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Study of Students' Conceptual Understanding and Mathematical Problem-Solving Skills in Buton

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Abstract
The objective of this study is twofold: first, to describe the conceptual understanding and mathematical problem-solving skills of students in Buton, Southeast Sulawesi; and second, to identify the factors that influence these skills. The methodological approach employed in this study is a literature review, which utilizes a descriptive qualitative strategy. The data were obtained through the collection and analysis of various literature sources, including scientific journals, research articles, and relevant documents regarding students' conceptual understanding and mathematical problem-solving skills. The findings of the study suggest that students' conceptual understanding and mathematical problem-solving skills exhibit variability and frequently fall below optimal levels. It has been observed that a number of students continue to experience difficulties in comprehending mathematical concepts in depth and applying them to the solution of mathematical problems, particularly those that are non-routine in nature. The factors influencing these two abilities are multifaceted, including both internal and external factors. A comprehensive review of the extant literature reveals that internal factors, including interest in learning, motivation, math anxiety, prior knowledge, and logical-mathematical intelligence, play a significant role in the learning process. Concomitantly, extraneous factors encompass pedagogical methodologies, learning materials, the learning milieu, and parental assistance. Moreover, the efficacy of interactive, problem-solving-based instructional models in enhancing students' comprehension of mathematical concepts and their proficiency in problem-solving has been demonstrated. Consequently, there is a necessity for more effective efforts to create active, contextual, and student-centered mathematics instruction so that students' conceptual understanding and mathematical problem-solving skills can develop effectively.

Keywords: Conceptual understanding; mathematical problem-solving; mathematics learning; literature study; Buton.

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INTRODUCTION

In the domain of mathematics education, conceptual understanding alone is insufficient if students lack the capacity to apply it to solve problems or challenges that are presented. Students who comprehend a mathematical concept are expected to utilize that concept to find solutions to various problems they encounter. Consequently, conceptual understanding is closely associated with problem-solving skills. The extent of a student's conceptual understanding directly correlates with their ability to identify the appropriate steps for problem-solving. Consequently, the cultivation of problem-solving skills constitutes a pivotal facet within the broader framework of mathematics education.

Mathematical problem-solving is considered a fundamental mathematical skill that students studying mathematics must master. The efficacy of this pedagogical approach is rooted in its capacity to foster critical thinking skills, promote logical reasoning, and facilitate the application of knowledge in problem-solving scenarios. Moreover, Hendriana et al. (2018) posit that while mathematical

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problem-solving skills are abstract in nature, the subject must still be taught to students. In the field of mathematics education, problem-solving is widely recognized as the fundamental aspect of the learning process, serving as the cornerstone of academic progress. In order to enhance their problem-solving capabilities, students must cultivate the capacity to comprehend problems, formulate mathematical models, solve problems, and interpret their solutions.

According to Regulation of the Minister of National Education of the Republic of Indonesia No. 22 of 2006 on Content Standards, the psychological aspects of mathematics learning are reinforced in its fifth point. The purpose of mathematics learning is stated to be the development of an appreciation for the usefulness of mathematics in life, namely a sense of curiosity, attention, and interest in learning mathematics, as well as perseverance and self-confidence in problem-solving. One such psychological aspect pertains to an individual's capacity to cope with adversity, which is commonly referred to as the Adversity Quotient (Hidayat, 2018). According to the most recent regulation, Ministry of Education and Culture Regulation No. 21 of 2016, the pedagogy of mathematics education emphasizes not only conceptual mastery but also the development of attitudes such as curiosity, perseverance, and self-confidence in solving mathematical problems.

Dahar (2017) posits that problem-solving is a human activity that integrates previously acquired concepts and rules, and is not merely a generic skill. Mathematical problem-solving ability is defined as the cognitive process through which students seek to identify solutions that align with their objectives. This ability encompasses a range of cognitive and practical skills, including readiness, creativity, knowledge, and the ability to apply these skills in real-world settings (Hendriana et al., 2018). Consequently, it is imperative to emphasize the continuous practice of this mathematical problem-solving ability among students. However, a closer examination reveals that students have not yet attained proficiency in mathematical problem-solving skills. Instead of addressing complex problems, students often opt for easier alternatives.

Problem-solving is a learning approach in which students are presented with new problems to solve (Bakoban & Amri, 2017). The pedagogy of mathematics instruction should commence with the introduction of problems that are pertinent to real-life scenarios and the presentation of contextual problems, thereby gradually guiding students to master mathematical concepts (Pratiwi & Deni, 2022). The objective of problem-solving is to enable students to meticulously observe the components of a problem, thereby engendering novel understandings (Pratiwi & Deni, 2022).

