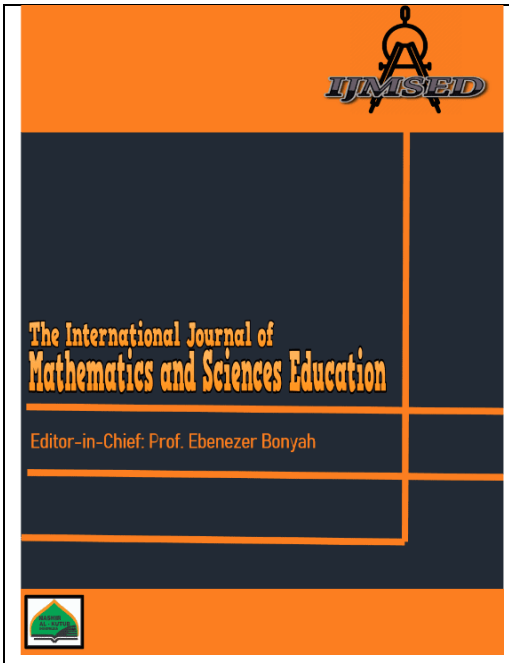
The International Journal of Mathematics and Sciences Education
Publication details, including instructions for authors and subscription information:
https://nakiscience.com/index.php/IJMSEd



Phenomenological exploration of low conceptual understanding in mathematical story problem-solving among Indonesian Junior High School Students

Rauhun Siti[a*], Indrawati[b], Bahri Samsul[c], Sudirman Sudirman[d], Ronaldo Rafael Olivero-Acuña[e]

[a]Department of Mathematics Education, Universitas Nahdlatul Wathon Mataram, Mataram, Indonesia, sitirauhun113@gamail.com

[b]Department of Mathematics Education, Universitas Nahdlatul Wathon Mataram, Mataram, Indonesia, indrawati0805088701@gmail.com

[c]Department of Mathematics Education, Universitas Nahdlatul Wathon Mataram, Mataram, Indonesia, samsulbahri024@gmail.com

[d]Department of Mathematics Education, Universitas Terbuka, Tangerang Selatan, Indonesia, sudirman.official@ecampus.ut.ac.id

[e]Department of Mathematics Education, University of the Atlantic, Barranquilla, Colombia, rrolivero@mail.uniatlantico.edu.co

To cite this article:
Siti, R., Indrawati, I., Samsul, B, Sudirman, S., & Olivero-Acuña, R.R. (2025). Phenomenological exploration of low conceptual understanding in mathematical story problem-solving among Indonesian Junior High School Students. *International Journal of Mathematics and Sciences Education, 3*(2), 93-104.
To link to this article:
https://nakiscience.com/index.php/IJMSEd
Published by:
Nasir Al-Kutub Indonesia
Residential Street Kila Rengganis, Block I, Number 11, Labuapi, Indonesia, 83361

International Journal of Mathematics and Sciences Education
Volume 3, Issue 2, pp. 93-104
https://nakiscience.com/index.php/IJMSEd

Phenomenological exploration of low conceptual understanding in mathematical story problem-solving among Indonesian Junior High School Students

Rauhun Siti[a*], Indrawati[b], Bahri Samsul[c], Sudirman Sudirman[d], Ronaldo Rafael Olivero-Acuña[e]
[a]Department of Mathematics Education, Universitas Nahdlatul Wathon Mataram, Mataram, Indonesia, sitirauhun113@gamail.com
[b]Department of Mathematics Education, Universitas Nahdlatul Wathon Mataram, Mataram, Indonesia, indrawati0805088701@gmail.com
[c]Department of Mathematics Education, Universitas Nahdlatul Wathon Mataram, Mataram, Indonesia, samsulbahri024@gmail.com
[d]Department of Mathematics Education, Universitas Terbuka, Tangerang Selatan, Indonesia, sudirman.official@ecampus.ut.ac.id
[e]Department of Mathematics Education, University of the Atlantic, Barranquilla, Colombia, rrolivero@mail.uniatlantico.edu.co

*Corresponding Author: sitirauhun113@gamail.com

Abstract
Mathematical story problems present persistent challenges for students worldwide, yet little research explores how students with low conceptual understanding subjectively experience these difficulties. This phenomenological study investigated the lived experiences of 15 Indonesian Grade VIII students (ages 13-15) with low conceptual understanding in mathematical story problem-solving. Using open-ended questionnaires and reflexive thematic analysis, we explored students' perceptions and challenges in a private junior high school in West Lombok Regency, Indonesia. Three interconnected themes emerged: (1) Internal Psychological Barriers—mathematics anxiety, fixed mindset beliefs, and internalized failure attributions; (2) Cognitive and Linguistic Challenges—difficulties in text comprehension, mathematical representation, strategic knowledge, and multi-step reasoning; and (3) Glimpses of Interest—unexpected positive affective responses to story contexts despite struggles. Findings reveal that low conceptual understanding is not a unitary cognitive deficit but a complex, multi-dimensional phenomenon involving cognitive, affective, linguistic, and motivational dimensions. Students experience multiple, compounding obstacles while carrying emotional burdens that further impede learning. By centering student voice, this study illuminates subjective realities that quantitative achievement data alone cannot capture. Implications suggest effective interventions must comprehensively address conceptual skills, affective barriers, linguistic demands, and motivation simultaneously. For Indonesian contexts, findings call for reconsidering traditional approaches prioritizing procedural fluency over conceptual understanding and student wellbeing. This research advances phenomenological methodology in mathematics education and provides actionable insights for developing responsive, equity-oriented instruction.

