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Improving Third-Grade Students' Cognitive Mathematics Learning Outcomes through Contextual Teaching and Learning at SDIT Al-Akhyar Cadika

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Abstract:
Mathematics learning in Grade III of SDIT Al-Akhyar Cadika, Bungo Regency, is still marked by students' difficulty in understanding concepts, suboptimal engagement, and weak links between the material and real life, so cognitive learning outcomes have not met expectations. This study aimed to describe the planning and implementation of the *Contextual Teaching and Learning* (CTL) approach, analyze students' learning activity, and measure the improvement in their cognitive mathematics learning outcomes. Classroom action research based on the Kemmis and McTaggart model was conducted in two cycles, each comprising planning, action, observation, and reflection. The subjects were 21 third-grade students, with the classroom teacher as a collaborator. Data were collected through observation, tests, interviews, and documentation, and were analyzed qualitatively using the Miles and Huberman model and quantitatively using descriptive statistics. The teacher's implementation of learning increased from 70% in the pre-cycle to 80% in Cycle I and 90% in Cycle II, a gain of 20 percentage points. Over the same stages, students' learning activity rose from 74.47% to 75.71% and 81.90%, a gain of 7.43 percentage points, while classical mastery, the percentage of students achieving the learning objective achievement criteria, increased from 57.14% (12 of 21 students) to 76.19% (16 students) and 90.48% (19 students), a gain of 33.34 percentage points. In conclusion, a CTL approach designed around students' everyday contexts and refined through collaborative reflection effectively improved both the learning process and the cognitive mathematics learning outcomes of third-grade students.

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Introduction (مقدمة)

Primary education plays a strategic role in building students' foundations of knowledge, reasoning, and readiness to deal with problems in life. At this level, mathematics is not merely positioned as a subject of arithmetic but as a vehicle for developing conceptual understanding, procedural fluency, reasoning, problem solving, communication, and mathematical connections. This orientation is in line with the current national learning outcomes (*capaian pembelajaran*) for mathematics, which aim to develop mathematical understanding and procedural skills, reasoning and proof, problem solving, communication and representation, mathematical connections, and mathematical disposition (Badan Standar, Kurikulum, dan Asesmen Pendidikan, 2025). Grade III is an important stage because, in Phase B, students begin to broaden their mastery of number concepts, including number sense for whole numbers up to 10,000 and place value, as well as arithmetic operations, measurement, and simple representations (Badan Standar, Kurikulum, dan Asesmen Pendidikan, 2025). Strengthening these foundations from the early grades is urgent because the mathematics performance of Indonesian students remains low; in PISA 2025, the mean mathematics score of Indonesian 15-year-olds was 364 points, well below the OECD average of 463 points (OECD, 2026). However, the abstract nature of mathematics often creates obstacles, particularly for students who are still at the concrete operational stage (Piaget & Inhelder, 1969), when the material is presented as formulas and exercises detached from their experience. Learning therefore needs to be designed so that formal concepts grow out of situations that are close to the children's environment. Accordingly, improving cognitive mathematics learning outcomes requires strategies that are meaningful, active, and appropriate to students' developmental characteristics.

Cognitive learning outcomes reflect students' mastery of knowledge and thinking processes after participating in learning. In mathematics, these outcomes appear in the ability to recall facts, understand concepts, apply procedures, analyze relationships, and solve problems logically (Anderson & Krathwohl, 2001). However, preliminary research documents at SDIT Al-Akhyar Cadika, Rimbo Tengah District, Bungo Regency, indicated that mathematics learning still faced difficulties in conceptual understanding, suboptimal learning engagement, and a tendency not to relate the material to real-life contexts. Similar conditions have recently been reported for the topic of money value equivalence in Grade III, where students' low understanding was associated with teacher-centered instruction and worksheets that contained only routine exercises without real-life contexts (Merita et al., 2026). Such conditions may turn students into mere recipients of information rather than builders of knowledge. When mathematical examples and problems do not start from experiences that children recognize, the meaning of concepts is difficult to form, and problem solving easily becomes a mechanical activity. Therefore, teachers need to shift learning from the transmission of formulas toward learning experiences that allow students to observe, ask questions, try things out, discuss, and reflect on how they arrive at answers. This shift is relevant for improving both the quality of the learning process and cognitive mathematics learning outcomes.

