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CORRELATION OF STUDENTS' WELL-BEING AND PROBLEM-SOLVING SKILLS IN MATHEMATICS

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Abstract

This literature review examines the relationship between student well-being and mathematical problem-solving skills, drawing on both global and Indonesian studies. Using Polya's problem-solving framework, Fredrickson's broaden-and-build theory, and SciSpace-assisted thematic analysis, the study synthesizes its findings. Results show significant correlations, notably between resilience and problem-solving ability (R = 0.819), with emotionally stable students demonstrating better cognitive flexibility and strategic adaptation. Three key mediators were identified: social support (especially in collectivist cultures), self-efficacy, and classroom emotional climate. Indonesian-specific findings reveal that academic pressure intensifies anxiety's negative impact on non-routine problem-solving. This review proposes three actionable recommendations: (1) teacher training in emotion-responsive pedagogy, (2) integration of metacognitive and coping strategies, and (3) school-based well-being interventions. Limitations include the dominance of correlational studies and limited socioeconomic factor consideration. Future research is encouraged to apply longitudinal designs and culturally adapted measurement tools to understand the dynamic between emotional states and problem-solving in education.
Keywords: *Student Well-Being*; *Mathematical Problem-Solving*; *Emotional Resilience*; *Cognitive Skills*

Abstrak

Tinjauan pustaka ini menyelidiki hubungan kesejahteraan siswa dan keterampilan pemecahan masalah matematika, berdasarkan studi global dan Indonesia. Menggunakan kerangka pemecahan masalah Polya dan teori broaden-and-build Fredrickson, serta analisis tematik berbantuan SciSpace, studi ini mensintesis temuan. Hasil menunjukkan korelasi signifikan, terutama antara resiliensi dan kemampuan pemecahan masalah (R = 0,819); siswa stabil emosional menunjukkan fleksibilitas kognitif dan adaptasi strategis lebih baik. Tiga mediator utama diidentifikasi: dukungan sosial (khususnya budaya kolektivis), efikasi diri, dan iklim emosional kelas. Temuan Indonesia mengungkapkan tekanan akademik memperparah dampak negatif kecemasan pada pemecahan masalah non-rutin. Tinjauan ini mengusulkan tiga rekomendasi: (1) pelatihan guru pedagogi responsif emosi, (2) integrasi strategi metakognitif dan koping, dan (3) intervensi kesejahteraan berbasis sekolah. Keterbatasan meliputi dominasi studi korelasional dan minimnya pertimbangan faktor sosial ekonomi. Penelitian mendatang didorong menerapkan desain longitudinal dan alat ukur adaptif budaya untuk memahami dinamika emosi dan pemecahan masalah dalam pendidikan.

Kata Kunci: *Kesejahteraan Siswa*; *Pemecahan Masalah Matematika*; *Resiliensi Emosional*; *Keterampilan Kognitif*

A. Introduction

Student well-being refers to the emotional, social, and academic balance experienced by learners. At the same time, researchers define problem-solving skills in mathematics as the ability to apply cognitive strategies to overcome mathematical challenges. The state of well-being itself may influence these problem-solving skills. Emotional stability, social connectedness, and academic fulfillment are vital for student well-being and particularly important in mathematical problem-solving. Math requires cognitive flexibility (Rahayuningsih et al., 2021) and adaptive reasoning (Yanti et al., 2021). Given that kids frequently encounter emotional and mental difficulties (Ekawati et al., 2025; Yani et al., 2025) in the classroom, this connection is highly pertinent.

Students' ability to solve math problems is significantly affected by emotions like anxiety and their ability to regulate them. Calculations are only one aspect of solving math problems; students also need to control their emotions, particularly impatience, and be conscious of their thought processes in order to assess and modify their approaches (OECD, 2024). Regrettably, worry and academic pressure are common problems among Indonesian students. Many students experience challenges in learning mathematics due to mental distress, where compromised emotional well-being is closely related to reduced academic performance (Maghfiroh et al., 2024). The negative impact of academic pressure and anxiety on students' problem-solving abilities is corroborated by empirical evidence demonstrating that students with lower anxiety levels consistently outperform their peers in mathematical problem-solving, especially in non-routine tasks requiring creative thinking (Amelia et al., 2023). Although further research is needed to clarify the causal mechanisms, current findings strongly indicate that emotional well-being plays a crucial role in shaping mathematics performance.