Article History
Received:
3 Mei 2025
Revised:
4 Juni 2025
Accepted:
25 December 2025
Published Online:
31 December 2025

Keywords:
Conceptual understanding;
Lived experience;
Junior high school students;
Mathematics anxiety;
Mathematical story problems

1. Introduction

Mathematical problem-solving, particularly in the context of story problems, represents a fundamental competency that students must develop throughout their educational journey (Pakabu et al., 2024; . Story problems, also known as word problems, require students to translate real-world

situations into mathematical representations and apply appropriate strategies to find solutions (Michael et al., 2025; Sudirman et al., 2024; Son et al.,2020). However, despite the critical importance of this skill, numerous studies have consistently revealed that students across various educational levels struggle significantly with story problems, with low conceptual understanding identified as a primary barrier to success (Verschaffel, Greer, & De Corte, 2000; Boonen, van Wesel, Jolles, & van der Schoot, 2014; Pongsakdi et al., 2020; Sudirman et al., 2021; Yumiati et al., 2024).

In the Indonesian educational context, this challenge is particularly pronounced. The Programme for International Student Assessment (PISA) results have repeatedly shown that Indonesian students score significantly below the international average in mathematical literacy. In PISA 2018, Indonesian students scored 379 in mathematics, compared to the OECD average of 487 (OECD, 2019). This performance indicates that a large proportion of Indonesian students struggle to interpret and recognize how simple situations can be represented mathematically, especially in word problem contexts. Story problem-solving represents one of the weakest areas, suggesting that the issue extends beyond mere computational skills and points to more fundamental problems in how students understand and approach mathematical concepts embedded within contextual scenarios.

Previous research on student difficulties with story problems has predominantly focused on identifying error patterns, categorizing types of misconceptions, or measuring achievement outcomes through quantitative methods (Pongsakdi et al., 2020; Powell, 2011). While these studies have provided valuable insights into what difficulties students face, they often fall short in illuminating how and why students experience these challenges from their own perspectives. The lived experiences of students grappling with low conceptual understanding—their thought processes, emotional responses, meaning-making strategies, and the contextual factors that shape their learning experiences—remain largely unexplored in the existing literature, particularly within the Indonesian educational setting.

Conceptual understanding in mathematics refers to the comprehension of mathematical concepts, operations, and relations, enabling students to construct connections between different pieces of knowledge and apply them flexibly in various situations (Kilpatrick, Swafford, & Findell, 2001). In the context of story problems, conceptual understanding involves recognizing the mathematical structure underlying real-world scenarios, identifying relevant information, establishing appropriate relationships between quantities, and selecting suitable problem-solving strategies. Students with low conceptual understanding often resort to surface-level approaches, such as keyword searching or blind application of algorithms, without genuine comprehension of the mathematical principles involved (Verschaffel et al., 2000). This superficial engagement not only leads to frequent errors but also prevents students from developing the deeper mathematical thinking necessary for tackling complex, non-routine problems.

To address this gap in understanding, a phenomenological approach offers a particularly powerful lens for investigation. Phenomenology, as a qualitative research methodology, seeks to explore and describe the essence of lived experiences as understood by those who experience them (Moustakas, 1994; van Manen, 2016). By employing phenomenological inquiry, researchers can move beyond surface-level descriptions of student difficulties to uncover the fundamental structures of consciousness and meaning that characterize the experience of struggling with mathematical concepts in story problems. This approach allows us to understand not merely that students face difficulties, but how these difficulties manifest in their cognitive and emotional experiences, what meanings students assign to these challenges, and how these experiences shape their ongoing relationship with mathematics.

Understanding the phenomenon of low conceptual understanding in story problem-solving from students' perspectives carries significant implications for mathematics education in Indonesia. First, it can inform more empathetic and responsive pedagogical practices that address not only cognitive but also affective dimensions of learning. Second, it can contribute to curriculum and instructional design that better aligns with students' actual experiences and needs. Third, it can provide insights into the cultural and contextual factors specific to Indonesian education that may influence how students experience and make sense of mathematical learning. Finally, by giving voice to students' lived experiences, this research honors their perspectives as legitimate and valuable sources of knowledge for improving mathematics education.

Therefore, this study aims to explore and describe the lived experiences of Indonesian students who demonstrate low conceptual understanding when solving mathematical story problems. Through phenomenological inquiry, we seek to answer the central research question: What is the essence of the

experience of students with low conceptual understanding as they engage with mathematical story problems in the Indonesian educational context? By illuminating these experiences, we hope to contribute to a more comprehensive understanding of this educational challenge and provide insights that can guide more effective interventions and support systems for struggling mathematics learners.

2. Methods

2.1 Research Design

This study employed a phenomenological research design to explore and describe the lived experiences of students with low conceptual understanding in solving mathematical story problems. Phenomenology is particularly appropriate for this inquiry as it seeks to understand the essence of experiences from the perspectives of those who live through them (Moustakas, 1994; van Manen, 2016). This approach enables researchers to move beyond observable behaviors and test scores to access the subjective meanings, perceptions, and feelings that students attach to their struggles with mathematical concepts. By adopting a phenomenological stance, this research prioritizes the voices and experiential knowledge of students themselves, recognizing them as legitimate sources of understanding about the phenomenon of low conceptual understanding in mathematics education.

2.2 Research Context and Setting

The study was conducted at a private junior high school in West Lombok Regency, Indonesia. This school was purposefully selected based on preliminary observations and discussions with mathematics teachers indicating that a significant number of students experienced difficulties in understanding mathematical concepts, particularly when solving story problems. The selection of a private school setting provided an opportunity to explore the phenomenon within a specific educational context while recognizing that students' experiences may be influenced by various contextual factors including instructional approaches, classroom dynamics, and institutional culture. The Indonesian educational context is particularly relevant given the country's persistent challenges in mathematics education, as evidenced by international assessment results (OECD, 2019).

