	59.6	21

Students' Learning Interest Distinguished by School

There were four schools involved in this study, as shown in Table 1. The differences in students' math learning interest scores by school were presented using multiple boxplots in Figure 2. The boxplots reveal variations in students' interest in learning mathematics across the four schools. MTs Ulumuddin and MTs Ihyaussunnah exhibit the highest median interest levels, indicating a relatively stronger engagement in mathematics, with MTs Ihyaussunnah showing slightly greater variability. In contrast, MTsN 1 Lhokseumawe has the lowest median and the widest interquartile range, suggesting a broader disparity in students' interest, including an outlier indicating exceptionally low interest. MTsN 2 Lhokseumawe shows a slightly higher median than MTsN 1 and exhibits a more consistent pattern, with no outliers. These differences highlight potential disparities in teaching strategies, resource availability, or socioeconomic influences among the schools, suggesting the need for targeted interventions to enhance uniformity in students' engagement in mathematics. However, the results of the variance analysis (ANOVA) conducted showed that there was no significant difference in learning interest scores ($F = 1.159$; $p = 0.327$).

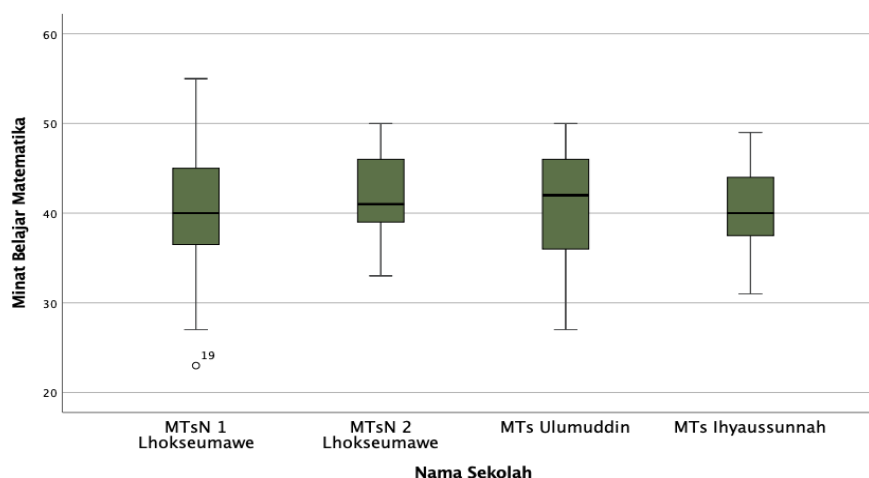


Figure 2. Boxplots for comparing students' math learning interest from the four schools

Relationships among Learning Interest and Learning Motivation with Counting Proficiency

From the previous analyses, we found that the scores on math learning interest, math learning motivation, and counting proficiency were normally distributed. Hence, Pearson correlation analysis could be applied to analyze the relations among the variables (Table 4).

Table 4. *Pearson correlation analysis of study variables*

Variable	Correlation coefficients	Sig.
Learning Interest VS. Counting Proficiency	0.516	0.000
Learning Motivation VS. Counting Proficiency	0.578	0.000
Learning Interest and Learning Motivation VS. Counting Proficiency	0.632	0.000

The correlation analysis indicates a significant positive relationship between students' interest in learning mathematics and their counting proficiency ($r = 0.516, p < 0.01$). This suggests that a higher interest in learning mathematics is moderately associated with improved counting skills. Similarly, there is a significant positive relationship between students' motivation to learn mathematics and their counting proficiency, with a slightly stronger Pearson correlation coefficient ($r = 0.578, p < 0.01$). This implies that higher motivation to learn mathematics is moderately to strongly associated with better counting proficiency. Furthermore, the multiple correlation coefficient ($r = 0.632, p < 0.01$) indicates a significant combined relationship between learning interest and motivation and counting proficiency, suggesting that these two factors together have a stronger association with students' numerical abilities than either factor alone. These findings highlight the importance of fostering both interest and motivation in mathematics education, as they collectively play crucial roles in enhancing students' numerical skills.