Contextual Teaching and Learning (CTL) offers a learning framework that connects academic content with students' personal, social, and everyday contexts (Johnson, 2002). This approach positions students as active subjects who construct understanding through seven components, namely constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment. In Grade III mathematics, arithmetic operations can be explored through shopping situations, sharing objects, measuring school supplies, or grouping objects in the classroom. Such contexts are not mere decorations for problems but starting points for discovering concepts, testing strategies, and explaining mathematical reasoning. The teacher's role is to prepare contextual problems, facilitate interaction, provide examples as needed, and use

evidence of learning processes and outcomes as a basis for improvement. Thus, CTL has the potential to narrow the gap between mathematical abstraction and students' concrete experience, while also fitting the needs of elementary school learning, which emphasizes direct involvement and peer communication. The approach also creates room for strengthening meaning before students master formal symbols.

The theory of constructivism serves as the theoretical foundation of this study because it explains the learning mechanism underlying the CTL approach. This theory views knowledge not as information transferred intact from teacher to student but as the result of active construction through interaction with objects and the environment (Piaget & Inhelder, 1969) as well as through social interaction (Vygotsky, 1978). In Grade III mathematics learning, students need to connect prior knowledge with real problems, manipulate concrete objects, express strategies, and revise their understanding through discussion and reflection. The theory is put into practice through the seven components of CTL, namely constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment (Johnson, 2002; Sanjaya, 2006), which are applied within the cycles of classroom action research. Accordingly, improvement in cognitive mathematics learning outcomes is understood as a consequence of students' active involvement in constructing, applying, and evaluating the meaning of mathematical concepts in everyday contexts. This foundation consistently links the title, objectives, method, and action design of the study.

Empirical studies show a positive trend in the application of CTL in elementary school mathematics. Sunandar (2009) reported that mathematics learning outcomes on fractions in a class taught with CTL were in the good category and higher than those in a class taught with textual learning. In Grade III, Yulianti et al. (2023) recorded an increase in classical mastery from 28.12% to 84.38% and in student activity from 65.17% to 85.43% through classroom action research. Babys (2025) found an increase in the mean score from 32.5 in the pretest to 88.75 in Cycle II, with 100% mastery on length measurement, while Pade et al. (2026) reported an increase in mastery from 15% to 89% on multiplication. In Grade IV, Fathurrahman (2024) likewise reported parallel increases in teacher activity, student activity, and learning outcomes across two action cycles. These findings reinforce the argument that meaningful contexts and students' active participation are important elements of elementary school mathematics learning. Similar positive effects have also been reported for CTL assisted by concrete media (Merteasih & Adnyana, 2026; Srisedani et al., 2026), play money (Silvia & Sutriyani, 2025), pop-up books (Desmi & Sutriyani, 2025), the school environment (Apriani, 2022), and open-ended problems (Novita Sari et al., 2020). A recent systematic review further confirms that CTL consistently improves elementary students' mathematics learning outcomes because it connects mathematics with daily life (Lisdiana et al., 2026). The contextual approach is even effective beyond mathematics, for example in early reading skills (Muna & Hendriawan, 2026). Nevertheless, the success of CTL cannot be generalized automatically, because subject matter, student characteristics, teacher competence, and the availability of media vary. Therefore, testing through planned action in a particular class remains necessary.

Despite this positive evidence, three research gaps remain. First, previous studies (Babys, 2025; Fathurrahman, 2024; Pade et al., 2026; Sunandar, 2009; Yulianti et al., 2023) differ in location, grade level, subject matter, design, media support, and outcome indicators, and they mainly report the magnitude of improvement from cycle to cycle. Less attention has been paid to how specific reflection decisions modify the implementation of the seven CTL components and how these modifications move together with students' learning activity and cognitive mastery. Second, recent work on money values in elementary school has focused on developing CTL-based worksheets and testing their validity and practicality (Merita et al., 2026) or on the effect of

CTL assisted by play money on conceptual understanding (Silvia & Sutriyani, 2025), so evidence on how classroom CTL actions improve cognitive learning outcomes on the value of thousand-rupiah denominations through successive cycles is still limited. Third, evidence from integrated Islamic elementary schools (SDIT), where mathematics learning is expected to be integrated with Islamic values (Fitrah & Kusnadi, 2022), remains scarce, including at SDIT Al-Akhyar Cadika. Without such evidence, teachers in similar schools have little guidance on how to adapt CTL to their students' characteristics and learning problems.

