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The influence psychological support and well-being, classroom management, and creativity on numeracy skills

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Abstract

Numeracy skills are fundamental in mathematics education, yet assessment results continue to reveal areas for improvement. This study investigates the influence of psychological support, psychological well-being, classroom management, and creativity on students' numeracy skills. This study employs a quantitative research method. Data were collected through document analysis of the 2024 National Assessment Public Report for elementary schools and their equivalents. A total sample of 81,824 students was selected based on the availability of complete data on the examined variables. Data analysis was conducted using structural equation modeling with the SEM-PLS approach. The results indicate that all independent variables positively and significantly influence students' numeracy skills, with creativity exerting the most substantial effect and a coefficient of determination of 18.1%. Additionally, psychological well-being partially mediates the relationship between psychological support and numeracy skills. Therefore, a more holistic learning approach is needed to improve numeracy skills by considering psychosocial factors and the learning environment. Theoretically, the study supports the view that numeracy development is not solely cognitive but shaped by affective and contextual dimensions. Practically, it calls for policies and teaching practices that promote psychological well-being, creativity, and supportive learning environments in schools.

Keywords: Classroom Management, Creativity, Numeracy, Psychological Support, Psychological Well-Being

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INTRODUCTION

Numeracy or mathematical literacy is a fundamental skill that enables students to understand and apply mathematics in real-life situations (Kusuma et al., 2021). However, various studies report that students' numeracy skills in Indonesia remain relatively low (Rakhmawati & Mustadi, 2022; Sa'dijah et al., 2023). The 2022 PISA results show that Indonesia's mathematics scores are still below the OECD average. Similarly, the 2024 National Assessment Public Report for primary education (SD/MI or equivalent) highlights that a significant number of students exhibit numeracy skills that require further improvement. This

low level of numeracy reflects persistent challenges in mathematics education, both in terms of pedagogical approaches and psychosocial factors, which influence students' engagement and motivation in understanding numerical concepts (Deda et al., 2023).

Ideally, mathematics instruction should not only focus on conceptual understanding and procedural skills but also consider psychosocial aspects that support students' engagement and comfort in the learning process. Psychological support from teachers and a conducive classroom environment can enhance interest, motivation, and positive attitudes toward learning (Busari et al., 2023; Sadoughi & Hejazi, 2023). In particular, psychological well-being plays a vital role in enhancing cognitive function, building confidence, and reducing mathematics anxiety, a key psychological barrier that impairs information processing and problem-solving (Jian et al., 2022; Zhuo et al., 2025). However, many students still experience academic pressure, low engagement, and emotionally unsupportive classrooms, often exacerbated by poor classroom management (Cambay & Paglinawan, 2024). These discrepancies between ideal instructional approaches and classroom realities underscore the urgency of adopting more holistic, student-centered strategies that integrate cognitive, emotional, and environmental factors in mathematics learning.

To bridge the gap between ideal and actual classroom conditions, strengthening psychological factors in mathematics instruction is essential. Previous studies have shown that psychological support from teachers can enhance students' psychological well-being, which ultimately contributes to academic achievement (Yang et al., 2021). Furthermore, both affective and academic support from teachers play a significant role in students' academic performance (Tao et al., 2022). Psychological well-being can enhance cognitive processes and help students build confidence in problem-solving while responding more positively to mathematical stimuli (Hill et al., 2021; Molina-Muñoz et al., 2023). Therefore, optimizing students' numeracy development requires instructional practices that integrate cognitive, emotional, and relational aspects of learning.

Effective classroom management plays a crucial role in enhancing students' focus and motivation in learning mathematics (Marder et al., 2023). In the context of numeracy, a positive classroom environment enables students to feel comfortable participating, engaging in discussions, and exploring various problem-solving strategies in mathematics. Moreover, creativity is strongly linked to numeracy skills, as it allows students to experiment with different problem-solving approaches and think more flexibly in understanding mathematical concepts (Nilimaa, 2023). Students with higher levels of creativity tend to develop a deeper

comprehension of numeracy concepts and employ more diverse strategies in solving problems. In line with meta-analytic reports, creativity has been found to positively correlate with mathematics achievement, as more creative students are better able to identify connections between concepts and apply more effective problem-solving strategies (Bicer et al., 2021).