Research on well-being and mathematical problem-solving in Indonesia remains very limited and fragmented despite the global relevance of the topic. Although data show a high prevalence of mental health problems such as hopelessness and anxiety among Indonesian adolescents and university students (Ekawati et al., 2025; Yani et al., 2025), as well as challenges related to emotion regulation, body image, and academic pressure (Yani et al., 2025), these studies have not directly linked them to mathematical problem-solving ability. On the other hand, students' mathematical problem-solving skills in Indonesia have consistently shown a need for improvement, as reflected by declining

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PISA scores (Salsabila & Asih, 2024) and the low percentage of students who can solve problems comprehensively (Kinasih & Mariani, 2025). Some research in Indonesia has explored non-cognitive factors, such as math learning anxiety and emotional support. However, the focus has been on general academic achievement rather than specific math problem-solving skills (Maghfiroh et al., 2024). Meanwhile, global studies identify gaps in understanding how students' self-perceptions (e.g., self-confidence) influence math performance and problem-solving (Velez & Abuzo, 2024), and meta-analyses suggest that the influence of factors such as parental involvement on math performance may moderate by geographic and cultural differences (Wang & Wei, 2024). Therefore, while there are separate indications of well-being challenges and math problem-solving issues in Indonesia, research that holistically and directly correlates these two domains is still very limited. It leaves a fragmented understanding of the complex interactions between students' psychological states and their cognitive abilities in mathematics.

To address this complexity, this study integrates two complementary theoretical frameworks. First, Polya's (1957) problem-solving model provides a structured approach to mathematical cognition through four phases: (1) problem comprehension, (2) solution design, (3) plan implementation, and (4) outcome evaluation. This model emphasizes metacognitive regulation—cognitive processes that empirical studies have found vulnerable to emotional interference (OECD, 2024). Second, the broaden-and-build theory Fredrickson (2001) developed describes how positive emotions increase cognitive bandwidth and enhance attentional focus, strategic flexibility, and resilience under stress—critical factors for solving non-routine mathematical problems. Combined, these frameworks offer a dual-pathway perspective in which emotional well-being supports problem-solving by both minimizing cognitive disruption (as described by Polya) and fostering psychological resources (as emphasized by Fredrickson), particularly within high-pressure educational environments such as those found in Indonesia (Maghfiroh et al., 2024).

Given these limitations, the current systematic literature review fills a critical and unique gap by analyzing the direct relationship between students' well-being and their ability to solve mathematical problems comprehensively, particularly in the context of Indonesian education. Little research has been conducted on this connection. Unlike previous Indonesian studies, which have primarily focused on general academic achievement or isolated aspects of mental health (Maghfiroh et al., 2024; Ekawati et al., 2025), this research deliberately bridges the divide to explore how psychological, emotional, and social well-being directly influence students' cognitive strategies and performance in

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mathematical problem-solving. This targeted strategy is crucial because of the lack of knowledge about the affective components of math learning in many situations (Živković et al., 2023). Furthermore, by fusing Polya's problem-solving model with Fredrickson's broaden-and-build theory, this work presents a novel dual-pathway paradigm for analysis. Often ignored in fragmented research, this theoretical synergy enables a thorough comprehension of how joyful emotions can improve cognitive functions and how emotional interference might hamper problem-solving stages. Global meta-analyses offer general insights, but they frequently lack the specific, context-specific information needed to create interventions that apply to Indonesia's own cultural and educational environment (Wang & Wei, 2024). This systematic review is unique in that it combines different results into a consistent understanding. It addresses the pressing need for comprehensive and locally relevant data to inform education practices in Indonesia.

This systematic literature review aims to (1) synthesize international and Indonesian research on the correlation between student well-being and mathematical problem-solving, (2) identify context-specific factors within Indonesia—such as cultural and pedagogical elements—that influence this relationship, and (3) propose evidence-based interventions to integrate student well-being into mathematics instruction. This review aims to support a more complete approach to math education in Indonesia by combining emotional and cognitive development so students can solve problems more effectively and improve their learning and well-being.

