

Efforts to Improve Learning Outcomes on Units of Length through Contextual Teaching and Learning (CTL) Assisted by Concrete Media in Elementary Schools

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Abstract

The Contextual Teaching and Learning (CTL) learning model is a learning model oriented toward real-world learning that is familiar in everyday life. Understanding mathematical concepts requires students to use critical, creative, and collaborative thinking skills to solve problems in a focused manner. One such learning model is CTL assisted by more concrete media to introduce units of length. This study aimed to improve learning outcomes in measuring units of length. Through the application of the Contextual Teaching and Learning (CTL) model, assisted by concrete media, students' ability to measure objects correctly can be improved. This study was based on Classroom Action Research (CAR) to improve teacher performance in implementing the learning process. The study was conducted in four stages—planning, implementation, observation, and reflection—repeated over two cycles. The study involved 14 students, consisting of 8 boys and 6 girls. The results showed a significant improvement in student learning outcomes. In the pre-cycle learning, the average learning outcome score was 59; after the intervention, the average score became 70, and in Cycle II it became 82. Classical mastery also increased. In the initial learning, 35% of students achieved mastery; in Cycle I, this increased to 10 students (71.42%), and in Cycle II to 13 students (92.85%). The conclusion of this study is that the application of the CTL model assisted by concrete media develops logical, critical, and systematic thinking skills in measuring objects, which contributes to improved student learning outcomes.

Keywords

Contextual teaching and learning, concrete media, units of length

Introduction

Education plays an important role in the process of maturation, enabling individuals to think maturely and make decisions about problems they face with a strong sense of responsibility. Elementary education aims to improve the quality of education and produce future generations with sound character and quality so that they can contribute to the nation and country. According to Lestari et al. (2023), the purpose of mathematics

learning in elementary schools is to prepare students to understand mathematical concepts and apply them to solving problems in everyday life. It also aims to develop students' attitudes toward appreciating the benefits of mathematics in their lives, including reasoning ability, critical thinking, and the ability to communicate in problem solving.

The 2013 Curriculum (in Al-Tabany 2017:10) states that mathematics learning in elementary schools emphasizes a scientific education approach, which focuses on five steps for acquiring knowledge: (1) through observation, students obtain authentic knowledge; (2) questioning can stimulate students' curiosity about something that occurs; (3) exploration develops reasoning through both synthesis and analysis; (4) reasoning means connecting the results of synthesis and analysis until a conclusion is reached; (5) communicating what they observe, see, and discover through verbal reasoning, problem-solving skills, and the ability to communicate mathematical ideas.

Learning mathematics involves studying concepts using various numbers and symbols, as well as relationships between numbers and operational procedures. Learning mathematics requires logical, creative, and critical thinking to understand mathematical concepts deeply. Learning mathematics is not about memorising definitions, but about understanding the concepts or topics being taught, so that problems related to those topics can be solved systematically and procedurally (Pratiwi & Octaviana, 2024). Currently, many learning models can be applied to create a good and engaging learning process for students. One example is a creative and engaging learning model, particularly in mathematics. The development of science and knowledge is currently very rapid; mathematics is a subject whose proofs are based on pure deduction, forming a unified system of absolute truth that cannot be revised, because mathematics studies calculations of numbers, quantities, geometry, and other absolute concepts that are useful in everyday life, such as measuring units of length (Harnis, 2021).

However, the reality in mathematics classrooms shows that the learning process is not yet as effective as expected. Many teachers still use direct instruction approaches centred on the teacher's activity in delivering learning materials. Students are still instructed to memorise mathematical formulas, which causes boredom and makes the learning process uninteresting. The approach used is very monotonous, consisting of lecturing, question-and-answer sessions, and solving problems. The lack of interaction in the learning process does not adequately encourage students to think critically, discuss, explore, and

collaborate, which hinders their understanding and development of mathematical thinking skills.

