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INTEGRATION OF CONTEXTUAL TEACHING AND LEARNING MODELS IN MATHEMATICS LEARNING IN GRADE 2 PRIMARY SCHOOL

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ABSTRACT

This study aims to describe in depth how the Contextual Teaching and Learning (CTL) model is integrated into mathematics instruction for second-grade elementary students. Using a descriptive qualitative approach, the research was conducted at Daarul Qur'an International School Jakarta. The primary informant was the second-grade classroom teacher, supported by three second-grade students to obtain a more comprehensive understanding of the learning process. Data were collected through classroom observations, in-depth interviews, and document analysis, including lesson plans, student worksheets, and students' work. Data validity was ensured through source and technique triangulation, while the data analysis process consisted of systematic stages of data reduction, data display, and conclusion drawing. The findings show that CTL integration is reflected in several instructional practices: connecting mathematical concepts to real-life contexts, using concrete teaching aids, providing exploratory and hands-on learning activities, strengthening collaboration through group discussions, and implementing reflection sessions that help students reassess their understanding. These practices support the development of students' conceptual comprehension and foster active participation, curiosity, and mathematical communication skills. The results also indicate that contextual learning environments encourage students to construct meaning based on their experiences, making mathematical ideas more meaningful and easier to internalize. In conclusion, the study emphasizes that CTL implementation contributes positively to students' understanding and engagement in mathematics learning. It further recommends that teachers design more varied and contextual learning activities and continuously develop their competencies in applying CTL strategies effectively and sustainably.

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1. INTRODUCTION

Mathematics education at primary school level plays a fundamental role in forming the basis of students' logical, analytical and systematic thinking skills from an early age (Widyaswarani et al., 2024). However, the reality of mathematics learning in Indonesia shows that the learning process that takes place in the classroom is still dominated by a lecture-based approach, one-way explanations, and routine exercises. The dominance of mechanistic methods that focus on procedures and memorisation results in students' understanding of mathematical concepts being superficial and meaningless. This condition is particularly experienced by lower grade students, such as Year 2 primary school students who are still in the concrete operational stage of cognitive development. They need learning that is close to real-life experiences, exploratory in nature, and involves the use of concrete objects in order to understand mathematical concepts more deeply. Empirical phenomena in various primary schools show that students are able to solve problems in contexts similar to those in exercises, but have difficulty when asked to apply these concepts to new, more contextual situations (Ramadhani et al., n.d.). This illustrates a serious scientific problem related to low conceptual understanding, problem-solving skills, and active student engagement in mathematics learning.

This phenomenon has created a gap between the curriculum requirements, which call for active and meaningful learning, and teaching practices that are still teacher-centred (SB, 2024). Both the Merdeka Curriculum and the 2013 Curriculum emphasise the importance of learning that fosters reasoning, problem solving, and mathematical connections (Dahroni et al., 2025). However, in practice, many teachers still teach using conventional methods, without linking the material to everyday experiences. This is reinforced by various research reports which found that teachers tend to rely on drill and memorisation methods because they are considered easier to implement and in line with the pressure to achieve good results. On the other hand, contextual and exploratory learning is considered to require more complex preparation, more time, and more varied teaching skills. The gap between curriculum demands and actual practice creates a void that needs to be filled with learning approaches that are more relevant to student characteristics (Praekanata et al., 2024).

Theoretically, there is also a gap between constructivist learning theory, which places students as builders of knowledge, and learning practices that still place students as passive recipients of information (Basri & others, 2025). The Contextual Teaching and Learning (CTL) approach has theoretically offered a learning framework that connects academic concepts with students' real-life experiences so that knowledge becomes more meaningful. (Dulyapit & Nurmala, 2025). CTL principles such as relating, experiencing, applying, cooperating, and transferring require teachers to provide learning experiences that facilitate exploration, interaction, problem solving, and reflection. Several learning development theories, including Piaget's constructivism theory, Dewey's experience theory, and Ausubel's meaningful learning theory, emphasise that students build understanding through active interaction with their concrete and social environments. However, the implementation of these theoretical principles often does not occur optimally in lower primary school classes due to limitations in teachers' pedagogical knowledge, the availability of learning media, and learning designs that are not yet truly contextual. (Andarwati et al., 2023). This is where the gap theory arises: there is a strong theory supporting contextual learning, but its implementation has not been consistently applied in mathematics learning in lower grades.