The results and evaluation of PISA 2015 indicate that students in Indonesia continue to demonstrate relatively low levels of proficiency. Specifically, in the domain of mathematics, Indonesia ranked 69th out of 76 evaluated countries, suggesting that Indonesian students' mathematical problem-solving skills remain below average. A contributing factor to students' substandard problem-solving performance on the Program for International Student Assessment (PISA) is their insufficient familiarity with the proper methodology for problem-solving. The most recent results from the Program for International Student Assessment (PISA) in 2022 indicate that Indonesian students' mathematics proficiency continues to fall short of global standards, though there has been a modest improvement in their ranking compared to previous results.

The students' substandard performance in mathematics can be attributed to a multitude of internal and external factors. A multitude of factors contribute to students' difficulties in fully engaging in the learning process. These include a lack of concentration during the learning process, low interest in learning, and the perception that mathematics is difficult. Therefore, it is essential to identify the factors that influence students' mathematical problem-solving skills in school. Once these factors are identified, steps can be formulated to improve these skills through the efforts of teachers in schools.

The ability to solve problems is closely related to proficiency in mathematics. When learning mathematics, students must be able to comprehend the language of mathematical problems, represent them in mathematical models, plan mathematical calculations, and solve non-routine problems (Konitah & Hendriana, 2022).

A multitude of studies have demonstrated that conceptual understanding and mathematical problem-solving skills are two pivotal factors that influence success in the domain of mathematics education. Research conducted by Anita (2014), Pangestu (2015), and Yulia (2017) indicates that students' low level of mathematical conceptual understanding is influenced by their interest in learning, their perception of mathematics, and their concentration during learning. Concurrently,

numerous studies have identified that mathematical problem-solving competencies can be augmented through the integration of innovative learning models, the incorporation of interactive learning media, and a student-centered learning approach. These findings suggest that conceptual understanding and mathematical problem-solving are critical areas of focus in mathematics education research, as both play a pivotal role in cultivating students' critical, logical, and systematic thinking skills.

Despite the plethora of studies conducted on conceptual understanding and mathematical problem-solving, the majority of research continues to prioritize the influence of learning models, learning strategies, or learning media on students' abilities. Moreover, these studies are predominantly conducted in urban areas or schools with relatively adequate access to education. A paucity of studies exists that specifically describe the state of students' conceptual understanding and mathematical problem-solving abilities in Kabupaten Buton. However, the geographical, social, and educational characteristics of Kabupaten Buton have the potential to present a different picture compared to other regions. Therefore, this study is important to describe the level of students' conceptual understanding and mathematical problem-solving skills in Kabupaten Buton as a basis for formulating strategies to improve the quality of mathematics education that are tailored to the region's needs.

As demonstrated in the preceding discourse, it is apparent that conceptual understanding and problem-solving skills play a pivotal role in students' mathematics learning, particularly in Kabupaten Buton. Nevertheless, a considerable number of students continue to grapple with comprehension and problem-solving in mathematics. Consequently, this literature review is imperative to furnish a thorough, evidence-based synopsis of the association between conceptual understanding and problem-solving skills, along with the factors that may impact these two skills.

LITERATURE REVIEW

Mathematical Concept Understanding

The cultivation of conceptual understanding in the domain of mathematics necessitates that students possess the capacity to utilize or apply the knowledge they have acquired in their learning activities. Conceptual understanding is defined as an individual's capacity to articulate a scenario in their own words, as well as to interpret or derive conclusions from data, graphs, or other forms of presentation (Susanto, 2013).

Conceptual understanding is defined as the ability to comprehend concepts and execute procedures (algorithms) with flexibility, accuracy, efficiency, and appropriateness (Jihad & Haris, 2013). This conceptual understanding is not merely about recognition or knowledge but rather mastery of the material, where students are able to restate concepts in a more easily understandable form and apply them. As posited by Putri and Mike in 2012, mathematical conceptual understanding is predicated on in-depth knowledge of the fundamental concepts that underpin the algorithms or formulas used in mathematics. Conceptual understanding in mathematics extends beyond mere memorization of formulas; it encompasses the comprehension of these concepts' meanings and the establishment of relationships between them. Indicators of mathematical conceptual understanding include: The following five points comprise the fundamental principles of mathematical thinking: 1) Restating a concept, 2) Classifying objects based on specific properties, 3) Providing examples and non-examples of a concept, 4) Presenting concepts in various forms of mathematical representation, 5) Applying concepts to problem-solving. Therefore, it can be concluded that mathematical conceptual understanding is the ability to comprehend and master mathematical material, whereby students are able to explain and draw conclusions from that material.

