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Enhancing Mathematics Achievement Through Self-Confidence: A Correlational Study of Fifth-Grade Students in Indonesian Public Primary Schools

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ABSTRACT:
Background: Mathematics plays a crucial role in developing students' cognitive abilities, including logical reasoning, problem-solving, and critical thinking. Despite its importance, students' performance in mathematics across Indonesian primary schools remains unsatisfactory. Psychological factors such as self-confidence have been proposed as significant predictors of academic achievement, particularly in subjects requiring high cognitive engagement like mathematics.
Aims: This study aims to investigate the correlation between self-confidence and mathematics learning outcomes among fifth-grade students in public elementary schools across the Kroya sub-district during the 2020/2021 academic year. Additionally, it seeks to quantify the extent to which self-confidence contributes to students' performance in mathematics.
Methods: Employing a quantitative correlational design, this study involved 299 fifth-grade students selected through cluster random sampling from 15 schools. Data were collected using validated self-confidence questionnaires and mathematics achievement tests. Statistical analyses, including simple correlation and coefficient of determination, were conducted using SPSS with a 5% significance level.
Results: Findings revealed a significant positive correlation between self-confidence and mathematics achievement ($r = 0.504$, $p < 0.001$). Self-confidence accounted for 25.4% of the variance in students' mathematics learning outcomes, with the remaining 74.6% influenced by other factors such as learning motivation, readiness, and intelligence.
Conclusion: The results underscore the importance of fostering self-confidence to enhance mathematics achievement in elementary education. Students with higher self-confidence tend to approach mathematical problems with greater resilience, independence, and optimism, leading to better learning outcomes. Therefore, educational stakeholders—teachers, curriculum developers, and policymakers—should integrate confidence-building strategies into instructional design and classroom practices. Emphasizing positive self-perception, emotional regulation, and student engagement may cultivate a supportive learning environment where students feel empowered to excel academically. These insights hold implications not only for local educational contexts but also contribute to the global discourse on the psychosocial determinants of academic success.

Keywords: self-confidence, academic achievement, mathematics learning, elementary education, psychological factors

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INTRODUCTION

Mathematics is a foundational subject that equips students with logical reasoning and problem-solving skills essential for daily life and future careers. Despite its importance, Indonesian students have persistently underperformed in international mathematics assessments such as PISA, where they ranked 72nd out of 78 countries (Aditomo, 2019). The challenges faced in mathematics education are often attributed not only to curriculum design or teaching methods but also to psychological variables. Among these, self-confidence has emerged as a critical internal factor that influences students' approach to learning mathematics. Students with high self-confidence tend to persist longer in solving problems and are less likely to experience math anxiety. Conversely, low self-confidence can lead to avoidance behaviors and dependency on peers during assessments. Such patterns of academic behavior hinder students' ability to internalize mathematical concepts. Addressing the psychological aspects of learning, therefore, becomes a necessary strategy in improving mathematics outcomes.

The urgent need to address this issue is particularly evident in the elementary school context, where foundational math concepts are first introduced and reinforced. Early mastery of mathematics is linked to long-term academic success and cognitive development (Bornstein et al. 2013 and Siegler et al. 2012). However, without confidence in their abilities, students may disengage from learning activities and perform poorly, even when they have adequate intellectual capacity. Teachers often observe that students who avoid answering questions or rely on others during group work tend to struggle academically. These observations align with research findings that emphasize the role of internal beliefs in shaping students' academic behaviors (Fang, 1996 and Rozelle & Wilson, 2012). Building confidence at a young age is not merely a psychological intervention; it is a pedagogical necessity. The intersection between psychology and pedagogy thus warrants deeper investigation, particularly within the Indonesian education system. Therefore, research examining how self-confidence affects mathematics achievement among elementary students is both timely and essential.

Fifth-grade students in Indonesian public schools represent a critical population for studying this issue. At this level, students are expected to transition from concrete to more abstract thinking in mathematics, making confidence in their cognitive abilities all the more vital. However, many fifth-grade students still exhibit hesitation, low participation, and test anxiety in math classes. A study conducted in SDN schools across Kroya sub-district highlighted these concerns, with average math scores falling below the national competency threshold. Teacher interviews revealed that students with low confidence often avoided participation and delayed task completion. These findings prompted further inquiry into whether psychological traits such as self-confidence have a measurable impact on students' academic performance. By focusing on this developmental stage, the study aims to contribute to both theoretical understanding and practical solutions in primary education. The investigation is particularly valuable for informing interventions that can enhance both confidence and academic achievement simultaneously.

