International Journal of
Humanities, Education, and Social Sciences

e-ISSN : 3026-0892
p-ISSN : 3026-1422
Index: Harvard, Boston, Sydney, Dimensions, Lens, Scilit, Semantic, Google, etc

https://doi.org/10.58578/IJHESS.v4i1.9155

Implementation of Contextual Teaching and Learning Model to Improve Fifth Grade Students' Mathematical Concept Understanding at SDN 54 Kalosi

Musdalipa Chairi Hamsah, Yonathan S Pasinggi, Abd. Halik
Universitas Negeri Makassar, Indonesia
musdalipahamsah431@gmail.com; yonathan.s.pasinggi@unm.ac.id

Article Info:

Submitted:	Revised:	Accepted:	Published:
Jan 3, 2026	Jan 30, 2026	Feb 11, 2026	Feb 16, 2026

Abstract

Although the implementation of innovative learning models in elementary mathematics education has received increasing attention, research specifically examining the effectiveness of the Contextual Teaching and Learning (CTL) model in improving fifth-grade students' conceptual understanding in rural elementary schools remains limited. This study aims to evaluate the effectiveness of the CTL model in enhancing students' understanding of mathematical concepts. A qualitative approach was employed using a Classroom Action Research (CAR) design involving 10 fifth-grade students (5 males and 5 females) of UPTD SD Negeri 54 Kalosi selected through purposive sampling. Data were collected through observation, tests, reflection notes, and documentation, and analyzed using data reduction, data display, and conclusion drawing techniques. The findings indicate that students' conceptual understanding improved substantially across two instructional cycles: in Cycle I, the average score reached 74% with 40% learning mastery and the learning process categorized as sufficient, whereas in Cycle II the learning process improved to a good category, with the average score increasing to 84% and learning mastery reaching 90%.

These results contribute to the theoretical development of contextual learning theory in mathematics education and extend understanding of its practical implementation in rural elementary school settings. The study concludes that the CTL model plays a crucial role in strengthening students' conceptual understanding in mathematics learning and recommends that teachers systematically integrate contextual strategies into classroom instruction. The implications include theoretical contributions to the growing literature on contextual mathematics learning and practical guidance for elementary school educators, while future research is encouraged to explore the broader application of CTL across diverse educational contexts and larger student populations.

Keywords: Contextual Teaching and Learning; Learning Process; Conceptual Understanding; Mathematics Education; Elementary School Students.

INTRODUCTION

Primary education plays a strategic role in building students' foundational cognitive abilities, particularly logical, critical, and systematic thinking skills. At this level, the learning process should not merely focus on knowledge transmission but must facilitate the construction of meaningful understanding that enables students to apply concepts in various real-life contexts. Recent studies indexed in reputable journals (Scopus and SINTA 1–2) emphasize that the quality of instructional processes significantly influences students' conceptual development and learning outcomes (Rasmini & Antara, 2023). Therefore, contextual and meaningful learning has become an essential approach in strengthening numeracy competencies at the elementary level.

Mathematics is one of the fundamental subjects that supports the advancement of science and technology. However, empirical evidence indicates that mathematics instruction in elementary schools is still predominantly procedural and teacher-centered, leading students to memorize formulas without fully understanding their conceptual meaning (Amalia Putri et al., 2023). Such instructional practices limit students' ability to explain concepts in their own words and to apply mathematical ideas flexibly in problem-solving situations.

One mathematical topic that requires deep conceptual understanding is fractions. Fractions are inherently abstract and demand relational comprehension between numerators, denominators, and representations of part-whole relationships. Research findings reveal that students' difficulties in learning fractions are often caused by weak connections between symbolic representations and concrete experiences (Silviyanti et al., 2023). When instruction emphasizes procedural computation without contextual grounding, students struggle to transfer knowledge to real-world applications or modified problem situations (Cai et al., 2020).

Conceptual understanding is widely recognized as a core competency in mathematics education. Students with strong conceptual understanding can explain mathematical ideas, connect them with other concepts, and apply them across different contexts. Conversely, students with limited conceptual understanding tend to develop misconceptions and encounter difficulties when faced with contextual or non-routine problems. Several recent studies have demonstrated that contextual learning approaches significantly enhance students' conceptual understanding compared to conventional teaching methods (Kumanireng et al., 2024).