In addition, there is a research gap that needs to be addressed. Although there is considerable research on the effectiveness of CTL, most studies have been conducted on upper elementary or junior high school students and generally use quantitative methods that only measure learning outcomes without describing the learning process or experience of students (Manurung, 2024). Previous studies have focused more on improving scores

rather than on how CTL is integrated into everyday mathematics learning, how teachers facilitate contextual experiences, or how students respond to concrete and exploratory activities in the context of Year 2 primary school. Several studies mention that CTL can improve mathematical communication skills and increase motivation and conceptual understanding, but only a few reveal the implementation process in detail at the lower grade level. In fact, research on CTL integration using a qualitative approach with analysis of lesson plans, student worksheets, student work, direct observation, and in-depth interviews is still very limited, especially in the context of Islamic elementary schools or international schools (Nadhiroh et al., 2025). Thus, this study occupies an important place in strengthening the literature on the comprehensive application of CTL in Year 2 primary school classrooms.

The novelty of this study lies in its focus on lower classes, its exploratory-qualitative nature, and its emphasis on the concrete integration of CTL in mathematics learning. Rather than merely measuring learning outcomes, this study describes teachers' strategies in relating material to real-life contexts, the use of concrete teaching aids, the implementation of group work, the provision of exploratory activities, and the use of reflection as a closing activity. In addition, this study explores students' direct experiences of how they understand concepts when using concrete objects, how they interact in groups, how their interest and curiosity develop, and how they communicate mathematical ideas in simple terms. This approach has not been widely used in previous studies, so this study has a novel contribution both theoretically and practically.

The purpose of this study is to describe in depth the integration of the CTL model in mathematics learning in Grade II of elementary school and to identify its influence on mathematical concept understanding, student active involvement, and mathematical communication skills (NURHAYATI, 2024). This study also aims to reveal the experiences of teachers and students in implementing contextual learning, including the challenges that arise and the pedagogical solutions implemented during the learning process (Fahrieyah & others, 2024). Through a comprehensive analysis of learning documents such as lesson plans, student worksheets, and student work, this study attempts to show how CTL-based learning can be realised in practice in Grade II primary school classrooms, where students are still at the concrete operational stage.

Based on this description, this introduction concludes that the integration of CTL in Grade II primary school mathematics learning is an urgent need to address various problems in mathematics learning that are mechanistic, meaningless, and non-contextual in nature (Setiyawan et al., 2024). The gap between theory and practice, as well as the scarcity of in-depth qualitative research on lower classes, indicates the need for research that focuses more on the learning process, not just learning outcomes (Meilina, 2025). The urgency of this research is even greater given the need for learning that fosters active engagement, curiosity, exploratory skills, and a strong understanding of concepts from an early age. (Harahap, 2024). This study is expected to contribute to enriching academic literature, strengthening contextual mathematics learning practices in primary schools, and providing recommendations that teachers can apply to improve the quality of mathematics learning.

2. RESEARCH METHOD

This study utilised a qualitative approach with a descriptive research design, which aimed to describe in depth the process of integrating the Contextual Teaching and Learning (CTL) model into mathematics learning in Year 2 of primary school. The qualitative approach was chosen because it allowed researchers to understand the learning phenomenon naturally, explore the perspectives of teachers and students, and analyse the processes and

meanings that emerged during learning activities. This approach is in line with the nature of research that emphasises interpretation and the authentic experiences of participants.