B. Research Method

We utilize the literature review method to analyze previous studies on students' well-being and mathematical problem-solving skills. Across various research domains, Literature Reviews or Systematic Literature Reviews (SLR) have become widely adopted. The process entails thoroughly examining and evaluating previously conducted research within a particular study area. It includes synthesizing the most current findings to provide a comprehensive overview of what researchers have already explored, emphasizing the advancements and key contributions made in the field while also drawing attention to existing limitations or gaps that suggest directions for future investigation and development (García-Holgado et al., 2020). Using this method, researchers can detect consistent patterns in the data and gaps in existing knowledge. We use the Literature Review method to fill the gap in Indonesia, where limited studies explore the intersection of student well-being and mathematical problem-solving abilities. To address Indonesia's educational problems more efficiently and effectively, we worked to create locally relevant educational solutions.

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We explore the relationship between students' well-being and their ability to solve mathematical problems using data from reliable academic sources. These resources present a range of psychological and educational views. Because our article is based on a literature review, we use the SciSpace web as the primary reference source. SciSpace is a web-based platform that helps users read and understand scientific articles more easily through features such as automatic explanation of complicated terms, AI-based highlights and comments, scientific literature search, and an interactive PDF reader that allows users to ask questions directly related to the content.

This study employs systematic literature analysis as its primary research instrument to examine the complex relationship between student well-being and mathematical problem-solving skills. Building upon King's (2021) comprehensive meta-analysis that established significant correlations between psychological well-being and academic achievement, our approach extends this understanding specifically to mathematics education. The analysis incorporates both quantitative and qualitative examination of existing studies, allowing for the identification of key patterns and gaps in current research (Živković et al., 2023).

The methodological framework goes beyond fundamental descriptive analysis by implementing a three-stage process: identification of relevant studies, thematic synthesis of findings, and comparative evaluation across different educational contexts. As demonstrated by Živković et al. (2023), this approach is particularly valuable for disentangling the interrelated effects of emotional factors (like math anxiety) and motivational components (such as self-efficacy) on academic performance. The inclusion criteria prioritize studies that measure well-being indicators and mathematical problem-solving outcomes, ensuring methodological consistency (Rodrigues et al., 2024).

For practical implementation of findings, the study adopts Rodrigues et al.'s (2024) organizational framework, which indicates the effect of institutional support in translating research insights into educational practice. Consequently, when we delve into what is happening inside students' minds, how teachers teach, and what schools are like, we understand how feelings and math skills are connected. It is not just about solving problems - how kids feel about themselves, handle pressure, and experience the classes that shape their math story. These insights are particularly valuable because they do not just sit on paper - they suggest concrete ways we might redesign math classes and support systems to help students thrive in all aspects of their learning.

Relevant literature is collected by identifying keywords and reviewing academic sources focused on student well-being and mathematical problem-solving.

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In conducting our case studies, we based much of our additional data collection on document analysis, which included reviewing reports, newsletters, scientific articles, and website content. We also examined the materials provided to us and looked into publications on impact evaluations, modalities, and knowledge exchanges (Klingebiel et al., 2024). This step helps narrow down the scope of the study to the most relevant material. It also increases the efficiency and accuracy of the data-gathering process.

To confirm that the references used are genuinely relevant to the topic "Correlation of Student's Well-Being and Problem-Solving Skills in Mathematics," we utilize the advanced features provided by the SciSpace platform. The process started using keywords like academic performance, mathematical problem-solving, student well-being, and educational psychology. SciSpace helps make scientific papers easier to understand by reducing technical words so that the main idea of each article can be quickly identified. AI-powered emphasizing and commenting tools draw attention to important aspects of the work, including the methodology, main points, and important discoveries. It facilitates a quicker screening of the literature. Additionally, we may use the interactive PDF reader to ask direct questions about the paper's content, which aids in our understanding of specific research methodology or findings. With this strategy, we were able to compose a collection of references that were not only relevant but also comprehensive and targeted to back the analysis of the interconnection between student well-being and math problem-solving ability.

Data is analyzed through reduction, selection, and triangulation to ensure valid findings on the correlation between well-being and math problem-solving. Data analysis extracts valuable corporate insights from numbers and information collected from various sources within a given company. In this way, it is possible to support decision-making for better results (Rodrigues et al., 2024). By removing extraneous details, these methods improve the analysis's dependability and guarantee its logical coherence while enabling us to concentrate on the most important discoveries. We went further by using essential data analysis principles through a comprehensive survey.

We aim to discover more complex patterns, not just categorizing analytical methods or variables but also assessing how much impact they have on strategic decisions. Our approach is holistic, analyzing the full institutional context and considering the role of internal culture. Our focus is on consistent patterns in the data that can fully explain the relationships between elements. This technique is one to which we can accredit a deeper understanding of the link between students' well-being and their ability to solve math problems beyond surface observations.