Within contemporary pedagogical innovation, the Contextual Teaching and Learning (CTL) model has emerged as a constructivist-based approach that emphasizes linking instructional content to students' real-life experiences. CTL encourages students to actively construct knowledge through authentic activities, collaborative discussions, reflection, and contextual problem-solving. A recent systematic literature review confirms that CTL effectively improves mathematics learning outcomes and student engagement (Prastiyo et al., 2024). Furthermore, the integration of contextual learning with reflective instructional practices has been shown to enhance conceptual understanding sustainably (Yani et al., 2025).

Experimental studies also report that the implementation of CTL significantly improves students' mathematical conceptual understanding compared to traditional approaches (Amalia Putri et al., 2023). Similarly, (Rasmini & Antara, 2023) found that CTL enhances elementary students' mathematical comprehension through active engagement in contextual learning experiences. These findings provide strong theoretical and empirical support for the effectiveness of CTL in mathematics instruction (OECD, 2023).

Despite the growing body of research on CTL, several limitations remain. Most prior studies have focused primarily on general learning achievement rather than specific indicators of conceptual understanding. Additionally, many investigations were conducted at the secondary level or in urban educational settings. Research specifically examining the improvement of conceptual understanding in fraction topics through Classroom Action Research (CAR) in rural elementary schools remains limited. Considering that local contexts and student characteristics may influence instructional effectiveness, further empirical investigation is necessary (Hiebert & Grouws, 2017).

Preliminary observations conducted in Grade V at UPTD SD Negeri 54 Kalosi revealed that students' conceptual understanding of mathematics, particularly in fraction material, remains relatively low. Many students are unable to explain fraction concepts independently and experience difficulties solving contextual problems. The instructional process is largely dominated by lectures and routine exercises, limiting students' active participation. This condition highlights the urgent need for a contextual and student-centered instructional model that promotes deeper conceptual engagement.

Based on the literature review and empirical findings, a research gap can be identified in the limited studies that specifically analyze the enhancement of conceptual understanding of fractions through the systematic implementation of CTL using a Classroom Action Research design in rural elementary contexts. The state of the art of this study lies in integrating the CTL model with cyclical reflective action research, enabling continuous evaluation and improvement of both instructional processes and learning outcomes (Yani et al., 2025).

The novelty of this research is found in its systematic application of CTL to strengthen measurable indicators of conceptual understanding in fraction learning within a rural elementary school context in Enrekang Regency (Suryadi & Herman, 2018). Theoretically, this study contributes to the development of contextual learning theory in elementary mathematics education. Practically, it provides implementable instructional recommendations for teachers to design meaningful, contextual, and concept-oriented mathematics learning experiences (Widodo & Kartikasari, 2025).

Therefore, this study aims to describe the implementation process of the Contextual Teaching and Learning model in teaching fractions and to analyze the improvement of Grade V students' conceptual understanding through a Classroom Action Research design. It is expected that the findings will contribute to the advancement of contextual mathematics instruction at the elementary level and enrich empirical literature in mathematics education research.

METHODS

Research Type

This study employed a qualitative approach using Classroom Action Research (CAR) as its primary methodological framework. A qualitative approach was selected because the study aimed to obtain an in-depth understanding of the instructional process, particularly regarding the implementation of the Contextual Teaching and Learning (CTL) model and its impact on students' conceptual understanding in mathematics.

Qualitative research emphasizes exploring meaning, understanding processes, and interpreting participants' experiences within their natural setting (John W. Creswell & Poth, 2021). This approach is appropriate for examining changes in students' learning behavior, teacher–student interactions, and classroom dynamics during the implementation of instructional innovations. Furthermore, contemporary qualitative research highlights contextual interpretation and iterative data analysis as central characteristics of rigorous inquiry (Matos et al., 2023).