To address these gaps, this study offers three forms of novelty. Contextually, it applies CTL to the value of thousand-rupiah denominations through buying-and-selling situations that are familiar to third-grade students in an integrated Islamic elementary school, a setting that has rarely been examined in CTL research. Methodologically, it does not merely compare results across cycles but traces three connected indicators in each cycle, namely the teacher's implementation of the CTL components, students' learning activity, and classical mastery on the cognitive test, and links every change in action to a documented reflection decision. Practically, it produces a classroom improvement model with a traceable process, so that teachers can see how the quality of CTL implementation relates to changes in learning outcomes and can adapt the model to their own classes.

Based on the foregoing, this study aimed to improve cognitive mathematics learning outcomes through the *Contextual Teaching and Learning* approach among third-grade students of SDIT Al-Akhyar Cadika, Rimbo Tengah District, Bungo Regency. This objective was elaborated to obtain a picture of the process of implementing the action, changes in learning activity, and improvement in students' cognitive achievement in each cycle. The study was directed at answering three research questions: (1) how mathematics learning through the *Contextual Teaching and Learning* approach is planned and implemented for third-grade students of SDIT Al-Akhyar Cadika; (2) how students' activity develops while mathematics learning through the *Contextual Teaching and Learning* approach is implemented; and (3) how students' cognitive mathematics learning outcomes improve after the implementation of the *Contextual Teaching and Learning* approach. These three research questions emphasize the link between teacher actions, student engagement, and learning outcome indicators, so that the answers can serve as a basis for data-driven reflection to improve mathematics learning in a meaningful and sustainable way. In this way, the results of the study can be held accountable.

Method (منهج)

Research Design and Setting

This study employed Classroom Action Research (CAR) with a mixed approach that combined qualitative and quantitative data. The choice of design, which refers to the Kemmis and McTaggart model (Arikunto et al., 2015; Kemmis & McTaggart, 1988), was based on the research objective, namely to improve the mathematics learning process and enhance students' cognitive learning outcomes through the application of *Contextual Teaching and Learning* (CTL). The study was conducted in Grade III of SDIT Al-Akhyar Cadika, Rimbo Tengah District, Bungo Regency. The research subjects were the 21 enrolled third-grade students and the classroom teacher as a collaborator, while the research object was the process of implementing CTL and students' cognitive mathematics learning outcomes. The study was carried out collaboratively so that the actions matched the learning needs, student characteristics, and the school's curriculum sequence. Before the action, the researcher identified the problems through observation of initial lessons, a review of evaluation results, and discussions with the teacher. The results of this identification were used to prepare the action plan, learning materials, data collection

instruments, and success criteria that were measurable, consistent, and relevant to the research objectives and research questions.

Research Procedure

The action was carried out in two cycles, and each cycle followed four interrelated stages, namely planning, action, observation, and reflection. In the planning stage, the researcher and the teacher prepared the teaching module, student worksheets, contextual media or objects, test instruments, and observation sheets. The action stage applied CTL through activities of constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment. Mathematics material was presented through problems close to students' experiences and adjusted to the Grade III learning objective sequence. During the action, the collaborator systematically observed the teacher's implementation of learning and students' activities. In the reflection stage, the researcher and the teacher analyzed obstacles, student responses, observation results, and test results to formulate improvements for the next cycle. The cycles were stopped at Cycle II, after the implementation of learning reached the very good category and student learning mastery had increased consistently. Every improvement decision was recorded so that the research process could be traced clearly and consistently.