Based on observations conducted by the teacher-researcher in Grade III at SDN 048 Pollung during the second-semester formative assessment on mathematics material concerning units of length, student learning outcomes were very low, with an average score of 59 and classical mastery of 35%. Based on interviews conducted by the teacher-researcher, most students considered mathematics a difficult and boring subject. The mathematics learning process was insufficiently contextual and did not use media to make abstract understanding more concrete, particularly regarding the concept of units of length. Students were confused and did not yet understand how to calculate conversions between units of length. In addition, students experienced anxiety and lacked confidence when facing mathematics assignments and formative tests (Lestari et al., 2023). The use of appropriate and efficient learning models can broaden the understanding of students experiencing difficulties, while appropriate learning media can serve as a tool for providing more accurate information (Muhsetyo et al., 2021).

To address the problems in learning mathematics, particularly the material on units of length, the teacher-researcher applied the Contextual Teaching and Learning (CTL) model, assisted by concrete media. The teacher-researcher chose CTL because the contextual teaching and learning model makes learning more active, meaningful, and enjoyable, thereby motivating students to think more critically. The benefits of CTL in the learning process include: (1) CTL actively involves students in seeking knowledge based on their own experiences; (2) the CTL learning model is oriented toward real-world contexts so that learning becomes more meaningful when applied to everyday life; (3) it encourages students to become more motivated and pursue achievement; and (4) it develops critical thinking and students' abilities in knowledge, attitudes, and skills (Tari & Rosana, in Sugiharti, 2020).

Learning media, particularly concrete media, refers to any tool used in the learning process to convey messages and stimulate students' interest in learning in a concrete manner to achieve learning objectives. Learning media are components of learning resources that contain instructional elements, so their effectiveness can have a significant positive influence (Rahmawati et al., 2025:7). Concrete media that are effective for understanding the measurement of units of length include a standard units-of-length ladder, rulers, measuring tapes, and tape measures. These are intended to facilitate

understanding of the concept of units of length; during mathematics learning, students become actively involved, making learning more engaging, meaningful, and enjoyable. With these concrete teaching aids, students can measure more easily in a contextual manner because they are related to everyday activities (Alfiah et al., 2018).

The principles for selecting concrete media in learning are as follows: (a) effectiveness and efficiency, meaning that the media are easy, inexpensive, and accessible in terms of both use and results; (b) supporting students' level of thinking by providing visual experiences to motivate learning, clarify, and simplify complex concepts. (c) The principle of interactivity, which encourages interaction and can increase students' learning motivation; (d) providing convenience and skills so that learning can proceed effectively and efficiently; (e) availability of time allocation that is appropriately relevant to the learning material; and (e) flexibility of use (Miftah, in Rahmawati et al., 2025:7).

The teacher-researcher believes that applying the CTL learning model assisted by concrete media can engage students' brain functions and develop creative thinking skills to find alternative solutions to problems, in line with previous research. Harnis (2012) stated in his research that the CTL approach emphasises students' full involvement in discovering the material being learned by connecting it with real-life situations, thereby making it easier for students to understand concepts and resulting in improved learning outcomes. Lestari et al. (2023) likewise found that with CTL, students are brought closer to the real world, so abstract concepts become more concrete, and students can complete measurements accurately.

According to Lestari (in Sugiharti, 2020:15), the stages carried out in the contextual teaching and learning model include grouping, modelling, questioning, learning community, inquiry, constructivism, authentic assessment, and reflection. When combined with the use of concrete media, these stages provide opportunities for students to become actively involved in learning activities. Students can reason about patterns and properties, manipulate objects, generalise, construct evidence, and explain ideas through mathematical statements.

Based on the explanation above, the teacher-researcher formulated the research problem as follows: "How can mathematics learning outcomes on units of length be improved through the application of the Contextual Teaching and Learning (CTL) model assisted by concrete media in Grade III elementary school?" The purpose of this study was to improve mathematics learning outcomes on units of length through the application of Contextual

Teaching and Learning using concrete media in Grade III elementary school. The teacher-researcher conduct a study entitled the learning study entitled “Efforts to Improve Learning Outcomes on Units of Length Through Contextual Teaching and Learning (CTL) Assisted by Concrete Media for Grade III Elementary School Students”.