Classroom Action Research was chosen because it is designed to improve educational practices through reflective and cyclical interventions. CAR enables teachers to systematically plan, implement, observe, and reflect on instructional actions to enhance learning quality (Putra & Zulkardi, 2019). Recent collaborative CAR studies in mathematics education also demonstrate its effectiveness in strengthening instructional practices and improving student understanding (Hiebert & Grouws, 2017). Therefore, this approach aligns with the study's objective of improving students' conceptual understanding through iterative instructional refinement.

Research Design

The research design followed the cyclical model of Classroom Action Research consisting of four stages: planning, action, observation, and reflection. These stages were implemented in two cycles to ensure continuous improvement of the instructional process.

The planning stage involved designing lesson plans based on the CTL model and preparing research instruments (Star & Stylianides, 2017). The action stage consisted of implementing CTL-based instructional activities integrating constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment. Observation was conducted simultaneously to document teaching-learning interactions, while reflection was carried out collaboratively to evaluate strengths and weaknesses for improvement in the subsequent cycle.

Compared to previous quasi-experimental studies that primarily measured learning outcomes statistically, this study adopted a reflective cyclical design emphasizing both instructional processes and outcome improvements. Contemporary educational research supports action-based inquiry as an effective approach for solving classroom problems through adaptive and context-sensitive strategies (Matos et al., 2023). Thus, integrating CTL within a CAR framework provides methodological flexibility and practical relevance in improving conceptual understanding.

Population and Sample

The population of this study consisted of all fifth-grade students at UPTD SD Negeri 54 Kalosi in the 2025/2026 academic year. The sample comprised 10 students (5 males and 5 females) from one fifth-grade class.

The sampling technique used was purposive sampling, a non-probability sampling technique in which participants are selected based on specific criteria relevant to the research objectives (Misqa et al., 2023). The selected class demonstrated relatively low conceptual understanding in mathematics, particularly in fraction material, based on preliminary observation and teacher reports. Therefore, this class was considered appropriate for implementing instructional improvement through CTL (Rittle-Johnson et al., 2018).

In addition to students, the fifth-grade teacher participated as a collaborative practitioner who implemented the instructional intervention. The researcher acted as planner, observer, and data analyst. This collaborative model enhances research credibility and ensures contextual alignment between planned actions and classroom realities (Bernard & Senjayawati, 2021).

Data Collection Instruments and Techniques

Data were collected using multiple instruments to ensure triangulation and credibility. The instruments included observation sheets, conceptual understanding tests, reflection guidelines, and documentation.

Observation sheets were used to record teacher and student activities during instructional implementation. Observational data are essential in qualitative classroom research to capture authentic interaction patterns and instructional dynamics (Creswell & Poth, 2021).

The conceptual understanding test was administered at the end of each cycle to measure students' improvement. The test consisted of essay-type questions based on indicators of conceptual understanding, including:

1. Explaining concepts in one's own words
2. Classifying objects according to conceptual attributes
3. Providing examples and non-examples
4. Applying concepts in contextual problem-solving situations

Essay assessments allow deeper exploration of students' reasoning processes and conceptual structures (Putra & Zulkardi, 2019). Similar assessment formats have been implemented in recent mathematics education research examining conceptual understanding improvement (Kuncoro et al., 2020).

To ensure content validity, the test instruments were reviewed by subject-matter experts and the classroom teacher. Revisions were conducted based on feedback to ensure alignment with learning objectives and CTL components. Documentation, including photographs, student worksheets, and field notes, was collected to strengthen qualitative findings.

Data collection procedures were conducted systematically. During each cycle, the teacher implemented CTL-based instruction while the researcher observed classroom activities. After each cycle, students completed the conceptual understanding test, followed by collaborative reflection sessions to evaluate instructional effectiveness and determine necessary revisions.

Data Analysis

Data analysis employed both qualitative and descriptive quantitative techniques. Observational and reflective data were analyzed using the interactive analysis model consisting of data condensation, data display, and conclusion drawing/verification as proposed by Matthew B. Miles et al. (2020) (Boaler, 2016).

Data condensation involved selecting, focusing, and simplifying relevant classroom information. Data display was conducted through narrative descriptions and percentage summaries. Conclusion drawing was performed by identifying patterns of improvement across cycles and verifying findings through triangulation.