Mathematical Problem-Solving

Problem-solving is a human activity that combines previously acquired concepts and rules. It is not merely a generic skill (Harahap, 2017). The ability to solve problems encompasses several components. Firstly, one must comprehend the problem at hand. Then, one must formulate a plan or design a strategy to solve the problem. Next, one must execute the calculations necessary to arrive at a solution. Finally, one must verify the accuracy of the solution or results. Mathematical problem-solving ability is defined as the cognitive process through which students seek to identify solutions that align with their objectives. This ability necessitates a multifaceted set of competencies, including

readiness, creativity, knowledge, and the adept application of these skills in daily life (Hendriana, Rohaeti, & Sumarmo, 2017).

Mathematical problem-solving encompasses the resolution of word problems, non-routine problems, and the application of mathematics to novel scenarios. This finding suggests a close relationship between problem-solving skills and students' reasoning abilities (Sumarmo, 2013). According to Thomas J. Cooney, problem-solving can be defined as the process of accepting a challenge and working diligently to complete a task for which the solution is not yet known. This necessitates that students employ active thinking to identify solutions. Mathematical problem-solving ability is defined as the capacity to utilize mathematical principles to address problems, whether they pertain to mathematics or real-world applications. This perspective underscores the significance of mathematics in practical, real-world settings (Ruseffendi, 2006).

Mathematical problem-solving skills refer to students' ability to find solutions to mathematical problems through systematic steps. According to the problem-solving process, it is imperative that students possess the following competencies: The first step is to understand the problem. The second step is to develop a solution plan. The third step is to implement the solution plan. The fourth step is to verify the results obtained. The cultivation of this skill is of paramount importance, as it equips students with the capacity to engage in logical, critical, and methodical problem-solving in the domain of mathematics. It can be concluded that mathematical problem-solving skills are the ability to solve mathematical problems by using logical reasoning to address a problem.

RESEARCH METHODS

Research Design

The present study employed a literature review method using a descriptive qualitative approach. The present literature review was conducted for the purpose of collecting, examining, and analyzing various research findings related to students' conceptual understanding and mathematical problem-solving skills. This approach enabled the researcher to access information and findings from prior studies without undertaking direct data collection in the field. The objective of this study is to examine the factors that influence students' conceptual understanding and mathematical problem-solving skills, as well as the various efforts that have been made to improve these two skills.

Instruments and Data Collection

The research data were obtained from scientific articles accessed through the Google Scholar database. The literature search was conducted using the keywords "mathematical concept understanding," "mathematical problem-solving," "students' conceptual understanding," and "mathematical problem-solving ability." The reviewed literature was constrained to articles published between 2015 and 2025, available in full text, and directly related to the research topic.

The selection process of literature was comprised of multiple stages, including identification, screening, eligibility assessment, and final selection of articles to be reviewed. The preliminary search yielded a number of relevant articles, which were then selected based on the relevance of their titles, abstracts, research objectives, and findings. In the interest of maintaining a narrow focus on the specific aspects of the study, articles not directly related to students' mathematical concept understanding and problem-solving abilities were excluded from the subsequent analysis. Following the selection process, a total of 12 articles were utilized as the primary sources for this study.

In an effort to minimize bias in the literature selection process, the researcher employed inclusion and exclusion criteria that had been established prior to the initiation of the data collection process. The selection of articles was further informed by the relevance of the topics, the quality of the publications, and the alignment with the research objectives.

Data Analysis

The data were then subjected to a manual thematic analysis. A meticulous examination of each selected article was conducted to ascertain the prevailing themes pertinent to students' conceptual understanding and mathematical problem-solving abilities. Subsequently, the data were grouped based on common themes, including internal and external factors, as well as learning strategies employed by students and the challenges they face in learning mathematics.

The results of the analysis were then presented descriptively by comparing, connecting, and synthesizing findings from the various studies reviewed. This process yielded a comprehensive depiction of the conceptual understanding and mathematical problem-solving abilities of the students, as informed by the findings of preceding research.

RESULTS

To obtain a comprehensive understanding of students' mathematical conceptual understanding and mathematical problem-solving skills, the researchers conducted a review of relevant literature. The review synthesized findings from journal articles and other scholarly publications that examined mathematical conceptual understanding, mathematical problem-solving skills, mathematical literacy, and the factors influencing these constructs. The reviewed literature was analyzed based on several characteristics, including the authors, year of publication, research context, and research methodology. A summary of the characteristics of the reviewed studies is presented in Table 1.