2.3 Research Participants

Fifteen Grade VIII students participated in this study, with ages ranging from 13 to 15 years. Participants were selected using criterion-based purposive sampling, a non-probability sampling technique commonly employed in qualitative research to identify information-rich cases that meet specific predetermined criteria (Palinkas et al., 2015; Campbell et al., 2020). The primary selection criterion was evidence of low conceptual understanding in mathematics, as indicated by: (1) teacher recommendations based on classroom observations and assessment results, (2) consistent difficulty in solving story problems across multiple assessments, and (3) demonstrated struggles in translating word problems into mathematical representations.

The selection of Grade VIII students was deliberate and theoretically grounded. Students at this developmental stage (early to middle adolescence) possess sufficient cognitive maturity and metacognitive awareness to reflect on and articulate their learning experiences, thought processes, and emotional responses to academic challenges (Steinberg, 2005). This age group is also characterized by developing capacity for abstract reasoning and self-reflection, making them capable of providing rich, detailed accounts of their experiences—essential qualities for phenomenological inquiry. Furthermore, Grade VIII students have accumulated several years of experience with mathematical story problems, providing them with a substantial experiential foundation from which to draw insights about their struggles and coping strategies.

All potential participants were provided with clear information about the study's purpose, procedures, voluntary nature of participation, and their right to withdraw at any time without consequence. Written informed consent was obtained from parents or legal guardians, while students provided written assent. Ethical approval for this study was obtained from the relevant institutional review board, and all procedures adhered to established ethical guidelines for research involving minors.

2.4 Data Collection Instrument

Data were collected using an open-ended questionnaire specifically designed to elicit rich, descriptive accounts of students' experiences with mathematical story problems. The questionnaire consisted of two carefully constructed open-ended questions that invited participants to explore and express their lived experiences, perceptions, challenges, and emotional responses related to solving story problems. The use of open-ended questions aligns with phenomenological methodology's emphasis on

allowing participants to describe their experiences in their own words, without imposing predetermined categories or response options (Moustakas, 1994).

Open-ended questions offer several methodological advantages for this study. First, they provide participants with flexibility and freedom to articulate their unique perspectives, experiences, and meanings without constraint (Braun & Clarke, 2013). Second, they allow for the emergence of unanticipated themes and insights that might be overlooked in more structured data collection approaches. Third, they respect the principle of phenomenological inquiry that prioritizes participants' subjective experiences and interpretations as the primary source of understanding. The questions were pilot-tested with a small group of students not included in the final sample to ensure clarity, appropriate language level, and capacity to elicit meaningful responses.

The questionnaire was administered in a quiet, comfortable setting during regular school hours. Students were given ample time to respond thoughtfully and were assured that their responses would be treated confidentially and would not affect their academic standing. The researcher was available to clarify questions or provide support as needed, though care was taken not to lead or influence students' responses.

2.5 Data Analysis

Data analysis followed Braun and Clarke's (2006, 2019) reflexive thematic analysis approach, a systematic yet flexible method for identifying, analyzing, and reporting patterns of meaning within qualitative data. Reflexive thematic analysis is particularly well-suited to phenomenological inquiry as it acknowledges the researcher's active role in knowledge construction while maintaining rigor and transparency in the analytical process (Braun & Clarke, 2019, 2022). This approach aligns with the study's phenomenological orientation by centering participants' experiences while recognizing that the researcher brings their own theoretical perspectives, assumptions, and interpretations to the analytical process.

The analysis proceeded through six iterative phases: (1) Familiarization with the data: The researcher engaged in repeated, active reading of all participant responses to develop deep familiarity with the data corpus. During this phase, initial observations, questions, and potential patterns were noted in analytical memos. (2) Generating initial codes: Systematic coding of the entire dataset was conducted, with codes capturing semantic (explicit) and latent (underlying) meanings related to students' experiences of low conceptual understanding. Codes were generated both inductively (emerging from the data) and deductively (informed by existing phenomenological and mathematics education literature). (3) Searching for themes: Codes were examined for patterns and grouped into candidate themes that captured meaningful patterns across the dataset. Visual representations (theme maps) were created to explore relationships between codes and potential themes. (4) Reviewing themes: Candidate themes were refined through iterative review at two levels—first ensuring internal homogeneity (coherence within themes) and external heterogeneity (clear distinctions between themes), then ensuring themes accurately reflected meanings evident in the entire dataset. Some themes were collapsed, split, or discarded during this phase. (5) Defining and naming themes: Final themes were clearly defined, with detailed descriptions capturing the essence of each theme and its relationship to the research question. Theme names were crafted to be concise yet evocative of the meanings they represent. (6) Producing the report: Findings were written up with vivid extracts from participant responses used to illustrate and provide evidence for each theme, situating findings within existing literature.

Throughout the analysis, the researcher maintained a reflexive journal documenting analytical decisions, emerging insights, questions, and reflections on how personal assumptions and perspectives might influence interpretation. This reflexive practice enhances the rigor and transparency of the analytical process (Braun & Clarke, 2019). To support the analysis and manage the data efficiently, artificial intelligence-based technology (ChatGPT) was utilized as an analytical aid for initial organization and pattern identification. However, all final interpretive decisions and thematic development remained under the researcher's critical judgment and were grounded in established phenomenological and qualitative research principles. The use of AI technology was approached critically and reflectively, recognizing both its potential benefits and limitations in qualitative analysis.