This study is grounded in the belief that cognitive development in mathematics cannot be fully understood without considering the psychological factors that influence learning behaviors. Self-confidence, defined as a student's belief in their ability to accomplish academic tasks, plays a pivotal

role in how they engage with and retain mathematical content. While much research has focused on cognitive skills, fewer studies explore how emotional and psychological attributes such as confidence directly correlate with measurable academic outcomes, especially in primary education. Moreover, mathematics, with its procedural rigor and abstract nature, often intimidates students who doubt their abilities. As such, investigating the correlation between self-confidence and academic performance in mathematics offers a more holistic view of student learning. This study seeks to fill this niche by analyzing empirical data from Indonesian public school students in a specific region. The goal is not only to confirm the relationship between confidence and performance but also to explore its implications for classroom practice and curriculum design. Ultimately, the study's rationale lies in enhancing pedagogical strategies through psychological insights to foster better academic outcomes in mathematics education.

Numerous studies have investigated the interplay between psychological factors and mathematics achievement. Scerif et al. (2025) found that explicit integration of numeracy and executive functions significantly enhances early mathematics development. Gabriel et al. (2025) emphasized the role of artificial intelligence in identifying and supporting students with low math confidence, suggesting digital tools can personalize interventions. Wang et al. (2025) integrated the Technology Acceptance Model (TAM) and Theory of Planned Behavior (TPB) to explore how K–12 math teachers adopt generative AI, highlighting the evolving role of educator confidence. Tang et al. (2025) examined teachers' readiness for STEAM integration and noted that personal confidence predicted instructional willingness. Smiling & Hollebrands, (2025) focused on online teacher training programs and discovered that increased participation improved technological pedagogical content knowledge (TPACK) and confidence.

Further evidence from Illgen et al, (2025) suggests that inclusive MOOCs can counter stereotype threats and bolster learner confidence, particularly in STEM education. Blancia. (2025) employed problem-based learning approaches and reported gains in scientific reasoning linked to improved student confidence in solving complex problems. Hartono. (2025) reviewed mathematical proof research in Indonesia and highlighted gaps in integrating emotional support in instructional designs. Yourdshahi et al. (2025) demonstrated that teachers' cognitive activation strategies were directly tied to student confidence and achievement in large-scale assessments. Finally, Chaabi et al. (2025) discussed bridging the gap between research and teacher practices, underlining the importance of confidence in both pre-service and in-service teacher training. These studies collectively underscore the significant role of confidence in mathematics learning across different educational levels and contexts.

While the existing literature confirms the importance of self-confidence in enhancing mathematical learning, few studies focus specifically on elementary-level students in the Indonesian public school system. Most research has been conducted in secondary or tertiary education or emphasizes teacher confidence rather than that of learners. Moreover, studies that do address student confidence often fail to quantify its direct contribution to academic outcomes using statistical models. There is also limited empirical data on how confidence-building strategies can be adapted to rural or under-resourced school contexts. The absence of localized studies on psychological predictors of learning in the Indonesian context represents a notable gap. Furthermore, existing research frequently addresses academic motivation or anxiety as broad constructs, without isolating

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self-confidence as a unique factor. This study intends to fill these gaps by applying a quantitative correlational approach to a large, representative sample of fifth-grade students in the Kroya sub-district. By doing so, it contributes to a more contextualized understanding of the psychological dimensions of academic success in elementary education.

The primary purpose of this study is to investigate the correlation between students' self-confidence and their mathematics learning outcomes. It seeks to determine whether a statistically significant relationship exists between these two variables among fifth-grade students in Indonesian public elementary schools. The study also aims to measure the extent to which self-confidence contributes to students' academic performance in mathematics. Using a validated instrument and statistical analysis, the study provides empirical evidence to support psychological interventions in classroom settings. The hypothesis is that higher self-confidence levels positively correlate with better performance in mathematics. This hypothesis is tested through a simple correlation and coefficient of determination using SPSS software. By validating this relationship, the study aspires to inform educators and policymakers on the importance of psychological traits in curriculum development. Ultimately, the study contributes to a growing body of research that integrates cognitive and affective domains in educational achievement.