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We used analytical techniques, including identifying critical themes and comparing studies, to reveal patterns of relationships between well-being and mathematical problem-solving ability. This method enables researchers to investigate the inter-relationships between findings from different contexts while categorizing directions of development that may trigger further research or refinement of learning practices (Rodrigues et al., 2024). By examining the similarities and differences between data, researchers can develop a more comprehensive framework for understanding the psychological and cognitive dynamics involved.

The analytical framework for this literature review incorporates diverse quantitative methods to process and interpret the synthesized data. Rodrigues et al. (2024) also explained that data analysis techniques include a variety of quantitative methods, such as statistical analysis, data exploration (data mining), data-based predictions (predictive analysis), and the use of artificial intelligence (machine learning). The data analysis mechanism is constrained in stages, from collecting raw data, identifying patterns and trends, and presenting the results in visual forms such as graphs or reports. The results of this analysis then provide the foundation for academic purposes and the formulation of educational policies. Going through these systematic stages makes the research findings more accurate and allows us to implement them directly in real situations.

C. Result and Discussion

This literature review examines scientific articles published between 2020 and 2025 that investigate the relationship between student well-being and mathematical problem-solving skills. The findings show a positive relationship between student well-being and their ability to solve mathematical problems. The well-being in question includes psychological, emotional, and social aspects. Students who feel emotionally comfortable, have stable mindsets, and receive support from their environment, especially their families, perform better when responding to challenging mathematics problems (Mhlongo & Naicker, 2022; Oriol-Granado et al.,2020). These findings indicate that cognitive abilities, as well as emotional and social conditions, influence mathematical thinking (Bicer et al., 2020; Laranang & Bondoc, 2020)

Table 1. Summary of Research Related to Student Well-Being and Mathematical Problem-Solving

No	Author (Year)	Title of Study	Key Findings
1	Nurhayati (2024)	Analysis Mathematical Resilience Relationship With Mathematical Problem Solving Ability in Functions Derivative Material	The study found a significant correlation of 0.819 between mathematical resilience and students' problem-solving abilities in

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			mathematics.
2	Firmansyah et al. (2024)	The Correlation between Students' Problem-Solving Abilities and Their Mathematical Thinking in High School Mathematics Education	The study found a strong and significant positive correlation between students' problem-solving abilities and their mathematical thinking.
3	Wahyuni et al. (2023)	Analysis of High School Students' Difficulties in the Material of Two Variable Linear Equation Systems	The study found that students primarily faced difficulties in conceptual understanding the material of two-variable linear equation systems.
4	Rezita and Rahmat (2022)	Hubungan Disposisi Matematis dengan Kemampuan Pemecahan Masalah pada Mata Pelajaran Matematika	The research found a strong and significant positive relationship between mathematical disposition and mathematical problem-solving abilities among 11th-grade science students at SMAN 2 Bukittinggi in the 2020/2021 academic

One of the studies reviewed, namely the research by Firmansyah et al. (2024), found that students' problem-solving abilities are closely related to their mathematical reasoning abilities. With a determination coefficient of $R^2 = 0.55$, their findings indicate that problem-solving skills account for over half the variation in mathematical reasoning ability. Researchers widely understand that solving math problems extends beyond merely following rules; it truly requires critical thinking and a strong logical base (Nlenur & Cordia, 2024). Interestingly, our study indicates that when students believe in themselves and their math chops, it well helps them develop those crucial skills. Students who feel confident in their abilities are usually calmer when working on problems, are less easily stressed, and have a more positive approach to mathematics lessons—which ultimately supports their well-being (Sari & Pujiastuti, 2025; Özcan & Kültür, 2021). This research directly contributes to Polya's established problem-solving framework. It particularly highlights the importance of a student's confidence and positive mindset in truly grasping the problem, planning its execution, carrying it out, and then reflecting on the outcome (Mohamed & Ismail, 2024; Suryana & Ningsih, 2024). Additionally, students' ability to identify relationships between data and evaluate their answers is also a crucial aspect of mathematical problem-solving (Munawaroh et al., 2023; Fahira & Ramlah, 2021).