Table 1. The following is a list of characteristics of the reviewed literature

Author (year)	Research Context	Research Methods
Qasim et al. (2015)	Mathematical literacy of junior high school students in Buton Utara Regency	Quantitative descriptive
Fitrianti & Molunggui (2024)	Improving elementary school students' mathematical conceptual understanding of the greatest common divisor (GCD) and least common multiple (LCM)	Classroom action research
Fajar et al. (2018)	Mathematical conceptual understanding of eighth-grade junior high school students	Quantitative descriptive
Mawaddah & Maryanti (2016)	The effect of Discovery Learning on junior high school students' mathematical conceptual understanding	Quasi-experimental
Aledya (2019)	Students' mathematical conceptual understanding	Literature review
Diana et al. (2020)	The relationship between mathematics anxiety and students' conceptual understanding	Qualitative descriptive
Sahija & Minarti (2025)	Mathematical problem-solving skills of elementary school students in geometry using Polya's problem-solving steps	Qualitative descriptive
Kurnia et al. (2020)	The relationship between learning interest and students' mathematical problem-solving skills	Correlational
Syati (2022)	Mathematical problem-solving skills based on learning styles and self-regulated learning among junior high school students	Qualitative descriptive
Sriwahyuni & Maryati (2022)	Students' mathematical problem-solving skills in statistics	Descriptive
Yuhani et al. (2018)	The effectiveness of Problem-Based Learning in improving junior high school students' mathematical problem-solving skills	Quasi-experimental
Rahmatiya & Miatun (2020)	The relationship between mathematical resilience and students' mathematical problem-solving skills	Qualitative descriptive

Analysis of Students' Mathematical Conceptual Understanding in Kabupaten Buton

As demonstrated in Table 1, Qasim et al. (2015) discovered that the mathematical literacy skills of public junior high school students in North Kabupaten Buton remain comparatively inadequate. A thorough examination of the data reveals that the mean mathematical literacy proficiency of students is less than 60%, with an average score of only 5.9 on a scale of 100. These findings suggest that there is a need for further development in students' ability to understand, interpret, and apply mathematical concepts in various situations. This deficiency in mathematical literacy is closely related to students' ability to understand mathematical concepts.

As demonstrated in Table 1, numerous studies have indicated that conceptual understanding can be enhanced through the implementation of suitable instructional models. Fitrianti and

Molunggui (2024) found that the application of the Snowball Throwing instructional model was able to improve students' conceptual understanding of the Greatest Common Factor (GCF) and Least Common Multiple (LCM). The efficacy of this approach is evidenced by the enhancement in students' mean achievement scores across each learning cycle, as gauged by end-of-cycle assessments, and by the escalation in students' engagement levels, as documented by partner teachers and researchers.

The findings of Mawaddah and Maryanti (2016) yielded consistent results. As demonstrated in Table 1, the implementation of the Discovery Learning model resulted in favorable outcomes for junior high school students' mathematical conceptual understanding. Furthermore, students exhibited favorable responses to the learning process. These findings suggest that student-centered learning can facilitate the development of a more profound conceptual understanding among students.

Concurrently, a study by Fajar et al. (2018) demonstrated that junior high school students' mathematical concept comprehension abilities exhibited variation across different ability categories. As indicated by the data, students in the high and moderate categories demonstrated proficiency in six indicators of mathematical concept comprehension. In contrast, students in the low category exhibited proficiency in only four indicators. These findings suggest that variations in concept comprehension abilities are influenced by each student's characteristics and abilities.

The significance of mathematical conceptual understanding is similarly underscored by Aledya (2019), who asserts that conceptual understanding constitutes a pivotal component in the domain of mathematics education. A solid grasp of concepts is instrumental in enabling students to solve various mathematical problems more effectively, as every mathematical procedure and rule is predicated on concepts that have already been understood.

In addition to being influenced by instructional models, mathematical conceptual understanding is also influenced by students' psychological factors. Diana et al. (2020) discovered that mathematical conceptual understanding varies based on levels of math anxiety. Students exhibiting low levels of anxiety demonstrated superior conceptual understanding in comparison to their counterparts with moderate or high levels of anxiety. Consequently, affective factors must be incorporated into efforts to enhance students' mathematical conceptual understanding.