Data Collection and Analysis

Research data were collected through observation, tests, interviews, and documentation. Observation used structured sheets to record the teacher's implementation of the CTL components and students' learning activities. The test consisted of items developed from the Grade III mathematics learning indicators to measure the ability to remember, understand, and apply concepts, and it was administered at the end of each cycle. Semi-structured interviews with the teacher and several students were used to deepen the observation findings, particularly regarding obstacles and responses to the action. Documentation included teaching modules, attendance lists, student work, photographs of activities, and evaluation scores. Qualitative data were analyzed through data reduction, data display, conclusion drawing, and verification in each cycle (Miles & Huberman, 1994). Quantitative data were analyzed descriptively using the class mean score and the percentage of learning mastery, where the mastery percentage was calculated as the number of students who achieved mastery divided by the total number of students, multiplied by one hundred percent. The trustworthiness of the findings was strengthened through technique triangulation, reflective discussions with the collaborating teacher, and comparison of process data with cognitive test results.

Result (نتائج)

The results addressing the first research question show that the *Contextual Teaching and Learning* approach in Grade III mathematics was implemented through a pre-cycle stage as the baseline, followed by two action cycles, Cycle I and Cycle II. In Cycle I, the teacher applied constructivism, inquiry, questioning, learning community, modeling, reflection, and authentic assessment by relating the topic of the value of thousand-rupiah denominations to students' everyday situations. Based on the observation sheets, the teacher's implementation of learning reached 70% in the pre-cycle (fair category) and 80% in Cycle I (good category), as presented in Table 1. Reflection on the pre-cycle identified obstacles in the form of some students being less focused, less active in communicating, and needing more time to complete tasks, especially in the questioning and learning community stages. Improvements in Cycles I and II were made through the use of concrete money media, gradual prompting questions, the assignment of roles within groups, and assistance for students who experienced difficulties. The implementation of learning

in Cycle II increased to 90% (very good category), indicating that the CTL actions were carried out more systematically after collaborative reflection. These data form the basis of the discussion.

Table 1. Teacher's Learning Implementation in the Pre-Cycle, Cycle I, and Cycle II

Stage	Teacher's learning implementation (%)	Category
Pre-cycle	70%	Fair
Cycle I	80%	Good
Cycle II	90%	Very good
Increase	20 percentage points	

The results addressing the second research question describe changes in students' learning activity during the implementation of CTL. In Cycle I, some students were already involved in observing contextual problems, asking questions, using concrete objects, discussing, and presenting solution strategies. Based on reflection, the action in Cycle II was improved by assigning roles within groups, demonstrating the use of concrete money media, posing simpler prompting questions, and assisting students who needed help. After these improvements were applied, learning activity increased from 74.47% in the pre-cycle to 75.71% in Cycle I and 81.90% in Cycle II, as shown in Table 2. The increase was reflected in students' involvement in discovering concepts, discussing, explaining answers, and reflecting on learning. This description shows a clear and measurable change in the learning process from Cycle I to Cycle II.

Table 2. Students' Learning Activity in the Pre-Cycle, Cycle I, and Cycle II

Stage	Students' learning activity (%)	Change from previous stage (percentage points)
Pre-cycle	74.47	–
Cycle I	75.71	+1.24
Cycle II	81.90	+6.19

Note: The change in Cycle I is calculated from the pre-cycle, and the change in Cycle II is calculated from Cycle I.

The results addressing the third research question show changes in cognitive mathematics learning outcomes after the implementation of CTL in each cycle, as summarized in Table 3. Before the action, in the pre-cycle, students' classical mastery was 57.14% (12 of 21 students). After Cycle I, classical mastery increased to 76.19% (16 students). The reflection showed that students still needed reinforcement on the indicators of understanding and applying the concept of the value of thousand-rupiah denominations to solve problems related to daily life. Therefore, the Cycle II action focused on using contextual problems closer to students' experiences, modeling solution steps, and reflective practice. In Cycle II, classical mastery reached 90.48% (19 students). Thus, mathematics learning through the CTL approach produced a consistent improvement in cognitive learning outcomes from the baseline to the end of Cycle II. This summary forms the basis for drawing conclusions.

Table 3. Students' Classical Mastery in the Pre-Cycle, Cycle I, and Cycle II

Stage	Classical mastery (students achieving the KKTP)
Pre-cycle	57.14% (12 of 21)
Cycle I	76.19% (16 of 21)
Cycle II	90.48% (19 of 21)

Note: Classical mastery = (number of students achieving the KKTP ÷ total number of students) × 100%, with n = 21. KKTP (Kriteria Ketercapaian Tujuan Pembelajaran) = learning objective achievement criteria.