3. Results and Discussion

3.1 Results

Through reflexive thematic analysis of open-ended questionnaire responses from 15 Grade VIII students, this study identified three overarching themes that capture the essence of students' lived experiences with low conceptual understanding in solving mathematical story problems. The analytical process progressed systematically from initial coding (10 codes) through categorical grouping (5 categories) to final thematic synthesis (3 themes). These themes illuminate both the obstacles' students encounter and, unexpectedly, some sources of positive engagement with mathematics despite their struggles.

3.1.1 Overview of Analytical Process

The analysis began with familiarization with the complete dataset, followed by systematic generation of initial codes that captured meaningful units within participants' responses. Ten initial codes emerged from this process, representing distinct aspects of students' experiences. These codes were then grouped into five broader categories based on thematic similarity and conceptual relationships. Finally, through iterative refinement and synthesis, three main themes were constructed that capture the fundamental patterns of meaning across the dataset. Table 1 presents the progression from initial codes through categories to final themes.

Table 1
Progression from Initial Codes to Final Themes

Initial Code	Description	Category → Theme
K1	Know the story but don't know what to do first	Difficulty understanding → Theme 2
K2	Math is difficult	Negative perceptions → Theme 1
K3	Lack of practice in solving strategies	Lack of practice → Theme 2
K4	Story is too long and difficult	Difficulty understanding → Theme 2
K5	Unfamiliar language in stories	Difficulty understanding → Theme 2
K6	Brain doesn't function properly	Negative self-perception → Theme 1
K7	Story connected to too many formulas	Difficulty understanding → Theme 2
K8	Love the story	Positive interest → Theme 3
K9	Math is very difficult	Negative perceptions → Theme 1
K10	Story is interesting and fun	Positive interest → Theme 3

Theme 1: Internal Psychological Barriers - Negative Affect and Self-Perception

The first theme captures the affective and self-evaluative dimensions of students' struggles with mathematical story problems. This theme emerged from codes expressing generalized negative perceptions of mathematics (K2, K9) and negative self-perceptions regarding mathematical ability (K6). Students articulated a profound sense of mathematics as inherently difficult—not merely challenging in specific instances, but fundamentally and comprehensively difficult. Representative statements included *"Because math is difficult"* and *"Math is very difficult."* The repetitive and emphatic nature of these statements suggests that difficulty is not perceived as situational or surmountable but rather as an essential characteristic of mathematics itself.

More concerning, students internalized these difficulties, attributing their struggles to personal inadequacy rather than to external factors or modifiable skill deficits. The statement *"Because my brain doesn't function properly"* is particularly striking in its attribution of failure to fundamental cognitive deficiency. This reflects what psychologists term a *fixed mindset* about mathematical ability—a belief that mathematical competence is an innate, unchangeable trait rather than a skill that can be developed through effort and appropriate instruction. Such beliefs are deeply problematic as they undermine motivation, reduce persistence in the face of difficulty, and create self-fulfilling prophecies of failure.

This theme illuminates the affective barrier that students with low conceptual understanding face—not only do they lack the mathematical tools to solve story problems effectively, but they also carry emotional baggage of anxiety, helplessness, and negative self-judgment that further impedes their learning. The experience of struggling with story problems is thus not merely a cognitive challenge but an emotionally laden experience that threatens students' academic self-concept and sense of competence.

Theme 2: Cognitive and Linguistic Challenges in Story Problem Comprehension

The second and most prominent theme centers on the specific cognitive and linguistic difficulties students experience when attempting to understand and solve story problems. This theme synthesizes codes related to comprehension difficulties (K1, K4, K5, K7) and inadequate problem-solving strategies (K3). Students' descriptions reveal multiple layers of challenge in the story problem-solving process.

At the textual level, students struggled with the linguistic demands of story problems. They found problems *"too long"* and complained that stories used *"language that is not familiar to us."* This highlights the dual linguistic burden of story problems—students must not only comprehend the narrative text but also navigate mathematical vocabulary and symbolic notation embedded within that text. For students with limited reading comprehension or vocabulary knowledge, this linguistic complexity becomes a significant barrier to accessing the mathematical content of the problem.

Beyond textual comprehension, students experienced difficulty in the translation and representation phase of problem-solving. One student poignantly expressed: *"Sometimes you know the story but don't know what to do first."* This statement captures a critical juncture where comprehension of the problem situation does not automatically translate into a mathematical solution strategy. Students understood the narrative—they could follow the story—but they could not bridge from that narrative understanding to mathematical representation and computation. This gap reveals a fundamental weakness in conceptual understanding: the inability to recognize mathematical structures underlying real-world scenarios and to select appropriate mathematical operations to model those structures.

Students also reported that stories were *"too much connected to other formulas,"* suggesting difficulty managing the multi-step reasoning and integration of multiple mathematical concepts that many story problems require. This speaks to limited strategic knowledge—students lacked practiced problem-solving heuristics or metacognitive strategies for approaching complex problems systematically. Finally, students acknowledged their *"lack of practice in implementing precise solving strategies,"* recognizing that repeated, deliberate practice with structured guidance had been insufficient in their learning history.

Collectively, this theme illustrates that low conceptual understanding in story problems is not a single deficit but a constellation of interconnected difficulties spanning linguistic comprehension, mathematical representation, strategic knowledge, and metacognitive awareness. The experience of solving story problems for these students is one of multiple, compounding obstacles at each stage of the problem-solving process.