Method

The study was conducted in Grade III at SD Negeri 048 Pollung using Classroom Action Research (CAR). The subjects were 14 Grade III elementary school students, consisting of 8 boys and 6 girls. The characteristic examined was students' understanding of units of length through the Contextual Teaching and Learning (CTL) approach assisted by concrete media during classroom learning activities. The study followed the stages of planning, action, observation, and reflection, repeated over two cycles, with the assistance of a peer as an observer in accordance with the research model of IGAK Wardani (2021).

Data collection techniques included observation, learning outcome tests, and documentation. Observations were conducted by the teacher-researcher and the observer using an observation sheet. Learning outcome tests were administered at the end of the learning process in each cycle. Documentation was carried out using notes, photographs, revised lesson plans, and grade lists as authentic evidence. To determine individual student achievement, the following formula was used: $\text{Student score} = \frac{\text{Score obtained}}{\text{Maximum score}} \times 100\%$.

To determine the percentage of students achieving classical mastery, the following formula was used: $\text{Percentage of classical student mastery} = \frac{X}{N} \times 100\%$.

Explanation:

X = number of students who achieved mastery; N = total number of students

The application of the problem-solving method was considered successful if student learning activities and learning outcomes during the study met the following success indicators:

1. Student Learning Activities
 - (1) Students' attention during lessons increases
 - (2) Students' involvement in the classroom learning process
 - (3) Students' cooperation during group work increases

(4) Students' confidence in presenting their work increases

2. Student Learning Outcomes

(1) The class average score is ≥ 75 , in accordance with the Minimum Mastery Criterion (KKM) set by the school.

(2) The minimum percentage of classical mastery is 85% of students achieving a score of ≥ 75 .

Results

Before implementing the improvement action, the teacher-researcher conducted pre-cycle learning to determine the extent to which students understood the concept of measuring units of length. The reflection results became the basis for implementing the action. The learning outcomes obtained were very low and did not reach the established KKM. The results are presented more clearly in the following table.

Table 1. Pre-Cycle Learning Outcomes

Score	Number of Students	Percentage	KKM Achievement
≥ 75	5	35.71%	Mastered
< 75	9	64.29%	Not Mastered
Total	14	100%	
Highest Score		80	
Lowest Score		55	
Average		59	

The table above shows that the average learning outcome score was 59, with 5 students (35.71%) achieving mastery. The highest student score was 80 and the lowest was 55. Based on the reflection, the teacher-researcher carried out an improvement in Cycle I by applying the CTL model assisted by concrete media.

Cycle I Learning Outcomes

Based on the implementation of the learning improvement conducted by the teacher-researcher, several findings from the observations became the basis for improving learning in Cycle I. The teacher-researcher designed a revised lesson plan using CTL steps and concrete media to facilitate students' understanding of the concept of measuring units of length. The established KKM stated that students were considered to have achieved mastery if they reached a score of ≥ 75 . Likewise, classical mastery was

considered achieved when the total number of students achieving mastery reached $\leq 85\%$. In Cycle I, the average score became 70 and 71.42% of students achieved mastery, as shown in Table 2 below.

Table 2. Cycle I Learning Outcomes

Score	Number of Students	Percentage	KKM Achievement
≥ 75	10	71.42%	Mastered
< 75	4	28.57%	Not Mastered
Total	14	100%	
Highest Score		90	
Lowest Score		70	
Average		70	

In the Cycle I learning improvement through the application of CTL assisted by concrete media, the average score increased to 70, and the number of students achieving mastery increased from 5 students (35.71%) in the pre-cycle to 10 students (71.42%). The highest score was 90 and the lowest was 70. However, in the Cycle I improvement, 4 students (28.57%) had still not achieved mastery. Based on observations by the peer observer, about 4 students were still unfocused and not actively involved in the learning process, and therefore had not achieved mastery. The approximately 28.57% of students who had not achieved mastery had a significant effect on classical mastery in the Cycle II learning improvement. Therefore, further learning improvement was needed and continued in Cycle II.

Cycle II Learning Outcomes

In Cycle II, almost all students were active and participated in the learning process, so both the class average score and classical mastery were achieved. The Cycle II learning outcomes are presented in Table 3 below.