Although various psychosocial and classroom factors have been recognized for their significant impact on numeracy skills, research exploring how these variables interact remains limited, particularly in the Indonesian primary education context. Most prior studies have examined these factors in isolation, focusing on individual effects such as creativity or well-being, and rarely investigating their combined influence or mediation mechanisms using large-scale, nationally representative data. For instance, previous studies examined the relationship between psychological support and academic achievement without considering classroom management or creativity, focused solely on affective and academic support in relation to student performance, or explored the role of psychological well-being in learning without integrating multiple psychosocial factors into a single analytical model (Molina-Muñoz et al., 2023; Hill et al., 2021; Tao et al., 2022; Yang et al., 2021).

To address this gap, the present study employs structural equation modeling (SEM-PLS) to examine the simultaneous effects of psychological support, psychological well-being, classroom management, and creativity on numeracy skills among over 80,000 students. Based on this background, the present study aims to analyze the effects of psychological support, psychological well-being, classroom management, and creativity on students' numeracy skills. Additionally, this study seeks to examine the mediating role of psychological well-being in the relationship between psychological support and numeracy skills. Unlike previous studies that examined these variables separately (Molina-Muñoz et al., 2023; Hill et al., 2021; Tao et al., 2022; Yang et al., 2021), this study offers a novel integrative model that captures their multidimensional interactions while confirming the mediating role of psychological well-being using nationally representative data from Indonesia.

METHOD

This study employs a quantitative with explanatory research design to examine the structural model of psychological support, psychological well-being, classroom management, and creativity in relation to elementary school students' numeracy skills. The analysis aims not only to describe relationships among variables but also to explain the extent to which these

psychosocial and classroom factors influence numeracy skills, while testing the mediating role of psychological well-being.

The research utilizes secondary data from the 2024 National Assessment Public Report for primary education (SD/MI or equivalent), published by the Ministry of Education, Culture, Research, and Technology on October 8, 2024. The study population consists of all students recorded in the report (N = 498,163). A randomly generated sample of 81,824 students was drawn from the national assessment dataset, with selection performed through the assessment system's automated randomization process to ensure unbiased sampling. The dataset is stratified by design to represent all provinces and various school characteristics, allowing proportional representation of regions and school types. Only students with complete data for all variables of interest were included in the final sample. The adequacy of the sample size was evaluated based on the "10-times rule" in SEM-PLS, which recommends a minimum sample size of at least ten times the maximum number of structural paths directed toward any latent construct (Assefa et al., 2020).

The research variables consist of five latent constructs: psychological support (PSP), psychological well-being (PWB), classroom management (CMA), creativity (CRE), and numeracy skills (NUM). Each construct is represented by its respective manifest variables (denoted in lowercase letters). Table 1 presents a description of each variable, referring to the national assessment indicators. Data collection in this study was conducted through document analysis, specifically by examining the National Assessment Public Report for primary education (SD/MI or equivalent) published by the Ministry of Education, Culture, Research, and Technology on October 8, 2024.

Table 1. Research Variable

No	Variable	Operational Definition
1	Psychological support	Composite student score on affective support, teacher attentiveness and care, and constructive feedback.
2	Psychological well-being	Composite student score on psychological well-being and perceived safety within the educational institution.
3	Classroom management	Composite student score on classroom orderliness and positive discipline.
4	Creativity	Composite student score on characteristics such as enjoyment of thinking differently, applying new ideas to problem-solving, and creating innovative works.
5	Numeracy skills	Composite student score based on the ability to think using mathematical concepts, procedures, facts, and tools to solve real-world problems across various relevant contexts.