Theme 3: Glimpses of Interest - Positive Affective Responses to Story Contexts

Unexpectedly, amid the predominantly negative experiences documented in Themes 1 and 2, a small but meaningful counter-theme emerged. Some students expressed positive affective responses to story problems, describing them as *"interesting and fun"* (K10) and stating *"I love the story"* (K8). This theme is noteworthy precisely because it contradicts the dominant narrative of struggle and negativity.

These positive responses suggest that the narrative framing of mathematical problems holds potential appeal for some students. The *story* aspect—the contextualization of abstract mathematics within real or imaginable scenarios—can serve as a point of engagement and interest. Students who expressed these positive sentiments appeared to appreciate the concrete, relatable nature of story problems even while struggling with the mathematical demands embedded within them.

This theme is developmentally important because it reveals that negative affect toward mathematics is not monolithic or inevitable. Even among students with documented low conceptual understanding, some maintain curiosity and positive interest in certain aspects of mathematical learning. This finding suggests potential leverage points for intervention—if the narrative and contextual elements of story problems can be made more consistently engaging and accessible, they might serve as motivational hooks that sustain student engagement long enough for conceptual understanding to develop.

However, it is crucial to note that positive interest alone is insufficient. The students who expressed enjoyment of stories still exhibited low conceptual understanding and struggled to solve the problems. Interest without understanding does not lead to success. Nevertheless, this theme reminds us that affective engagement—students' emotional connection to mathematical content—matters and can be cultivated as part of a comprehensive approach to developing conceptual understanding.

3.2 Discussion

This phenomenological study sought to explore and describe the lived experiences of Indonesian students with low conceptual understanding when solving mathematical story problems. The three themes that emerged—internal psychological barriers, cognitive and linguistic challenges, and glimpses of positive interest—together paint a complex picture of how these students experience mathematics learning. In this section, we interpret these findings in relation to existing theoretical frameworks and empirical research, consider their implications for mathematics education, and acknowledge the study's limitations.

3.2.1 The Affective Dimension: Mathematics Anxiety and Fixed Mindsets

The first theme revealed profound negative affect toward mathematics and deeply internalized attributions of personal inadequacy. These findings align closely with extensive research on mathematics anxiety—a well-documented phenomenon characterized by feelings of tension, apprehension, and dread that interfere with mathematical performance (Ashcraft, 2002; Ramirez et al., 2018). Meta-analytic research has consistently demonstrated robust negative correlations between mathematics anxiety and achievement, with effect sizes ranging from $r = -0.27$ to $r = -0.36$ (Barroso et al., 2021; Zhang et al., 2019). Our participants' descriptions of mathematics as comprehensively and fundamentally difficult echo the affective experiences documented in this literature.

Particularly concerning is the internalized attribution pattern evident in statements like "my brain doesn't function properly." This reflects what Dweck (2006) termed a fixed mindset—the belief that intelligence and mathematical ability are fixed traits rather than qualities that can be developed through effort and learning. Research has shown that fixed mindsets predict lower achievement, reduced persistence, and avoidance of challenging tasks (Blackwell, Trzesniewski, & Dweck, 2007). When students attribute failure to stable, internal, and uncontrollable causes (e.g., insufficient intelligence), they are less likely to invest effort in learning and more likely to develop learned helplessness (Weiner, 1985).

The Indonesian educational context may contribute to these maladaptive beliefs. Traditional mathematics instruction in many Indonesian schools emphasizes procedural skills, rote memorization, and performance on standardized assessments rather than conceptual understanding and growth-oriented learning (Zulkardi & Putri, 2019). In such environments, students who struggle are easily identified and may receive implicit or explicit messages that they simply "are not good at math" rather than receiving targeted support to develop specific skills or conceptual understanding. The PISA 2018 findings showing Indonesian students' mathematics scores well below the OECD average (OECD, 2019) reflect systemic challenges that likely shape students' self-perceptions and beliefs about mathematics.

3.2.2 Cognitive and Linguistic Demands of Story Problems

The second theme illuminated multiple layers of difficulty students experience in comprehending and solving story problems. These findings resonate with established models of mathematical word problem solving, particularly Verschaffel et al.'s (2000) framework which identifies several distinct cognitive processes: text comprehension, situation model construction, mathematical model formulation, and solution execution. Our participants' experiences suggest breakdowns at multiple points in this process.

Students' reports of unfamiliar language and excessively long problems point to difficulties at the text comprehension stage. Research has consistently demonstrated that reading comprehension ability significantly predicts word problem-solving success (Boonen et al., 2014; Pongsakdi et al., 2020). When students struggle to parse the linguistic structure of a problem or encounter unfamiliar vocabulary, they cannot construct an accurate mental representation of the problem situation—a prerequisite for mathematical solution. In the Indonesian context, this linguistic burden may be compounded when problems are presented in formal Indonesian (Bahasa Indonesia) that differs from students' everyday conversational language or regional dialects.

The statement "sometimes you know the story but don't know what to do first" reveals a more fundamental problem: difficulty translating from situation understanding to mathematical representation. This is the hallmark of weak conceptual understanding. Students with strong conceptual understanding recognize structural similarities between different problem situations and can flexibly apply mathematical schemas—abstract knowledge structures that specify relationships between problem elements and appropriate solution strategies (Powell, 2011). In contrast, students with low conceptual

understanding often rely on superficial problem features (e.g., specific keywords like "altogether" or "left") to decide which operation to perform, without genuine understanding of the mathematical relationships involved (Verschaffel et al., 2000).