A comprehensive evaluation of the study's findings, as outlined in Table 1, reveals a multifaceted relationship between students' comprehension of mathematical concepts and a myriad of factors. These factors encompass literacy skills, instructional models, academic aptitude, and psychological conditions. The interplay among these elements underscores the complexity of student understanding and the necessity for comprehensive educational strategies that address these influences. A multitude of studies have indicated that the implementation of innovative and participatory instructional models has the potential to serve as a viable alternative for enhancing students' comprehension of mathematical concepts.

Analysis of Students' Mathematical Problem-Solving Skills in Kabupaten Buton

Research by Sahija and Minarti (2025) indicates that students' mathematical problem-solving abilities in geometry, as measured by their use of Polya's steps, vary according to their level of ability. Students with high and moderate abilities demonstrate an aptitude for problem comprehension and the formulation of solution strategies. Conversely, students with low abilities encounter difficulties in comprehending problems and identifying the appropriate steps for problem-solving. These findings suggest that conceptual mastery plays a crucial role in the success of mathematical problem-solving.

As indicated in Table 1, Kurnia et al. (2020) identified a substantial association between students' interest in learning mathematics and their mathematical problem-solving abilities at SMP Negeri 6 Buton Tengah. However, the correlation coefficient obtained was modest in magnitude. These results suggest that increasing students' interest in learning has the potential to support improvements in their mathematical problem-solving skills.

As Syati (2022) demonstrate, students have been shown to possess a high level of aptitude in problem-solving and problem-planning. However, the efficacy with which they implement these strategies and verify the accuracy of their answers remains at a moderate level. These results suggest that some students continue to encounter difficulties during the implementation and evaluation phases of problem-solving.

A parallel phenomenon was documented in the study conducted by Sriwahyuni and Maryati (2022). Preliminary findings indicate that students' mathematical problem-solving skills in statistics

are persistently in the low category. The percentage of achievement for the indicator "identifying the sufficiency of data" was 19%, while the other indicators ranged from 56.25% to 62.50%. These findings suggest that students' mathematical problem-solving skills continue to necessitate dedicated attention during the learning process.

The enhancement of mathematical problem-solving competencies can be facilitated by the implementation of suitable learning models. Yuhani et al. (2018) discovered that students who were instructed via the Problem-Based Learning (PBL) approach exhibited superior mathematical problem-solving competencies in comparison to students who adhered to traditional learning methodologies. This finding underscores the significance of employing learning models that prioritize students' active engagement in problem-solving.

Research by Rahmatiya and Miatun (2020) indicates that students who exhibit high mathematical resilience possess superior problem-solving skills. This is due to their ability to adhere to systematic solution steps and their high level of self-confidence. Conversely, students with moderate mathematical resilience tend to exhibit less meticulousness and are more prone to abandoning tasks when confronted with challenging problems.

In consideration of the findings presented in Table 1, it can be concluded that students' mathematical problem-solving skills are influenced by their academic ability, interest in learning, instructional model, and mathematical resilience. Consequently, enhancing mathematical problem-solving competencies necessitates instructional methodologies that prioritize not only the mastery of subject matter but also the cultivation of students' motivation, perseverance, and self-assurance in addressing mathematical problems.

DISCUSSION

Mathematical Concept Understanding

A review of the extant literature reveals a paucity of conclusive evidence regarding the students' comprehension of mathematical concepts in Kabupaten Buton. A study by Qasim et al. (2015) revealed that students' literacy skills in North Kabupaten Buton remain relatively low. Adequate mathematical literacy is a prerequisite for students to comprehend academic material. Students who demonstrate an insufficient level of mathematical literacy face challenges in interpreting information, connecting mathematical ideas, and applying them in various situations. This finding aligns with Aledya's (2019) assertion that conceptual understanding serves as the foundation for students to categorize, connect, and apply mathematical concepts in problem-solving.

A multitude of studies have also indicated that conceptual understanding can be enhanced through the implementation of appropriate instructional models. Fitrianti & Molunggui (2024) discovered that the implementation of the Snowball Throwing instructional model resulted in an enhancement in students' conceptual understanding. These results are consistent with the findings of Mawaddah & Maryanti (2016), who demonstrated that the implementation of the Discovery Learning model enhanced students' conceptual understanding abilities, placing them in the "good" category. The congruence of these findings suggests that learning opportunities that enable students to actively discover, discuss, and construct their own knowledge are more efficacious in enhancing conceptual understanding than teacher-centered learning.