The research was conducted at Daarul Qur'an International Elementary School in Jakarta, which has an Islamic-based learning environment and uses modern learning methods. The research setting was chosen purposefully to obtain a comprehensive picture of the implementation of CTL in lower grades (Pepilina et al., 2025). The research informants consisted of Year 2 teachers as the main informants, as well as three Year 2 students as supporting informants who were selected based on teacher recommendations, taking into account their communication skills and involvement in learning (Bantani et al., 2025). Informants were selected using purposive sampling, a technique commonly used in qualitative research because it allows researchers to select participants who are most relevant to the research objectives.

The research lasted for one month and included classroom observation, in-depth interviews, and the collection of documents such as lesson plans, student worksheets, and student work. Observations were conducted directly to record learning activities and teacher-student interactions in implementing CTL. Interviews were semi-structured, allowing researchers to explore information more flexibly and deeply about the experiences of teachers and students. Meanwhile, documentation was used to analyse the planning and results of learning implementation. Data validation was carried out using source triangulation and technique triangulation to ensure the credibility and validity of the findings. Triangulation is considered effective in strengthening data reliability because it involves various complementary data collection sources and techniques.

Data analysis followed the model of Miles, Huberman, and Saldaña (2014), which includes three main stages: data reduction, data presentation, and conclusion drawing. Data reduction was carried out to select important information relevant to the research focus, data presentation was compiled in the form of narratives and tables of findings, while conclusions were made through a continuous verification process until strong and consistent patterns of findings were obtained.

3. RESULTS AND DISCUSSION

The results of research on the integration of the Contextual Teaching and Learning (CTL) model in mathematics learning in Grade II at Daarul Qur'an International Elementary School in Jakarta show that the application of CTL components is consistent and has a positive impact on students' understanding of mathematical concepts and learning engagement (Purwanti et al., 2020). Based on the results of observations conducted during three meetings, it was found that teachers integrated CTL by linking the material to real-life experiences, using concrete teaching aids, providing exploratory activities, group discussion activities, and learning reflections. At the beginning of the lesson, teachers always started by linking the mathematics material to the students' daily experiences, for example by asking them to observe the length of tables, books, pencils, or other objects in the classroom before taking measurements (Varadila et al., 2023). This approach supports Berns and Erickson's idea that effective CTL occurs when subject matter is linked to contexts that are familiar to students' lives. In addition, teachers routinely use concrete teaching aids such as rulers, flat blocks, ice cream sticks, number cards, and pieces of paper for exploratory activities. Students appear enthusiastic when they take direct measurements or construct flat shapes from these materials. Concrete experiences such as these are in line with the cognitive development stage of primary school students, who are still in the concrete operational phase according to Piaget, so that their understanding is more easily formed through direct activities than abstract explanations (Marinda, 2020).

The observations also showed that teachers encouraged students to apply mathematical concepts in real-life situations, such as when solving word problems involving determining the additional length of string needed for classroom decorations or measuring the height of drinking bottles. This demonstrates the implementation of the applying component, namely the application of knowledge in real life. This is in line with Anderson and Krathwohl, who emphasise that meaningful learning occurs when students not only remember concepts but are also able to apply them in authentic contexts.

Picture 1. Interaction between students within groups

Interaction between students within groups was also observed during the learning process. Teachers organised students into small groups to work together to complete tasks such as measuring several objects or arranging pieces of shapes into specific flat figures. Group activities encourage discussion, idea sharing, and mutual assistance, thereby realising the learning community component of CTL. These findings reinforce Vygotsky's (1978) theory that social interaction is an important factor in the formation of students' conceptual understanding. At the end of the lesson, teachers ask students to reflect on their learning process by writing conclusions in their reflection journals or verbally expressing what they have learned that day. Students wrote down their experiences, such as ‘I learned how to use a ruler’ or ‘Flat shapes can be constructed from other shapes.’ This reflection activity is an integral part of CTL learning because it provides an opportunity for students to realise their progress in understanding. Through reflection, students indirectly assess their level of understanding and identify things that are still confusing. A consistent reflection process shows that teachers have fully implemented the CTL components.