Students' acknowledgment of insufficient practice with problem-solving strategies is also significant. Effective strategy instruction—teaching students systematic approaches for analyzing problems, representing relationships, planning solutions, and monitoring progress—has robust empirical support (Montague, 2008; Fuchs et al., 2008). However, such explicit strategy instruction is often absent from traditional mathematics curricula that prioritize computational fluency over strategic problem-solving. Our findings suggest that Indonesian students may receive limited exposure to varied problem types and insufficient guided practice in applying systematic solution strategies.

3.2.3 The Paradox of Interest Without Understanding

The emergence of Theme 3—positive interest in story contexts—presents an intriguing paradox. Some students who struggled significantly with story problems nevertheless found them "interesting" and "fun." This finding challenges simplistic assumptions that low achievement inevitably coincides with complete disengagement or negative affect. It suggests that motivation and competence, while related, are partially independent dimensions of mathematical learning.

From a motivational perspective, these positive responses may reflect situational interest—momentary, context-specific engagement triggered by novel, concrete, or personally relevant content (Hidi & Renninger, 2006). Story problems, when well-crafted, situate abstract mathematics within narrative contexts that students can imagine or relate to. This contextualization can provide an initial hook for engagement. However, for situational interest to develop into sustained individual interest and intrinsic motivation, students must experience success, develop competence, and perceive mathematics as valuable and meaningful (Ryan & Deci, 2000).

The practical implication is that while engaging contexts matter, they are not sufficient. Students need both the motivation to engage and the conceptual tools to succeed. Effective mathematics instruction must attend to both dimensions—designing problems that capture students' interest while simultaneously providing the scaffolding, explicit instruction, and deliberate practice necessary for developing conceptual understanding and problem-solving competence.

3.2.4 Implications for Mathematics Education in Indonesia

These findings carry several implications for improving mathematics education, particularly in the Indonesian context. First, mathematics instruction must explicitly address students' affective experiences and beliefs about mathematics. Professional development should prepare teachers to recognize mathematics anxiety, challenge fixed mindset beliefs, and create classroom environments that emphasize growth, effort, and improvement rather than fixed ability. Interventions promoting growth mindset (e.g., Paunesku et al., 2015) and reducing mathematics anxiety (e.g., Ramirez et al., 2018) have demonstrated effectiveness and warrant adaptation for Indonesian contexts.

Second, instruction must systematically develop conceptual understanding alongside procedural skills. This requires moving beyond traditional emphases on memorization and computation toward approaches that help students understand the underlying mathematical structures and relationships in story problems. Research-based instructional frameworks such as schema-based instruction (Jitendra et al., 2009) and explicit strategy instruction (Montague, 2008) provide evidence-based models for developing both conceptual understanding and strategic competence.

Third, given the linguistic demands documented in Theme 2, mathematics teachers must attend to language and literacy. This includes pre-teaching mathematical vocabulary, providing sentence frames and linguistic scaffolds, and explicitly teaching students to parse complex sentences and extract relevant information. In multilingual contexts like Indonesia, additional attention to language supports is particularly important.

Finally, the presence of positive interest (Theme 3) suggests opportunities for leveraging contextual and narrative elements to increase engagement. Problem contexts should be varied, culturally relevant, and genuinely interesting to students. However, interest-driven approaches must be coupled with systematic instruction in problem-solving strategies and conceptual understanding to translate engagement into achievement.

3.2.5 Limitations and Future Research

Several limitations should be considered when interpreting these findings. First, data were collected exclusively through written questionnaire responses. While open-ended questionnaires allowed students to express their experiences in their own words, they may not capture the depth and richness that face-to-face interviews could provide. Future phenomenological studies should consider incorporating in-depth individual interviews or focus groups to elicit more detailed narratives of students' lived experiences.

Second, the sample was drawn from a single private school in West Lombok Regency. While this focused scope enabled detailed exploration of the phenomenon within a specific context, it limits transferability to other settings. Students in public schools, urban contexts, or different regions of Indonesia might experience low conceptual understanding differently. Future research should examine these experiences across diverse Indonesian educational contexts to identify both commonalities and contextual variations.

Third, while the study identified key themes in students' experiences, it did not examine the developmental trajectories of these experiences or track changes over time. Longitudinal phenomenological research could illuminate how students' experiences and understandings evolve as they progress through school and encounter different instructional approaches.

Finally, this study focused exclusively on students' perspectives. While centering student voice is valuable and important, a more comprehensive understanding would also incorporate teachers' perspectives on students' struggles, observational data of actual problem-solving attempts, and analysis of the specific story problems students encounter in their curriculum. Future research integrating multiple data sources and perspectives would provide a more holistic understanding of the phenomenon.

4. Conclusion

This phenomenological study has illuminated the lived experiences of Indonesian students with low conceptual understanding as they engage with mathematical story problems. Through analysis of students' own descriptions of their struggles and perceptions, three interconnected themes emerged that together characterize the essence of this phenomenon: internal psychological barriers marked by mathematics anxiety and fixed mindset beliefs; cognitive and linguistic challenges spanning text comprehension, mathematical representation, and strategic problem-solving; and surprising glimpses of positive interest in story contexts despite ongoing difficulties.

These findings reveal that low conceptual understanding in story problem-solving is not a simple, unitary deficit but rather a complex, multi-dimensional phenomenon encompassing cognitive, affective, linguistic, and motivational dimensions. Students' experiences are characterized by multiple, interacting obstacles—they face problems that seem linguistically impenetrable, mathematical structures they cannot recognize or represent, persistent feelings of inadequacy and anxiety, and limited strategic knowledge for approaching problems systematically. Yet amid these challenges, some students maintain curiosity and interest in mathematical contexts, suggesting that negative affect and disengagement are not inevitable consequences of low achievement.