Additionally, According to Nurhayati's (2024) research, problem-solving skills, and mathematics recovery are strongly correlated. It is clear from the correlation value of $R = 0.819$ that students'

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performance in solving problems demonstrates a close link with their ability to recover from mathematical setbacks. Students with high resilience tend not to give up quickly, can regulate their emotions when facing challenges, and remain focused on finding solutions (Li et al., 2024; Egan et al., 2022). On the other hand, the relationship between resilience and conceptual understanding of mathematics was weaker (r = 0.181) but still relevant. These results suggest that while knowledge of fundamental ideas remains crucial for problem-solving, it is not the sole critical component for effective problem-solving. Frederic advocates for the idea that learning math should focus on building deep meaning and context rather than merely following steps mindlessly. It makes sense that our focus on keeping students engaged and truly understanding concepts fits perfectly with his way of thinking. More, studies affirm that mathematical resilience, defined as the ability to maintain self-efficacy amidst personal or social threats to mathematical well-being, is crucial for academic progress (Karakas & Sezer, 2022; Johnston-Wilder & Lee, 2021).

Complementing prior findings, Rezita and Rahmat's (2022) study highlights the substantial and significant correlation between mathematical disposition and students' problem-solving capacity. Mathematical disposition refers to students' tendency to think and behave positively when engaging with mathematics, including self-confidence, perseverance, curiosity, and the ability to face problems effectively (Živković et al., 2023). This study reveals that students with positive mathematical attitudes and good thinking habits are more effective at solving mathematical problems, with a correlation coefficient of r = 0.691. Results show that in addition to purely cognitive skills, affective and behavioral elements — also known as dispositions — are also crucial for successfully paired problem-solving and for supporting students' academic well-being. According to Polya's work, these optimistic dispositions are essential for progressing through the problem-solving stages because they enable students to navigate each stage, understand the problem, and verify the solution with sufficient perseverance and flexibility. These positive dispositions also help reduce mathematics anxiety, which can hinder performance (Wang & Liu, 2025; Pérez-Fuentes et al., 2020).

These results are in line with self-determination theory, which states that the fulfillment of autonomy, competence, and social connectedness are essential for well-being and academic success. In mathematics learning, when students feel in control of their learning process, feel capable, and feel supported by teachers and friends, they tend to be more actively involved and show better results (Reeve, 2024; Zhang & Zhang, 2025). Research by Wahyuni et al. (2023) confirms this, stating that social support from the school environment mediates between students' well-being and their ability to solve mathematics problems. Teacher support,

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has been shown to directly influence students' motivation and self-efficacy, which in turn enhances academic performance (Affuso et al., 2023).

However, several methodological limitations need consider from the studies reviewed. Most studies employ a correlational approach, making it impossible to establish a cause-and-effect relationship with certainty (Mhlongo & Naicker, 2022). In other words, although well-being and problem-solving ability are related, we cannot be certain whether well-being improves cognitive ability or vice versa. In addition, elements such as socioeconomic status, the educational background of parents, the strength of family support systems, and even the prevailing cultural norms within a society that prevail in a community are still rarely discussed in depth (Sibiya & Ndlovu, 2025; Tan, 2024). Nevertheless, these factors can significantly impact both the increase and decrease in the relationship between students' mental health and their math proficiency (Joshanloo & Jovanović, 2020; Chirkina et al., 2020; Joseph et al., 2020). Ongoing longitudinal studies, such as Zhong's (2025) research on mathematics education well-being, are expected to provide further insights into these sociocultural factors.

D. Conclusion

Our findings support the predictions of Polya and Fredrickson. Polya's theory views problem-solving as a step-by-step journey heavily influenced by how we think about our thinking, known as metacognition. Meanwhile, Fredrickson's broaden-and-build theory suggests that positive emotions can expand our thought processes and enhance our ability to recover from adversity. By combining these two ideas, it becomes clear that students who feel emotionally well will be better equipped to grasp problems, plan their approach, and adapt as they work through math challenges, especially in a demanding environment like Indonesian education.

Implementing practical treatments to promote well-being and problem-solving is a valuable skill. Schools should emphasize metacognition and coping mechanisms in the mathematics curriculum by including emotion-responsive teaching in teacher preparation programs. Peer support groups and well-being classes are two additional school-based programs that can help mitigate the detrimental effects of academic pressure. Frankly, for kids to truly flourish, both intellectually and emotionally, it is down to teachers, lecturers, parents, and the government working hand in hand to cultivate a nurturing educational environment. When we really get these things right, students will not just improve in their studies; they will also develop as people, paving the way for a generation that's both mathematically clever and incredibly strong-willed.

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