Data analysis was conducted using the SEM-PLS approach, which includes evaluating the measurement and structural models. Convergent validity was assessed through loading

factors (> 0.70) and Average Variance Extracted (AVE > 0.50) (Hair et al., 2017). Discriminant validity was confirmed using cross-loading, the Fornell-Larcker criterion, and HTMT ratio (< 0.90) (Hair et al., 2017; Hair et al., 2019). The reliability of the measurement model is assessed using composite reliability, with a threshold of 0.6 (Sarstedt et al., 2017). The national assessment instrument was developed by the Ministry of Education, Culture, Research, and Technology, but no detailed information is publicly available regarding its empirical validity and reliability testing. This constitutes a limitation of the study, as the quality of measurement cannot be independently verified. Future studies are encouraged to address this by validating the instrument using established psychometric procedures.

The evaluation of the structural model includes the coefficient of determination and the significance of path coefficients. The classification of the coefficient of determination (R^2) levels used in this study is presented in Table 2. The significance of the path coefficients is used for hypothesis testing, with a critical threshold of 5%. Path coefficient significance is assessed using the PLS bootstrapping algorithm with 5,000 bootstrap samples. Table 2 (Hair et al., 2019) describe the path coefficients in this study include indirect effects and total effects.

Table 2. Classification of Coefficient of Determination (R^2)

R^2 range value	Interpretation
$R^2 < 0.25$	Very weak
$0.25 \leq R^2 < 0.50$	Weak
$0.50 \leq R^2 < 0.75$	Moderate
$0.75 \leq R^2$	Substantial

RESULTS AND DISCUSSION

The results and discussion in this study are presented in two sections, following the sequential stages of analyzing and interpreting the SEM-PLS model (Hair et al., 2019). The first section presents the findings and discussion related to the evaluation of the measurement model, specifically the validity and reliability of the latent construct indicators. The second section discusses the results of the structural model, focusing on the causal relationships among the constructs.

Evaluation of the Measurement Model

The evaluation of the measurement model for reflective indicators in the SEM-PLS framework is based on convergent validity, discriminant validity, and reliability. As shown in Table 3., the loading factor of each indicator on its respective latent construct is not less than 0.7, thereby meeting the requirement for convergent validity. This indicates that the indicators effectively reflect their respective latent constructs (Hair et al., 2017).

Table 3. Loading Factor and Cross-Loadings of Each Indicator

Indikator	PSP	PWB	CMA	CRE	NUM
psp1	**0.851**	0.556	0.587	0.321	0.250
psp2	**0.838**	0.538	0.510	0.331	0.252
psp2	**0.732**	0.412	0.418	0.226	0.187
pwb1	0.572	**0.905**	0.494	0.391	0.318
pwb2	0.560	**0.901**	0.493	0.431	0.314
cma1	0.514	0.473	**0.796**	0.296	0.228
cma2	0.543	0.447	**0.875**	0.265	0.285
cre1	0.344	0.414	0.315	**0.849**	0.286
cre2	0.291	0.373	0.259	**0.875**	0.312
num1	0.256	0.322	0.282	0.317	**0.887**
num2	0.232	0.277	0.246	0.278	**0.841**
num3	0.267	0.319	0.285	0.313	**0.866**
num4	0.242	0.298	0.261	0.299	**0.887**

Furthermore, the loading factors of the indicators on their corresponding latent constructs are higher than their correlations with other constructs, demonstrating good discriminant validity. Additional evaluations supporting convergent validity, discriminant validity, and the reliability of the measurement model are presented in Table 4.

Table 4. Validity and Reliability of Constructs

Constructs	Reliability	AVE	PSP	PWB	CMA	CRE	NUM
PSP	0.850	0.654	**0.809**	0.822	0.859	0.523	0.349
PWB	0.899	0.816	0.627	**0.903**	0.822	0.641	0.420
CMA	0.823	0.700	0.631	0.546	**0.837**	0.547	0.426
CRE	0.853	0.743	0.367	0.455	0.332	**0.862**	0.452
NUM	0.926	0.758	0.287	0.350	0.309	0.347	**0.870**

Note: Diagonal values (bolded) represent the square root of AVE. Values below the diagonal indicate inter-construct correlations, while values above the diagonal represent the HTMT ratio.