Table 3. Cycle II Learning Outcomes

Score	Number of Students	Percentage	KKM Achievement
≥ 75	13	92.85%	Mastered
< 75	1	7.15%	Not Mastered
Total	14	100%	
Highest Score		100	
Lowest Score		75	
Average		82	

Based on the Cycle II learning improvement data implemented through the Contextual Teaching and Learning (CTL) model using concrete media, mathematics learning outcomes on units of length improved significantly in terms of scores and mastery. The score increased from 70 in Cycle I to 82, while classical mastery increased from 10 students (71.42%) to 13 students (92.85%) in Cycle II. The highest score was 100 and the lowest was 75. Thus, the study was considered successfully implemented.

Analysis of Learning Outcome Improvement

Based on the analysis of the pre-cycle, Cycle I, and Cycle II results, the learning improvement before and after using the CTL model assisted by concrete media is presented in the figure below.

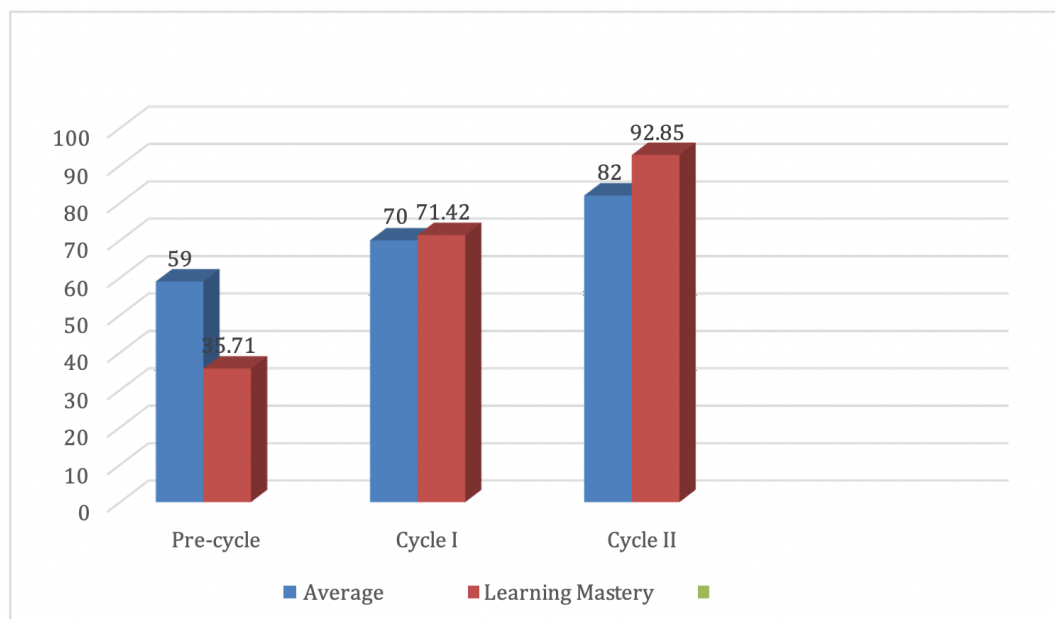


Figure 1. Improvement in Average Scores by Cycle

Based on the figure showing the improvement in learning outcomes in each cycle, it can be concluded that the application of the Contextual Teaching and Learning (CTL) model in Grade III at SD Negeri 048 Pollung resulted in improvement in every learning cycle. Before the intervention, only 5 of 14 students (35.71%) achieved mastery, and the score obtained was also very low at 59.00. After the Cycle I intervention, it became 72.42%, an increase of approximately 36.71%. Likewise, the class average score became 70, an increase of approximately 11 points. Because approximately 28.75% of students were still found to be unfocused during the learning process, the study continued to Cycle II, where there was a very significant improvement: the percentage of students achieving mastery became 92.85%, an increase of 21.43%, and the class average score became 82.00, an increase of approximately 12 points. Thus, the learning improvement activity, and therefore the mathematics learning study on units of length, was declared successful and discontinued after Cycle II.