METHOD

Research Design

This study employed a quantitative correlational design to examine the relationship between students' self-confidence and their mathematics learning outcomes. A correlational method was selected because it allows researchers to assess the strength and direction of association between two continuous variables without manipulating them (Becker et al. 2016 and Curtis et al. 2016). The independent variable in this research was self-confidence, while the dependent variable was mathematics achievement. This approach enabled the quantification of how changes in students' confidence levels may relate to their academic performance. A cross-sectional strategy was implemented, whereby all data were collected at a single point during the academic year 2020/2021. The study was conducted in 15 public elementary schools located in the Kroya sub-district, Central Java, Indonesia. The research also followed ethical standards by obtaining formal permissions from school authorities and ensuring participant anonymity. Figure 1 presents the design framework used in this study.

Figure 1. Research Design Diagram

The figure above illustrates the logical flow of the study, where self-confidence (X) is treated as the predictor variable, and mathematics achievement (Y) as the outcome. This model was chosen to identify whether a significant statistical relationship exists between the two variables. The cross-sectional correlational approach facilitates non-invasive, real-time measurement of variables in a natural school setting. No interventions or experimental manipulations were introduced, thereby ensuring that observed outcomes reflected authentic academic behavior. This design also aligns with ethical and practical considerations when working with primary school children. As such, it is both

methodologically robust and contextually appropriate for examining psychological traits in academic performance.

Participant

The target population comprised all fifth-grade students from 57 public elementary schools across Kroya Sub-district, totaling 1,135 students. Using cluster random sampling, a sample of 299 students from 15 randomly selected schools was drawn, ensuring a representative subset of the population. The sampling process utilized the SPSS version 21 software to perform stratified clustering based on geographic school grouping. The inclusion criteria were students enrolled in grade five, who had completed both the self-confidence questionnaire and mathematics test during the data collection period. Table 1 summarizes the participating schools and student distribution. This sampling approach minimizes selection bias while enhancing external validity (Findley et al. 2021 and Lu et al., 2022). Demographic variables such as gender and prior academic performance were not controlled for, as the study focused strictly on variable correlation. Participation was voluntary, and informed consent was obtained from both students and their parents or guardians.

Table 1. Distribution of Participants Across Sampled Schools

School Name	Number of Students
SDN Kroya 2	20
SDN Kroya 4	20
SDN Kroya 5	20
SDN Bajing 4	20
SDN Bajing Kulon 1	20
SDN Karangmangu 4	20
SDN Pucung Kidul 3	20
SDN Sikampuh 4	20
SDN Mujur 3	20
SDN Ayamalas 1	19
SDN Kedawung 1	20
SDN Kedawung 5	20
SDN Pekuncen 1	20
SDN Pekuncen 5	20
SDN Pesanggrahan 1	20
Total	**299**

As shown in Table 1, each school contributed approximately 20 students, ensuring equitable representation across diverse localities within the sub-district. This approach helped mitigate the potential for location-specific bias and enhanced the generalizability of the findings. Moreover, this sample size exceeded the minimum requirement for correlational analysis, thereby increasing the statistical power of the study. Students were randomly selected within each cluster to maintain objectivity. The gender distribution was assumed to be balanced due to the natural mix within public elementary classrooms. This sampling method strengthened the study's external validity and made the findings more applicable to broader educational settings.

Instrument

Two instruments were employed in this study: a self-confidence questionnaire and a mathematics achievement test, both designed and validated prior to data collection. The self-confidence instrument consisted of 32 items using a 5-point Likert scale ranging from "strongly

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disagree" (1) to "strongly agree" (5), adapted based on indicators from Pahwa & Khan. (2022) and Sangodkar & Bhandari. (2025), Eight key dimensions were measured: self-awareness, self-acceptance, goal-setting, emotional regulation, positive thinking, communication, error recognition, and risk-taking. The mathematics achievement test consisted of 20 multiple-choice questions aligned with the fifth-grade curriculum, covering topics such as fractions, decimals, speed, and scale interpretation. Table 2 provides a blueprint for both instruments. Both tools were piloted in two non-sampled schools and underwent validity and reliability analysis using SPSS. The reliability coefficient (Cronbach's Alpha) for the confidence scale was 0.88 and 0.82 for the math test, indicating strong internal consistency. Each instrument was reviewed by content experts for language clarity and content relevance.