Based on Table 4, the inter-construct correlations do not exceed the square root of AVE, and the HTMT ratio remains below 0.90, thereby supporting strong discriminant validity (Hair et al., 2017). Additionally, the AVE values for each construct exceed 0.5, confirming good convergent validity. This finding supports the view that higher AVE values are associated with lower measurement error in constructs derived from their indicators (Sudbury-Riley et al., 2017). The reliability of the constructs, assessed through composite reliability, meets the required threshold of 0.7, indicating satisfactory internal consistency. Therefore, the measurement model in the PLS-SEM framework is deemed valid and reliable, allowing further evaluation of the structural model.

Evaluation of the Structural Model

The evaluation of the structural model aims to investigate the causal relationships among constructs by examining the coefficient of determination and the significance of path coefficients. As depicted in Figure 1, the coefficient of determination for numeracy skills is 0.181, indicating that 18.1% of the variance in numeracy skills can be explained by psychological support, psychological well-being, classroom management, and creativity. According to Table 2., all determination coefficients in this structural model fall within the very weak category ($R^2 < 0,25$) (Hair et al., 2019). This suggests that numeracy skills are influenced not only by the variables examined in this study but also by external factors, which account for the remaining 81.9% of the variance. Despite the relatively low coefficient of determination, these results remain robust, as they are supported by the external validity of the study's representative sample size. The significance of path coefficients is presented in Table 5.

Table 5. Path Coefficients on Numeracy Skills

Path	Path Coefficient	Standard Deviation	t-statistic	p-values
Indirect				
PSP → PWB → NUM	0.103	0.003	36.439	0.000
Total				
PSP → NUM	0.121	0.004	27.714	0.000
PWB → NUM	0.165	0.004	36.913	0.000
CMA → NUM	0.135	0.004	32.727	0.000
CRE → NUM	0.221	0.004	58.767	0.000

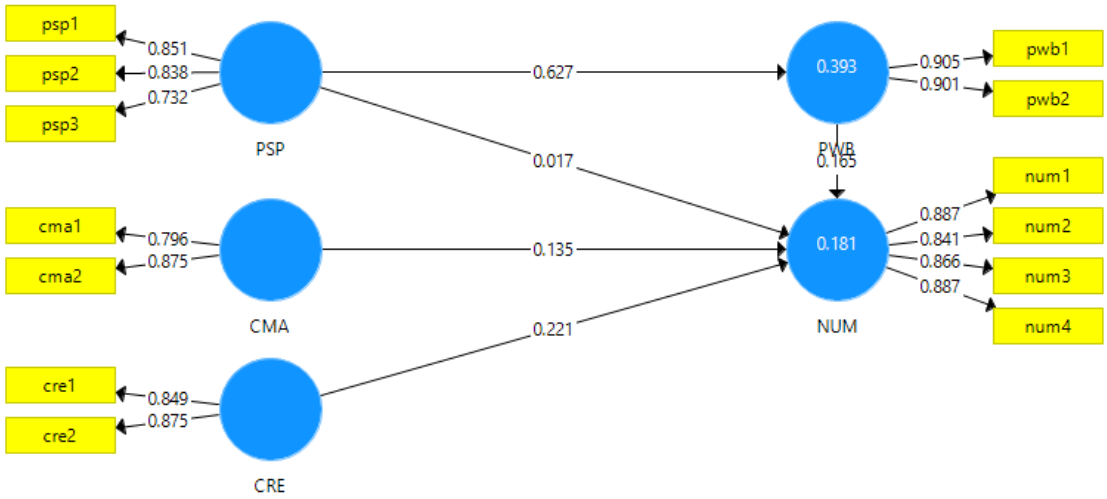

Figure 1. Path Diagram With Parameter Estimate Values

Based on Table 5, all path coefficients, including indirect and total effects, are significant at 0.05. This finding indicates that, within the structural model, psychological support, psychological well-being, classroom management, and creativity have a significant impact on

students' numeracy skills. Furthermore, the mediation model reveals that psychological well-being functions as a partial mediator in the relationship between psychological support and numeracy skills. The significance test results for the path coefficients support all research hypotheses formulated in this study.