Discussion

After the learning improvement study ended and was declared successful, several stages had been completed in achieving success in the mathematics learning improvement study on units of length, which was conducted over two cycles. In each cycle, strengths and weaknesses were identified. For example, in Cycle I, some students were still unfocused because learning models such as CTL and the use of media were unfamiliar to the students, so some did not participate in the learning process and appeared stiff and passive (Pratiwi & Oktavia, 2024). The classroom situation was less conducive, and the allocated time could not be used effectively. Therefore, the teacher had to motivate students to remain calm during the learning process. The average score in Cycle I was 70, while the KKM was ≤ 75 and classical mastery was still 71.42%, whereas classical mastery was stated to be achieved at $\leq 85\%$. Thus, Cycle II needed to be continued to achieve the KKM and classical mastery, as in the research by Apriliyani, Sessu, and Miatun (2023).

Nevertheless, the advantage of the Cycle I learning improvement was that it was substantially better than the initial learning, which had been conducted conventionally without an appropriate learning model or media. The improvement action using the CTL learning model created a more enjoyable learning atmosphere; students became more aware of their environment because it was connected to their everyday lives; they became more confident in expressing what they experienced and saw in real life; and students

became better prepared to solve problems (Sugiharti, 2020:14). The use of concrete media also played an important role in achieving learning objectives, as concrete media provided the information students needed to solve problems, such as rulers, measuring tapes, and standard units-of-length ladders, which could make abstract explanations more concrete (Rahmawati et al., 2025:7).

In the Cycle II learning improvement, the teacher-researcher was better able to manage and organize the class. Grade III students were more motivated because they gained direct and more enjoyable experiences. Students were able to follow the steps of CTL well and systematically, as stated by Hariani, Helsa, and Ahmad (2020:5). CTL actively involves students in seeking knowledge based on their own experiences, is oriented toward real-world contexts so that learning becomes more meaningful, motivates students to pursue achievement, and develops critical thinking. The students' learning outcomes in Cycle II showed a very significant improvement: the percentage of students achieving mastery became 92.85%, an increase of 21.43%, while the class average score became 82.00, an increase of approximately 12 points. Thus, the learning improvement activity, and therefore the mathematics learning study on units of length, was declared successful and discontinued after Cycle II. According to Purwanto (in Limbong, 2022:11), CTL can also help teachers connect learning materials with real-world situations; students gain direct and real experiences and are able to appreciate the realities of learning that they have experienced in everyday life.

Based on the data presented, the teacher-researcher concluded that learning in Cycle II was successful, as demonstrated by achieving a KKM score of 82 and classical mastery of 92.85%. Therefore, the success of the mathematics learning improvement study on units of length through the application of the Contextual Teaching and Learning (CTL) model using concrete media in mathematics learning on units of length in Grade II at SD Negeri 048 Pollung was declared successful, with the learning objectives achieved well.

Conclusion

Based on the Classroom Action Research conducted in Grade III at SD Negeri 048 Pollung through the application of the Contextual Teaching and Learning (CTL) model assisted by concrete media, student learning outcomes can be improved. This improvement is demonstrated by the learning outcome data for each cycle: in the pre-cycle learning, only 5 of 14 students (35.71%) achieved mastery, and the score obtained was very low at 59.00.

After the intervention using the CTL model assisted by concrete media in Cycle I, learning mastery increased to 72.42%, an increase of approximately 36.71%. The class average score became 70, an increase of approximately 11 points. In Cycle I, approximately 4 students (28.75%) had not achieved mastery; however, after continuing the improvement to Cycle II, there was a very significant increase, with the percentage of students achieving mastery becoming 92.85%, an increase of 21.43%, and the class average score becoming 82.00, an increase of approximately 12 points. The application of the Contextual Teaching and Learning (CTL) model assisted by concrete media became the answer and conclusion to the research question.

Recommendations

The researcher, who also works as a teacher, provides several recommendations: (1) The application of the contextual teaching and learning (CTL) approach assisted by concrete media can be an alternative learning model for attracting students' interest and increasing their learning motivation; (2) Concrete media play a very important role in providing information so that abstract concepts can be understood more concretely; (3) The CTL learning model can be used to improve the quality of learning; (4) Future researchers are expected to use this study as one reference for similar research; (5) it can be used as a reference for future research.

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