Discussion (مناقشة)

Planning and Implementation of Mathematics Learning through the CTL Approach

The answer to the first research question shows that the application of the CTL approach in Grade III mathematics took place through collaboratively developed planning and an implementation that was continuously improved in each cycle. Planning began with problem identification in the pre-cycle, which revealed that the teacher's implementation of learning had reached only 70% (fair category). Based on this finding, the researcher and the teacher prepared a teaching module, student worksheets, concrete money media, test instruments, and observation sheets grounded in the topic of the value of thousand-rupiah denominations. The money context was not chosen by chance, since buying and selling is a familiar experience for students both at school and at home. This choice is in line with (Johnson's, 2002) idea that contextual learning connects academic content with students' personal and social situations. Thus, the quality of planning became the first foundation for the success of the action, because all CTL components depend on the appropriateness of the chosen context.

In Cycle I, learning followed the seven CTL components in a sequential and interrelated manner, in accordance with the teaching module developed together with the teacher. The teacher opened the lesson with a contextual problem about buying and selling in students' daily lives and then invited them to relate the problem to their prior knowledge of money values. The inquiry stage was directed so that students discovered the values and equivalences of thousand-rupiah denominations by themselves, while the questioning and learning community stages were realized through small-group discussions. The teacher then modeled how to count and compare money values and closed the activity with reflection and authentic assessment of students' processes and work. The implementation of learning at this stage reached 80% (good category). This achievement indicates that the CTL framework had been applied in full, although the quality of several components, especially questioning and learning community, still needed strengthening so that all students could be engaged equally.

Collaborative reflection at the end of Cycle I revealed three main obstacles: some students were less focused, less active in communicating, and needed more time to complete tasks. These obstacles were most evident in the questioning and learning community stages, two components that require the courage to speak and the ability to work together. The researcher and the teacher then formulated improvements in the form of more intensive use of concrete money media, gradual prompting questions, clear role assignments within groups, and special assistance for students who experienced difficulties. These improvements show the function of reflection as a data-based decision-making mechanism rather than merely the closing of a cycle. This logic is consistent with the (Kemmis and McTaggart, 1988) model, which positions reflection as a bridge between observation and re-planning. Consequently, every change of action in Cycle II had an empirical basis that could be traced and accounted for by both the researcher and the collaborating teacher.

The implementation of Cycle II showed an increase in learning implementation to 90% (very good category). This figure marks an increase of ten points from Cycle I and twenty points from the pre-cycle. The increase occurred because the teacher no longer merely followed the sequence of CTL components but also adjusted the level of assistance to students' needs. Gradually structured prompting questions enabled students to move from simple observation toward reasoning about money values. Role assignments within groups ensured that each member had a clear responsibility, while individual assistance helped students who lagged

behind to keep up with the lesson. This practice reflects (Vygotsky's, 1978) concept of the zone of proximal development, that is, the zone in which students can complete tasks with the help of a more competent person. Such graduated assistance is in line with the concept of *scaffolding* proposed by (Wood et al., 1976). Thus, the increase in learning implementation reflects an improvement in the quality of the teacher's mediation rather than mere procedural compliance.

These findings on the planning and implementation of CTL are consistent with the results of several previous studies. (Babys, 2025) reported that applying CTL to length measurement in Grade III increased the mean score from 32.5 in the pretest to 88.75 in Cycle II. Pade et al. (2026) also showed an increase in mastery from 15% to 89% on the multiplication of whole numbers. At a higher grade level, (Mira, 2024) applied CTL in two cycles in Grade V and obtained an increase in mastery from 78% to 94%. Research by (Lapassi et al., 2023) and (Wardani et al., 2020) further confirms that CTL can serve as an action strategy for improving mathematics learning. Nevertheless, this study adds evidence that the success of implementation is largely determined by the quality of collaborative reflection between the researcher and the classroom teacher. This collaboration kept the actions relevant to the characteristics of the students of SDIT Al-Akhyar Cadika, while also enriching the empirical evidence on the application of CTL in integrated Islamic elementary schools.