Evidence of variations in conceptual understanding abilities is also apparent when considering student characteristics. Research by Fajar et al. (2018) demonstrated that students in the high and moderate ability categories demonstrated mastery of all indicators of mathematical conceptual understanding. In contrast, students in the low ability category continued to encounter challenges with several indicators. These findings suggest that conceptual understanding abilities are not uniformly distributed among students, indicating the necessity of learning strategies that can cater to these differences.

In addition to the role of learning factors and academic ability, affective factors have been demonstrated to play an important role in the understanding of mathematical concepts. Diana et al. (2020) found that students with low levels of math anxiety demonstrated better conceptual understanding than students with moderate and high levels of anxiety. These findings suggest that students' psychological states may have a significant impact on their cognitive processes and their capacity to comprehend mathematical concepts. Anxiety in students has been shown to be associated

with diminished concentration and self-confidence in the domain of mathematics, which in turn can result in a decline in conceptual understanding.

In light of the aforementioned findings, it can be posited that students' comprehension of mathematical concepts is influenced by a multitude of factors, including, but not limited to, cognitive, affective, and learning factors. Consequently, enhancing conceptual understanding necessitates the implementation of suitable instructional models, in conjunction with a consideration of students' psychological states and their existing knowledge.

Mathematics Problem-Solving of Students

The findings of the study suggest that students' mathematical problem-solving abilities continue to exhibit significant variability. Research by Sahija & Minarti (2025) indicates that students with high and moderate abilities generally demonstrate proficiency in problem-solving and the formulation of solution strategies. In contrast, students with low abilities continue to face challenges in identifying the appropriate steps for problem-solving. These findings are consistent with the perspectives of Hendriana et al. (2018), who assert that the ability to solve problems necessitates prior knowledge, creativity, and the capacity to apply mathematical concepts to real-world scenarios.

The results of the study by Sriwahyuni & Maryati (2022) indicate that students' mathematical problem-solving skills in statistics remain relatively low, particularly regarding the indicator of identifying data sufficiency. These findings suggest that some students still struggle to understand the information provided and translate it into an appropriate mathematical model. This situation suggests that students are not yet fully prepared to engage with problems that demand higher-order thinking skills and the resolution of complex issues.

From a pedagogical perspective, research by Yuhani et al. (2018) demonstrates that a problem-based learning approach yields superior outcomes in enhancing students' mathematical problem-solving skills when compared to conventional instruction. This finding aligns with the perspective articulated by Pratiwi and Alyani (2022), who contend that the initiation of mathematics instruction should be marked by the introduction of contextual problems. This approach, they argue, facilitates students' gradual development of understanding and the cultivation of problem-solving strategies. Consequently, problem-solving-oriented instruction can serve as an effective alternative for enhancing students' critical and systematic thinking skills.

In addition to the role of learning factors, students' internal factors also contribute to their mathematical problem-solving abilities. Research by Kurnia et al. (2020) demonstrates a positive correlation between interest in learning and mathematical problem-solving abilities. These findings are corroborated by a study by Rahmatiya & Miatun (2020), which found that students with high mathematical resilience demonstrated superior problem-solving skills compared to those with moderate or low resilience. Students who demonstrate a profound interest in learning and an unwavering commitment to problem-solving tend to exhibit heightened motivation, resilience, and a propensity to persevere in the face of challenges.

The study's findings underscore the pivotal role of conceptual mastery, student interest in learning, mathematical resilience, and instructional approaches in fostering students' mathematical problem-solving skills. Consequently, endeavors aimed at enhancing problem-solving skills must be comprehensive, emphasizing the enhancement of quality instruction while concurrently fortifying students' intrinsic factors.

The Relationship Between Conceptual Understanding and Problem Solving

A comprehensive review of pertinent literature reveals a close correlation between conceptual understanding and mathematical problem-solving skills. The findings of Sahija & Minarti (2025) indicate that students with a strong grasp of concepts tend to be better able to understand problems and determine appropriate solution strategies. Conversely, students with a poor conceptual understanding often face difficulties in identifying the steps necessary to solve problems.

These findings align with Aledya's (2019) view that concepts serve as the foundation for understanding and solving problems. Individuals who have mastered numerous concepts tend to exhibit a more seamless integration of the knowledge they have acquired with relevant problem-solving strategies. Consequently, conceptual understanding serves as the foundational element for the development of mathematical problem-solving skills.