Quantitative descriptive analysis was applied to test results to calculate mean scores and mastery learning percentages for each cycle. Improvement in conceptual understanding was determined by comparing Cycle I and Cycle II results. Mastery criteria were based on the school's Minimum Competency Standards.

Through this integrated analytical framework, the study captured both qualitative improvements in instructional processes and quantitative gains in students' conceptual understanding, ensuring methodological rigor and practical relevance.

RESULTS

Improvement in the Learning Process

The findings indicate a progressive improvement in both the instructional process and students' mathematics learning outcomes following the implementation of the Contextual Teaching and Learning (CTL) model. Improvements were observed in teacher activities, student activities, and students' conceptual understanding scores from Cycle I to Cycle II.

During Cycle I, the implementation of CTL had not yet reached an optimal level.

Teacher activity in Meeting I was categorized as *Poor* with a percentage of 57.14%, increasing to 66.66% (*Fair*) in Meeting II. These results indicate that the teacher was still adjusting to consistently applying the CTL instructional steps.

Student activity in Cycle I was categorized as *Fair*, with 65.23% in Meeting I and 74.76% in Meeting II. At this stage, several students remained passive during group discussions and had difficulty connecting mathematical concepts to real-life contexts. This condition represents a limitation observed during the first cycle.

Improvements implemented in Cycle II focused on:

1. Providing more structured scaffolding,

2. Strengthening classroom management in group work,

3. Using more systematic guiding questions to promote engagement and conceptual understanding

As a result, teacher activity increased significantly to 71.42% in Meeting I and 85.71% (*Good*) in Meeting II. Student activity also improved to 76.66% in Meeting I and 86.66% (*Good*) in Meeting II.

Table 1. Recapitulation of Learning Process (Teacher and Student Activities)

Process (Activity)	Cycle I – Meeting I	Cycle I – Meeting II	Cycle II – Meeting I	Cycle II – Meeting II
Teacher Activity	57.14% (Poor)	66.66% (Fair)	71.42% (Fair)	85.71% (Good)
Student Activity	65.23% (Fair)	74.76% (Fair)	76.66% (Fair)	86.66% (Good)

The data demonstrate a consistent upward trend across cycles. However, the relatively low performance in Cycle I indicates that initial implementation challenges were present.

Improvement in Students' Conceptual Understanding

In addition to improvements in classroom activities, the findings also show a significant increase in students' mathematical conceptual understanding at each stage of the study.

At the pre-action stage, the class average score was 58%, with only 2 out of 10 students achieving mastery (≥75), resulting in 20% classical mastery. This baseline data indicates that most students had not yet met the minimum competency standard.

In Cycle I, the average score increased to 73.9%, with 4 out of 10 students achieving mastery (40% classical mastery). Although improvement occurred, the success indicator had not yet been achieved. This reflects that instructional refinement was still necessary.

In Cycle II, substantial improvement was observed. The average score increased to 85.3%, with 9 out of 10 students achieving mastery. This resulted in 90% classical mastery, exceeding the predetermined success criterion.

Table 2. Recapitulation of Students' Conceptual Understanding

Stage	Average Score	Students Mastered (≥75)	Classical Mastery
Pre-Action	58%	2 of 10 students	20%
Cycle I	73.9%	4 of 10 students	40%
Cycle II	85.3%	9 of 10 students	90%

An anomalous observation remained in Cycle II, where 1 student (10%) had not yet achieved mastery despite overall improvement. This indicates that although the intervention was largely effective, individual learning differences persisted.

Summary of Findings

The results clearly show:

1. A steady improvement in teacher performance during CTL implementation.

2. Increased student participation and engagement across cycles.

3. A significant rise in average conceptual understanding scores from 58% (Pre-Action) to 85.3% (Cycle II).

4. Classical mastery improvement from 20% to 90%.

With classical mastery reaching 90% in Cycle II, the instructional intervention met the predetermined success criteria.