The influence of psychological support on numeracy skills

This study found that psychological support has a positive and significant effect on students' numeracy skills ($b = 0.121$; $p < 0.001$). This finding aligns with educational psychology theories, which emphasize the importance of social and emotional environments in supporting academic achievement (Tao et al., 2022). Teacher support and attention can foster a conducive learning environment, increasing students' likelihood of participating and engaging in the learning process, which ultimately has a positive impact on their academic performance (Busari et al., 2023). In addiction, psychological support helps students focus on solving numerical problems and applying critical thinking strategies (Yang et al., 2021). Students who receive attention and support from teachers show improved mathematical problem-solving skills because they feel more comfortable experimenting and learning from mistakes.

Furthermore, psychological support from teachers plays a crucial role in developing students' self-efficacy in numeracy. According to self-determination theory (SDT), teacher support that meets students' psychological needs enhances self-efficacy and triggers both intrinsic and extrinsic motivation (Yang et al., 2021). A meta-analysis found that psychological support has a stronger effect size on academic achievement than autonomy support or academic support (Tao et al., 2022). Additionally, psychological support from teachers can help reduce math anxiety (Zhuo et al., 2025). In other words, when students feel supported and valued, they become more motivated to practice and explore numeracy concepts without fear of making mistakes.

The influence of psychological well-being on numeracy skills

This study found that psychological well-being has a positive and significant effect on students' numeracy skills ($b = 0.165$; $p < 0.001$). In the context of numeracy learning, high psychological well-being helps students stay focused, develop learning resilience, and build confidence in solving numerical problems. This finding aligns with the view that students' psychological well-being is strongly linked to academic achievement (Grabel, 2017). Students with higher psychological well-being tend to continuously develop themselves (Ling et al., 2022), including in their academic abilities. This is because a sense of security reduces

academic stress and enhances student engagement in learning, ultimately supporting the development of numeracy skills.

Furthermore, good psychological well-being contributes to emotional regulation and intrinsic motivation, both of which are essential for numeracy learning. According to self-determination theory, the basic psychological needs for competence, autonomy, and relatedness are crucial for psychological well-being, particularly in fostering positive emotions and intrinsic motivation (Holzer et al., 2021). Thus, psychological well-being serves as a foundation for effective learning processes, especially in subjects requiring high concentration, such as mathematics. Psychological well-being also positively and significantly influences models predicting students' mathematics scores (Molina-Muñoz et al., 2023). In other words, a learning environment that supports psychological well-being can create optimal conditions for students to develop numeracy skills.

The influence of psychological support through psychological well-being on numeracy skills

This study found that psychological well-being serves as a partial mediator in the relationship between psychological support and students' numeracy skills. This finding indicates that psychological support from teachers not only has a direct impact on improving students' numeracy skills but also contributes to enhancing psychological well-being (Yang et al., 2021), which in turn strengthens its effect on numeracy performance. When students feel emotionally and socially supported by their teachers, they experience an increase in psychological well-being, including a sense of security, comfort, and motivation to learn (Sadoughi & Hejazi, 2023). Higher psychological well-being is also associated with better academic achievement in mathematics (Molina-Muñoz et al., 2023).

This mediation mechanism can be explained through self-determination theory, which emphasizes that psychological support from teachers helps fulfill students' need for social connectedness, thereby making them feel more valued and supported in the learning environment (Holzer et al., 2021). As psychological well-being improves, students become more capable of managing academic stress, increasing perseverance, and developing a growth mindset when facing numeracy challenges. Students with higher psychological well-being are better able to comprehend mathematics, recognize its importance, and respond more positively to numerical challenges (Hill et al., 2021). In other words, psychological well-being acts as a bridge linking the positive impact of psychological support to numeracy skills, ensuring that

students develop not only academic competencies but also the mental readiness to tackle complex mathematical challenges.