From a phenomenological perspective, this study has honored students' experiential knowledge and given voice to those who struggle—whose experiences are often rendered invisible in large-scale quantitative studies focused on test scores and error rates. By centering students' subjective meanings and lived realities, we gain insights that can inform more humane, responsive, and effective mathematics education. We see not just that students struggle, but how they experience that struggle—the emotional weight they carry, the meanings they make of their difficulties, and the moments of engagement that persist despite ongoing challenges.

The practical implications are clear: effective support for students with low conceptual understanding must be comprehensive, addressing cognitive skill development, affective barriers, linguistic demands, and motivational engagement simultaneously. Mathematics educators must recognize that students bring not only cognitive gaps but also emotional vulnerabilities and maladaptive beliefs into the classroom. Instruction must therefore cultivate both competence and confidence, providing both the conceptual tools for success and the affective support for persistence. Intervention efforts should include explicit strategy instruction, attention to mathematical language and vocabulary, cultivation of growth mindsets, reduction of mathematics anxiety, and design of engaging, accessible problem contexts.

In the Indonesian context specifically, these findings call for reconsidering traditional pedagogical approaches that emphasize procedural fluency and test preparation at the expense of conceptual understanding and student wellbeing. As Indonesia continues efforts to improve mathematics education outcomes, attention must extend beyond raising test scores to fostering genuine conceptual understanding, positive mathematical identities, and resilient problem-solving dispositions. The voices of students documented in this study remind us that behind every data point indicating low achievement is a young person grappling with complex cognitive and emotional challenges—and that understanding and supporting those students requires attending to their lived experiences, not just their test performance.

Ultimately, this phenomenological exploration contributes to the growing body of research recognizing that mathematical learning is not merely a cognitive process but a human experience—one shaped by beliefs, emotions, social contexts, and personal meanings. By continuing to investigate and honor students' lived experiences, mathematics education research can become more responsive to learners' actual needs and more effective in supporting all students toward mathematical competence and confidence.

Acknowledgments

The authors would like to express sincere gratitude to all individuals and institutions who contributed to the successful completion of this research. First and foremost, we extend our heartfelt appreciation to the 15 student participants who generously shared their experiences, thoughts, and feelings about their struggles with mathematical story problems. Their willingness to be vulnerable and honest in describing their lived experiences forms the heart of this study, and we are deeply honored to have been entrusted with their voices. We are grateful to the administration, mathematics teachers, and staff of the participating private junior high school in West Lombok Regency for their support, cooperation, and facilitation of this research. Their commitment to improving mathematics education and their openness to research collaboration made this study possible. Special thanks to the mathematics teachers who assisted in participant recruitment and provided valuable contextual insights about students' learning experiences. We acknowledge the parents and guardians who consented to their children's participation and supported this research endeavor. We also thank the institutional review board that provided ethical approval and guidance to ensure this research met the highest standards for protecting human participants, particularly minors.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this article. This research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. The authors have no competing interests, financial or otherwise, that could have influenced the design, conduct, analysis, interpretation, or reporting of this research. All decisions regarding methodology, data collection, analysis, and presentation were made independently and guided solely by scientific integrity and the pursuit of knowledge to benefit mathematics education.

Data Availability Statement

Due to the sensitive nature of the data collected from minor participants and ethical considerations regarding confidentiality, the raw qualitative data (questionnaire responses) from this study are not publicly available. However, de-identified excerpts and representative quotes are provided throughout the manuscript to support transparency and allow readers to assess the trustworthiness of findings. Researchers interested in additional information about the data or methodology may contact the corresponding author with specific inquiries, subject to ethical restrictions.

5. References

Ashcraft, M. H. (2002). Math anxiety: Personal, educational, and cognitive consequences. *Current Directions in Psychological Science, 11*(5), 181-185. https://doi.org/10.1111/1467-8721.00196

Barroso, C., Ganley, C. M., McGraw, A. L., Geer, E. A., Hart, S. A., & Daucourt, M. C. (2021). A meta-analysis of the relation between math anxiety and math achievement. *Psychological Bulletin, 147*(2), 134-168. https://doi.org/10.1037/bul0000307

Blackwell, L. S., Trzesniewski, K. H., & Dweck, C. S. (2007). Implicit theories of intelligence predict achievement across an adolescent transition: A longitudinal study and an intervention. *Child Development, 78*(1), 246-263. https://doi.org/10.1111/j.1467-8624.2007.00995.x

Boonen, A. J., van Wesel, F., Jolles, J., & van der Schoot, M. (2014). The role of visual representation type, spatial ability, and reading comprehension in word problem solving: An item-level analysis in elementary school children. *International Journal of Educational Research, 68*, 15-26. https://doi.org/10.1016/j.ijer.2014.08.001

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology, 3*(2), 77-101. https://doi.org/10.1191/1478088706qp063oa

Braun, V., & Clarke, V. (2013). *Successful qualitative research: A practical guide for beginners*. Sage Publications.

Braun, V., & Clarke, V. (2019). Reflecting on reflexive thematic analysis. *Qualitative Research in Sport, Exercise and Health, 11*(4), 589-597. https://doi.org/10.1080/2159676X.2019.1628806

Braun, V., & Clarke, V. (2022). *Thematic analysis: A practical guide*. Sage Publications.

Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: Complex or simple? Research case examples. *Journal of Research in Nursing, 25*(8), 652-661. https://doi.org/10.1177/1744987120927206

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House.