Analytically, the increase in learning implementation from 70% to 80% and 90% shows that the CTL approach cannot be understood as a procedure that only needs to be carried out once but rather as a practice that matures through cycles of improvement. The ten-point increase in each cycle is directly related to the reflection decisions, especially the use of concrete media, gradual prompting questions, role assignments, and assistance. This pattern shows that the constructivism and inquiry components are effective only when supported by well-managed questioning and learning community components. From the perspective of constructivist theory, the teacher functions as a mediator who organizes the learning environment so that students can construct knowledge independently (Piaget & Inhelder, 1969). Thus, the answer to the first research question is that planning based on the local context and implementation refined through collaborative reflection made CTL systematic and meaningful. This finding also confirms the methodological novelty of the study, namely the traceability of the relationship between reflection decisions and improvements in the quality of learning implementation, so that this action model can be adapted by other teachers.

Students' Learning Activity during the Implementation of CTL

The answer to the second research question shows that students' learning activity increased as the implementation of CTL improved. In the pre-cycle, learning activity was 74.47%; it then increased to 75.71% in Cycle I and 81.90% in Cycle II. Overall, the increase reached 7.43 percentage points from the baseline. The observed indicators included students' involvement in observing contextual problems, asking questions, using concrete objects, discussing, presenting solution strategies, explaining answers, and reflecting on learning. These changes were in line with the growing number of students who achieved the learning objective achievement criteria (KKTP) on the cognitive test, namely from 12 to 16 and finally 19 out of 21 students (Table 3). These data show that learning activity did not stand alone but moved together with the quality of the teacher's actions, which were continuously improved through reflection in each cycle. Therefore, student activity can be read as a process indicator that bridges the implementation of CTL and the achievement of cognitive mathematics learning outcomes in Grade III of SDIT Al-Akhyar Cadika.

The increase in learning activity in Cycle I was relatively small, at only 1.24 percentage points from the pre-cycle. This finding should be interpreted carefully because it indicates an

adaptation period when students first encountered a learning pattern that required them to discover, ask questions, and discuss. Students who had previously been accustomed to receiving explanations from the teacher needed time to adjust to their new role as builders of knowledge. Observation results also showed that some students were still less focused, reluctant to express opinions in groups, and tended to wait for answers from their peers. Within Piaget's theoretical framework, this condition can be understood as a process of accommodation, that is, the adjustment of cognitive structures to new learning experiences. This obstacle also shows that a change in learning approach does not immediately change students' learning habits. Hence, the small increase in Cycle I actually became important information for the teacher in designing more targeted and measurable forms of support, especially for the questioning and learning community components.

In Cycle II, learning activity increased more sharply, by 6.19 percentage points, reaching 81.90%. This increase was closely related to the action improvements formulated from the reflection on Cycle I. The size of this increase was almost five times that of the previous cycle. Clear role assignments within groups gave each student a reason to participate actively. The teacher's demonstration of how to use concrete money media helped students understand how to manipulate objects before moving on to symbolic representations (Merteasih & Adnyana, 2026; Silvia & Sutriyani, 2025; Srisedani et al., 2026). Simpler prompting questions lowered the barrier to speaking, while the teacher's assistance ensured that students who experienced difficulties could still participate. These strategies illustrate the application of *scaffolding*, namely temporary assistance that is gradually reduced as students' abilities increase (Wood et al., 1976). Interaction in the learning community also made peers a source of help, as (Vygotsky, 1978) emphasized that higher mental functions develop through social interaction. Thus, improving the structure of interaction was the key to the increase in students' learning activity.

The increase in learning activity was also evident in the quality of students' engagement, not only in its quantity, as recorded in the observation sheets and interviews with the teacher. In Cycle II, students more often discovered concepts by manipulating concrete money, discussed to compare strategies, explained the reasons behind their answers, and reflected on the mistakes they had made. These activities reflect the concrete operational stage, when children need real objects to reason logically about mathematical relationships (Piaget & Inhelder, 1969). This finding is in line with the study by (Masuddi et al., 2022), which showed that CTL produced better results than conventional learning, especially for students with a kinesthetic learning style. (Rambe et al., 2022) also found an interaction between the CTL approach and learning styles on mathematics learning outcomes. Thus, the variety of activities in CTL accommodates students with different learning characteristics. This also explains why the number of actively engaged students increased gradually until the end of Cycle II.