The findings of this study also suggest that enhancing conceptual understanding through active learning models, such as Discovery Learning and Snowball Throwing, can indirectly contribute to the development of students' problem-solving skills. Therefore, it can be posited that these two abilities are closely related. Students who possess a robust conceptual understanding tend to demonstrate a higher level of proficiency in problem-solving, as they possess the ability to apply the concepts they have acquired to real-world situations. Conversely, students who lack a profound comprehension of the subject matter may encounter challenges in identifying effective problem-solving strategies. Consequently, conceptual understanding can be regarded as the foundational element for cultivating mathematical problem-solving competencies.

Factors Affecting These Two Abilities Based on the Available Literature

A comprehensive review of extant studies reveals that students' comprehension of mathematical concepts and proficiency in problem-solving is influenced by a multitude of factors, both intrinsic to the students themselves and extrinsic to the learning environment. These factors are interconnected and contribute to the determination of students' success in comprehending and applying mathematical concepts.

First, the present study identifies a negative perception of mathematics as a factor that influences students' understanding of mathematical concepts. Many students regard mathematics as a challenging discipline, which engenders a reluctance to engage with it. Anita (2014) posits that mathematics is frequently perceived as a formidable challenge in the learning process, attributable to its complexity. This perception has the potential to engender a decline in student interest in mathematics. Pangestu (2015) has noted that students' interest in studying mathematics remains low, as evidenced by their lack of engagement and enthusiasm during the learning process.

Furthermore, students' comprehension of mathematical concepts is also influenced by their level of concentration during the learning process. Yulia (2017) discovered that students' concentration in mathematics lessons remains low, as indicated by a lack of attention to the teacher's explanations and a tendency for students to engage in other activities during class. This phenomenon may emerge due to the presentation of the material failing to captivate students. The ability to concentrate well is closely related to student discipline, which is influenced by the school environment, family, and community (Fajrie, 2020).

Another factor that influences students' understanding of mathematical concepts is their perception of the teacher. The manner in which educators present material, select teaching methods, and establish learning environments can significantly influence students' comprehension levels. Hadi (2015) posits that educators must employ suitable methods to facilitate students' comprehension of mathematical concepts and engagement in the learning process. In alignment with this perspective, Wanabuliandari et al. (2016) underscore the significance of enjoyable learning experiences, asserting that such environments are instrumental in preventing student boredom and fostering active engagement in learning activities.

From an internal perspective, students' ability to understand mathematical concepts and solve problems is influenced by their interest in learning, motivation, anxiety toward mathematics, and learning styles. It has been demonstrated that elevated levels of interest and motivation have a positive impact on student engagement and comprehension of the material presented. Conversely, anxiety toward mathematics can hinder students' ability to concentrate, remember, and connect various concepts they have learned. Furthermore, differences in learning styles have been demonstrated to affect how students receive and process information (Smith, 2019). Consequently, these factors must be taken into account in the learning process.

Concomitantly, external factors such as pedagogical methodologies employed, the accessibility of learning resources, and parental involvement play a pivotal role in shaping the educational landscape. The utilization of teaching methods that are not aligned with students' real-world experiences, in conjunction with a teacher-centered approach, has the potential to engender passive student behavior. Moreover, the dearth of contextual and interactive learning materials engenders an environment that is less engaging and less meaningful for students. Parental support has been demonstrated to play a crucial role in enhancing motivation and discipline in learning. Guidance, supervision, and encouragement from parents have been shown to facilitate a more profound understanding of mathematical concepts among students.

The present study lends further credence to the notion that a robust comprehension of mathematical concepts during elementary education is paramount, as it serves as the foundational basis for subsequent learning and the cultivation of critical thinking abilities. A solid conceptual understanding facilitates students' ability to connect various mathematical topics, thereby rendering the learning process more meaningful. Furthermore, students who possess a robust conceptual understanding often demonstrate an enhanced capacity to resolve problems that necessitate reasoning and analysis. These abilities also play a role in boosting students' self-confidence when facing various learning challenges.

Secondly, with respect to students' mathematical problem-solving abilities, internal factors are as follows: Firstly, the concept of prior knowledge is introduced. Prior knowledge has been shown to facilitate and enhance students' mastery of core material. The utilization of prior knowledge in the comprehension of new material has been demonstrated to exert a positive influence on mathematical problem-solving abilities. Furthermore, an appreciation for mathematics has been identified as a contributing factor. The cultivation of appreciation for mathematics has been demonstrated to engender enthusiasm and serious engagement in the discipline. The degree to which individuals exhibit enthusiasm and a genuine engagement in the domain of mathematics has been demonstrated to have a direct impact on the enhancement of their mathematical problem-solving skills. Furthermore, this enthusiasm and engagement have been shown to have a significant influence on the development of logical-mathematical intelligence. The ability to link information with suitable methods for problem-solving and mathematical calculation is a hallmark of logical-mathematical intelligence. Consequently, logical-mathematical intelligence exerts a substantial influence on mathematical problem-solving ability.