Fuchs, L. S., Fuchs, D., Prentice, K., Burch, M., Hamlett, C. L., Owen, R., & Schroeter, K. (2003). Enhancing third-grade students' mathematical problem solving with self-regulated learning strategies. *Journal of Educational Psychology, 95*(2), 306-315. https://doi.org/10.1037/0022-0663.95.2.306

Hidi, S., & Renninger, K. A. (2006). The four-phase model of interest development. *Educational Psychologist, 41*(2), 111-127. https://doi.org/10.1207/s15326985ep4102_4

Jitendra, A. K., Star, J. R., Starosta, K., Leh, J. M., Sood, S., Caskie, G., Hughes, C. L., & Mack, T. R. (2009). Impro ving seventh grade students' learning of ratio and proportion: The role of schema-based instruction. *Contemporary Educational Psychology, 34*(3), 250-264. https://doi.org/10.1016/j.cedpsych.2009.06.001

Kilpatrick, J., Swafford, J., & Findell, B. (Eds.). (2001). *Adding it up: Helping children learn mathematics*. National Academy Press. https://doi.org/10.17226/9822

Michael, B., Arthur, Y. D., & Asare, B. (2025). Influence of peer learning, self-regulatory learning, and mathematics interest on mathematics performance. *International Journal of Didactic Mathematics in Distance Education, 2*(1), 105–116. https://doi.org/10.33830/ijdmde.v2i1.10313

Montague, M. (2008). Self-regulation strategies to improve mathematical problem solving for students with learning disabilities. *Learning Disability Quarterly, 31*(1), 37-44. https://doi.org/10.2307/30035524

Moustakas, C. (1994). *Phenomenological research methods*. Sage Publications. https://doi.org/10.4135/9781412995658

OECD. (2019). *PISA 2018 results (Volume I): What students know and can do*. OECD Publishing. https://doi.org/10.1787/5f07c754-en

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research, 42*(5), 533-544. https://doi.org/10.1007/s10488-013-0528-y

Pakabu, K. T. S., Sudirman, S. ., Kandaga , . T. ., Rodríguez-Nieto, C. A. ., & Dejarlo, J. O. (2024). Developing Papuan cultural contextual E-Module learning devices in linear programs to improve students' mathematical problem-solving skills. *International Journal of Mathematics and Sciences Education, 2*(1), 25–42. https://doi.org/10.59965/ijmsed.v2i1.107

Paunesku, D., Walton, G. M., Romero, C., Smith, E. N., Yeager, D. S., & Dweck, C. S. (2015). Mind-set interventions are a scalable treatment for academic underachievement. *Psychological Science, 26*(6), 784-793. https://doi.org/10.1177/0956797615571017

Pongsakdi, N., Kajamies, A., Veermans, K., Lertola, K., Vauras, M., & Lehtinen, E. (2020). What makes mathematical word problem solving challenging? Exploring the roles of word problem

characteristics, text comprehension, and arithmetic skills. *ZDM Mathematics Education, 52*(1), 33-44. https://doi.org/10.1007/s11858-019-01118-9

Powell, S. R. (2011). Solving word problems using schemas: A review of the literature. *Learning Disabilities Research & Practice, 26*(2), 94-108. https://doi.org/10.1111/j.1540-5826.2011.00329.x

Ramirez, G., Shaw, S. T., & Maloney, E. A. (2018). Math anxiety: Past research, promising interventions, and a new interpretation framework. *Educational Psychologist, 53*(3), 145-164. https://doi.org/10.1080/00461520.2018.1447384

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68-78. https://doi.org/10.1037/0003-066X.55.1.68

Steinberg, L. (2005). Cognitive and affective development in adolescence. *Trends in Cognitive Sciences, 9*(2), 69-74. https://doi.org/10.1016/j.tics.2004.12.005

Sudirman, S., Rodríguez-Nieto, C. A. ., & Bonyah, E. (2024). Integrating ethnomathematics and ethnomodeling in Institutionalization of school mathematics concepts: A study of fishermen community activities. Journal on Mathematics Education, 15(3), 835–858. https://doi.org/10.22342/jme.v15i3.pp835-858

Sudirman, S., Mellawaty., M., Yaniawati, P., & Indrawan, R. (2021, February). Augmented reality application: What are the constraints and perceptions of the students during the covid 19 pendemic's 3D geometry learning process?. In *Journal of Physics: Conference Series* (Vol. 1783, No. 1, p. 012007). IOP Publishing.

van Manen, M. (2016). *Phenomenology of practice: Meaning-giving methods in phenomenological research and writing*. Routledge. https://doi.org/10.4324/9781003228073

Verschaffel, L., Greer, B., & De Corte, E. (2000). *Making sense of word problems*. Swets & Zeitlinger. https://doi.org/10.1023/A:1004190927303

Weiner, B. (1985). An attributional theory of achievement motivation and emotion. *Psychological Review, 92*(4), 548-573. https://doi.org/10.1037/0033-295X.92.4.548

Zhang, J., Zhao, N., & Kong, Q. P. (2019). The relationship between math anxiety and math performance: A meta-analytic investigation. *Frontiers in Psychology, 10*, 1613. https://doi.org/10.3389/fpsyg.2019.01613

Yumiati, Y., Rodriguez-Nieto., C.A., Bonyah, E., Sudirman, S & Haji, S. (2024). Evaluating Bengkulu culture's role in mathematics learning outside classrooms for understanding measurement. *International Journal of Evaluation and Research in Education*, *13*(6), 4307-4320. http://doi.org/10.11591/ijere.v13i6.30163

Zulkardi, Z., & Putri, R. I. I. (2019). New perspectives in Indonesian mathematics education. *Journal on Mathematics Education, 10*(1), 1-8. https://doi.org/10.22342/jme.10.1.5878.1-8