Effect of math learning interest and math learning motivation on counting proficiency

The multiple linear regression analyses resulted in a regression model of $Y = -15.361 + 0.219X_1 + 0.324X_2$, where Y is the counting proficiency, X_1 is math learning interest, and X_2 is math learning motivation. Table 5 presents the analysis of variance of the model.

We conducted regression assumption tests, including a normality test of the residuals, a linearity test, and a multicollinearity test. The normality test using the Kolmogorov-Smirnov test shows that the residuals are normally distributed ($p = 0.200$), confirming that they meet the normality assumption. The linearity test assesses whether a linear relationship exists between the independent variables (learning interest and motivation) and the dependent variable (counting proficiency). The result indicates that the linearity assumption is satisfied, as the linearity significance ($p = 1.000$) is well above 0.05, and the deviation from linearity is not significant ($p = 0.496$). Lastly, the multicollinearity test assesses correlations among the independent variables. The Variance Inflation Factor (VIF) values for learning interest and learning motivation are both 1.345, which is well below the threshold of 10, indicating no multicollinearity issues. Additionally, the tolerance values for both predictors are 0.744, which are above the minimum acceptable value of 0.1, further confirming the absence of multicollinearity. Hence, the assumption tests confirmed the suitability of the regression model.

Table 5. ANOVA of the effects of math learning interest and math learning motivation on counting proficiency

Model	Coefficient		Sig.	
	B	Std. Error		
Constant	-15.361	2.380	-6.455	.000
Learning Interest	.219	.053	4.151	.000
Learning Motivation	.324	.054	5.978	.000

Dependent Variable: Counting Proficiency

The regression analysis shows that both students' math learning and motivation significantly influence their counting proficiency. Learning interest has a positive and statistically significant effect, with a coefficient of 0.219 ($p < 0.001$), indicating that for every unit increase in learning interest, counting proficiency improves by 0.219 units. Similarly, learning motivation also has a significant positive effect, with a coefficient of 0.324 ($p < 0.001$), suggesting that a unit increase in motivation is associated with a 0.324-unit increase in counting proficiency. The determination coefficient of the model (R -squared) was 0.399, which means that the regression model explains approximately 39.9% of the variance in students' counting proficiency. This indicates a moderately strong fit, suggesting that students' interest in and motivation for math learning together account for a substantial portion of the variation in their counting skills. While this is a significant proportion, it also implies that approximately 60.1% of the variance is attributable to other factors not included in the model. Thus, the model effectively highlights the importance of interest and motivation as key contributors to counting

proficiency. However, additional variables may need to be explored to understand the factors affecting students' numerical abilities.

The results highlight that both interest and motivation are critical factors in enhancing students' numerical abilities, with motivation having a slightly stronger effect. These findings underscore the importance of improving students' interest and motivation in mathematics education to enhance their counting proficiency effectively.

DISCUSSION

The findings of this study support previous research emphasizing the essential role of learning interest and motivation in improving students' mathematics performance (Kristia et al., 2021; Sihombing et al., 2021). The significant positive correlation between learning motivation and counting proficiency highlights the importance of intrinsic and extrinsic motivational factors in mathematical learning. As suggested by Adamma et al. (2018), intrinsic motivation may enhance curiosity and self-regulated learning, enabling students to enjoy the learning process, engage deeply with mathematical concepts, and improve their proficiency. This is particularly relevant in a subject like mathematics, where persistent effort and problem-solving abilities are vital for success. Similarly, intrinsic motivation, defined as the drive to engage in an activity for its inherent satisfaction, plays a crucial role in fostering student engagement across emotional, cognitive, and behavioral dimensions (Mkhize, 2019).