Interview data with teachers and students reinforce the observations. Teachers stated that CTL was integrated because traditional lecture methods were ineffective for Year 2 students, who needed concrete experiences and real activities. Teachers said that ‘children will understand more quickly if they can hold, see, and practise directly.’ This is in line with constructivist learning theory, which states that knowledge must be constructed through interaction with the environment, not just given verbally. In addition, teachers said that CTL helps increase student motivation because learning activities become more interesting and less monotonous.

Student responses also showed similar results. The students interviewed said they liked measuring objects and working in groups. They felt happy because they could learn while playing and doing real activities, not just doing problems in books. One student said that he found it easier to understand mathematics when he could see and touch the objects being studied directly. This statement is supported by Baroody's research, which states that the use of concrete manipulatives in mathematics learning can increase students' concentration, motivation, and understanding of concepts.

Analysis of the overall data shows that CTL integration has a significant impact on improving students' understanding of mathematical concepts (Mudrikah et al., 2025). Through direct experience, students can understand the concept of length measurement, distinguish between types of flat shapes, and apply simple arithmetic operations in real-world contexts more easily. The results of this study are in line with Nurhadi's findings, which show that CTL can improve mathematical thinking skills and conceptual understanding in primary school students. In addition to improving conceptual understanding, CTL also increases students' active involvement in learning. Students appear to be more responsive, ask questions more often, and are more active in group discussions. CTL has also been shown to improve students' mathematical communication skills, as they are asked to explain their measurement results, express their opinions in groups, and write conclusions in their reflection journals. (Hasmir, 2023).

However, this study also found several challenges in implementing CTL. One of the main obstacles is the imbalance of participation within groups. In some groups, more dominant students tend to dominate activities, while shy or less confident students participate less. This shows the need for teachers to develop strategies to facilitate an equal distribution of roles during group work. In addition, CTL learning requires more time because exploratory activities take longer than traditional methods. Teachers must manage time effectively so that all components of learning can be carried out properly (Husnullail et al., 2024). Another challenge is the need for a variety of teaching aids and activities to prevent students from becoming bored. It was also found that the success of CTL greatly depends on the creativity of teachers in designing interesting and relevant learning activities.

Overall, the results of this study indicate that the integration of the CTL model in Grade II primary school mathematics learning can improve students' conceptual understanding, learning motivation, active engagement, and mathematical communication skills. Although there are still some challenges, the benefits far outweigh them. This study confirms that CTL is a relevant, effective approach that is in line with the cognitive development characteristics of primary school students (Putri et al., 2025). Therefore, the implementation of CTL needs to be continuously improved, both through teacher training and more varied and creative lesson planning (Utama et al., n.d.).

4. CONCLUSION

Based on the results of research on the integration of the Contextual Teaching and Learning (CTL) model in mathematics learning in Grade II elementary school, it can be concluded that the application of CTL is able to create a more meaningful, contextual learning process that is in line with the cognitive development characteristics of lower grade students. CTL is effectively integrated by linking the material to students' daily experiences, utilising concrete teaching aids, providing exploratory activities, strengthening cooperation in small groups, and conducting reflections at the end of the learning process. The integration of these components can improve students' understanding of mathematical concepts, encourage active engagement, foster curiosity, and strengthen

mathematical communication skills. The results of this study confirm that CTL is an appropriate approach to apply to mathematics learning in early grades because it helps students build understanding based on their real experiences.

The recommendations of this study emphasise the importance of developing more varied and context-rich lesson plans so that teachers can maximise the potential of CTL in mathematics learning. Teachers need to receive ongoing training on CTL implementation strategies, the use of concrete media, and group work management to ensure more equitable student participation. In addition, schools are advised to provide adequate learning resources, such as mathematical manipulatives and reflection tools, to support successful implementation.

The implications of this study show that CTL can be an effective alternative learning approach to improve the quality of mathematics learning in lower grades. At the practical level, the research results provide an implementation model that can be used as a reference for teachers to create more active and meaningful learning. At the theoretical level, this study enriches the study of CTL implementation in primary school mathematics. For further research, it is recommended to explore more deeply the influence of CTL on students' critical thinking, problem-solving, and mathematical literacy skills.

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