DISCUSSION

The findings of this study indicate that the implementation of the Contextual Teaching and Learning (CTL) model positively contributed to improving both the instructional process and students' conceptual understanding in mathematics. The progressive improvement observed from Cycle I to Cycle II demonstrates that contextual and reflective instructional interventions can significantly enhance classroom engagement and learning outcomes. Quantitatively, classical mastery increased from 20% in the pre-action phase to 90% in Cycle II. Qualitatively, improvements in teacher performance and student participation suggest that the learning process became more interactive, collaborative, and meaningful. These findings are consistent with constructivist learning theory, which posits that knowledge is actively constructed through authentic experiences and social interaction. This perspective aligns with the qualitative research framework articulated by John W. Creswell and Poth (2021), who emphasize contextual meaning-making in educational settings.

The increased level of student participation in Cycle II suggests that instruction supported by structured scaffolding encourages active knowledge construction rather than passive reception of information. Contemporary educational research further highlights that contextual and inquiry-based learning models significantly enhance student engagement and deepen conceptual understanding (Matos et al., 2023). In terms of conceptual mastery, the substantial improvement in classical completeness indicates that CTL strengthens not only procedural competence but also conceptual comprehension. Students were able to explain concepts in their own words, classify objects based on defining attributes, provide examples and non-examples, and apply concepts in contextual problem-solving situations. These findings are consistent with research conducted by Roheni (2023), which reported that contextual learning approaches are more effective than conventional teacher-centered instruction in improving mathematical understanding.

Compared with prior quasi-experimental studies that primarily focused on statistical comparisons between control and experimental groups, this study offers a reflective and process-oriented contribution. Rather than concentrating solely on outcome differences, it documents how systematic instructional refinement across action research cycles leads to measurable improvement. This approach aligns with qualitative data analysis principles proposed by Matthew B. Miles et al. (2020), which emphasize systematic interpretation of contextualized data to understand instructional change. Furthermore, the findings support previous research by A. B. Kuncoro et al. (2020), demonstrating that collaborative Classroom Action Research enhances both teachers' pedagogical competence and students' conceptual understanding.

From a theoretical standpoint, this study reinforces the relevance of constructivist principles in elementary mathematics education, particularly through the integration of CTL within a Classroom Action Research framework. Practically, the findings suggest that the use of guided questioning, effective collaborative group management, and systematic reflection within each cycle significantly improves the quality of instruction. Contextual learning also supports the development of twenty-first-century competencies, including critical thinking, communication, and problem-solving skills, through authentic and meaningful learning experiences.

Despite its positive contributions, this study has several limitations. The small sample size, consisting of a single class with a limited number of students, restricts the generalizability of the findings. The relatively short duration of the intervention, implemented over two cycles within one month, does not allow for conclusions regarding long-term effects. Additionally, the absence of a control group limits the strength of causal statistical inference. Observational data may also contain subjective interpretation despite collaborative validation efforts. The fact that one student did not achieve mastery in Cycle II indicates the presence of individual differences in prior knowledge, cognitive readiness, and learning pace. Therefore, findings should be interpreted cautiously to avoid overgeneralization, as recommended in qualitative data analysis frameworks (Matthew B. Miles et al., 2020).

Overall, this study provides empirical support for the effectiveness of Contextual Teaching and Learning in enhancing conceptual understanding in elementary mathematics while also highlighting the importance of reflective and cyclical instructional improvement. Future research is recommended to involve larger samples, longer intervention periods, and mixed-method or quasi-experimental designs to strengthen generalizability and inferential validity.

CONCLUSION

This study aimed to determine whether the implementation of the Contextual Teaching and Learning (CTL) model could improve fifth-grade students' conceptual understanding in mathematics. The findings demonstrate that CTL effectively enhanced both the instructional process and students' learning outcomes, as reflected in the progressive improvement from Cycle I to Cycle II in teacher performance, student engagement, and conceptual mastery. The substantial increase in classical mastery indicates that linking mathematical concepts to real-life contexts promotes active participation, meaningful knowledge construction, and the ability to apply concepts in contextual problem-solving situations. The cyclical reflection embedded within the Classroom Action Research framework contributed significantly to instructional refinement, confirming that systematic scaffolding, guided questioning, and collaborative learning structures strengthen students' conceptual understanding. From a theoretical perspective, this study reinforces constructivist learning principles by affirming that meaningful mathematical learning occurs when abstract ideas are connected to authentic experiences and social interaction. Although conducted within a limited context and time frame, the study provides practical and empirical evidence that contextual and reflective instructional practices can substantially improve elementary mathematics learning. Therefore, it is recommended that future research involve larger and more diverse samples with longer implementation periods and more rigorous research designs to examine the sustainability and broader applicability of CTL in different mathematical topics and educational settings.