The influence of classroom management on numeracy skills

This study found that classroom management has a positive and significant effect on students' numeracy skills ($b = 0.135$; $p < 0.001$). This finding suggests that a well-managed classroom environment provides students with more opportunities to learn, make decisions, and take responsibility for monitoring their academic progress, including their academic performance (Niemi et al., 2024). In the context of numeracy, a well-organized classroom fosters a conducive learning environment, enabling students to focus more effectively on understanding mathematical concepts without unnecessary distractions (Marder et al., 2023). This aligns with findings showing that effective classroom management is correlated with improved academic achievement (Herman et al., 2022). Well-structured classroom management helps minimize distractions and fosters greater student engagement in the learning process.

Moreover, effective classroom management contributes to a positive socio-emotional climate. According to self-determination theory, students are more motivated to learn when they feel safe, valued, and have positive relationships with teachers and peers (Holzer et al., 2021). In numeracy learning, a well-managed classroom encourages students to feel more confident in asking questions, engaging in discussions, and experimenting with new problem-solving strategies. Teachers who are attuned to students' emotional dynamics help create a positive emotional climate in the classroom, which fosters student engagement and promotes academic success (Busari et al., 2023). Thus, a well-organized learning environment supports students in understanding concepts, solving problems, and developing critical thinking strategies in numeracy.

The influence of creativity on numeracy skills

This study found that creativity has a positive and significant effect on students' numeracy skills ($b = 0.221$; $p < 0.001$). This finding is consistent with a meta-analysis reporting a positive relationship between creativity and mathematical achievement (Bicer et al., 2021). In numeracy, creativity plays a crucial role in identifying new patterns, generating novel ideas, and developing innovative solutions to complex mathematical problems in various situations (Nilimaa, 2023). Students with high levels of creativity were better able to generate alternative solutions in mathematical problem-solving, which demonstrating cognitive flexibility in numerical thinking (de-la-Peña et al., 2021). Students accustomed to divergent thinking tend to

grasp conceptual relationships in mathematics more effectively, allowing them to solve numerical problems in a more efficient manner.

Creativity is considered a subcomponent of intelligence and is closely linked to cognitive flexibility in developing original ideas (Bicer et al., 2021). Highly creative students are more confident in exploring new approaches, unafraid of making mistakes, and continuously seek innovative ways to solve problems. Creativity in mathematics enables students to discover multiple correct solutions to a problem, enhancing their understanding and application of mathematical concepts in diverse contexts (Nurzulifa & Dwijanto, 2021). Moreover, Piaget's constructivist theory emphasizes that students learn more effectively when they actively construct their own understanding through exploration and innovation (Erawati & Adnyana, 2024). Thus, a learning environment that fosters creativity supports students in enhancing their numeracy skills more effectively, as they have the freedom to experiment with different strategies without fear of failure.

The implications of these findings reinforce the idea that students' numeracy skills are not solely dependent on cognitive factors but are also influenced by psychosocial aspects, the learning environment, and creativity. Psychological support from teachers plays a crucial role in enhancing students' psychological well-being, which in turn strengthens their numerical reasoning abilities. Effective classroom management fosters a conducive learning atmosphere, enabling students to focus more on understanding numerical concepts. Creativity equips students with the ability to discover diverse strategies for solving mathematical problems. Therefore, schools and educators should adopt a more holistic approach to learning by balancing academic development with student well-being. Teacher training programs should integrate classroom management strategies, teaching techniques that promote creativity, and approaches that support students' psychological well-being, including counseling services and social-emotional learning methods.

CONCLUSION

The study highlights the significant influence of psychological support, psychological well-being, classroom management, and creativity on primary students' numeracy skills, based on data from the 2024 National Assesment Public Report. Psychological well-being also acts as a partial mediator in the relationship between psychological support and numeracy skills. However, the R^2 18.1% indicates the presence of other unmeasured factors. Future research could explore additional factors that may mediate or moderate the structural model of numeracy

skills. Moreover, a mixed-methods approach could provide a deeper understanding of students' experiences related to learning environment factors and student characteristics in shaping numerical thinking. These findings suggest that improving numeracy requires more than cognitive emphasis. Accordingly, teachers are recommended to apply strategies that foster student well-being and creativity alongside effective classroom management, while policymakers should strengthen teacher training programs and provide institutional support for social-emotional learning and student mental health initiatives in schools.

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