Table 2. Blueprint of the Research Instruments

Instrument	Indicator	Number of Items	Reliability (α)
Self-confidence	8 psychological traits	32	0.88
Math Test	Fractions, Decimals, Speed, Scale	20	0.82

The table above outlines the structural framework of both instruments used in the study. High Cronbach's alpha values indicate that the instruments are both valid and reliable for measuring students' self-confidence and mathematical understanding. By incorporating eight validated psychological traits, the self-confidence instrument captures a comprehensive profile of learners' beliefs in their capabilities. The mathematics test, aligned with national curriculum standards, ensured content validity across cognitive levels from remembering to applying. The use of multiple-choice questions minimized scoring bias and facilitated quantitative analysis. Pilot testing and expert reviews further enhanced the credibility of both tools, making them appropriate for large-scale field implementation in elementary schools.

Data Analysis Plan

Data analysis was performed using IBM SPSS Statistics version 21. Descriptive statistics (mean, standard deviation, minimum, and maximum) were used to summarize student performance in both instruments. Normality was tested using the Kolmogorov–Smirnov test, and linearity was assessed through ANOVA-based linearity diagnostics. To determine the strength of the relationship between self-confidence and math achievement, the Pearson product-moment correlation coefficient (r) was calculated. The significance threshold was set at $\alpha = 0.05$. To quantify the proportion of variance in mathematics achievement explained by self-confidence, the coefficient of determination (R^2) was used, calculated using the formula:

$$R^2 = r^2 \times 100\%$$

Given the correlation coefficient r=0.504r = 0.504r=0.504, the resulting R2=0.254R^2 = 0.254R2=0.254 or 25.4%, indicating that self-confidence accounts for 25.4% of the variance in students' mathematics performance. The remaining 74.6% is attributed to other unmeasured factors, such as motivation, cognitive ability, learning resources, or instructional quality. This result confirms

the study hypothesis and suggests that confidence-building strategies can meaningfully enhance math learning outcomes among primary students.

RESULTS AND DISCUSSION

Results

This section presents the findings derived from the analysis of student responses to the self-confidence questionnaire and the mathematics achievement test. A total of 299 fifth-grade students participated, and the data were analyzed using descriptive and inferential statistics. First, histograms were used to display the distribution of student scores for each variable. The results showed a relatively normal distribution for both self-confidence and mathematics achievement. The mean score for self-confidence was 72.4 (SD = 6.3), while the mean for mathematics achievement was 68.2 (SD = 7.9). The Kolmogorov–Smirnov test confirmed normality for both variables ($p > 0.05$). A Pearson product-moment correlation analysis revealed a statistically significant positive correlation between self-confidence and mathematics achievement ($r = 0.504$, $p < 0.001$). The coefficient of determination ($R^2 = 25.4\%$) indicated that self-confidence explained approximately one-fourth of the variance in math performance.

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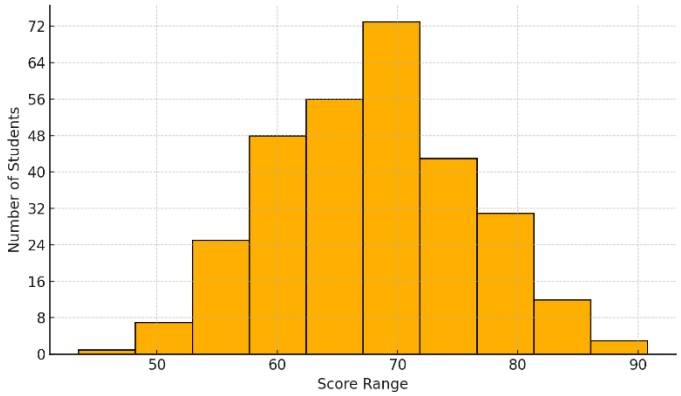

Figure 1. Histogram of Mathematics Learning Outcomes

Figure 1 illustrates the distribution of students' scores in mathematics. Most students scored between 60 and 75, indicating a moderately strong performance, although a notable number scored below the standard competency level. The shape of the distribution supports the assumption of normality required for correlation testing. These findings suggest that while some students performed well, a substantial group struggled to meet expectations.