In addition, the simultaneous effect of learning interest and motivation on counting proficiency aligns with Oudeyer et al. (2016), who reported that intrinsic motivation has a significant impact on students' mathematics problem-solving skills. Students with intrinsic interest and excitement in learning tend to engage more deeply with mathematical concepts, resulting in improved performance in mathematics. On the other hand, the regression analysis results in this study indicate that learning motivation has a greater impact on counting proficiency. This echoes the findings of Michaelides et al. (2019), emphasizing that motivation not only increases learning persistence but also helps students persevere and cope with challenges in mathematics learning. This is corroborated by Alkiyumi and Albeloushi (2021), who found that persistence is crucial in mathematics, as solving many mathematical problems requires sustained effort and trial and error.

These findings have important implications for educational practices, specifically for Madrasah Tsanawiyah (MTs). Curriculum in MTs emphasizes Islamic religious subjects more, and mathematics may not be perceived as a core priority by students. The phenomena may present both challenges and opportunities for mathematics teachers to bring religious values into mathematics learning. Teachers may design mathematics instruction in a more meaningful and relatable way by integrating students' real-life religious and cultural experiences, such as zakat calculations and lunar-calendar-based problem-solving. In this way, students' interest and motivation in mathematics learning could be improved. Students' cultural backgrounds, on the other hand, need to be taken into account when designing teaching practices to improve interest and motivation in learning. Instructional strategies such as project-based learning, contextual learning, and collaborative tasks are more likely to promote learning engagement (Sihombing et al., 2021). Other teaching approaches that provide supportive interactions, real-world applications, and adaptive pacing have also been suggested to reduce mathematics anxiety (Firmansyah & Mubarika, 2019; Kristia et al., 2021). Similarly, Pane et al. (2017) showed that personalized learning approaches positively affect student achievement in mathematics.

Additionally, several motivational interventions, such as rewards, goal setting, and feedback, have been shown to increase counting proficiency effectively. For instance, Vu et al. (2022) showed a positive reciprocal correlation between motivation and achievement: higher motivation leads to greater academic success, which in turn enhances motivation. This cycle suggests the critical role of motivation in sustaining students' efforts to cope with academic challenges.

On the other hand, incorporating technology into mathematics education can make learning more engaging and accessible (Betty & Nasri, 2023). Gamified learning environments or digital tools may enhance students' interest and motivation to learn, as they are more likely to engage with interactive, visually stimulating content.

To sum up, these findings suggest the need for holistic and responsive instructional models that consider not only cognitive but also affective factors of mathematics learning. In the context of Islamic

education, affective factors such as interest and motivation can be enhanced by integrating students' lived religious experiences and cultural values into pedagogical design. As suggested by Adamma et al. (2018), fostering a positive emotional connection with mathematics through supportive teaching practices not only improves proficiency but also builds students' efficacy and reduces mathematics anxiety. This highlights the need for sustained, multifaceted interventions that integrate cognitive, motivational, and interest dimensions to promote long-term success in mathematics learning, especially in faith-based educational settings such as MTs.

CONCLUSION

The results show that student interest and motivation in learning mathematics have positive and significant effects on students' counting proficiency. These results support the theoretical perspectives of the important role of affective factors in academic performance (Firmansyah & Mubarika, 2019; Kristia et al., 2021). Based on the relationships found, mathematics teachers may need to be more aware of students' interests and motivation in designing pedagogical interventions in mathematics classrooms. Differentiated strategies for diverse student profiles (Kristia et al., 2021) and contextualized learning experiences that connect mathematical concepts to real-world applications (Firmansyah & Mubarika, 2019) could be among the approaches suitable for this issue. Consequently, future research can be directed toward exploring the longitudinal effects of such interventions on students' mathematical performance.

DECLARATIONS

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Statement were utilized at any stage of this study, including during data collection, analysis,
visualization, or manuscript preparation. All work presented in this study was
conducted manually by the authors without the assistance of AI-based tools or
systems
Additional : Additional information is available for this paper.
Information

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