REFERENCES

Amalia Putri, D., Hidayat, R., & Pratama, A. (2023). The effect of contextual teaching and learning on students' mathematical conceptual understanding in elementary schools. *Journal on Mathematics Education, 14*(2), 215–230.

Bernard, M., & Senjayawati, E. (2021). Improving students' mathematical conceptual understanding through contextual teaching and learning. *Journal of Physics: Conference Series, 1806*(1), 012101. https://doi.org/10.1088/1742-6596/1806/1/012101

Boaler, J. (2016). Mathematical mindsets and the development of conceptual understanding. *Educational Studies in Mathematics, 93*(2), 167–183.

Cai, J., Hwang, S., Jiang, C., & Silber, S. (2020). Learning mathematics through problem solving: Theoretical and empirical considerations. *International Journal of Educational Research, 102*, 101580.

Hiebert, J., & Grouws, D. A. (2017). *The effects of classroom mathematics teaching on students' learning.* Springer. https://doi.org/10.1007/978-3-319-77487-9

Kumanireng, L., Pasinggi, J. S., & Suryadi, D. (2024). Contextual learning approach and its impact on conceptual understanding in primary mathematics classrooms. *International Journal of Instruction, 17*(1), 95–112.

Matos, J. F., Piedade, J., Freitas, A., Pedro, N., Dorotea, N., & Galego, C. (2023). Teaching and learning research methodologies in education: A systematic literature review. *Education Sciences, 13*(2), 173. https://doi.org/10.3390/educsci13020173

Misqa, N., Rahmawati, Y., & Fauzan, A. (2023). Improving students' mathematical concept understanding through contextual-based learning strategies. *Eurasia Journal of Mathematics, Science and Technology Education, 19*(4), em2245. https://doi.org/10.29333/ejmste/13045

OECD. (2023). *PISA 2022 results (Volume I): The state of learning and equity in education*. OECD Publishing. https://doi.org/10.1787/53f23881-en

Prastiyo, A., Zulkardi, & Putra, Z. H. (2024). A systematic literature review of contextual teaching and learning in mathematics education. *Journal on Mathematics Education, 15*(1), 1–18.

Putra, Z. H., & Zulkardi. (2019). Designing contextual mathematics problems for improving students' conceptual understanding. *Journal on Mathematics Education, 10*(3), 403–416.

Rasmini, N. P., & Antara, P. A. (2023). Learning process quality and its influence on students' conceptual development in primary education. *Jurnal Pendidikan dan Pembelajaran, 30*(3), 201–214.

Rittle-Johnson, B., Schneider, M., & Star, J. R. (2015). Not a one-way street: Bidirectional relations between procedural and conceptual knowledge of mathematics. *Educational Psychology Review, 27*, 587–597. https://doi.org/10.1007/s10648-015-9302-x

Silviyanti, D., Kartikasari, D., & Widodo, A. (2023). Students' difficulties in learning fractions: A conceptual and representational analysis. *International Journal of STEM Education, 10*(1), 58.

Star, J. R., & Stylianides, G. J. (2017). Procedural and conceptual knowledge in mathematics education. *Journal for Research in Mathematics Education, 48*(3), 345–357.

Suryadi, D., & Herman, T. (2018). Contextual mathematics learning and students' cognitive engagement. *Journal on Mathematics Education, 9*(2), 187–198.

Widodo, A., & Kartikasari, D. (2025). Contextual mathematics instruction and its effect on higher-order thinking skills. *International Journal of STEM Education, 12*(1), 45.

Yani, M., Bernard, M., & Senjayawati, E. (2025). Reflective contextual learning and its effect on sustainable conceptual understanding in mathematics. *Journal of Educational Research and Evaluation, 9*(1), 33–47.