Learning activities in the CTL approach are also consistent with the character of education in integrated Islamic elementary schools, which combines academic strengthening with Islamic values. The command to read in QS. al-'Alaq [96]: 1–5 is not only interpreted as reading texts but also as an invitation to observe, examine, and understand the phenomena around human beings (Kementerian Agama Republik Indonesia, 2019). In addition, the Qur'an often conveys abstract messages through concrete parables, such as the parable of a good word as a good tree in QS. Ibrahim [14]: 24–25 (Kementerian Agama Republik Indonesia, 2019). This principle of presenting meaning through things close to experience is in line with the CTL step of connecting mathematical concepts with the buying and selling activities that students experience. The findings of this study are also supported by (Gustiani and Miaz, 2023), who applied CTL in elementary schools, and (Martini, 2019), who reported improved learning outcomes among third-grade students through CTL. Therefore, CTL can be regarded as an approach that is

pedagogically relevant and consistent with the values of Islamic education developed at SDIT Al-Akhyar Cadika.

Analysis of the learning activity data shows that the increase in student engagement followed a gradual pattern, relatively slow in Cycle I and faster in Cycle II. This pattern confirms that changing learning habits requires sufficient time and structured support. The implementation of the CTL components alone was not enough to encourage equal participation, so the teacher needed to organize group roles, simplify questions, and provide assistance according to students' needs. When such *scaffolding* was provided, students were more willing to express ideas, use concrete media, and explain their solution strategies. Thus, the answer to the second research question is that students' learning activity increased from 74.47% to 81.90% because CTL provided concrete, social, and reflective learning experiences. Theoretically, this finding confirms the constructivist views of Piaget and Vygotsky that knowledge is constructed through interaction with objects and with other people. Furthermore, this finding shows that collaborative reflection is an important mechanism for transforming passive participation into active engagement.

Improvement in Cognitive Mathematics Learning Outcomes after the Implementation of CTL

The answer to the third research question shows that students' cognitive mathematics learning outcomes improved consistently after the CTL approach was implemented. Classical mastery in the pre-cycle was only 57.14%, or 12 out of 21 students. After the Cycle I action, classical mastery increased to 76.19%, or 16 students, and then reached 90.48%, or 19 students, in Cycle II. Thus, classical mastery increased by 33.34 percentage points from the baseline to the end of the action. The increases of 19.05 percentage points in Cycle I and 14.29 percentage points in Cycle II show that the effect of the action was already visible in the first cycle and continued to strengthen after the improvements were made. This pattern of improvement also met the research expectations because almost all students had reached the KKTP. The pattern shows that CTL not only improved the learning atmosphere but also had a real impact on students' cognitive mastery of the value of thousand-rupiah denominations.

Despite the considerable increase, the Cycle I results still revealed weaknesses in the indicators of understanding and applying concepts. These weaknesses were identified through an analysis of test answers and students' work on the worksheets. In general, students were able to recognize the values of thousand-rupiah denominations, but some were not yet able to use them to solve everyday problems involving the calculation of money values. In the revised Bloom's taxonomy, this condition indicates that some students had mastered the remembering dimension but had not fully moved on to the understanding and applying dimensions (Anderson & Krathwohl, 2001). The understanding dimension requires students to be able to explain meaning, whereas the applying dimension requires the use of procedures in new situations. This gap confirms that the context presented in Cycle I had not fully bridged factual knowledge and procedural knowledge. Therefore, the results of reflection in Cycle I became an important basis for designing actions that placed greater emphasis on applying concepts in real situations familiar to students.

The Cycle II action focused on three improvements, namely the use of contextual problems closer to students' experiences, the modeling of solution steps, and reflective practice. More familiar contextual problems made it easier for students to interpret questions and connect them with their existing knowledge. Modeling solution steps provided concrete examples of mathematical thinking, while reflective practice encouraged students to re-examine their strategies and answers. These three improvements ultimately produced classical mastery of 90.48%, meaning that 19 out of 21 students achieved mastery. This achievement shows that

modeling and reflection, two CTL components often regarded as complementary, play a strategic role in strengthening the understanding and applying dimensions. This finding is in line with (Johnson's, 2002) principle that meaning is formed when students connect academic material with their own experiences. Thus, the improvement in learning outcomes in Cycle II was the result of targeted action improvements.