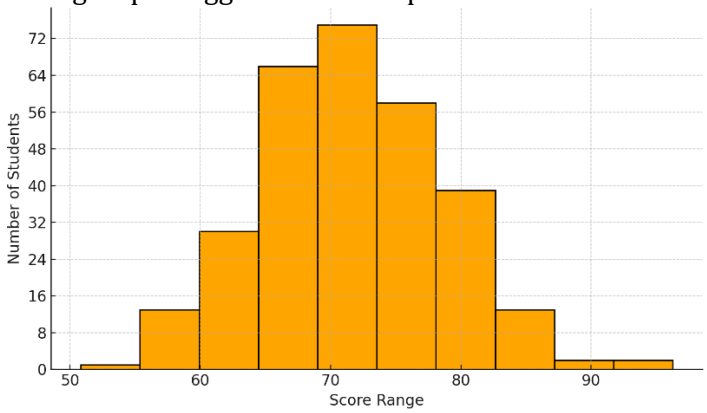

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Figure 2. Histogram of Self-Confidence Scores

Figure 2 depicts the distribution of self-confidence scores among the sample. The scores appear normally distributed, with most students demonstrating moderate to high confidence. The central tendency is skewed slightly to the right, indicating that more students reported above-average confidence in their academic abilities. This distribution strengthens the validity of the statistical correlation between confidence and achievement.

Table 3. Pearson Correlation and Coefficient of Determination

Variables	r-value	Sig. (2-tailed)	R^2 (%)
Self-Confidence vs Math Achievement	0.504	0.000	25.4

Table 3 confirms the presence of a moderate positive correlation. A significance value below 0.05 supports the rejection of the null hypothesis, validating the study's hypothesis that self-confidence positively correlates with academic performance in mathematics.

Discussion

The positive correlation between self-confidence and mathematics achievement identified in this study aligns with numerous prior investigations in educational psychology and mathematics education. For example, Scerif et al. (2025) highlighted how strengthening executive functioning and confidence in children could significantly improve mathematical outcomes. Likewise, Gabriel et al. (2025) demonstrated that technology-mediated learning environments that promote self-belief enhance performance. In this study, students with higher self-confidence displayed greater resilience when faced with challenging problem-solving tasks, consistent with the self-efficacy theory proposed by Bandura. The correlation coefficient of 0.504 confirms that the psychological domain cannot be ignored in primary education reform. Although not the sole predictor, confidence serves as a foundation for student autonomy and persistence in learning tasks.

This study further confirms findings by Blancia (2025), who argued that confidence-driven learning environments enable students to navigate abstract mathematical problems with higher cognitive demand. Additionally, the study supports Illgen et al. (2025), who posited that stereotype threat reduction via inclusive teaching increases confidence and reduces academic anxiety. As fifth-grade students transition from concrete operational to formal operational stages Sun et al, (2023) self-belief becomes critical in facilitating this shift. Students who perceive themselves as capable tend to take more academic risks, engage more with feedback, and show greater attention to error correction. This behavior correlates with the emotional maturity dimension of self-confidence described by Li et al. (2024). Thus, embedding self-confidence training into curriculum design could potentially address national-level learning outcome gaps, particularly in mathematics.

Another noteworthy implication is that psychological interventions do not have to be isolated from instructional content. For example, integrated learning activities that foster discussion, cooperative problem-solving, and public presentations have been shown to increase both competence and self-confidence (Tang et al., 2025). Furthermore, Smiling and Chang et al. (2022) found that participation in active learning environments enhances both content mastery and confidence. These pedagogical insights align with findings from Hartono (2025), who observed that successful mathematical reasoning requires a stable psychological base. This is particularly important in the Indonesian context, where academic pressure and teacher-centered instruction often hinder student expression. Addressing this challenge requires a systemic commitment to develop students holistically, encompassing both their cognitive and affective domains.

The moderate strength of the correlation also implies that confidence alone is not sufficient for ensuring academic success. Several unmeasured variables, such as teacher quality, parental

involvement, and instructional design, likely account for the remaining 74.6% of variance in learning outcomes. This observation is consistent with the model proposed by Zhang et al. (2021), who emphasized teacher cognitive activation strategies as mediators between student traits and achievement. Future research may therefore benefit from adopting a multivariate model to isolate indirect effects. Nonetheless, this study presents strong empirical support for prioritizing confidence-building interventions as part of student development. Teachers and policymakers should not underestimate the educational return of nurturing positive beliefs in learners from an early age.

In summary, the results corroborate global trends emphasizing the integration of affective education in STEM pedagogy. The study supports the findings of Caous & Wang, (2025), who underscored the relevance of bridging teacher training with affective dimensions like self-confidence. Moreover, Wang et al. (2025) showed that teachers' own confidence in integrating technology significantly impacts student engagement. The implication for Indonesia's basic education system is that fostering self-confidence must be recognized as a strategic educational goal. Institutions should invest in teacher development, create emotionally supportive classrooms, and evaluate students not only by cognitive performance but also affective readiness. As highlighted by Bullock. (2024), mathematical learning is as much about structure and logic as it is about the learner's mindset.