The impact of prior knowledge, appreciation of mathematics, and logical-mathematical intelligence on students' mathematical problem-solving abilities have been a subject of interest in the academic community. Furthermore, a multitude of factors must be considered, including but not limited to: learning difficulties, mastery of the material, social context, attitudes toward mathematics, mood, attention, laziness, responses, engagement, and discussion. A multifaceted approach is imperative for effective problem identification, definition, and management. This process involves the identification of the problem, the establishment of its objectives, the exploration of potential strategies, the implementation of these strategies, and a subsequent review of the results. However, the most salient factor in mathematical problem-solving ability is the implementation of strategies (act), followed by the determination of possible strategies (explore), the identification of the problem (identify), the definition of the problem's objectives (define), and the review of the solution (look).

A more adaptive, interactive, and contextual educational approach is essential for improving the quality of mathematics learning. Moreover, the role of the family environment and the enhancement of teachers' professional capacity are also foundational to success in building a deep and sustainable understanding of mathematical concepts. The findings of this study indicate that the students' subpar performance in conceptual understanding and mathematical problem-solving skills is attributable to a confluence of interconnected factors. Consequently, a multifaceted approach is imperative to enhance the quality of learning, fortify students' internal factors, and foster an optimal learning environment, thereby facilitating the optimal development of both skills.

The implications of these research findings suggest that improving students' conceptual understanding and mathematical problem-solving skills requires a teaching approach that focuses not only on learning outcomes but also on an active, interactive, and meaningful learning process. It is imperative that educators implement learning strategies that can develop conceptual understanding while simultaneously honing students' problem-solving skills. Furthermore, the enhancement of students' motivation, interest in learning, and self-confidence in studying mathematics is contingent upon the optimization of support from families, schools, and the learning environment. These findings can serve as a foundation for teachers and school administrators in designing more effective instruction to continuously improve the quality of mathematics education.

CONCLUSION

The extent to which students comprehend mathematical concepts, as evidenced by extant research, evinces equivocal outcomes. It has been demonstrated that certain students have already developed a solid foundation of understanding, particularly in scenarios where educational

methodologies are employed that facilitate student engagement, such as discovery learning. However, there are still students who struggle to understand mathematical concepts in depth, particularly those with low literacy levels and high levels of learning anxiety. Furthermore, the mathematical problem-solving abilities of students exhibit variance across different ability levels. Students who demonstrate high and moderate ability levels tend to exhibit proficiency in problem identification, strategic planning, and effective problem-solving. Conversely, students with lower aptitude levels continue to face challenges in identifying essential information, conceptualizing mathematical problems, and determining suitable solution strategies. A comprehensive review of the extant literature reveals that students' conceptual understanding and mathematical problem-solving abilities are influenced by a variety of factors. These include internal factors, such as interest and motivation to learn, math anxiety, learning styles, prior knowledge, appreciation for mathematics, and logical-mathematical intelligence. In addition, external factors, including the teaching methods used by teachers, the availability of contextual and interactive learning materials, and support from family and the learning environment, play a significant role in shaping these abilities. These factors are interrelated in determining students' success in understanding mathematical concepts and solving problems.

The results of the study indicate that conceptual understanding and mathematical problem-solving skills are two important and interrelated aspects of learning mathematics. A strong conceptual understanding is essential for problem-solving because it allows students to connect mathematical ideas and apply them to different situations. However, the analysis shows that students' abilities in both areas are suboptimal. Some students rely solely on memorizing formulas without understanding the concepts deeply, so they experience difficulty with varied or non-routine problems. This suggests that the learning process has not sufficiently encouraged critical and active thinking in students as they construct their own understanding.

This study has several limitations. First, the study was conducted using a literature review, so the results depend on the quality and availability of the sources consulted. Second, this study did not involve direct data collection in the field, so the findings cannot reflect actual student conditions specifically. The sources analyzed were limited to a small number of journals and references, so other research findings may have been excluded. Fourth, the literature sources were not all from Kabupaten Buton. Although the study focused on Kabupaten Buton, some of the analyzed journals came from other regions. Therefore, the results need to be interpreted with the regional differences in mind. Therefore, further research is recommended that includes direct participation of subjects to obtain more comprehensive data reflecting actual conditions.

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