The improvement in cognitive learning outcomes also shows a close relationship with the quality of the learning process. As the teacher's implementation of learning increased from 70% to 90% and learning activity rose from 74.47% to 81.90%, classical mastery also increased from 57.14% to 90.48%. The three indicators moved in the same direction, and none of them declined from one cycle to the next, which strengthens the argument that learning outcomes are a consequence of the quality of the teacher's actions and students' engagement. This relationship is supported by the meta-analysis of (Parhusip and Hardini, 2020), which found that contextual learning effectively improved elementary students' mathematical understanding, with an average increase of 46.59% (see also Lisdiana et al., 2026). (Rahmah and Ermawati, 2022) also demonstrated a significant effect of the CTL model on the mathematics learning outcomes of fourth-grade students (see also Novita Sari et al., 2020). Thus, the findings of this study strengthen the empirical evidence that CTL is an effective approach for improving cognitive mathematics learning outcomes.

In general, the findings of this study are also in line with the results of previous studies at different grade levels and on different topics. (Sunandar, 2009) reported that mathematics learning outcomes in a class using CTL were higher than those in a class using textual learning, while (Yulianti et al., 2023) recorded an increase in mastery from 28.12% to 84.38% among third-grade students. (Nafsiah et al., 2025) also examined the effect of CTL on students' mathematics learning outcomes (see also Apriani, 2022; Desmi & Sutriyani, 2025), while Agrita (2021) showed that learning based on real problems can improve mathematics learning outcomes in Grade III. Nevertheless, two students had still not achieved learning mastery by the end of Cycle II. This condition indicates the need for remedial learning and differentiated assistance for students with different learning paces. Therefore, classical success should not obscure the individual needs of students who require more time, assistance, and a wider variety of learning strategies.

Analytically, the increase in classical mastery from 57.14% to 76.19% and 90.48% proves that CTL had a positive impact on the cognitive mathematics learning outcomes of third-grade students. The largest increase occurred in Cycle I, which shows that presenting the material through the context of buying and selling and concrete money media immediately helped students understand money values. The increase in Cycle II shows that modeling solution steps and reflective practice strengthened the understanding and applying dimensions. Thus, the answer to the third research question is that cognitive mathematics learning outcomes improved consistently because CTL integrates meaningful contexts, constructive activities, and focused reflection. This finding also confirms that the implementation of actions, learning activity, and learning outcomes are three interrelated indicators. The implication is that teachers need to monitor these three indicators simultaneously so that learning improvement is oriented not only toward final scores but also toward the quality of the process.

Conclusion (خاتمة)

This study aimed to improve the cognitive mathematics learning outcomes of third-grade students at SDIT Al-Akhyar Cadika through the *Contextual Teaching and Learning* (CTL) approach, and its findings answer the three research questions as follows. First, CTL was planned collaboratively around a context that students knew well, namely buying and selling with thousand-rupiah denominations, and its seven components were adjusted after each cycle rather

than applied as a fixed sequence; with gradual prompting questions, group role assignments, concrete money media, and targeted assistance, the teacher's implementation reached the very good category in Cycle II. Second, students' learning activity developed gradually: the gain was small in Cycle I, while students were adapting to discovering and discussing, and became clearly larger in Cycle II, once the structure of group interaction had been improved. Third, cognitive learning outcomes improved in both cycles until 19 of the 21 students achieved the KKTP, and the remaining weakness in understanding and applying money values was addressed mainly through more familiar contextual problems, modeling of solution steps, and reflective practice. Taken together, the quality of the teacher's actions, student engagement, and cognitive mastery improved in the same direction, with data-driven collaborative reflection as the mechanism that connected them. Because the study involved only one class, one topic, and two cycles without a comparison group, these findings should be generalized with caution. Teachers are advised to apply CTL with continuous reflection, *scaffolding*, and differentiated assistance, including remedial support for students who have not yet achieved mastery, while future research could test this model on other topics and grade levels using experimental or mixed designs.

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