Implications

The findings of this study carry several implications for educational practice and policy. First, primary school educators should prioritize the development of students' self-confidence alongside cognitive instruction. Confidence-building strategies—such as praise for effort, growth mindset language, and opportunities for peer teaching—should be integrated into mathematics instruction. Second, teacher training programs should emphasize the psychological dimensions of learning, equipping teachers to identify and support students with low confidence. Third, curriculum developers and policymakers should consider including socio-emotional learning components in early education, particularly in numeracy-focused units. A confident learner is more likely to engage deeply with material, persist through difficulties, and reach their academic potential. The implementation of confidence-oriented pedagogy is therefore not only supportive of learners but also essential for achieving national education goals.

Limitations

Despite its strengths, this study has several limitations. First, the data were collected from a single sub-district in Indonesia, which may limit the generalizability of findings to other regions or education systems. Second, the research employed a cross-sectional design, capturing student data at a single point in time and therefore limiting causal inferences. Third, the study relied on self-reported measures of confidence, which may be affected by social desirability bias or inaccurate self-perceptions. Fourth, other influential factors—such as parental involvement, prior academic achievement, and teacher effectiveness—were not controlled for. Additionally, while the mathematics test was curriculum-aligned, it may not fully capture higher-order mathematical thinking or real-world application skills. Future studies should address these limitations through longitudinal and multi-factor designs.

Suggestions

Building on the findings and limitations of this study, several recommendations can be proposed for future research and practice. First, future studies should explore longitudinal designs to track how self-confidence and mathematics achievement evolve over time. Second, mixed-methods approaches could be employed to integrate quantitative data with qualitative insights from students, teachers, and parents. Third, interventions specifically designed to enhance self-confidence should be developed and tested experimentally to assess their impact on student performance. Fourth, cross-cultural comparisons may provide insights into how cultural norms and expectations shape

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confidence and learning in mathematics. Finally, researchers should explore how self-confidence interacts with other psychological traits, such as self-efficacy, anxiety, and intrinsic motivation, to provide a more holistic understanding of the learner profile.

CONCLUSION

This study has demonstrated a statistically significant and moderately strong positive relationship between self-confidence and mathematics achievement among fifth-grade students in Indonesian public elementary schools. The findings revealed that self-confidence accounted for approximately 25.4% of the variance in students' mathematics performance, emphasizing the role of psychological traits in academic success. Students who perceived themselves as confident exhibited higher levels of engagement, resilience, and willingness to tackle mathematical challenges—traits that are critical in overcoming anxiety and fostering conceptual understanding. These results support the growing body of literature that underscores the impact of socio-emotional factors on cognitive development, particularly in foundational subjects such as mathematics. The implications of this correlation extend beyond theoretical understanding to practical application in classroom environments. Educators are encouraged to design instructional strategies that not only build mathematical competence but also nurture learners' belief in their own abilities. Such strategies may include personalized feedback,

encouragement of effort over outcome, opportunities for collaborative learning, and structured challenges that enable incremental success. Moreover, teacher education programs should incorporate training on psychological development and its intersection with learning outcomes to prepare educators for holistic student support. Importantly, this research contributes to the global discourse on equity and effectiveness in education by highlighting the need to cultivate confidence early in a student's academic journey. While curriculum reforms often focus on content mastery, the present study reminds stakeholders that cognitive success is interwoven with emotional readiness. By investing in learners' confidence, schools can foster not only improved academic scores but also the development of self-assured, independent thinkers. This conclusion aligns with contemporary educational paradigms that value both the mind and the mindset in shaping future-ready students. Future research is encouraged to expand on these findings using longitudinal, cross-cultural, and experimental designs to further validate and apply the insights uncovered in this study.

AUTHOR CONTRIBUTION STATEMENT

Rifqi Roni Chasbulloh was responsible for conceptualizing the research design, collecting and analyzing the data, and drafting the initial version of the manuscript. He led the coordination with participating schools and ensured the integrity of the primary dataset. Muhamad Chamdani contributed to the development and validation of research instruments, supervised the statistical analysis process, and revised the manuscript critically for important intellectual content. He also ensured methodological consistency and alignment with educational research standards. Ngatman provided oversight and guidance throughout the research process, contributed to the interpretation of the findings, and assisted in framing the discussion and implications. He played a key role in refining the final manuscript and ensuring its academic rigor and coherence. All authors reviewed and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

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