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Increased Motivation and Ability Student Numeracy Through the Application of a Contextual Approach to Mathematics Learning

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Abstract: This research aims to describe and analyze: 1) the implementation of a contextual approach to mathematics learning in perimeter of plane figures material to increase the motivation and numeracy skills of third-grade students at Cawan Jatinom Klaten Elementary School, 2) the increase in students' learning motivation after implementing the contextual approach, and 3) the improvement in students' numeracy skills following its application. The research employed a Classroom Action Research (CAR) design, comprising planning, implementation, observation, and reflection. The subjects consisted of 12 third-grade students, and data were collected through tests, observations, interviews, and documentation. Data analysis was conducted using both quantitative and qualitative methods. The results showed that the contextual learning approach, implemented through the use of measuring tapes and real objects inside and outside the classroom, successfully increased students' engagement and understanding of perimeter concepts. Students became more active and motivated; the classroom atmosphere became more conducive to learning, and instruction shifted from a teacher-centred to a student-centred approach. After two cycles of intervention, students' numeracy skills improved, as the hands-on use of real objects helped them grasp concepts such as length, width, and circumference more easily. It is recommended that the contextual learning approach be applied in other classes or explored further to enhance mathematics teaching methods in general.
Keywords: motivation, numeracy, contextual, mathematics

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Introduction

According to the Program for International Student Assessment (PISA), organised by the Organisation for Economic Co-operation and Development (OECD), the value of students' numeracy abilities in Indonesia indicates that around 71% of students do not reach the minimum level of competence in mathematics (Putra, 2022). Based on the results of the PISA test (2015) and the Organization for Economic Co-operation and Development (OECD). The results of the mathematics tests conducted by PISA differ significantly between Vietnam and Indonesia. Vietnam got a score of 495 (average score 490), while Indonesia scored 387 and 395, with an average score of 500. Singapore achieved the highest score with a score of 618 (Han & Santoso, 2017). These results suggest that Indonesian students continue to exhibit low numeracy levels.

Low numeracy skills can be attributed to the way mathematics is perceived. It is often viewed as a difficult and intimidating subject, which may reduce students' motivation to engage in math lessons (Putra, 2022). One contributing factor is the lack of teacher innovation in the learning process, particularly the limited use of varied instructional approaches or models. Teachers often serve primarily as information providers, offering few opportunities for students to actively participate in the learning process (Cahyani et al., 2022).

This condition is also found in Class III of Cawan Jatinom Klaten Elementary School, where mathematics learning is generally conducted through lectures, question-and-answer sessions, and

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assignments. This teacher-centred approach positions the teacher as the sole source of knowledge, and it does not provide students with opportunities to interact and collaboratively build their understanding. Before the intervention, a significant number of students had not yet achieved the minimum learning mastery. Many students demonstrated low numeracy skills, with nine students struggling to solve mathematical problems in essay form, especially those related to real-life contexts. As a result, their mathematics learning outcomes remained suboptimal, with nine students (75%) scoring below the minimum competency criteria (KKM in the Indonesian context).

Observations also revealed that students' motivation to learn was low. Of the 12 students, seven were identified as lacking diligence in completing tasks, easily giving up when faced with difficulties, showing low enthusiasm during lessons, and displaying little interest in learning. In addition, these students often relied on their peers to complete tasks. The low motivation is closely related to the general orientation of mathematics education in elementary schools, which typically: 1) treats students as passive recipients, 2) positions the teacher as the sole authority and source of knowledge, 3) focuses heavily on content delivery, and 4) applies centralized management. These characteristics limit student engagement and hinder the development of meaningful, context-based learning. As a result, students play a passive role, while the teacher dominates the learning process. This disconnect from students' everyday experiences contributes to their low motivation in learning mathematics (Hadi, 2015).

Efforts to improve mathematics learning outcomes in elementary school require strengthening numeracy. Numeracy skills can provide benefits in carrying out daily activities. Perhaps some people already understand mathematical concepts, but many struggle to apply them effectively. Therefore, numeracy and mathematics are related to each other (Cahyani et al., 2022). The Ministry of Education and Culture, Research, and Technology's policy is to improve students' numeracy skills through the Merdeka Belajar program, thereby strengthening their literacy and numeracy. This is one of the priority programs. Government Regulation Number 57 of 2021 concerning National Education Standards places the cultivation of character in line with Pancasila values, as well as students' literacy and numeracy competencies, as the focus in Graduate Competency Standards for educational units at the basic education level. This effort is a concrete manifestation of the implementation of strengthening Human Resources, as stated in the Presidential Regulation concerning the National Medium-Term Development Plan 2020-2024 and the Ministry of Education and Culture's Strategic Plan 2020-2024.

Numeracy learning is closely related to what students do in their daily lives. Simple things, such as knowing the time, recognising various shapes of geometric objects, and using numbers in daily activities, among others. From this activity, aspects of numeracy content and context are evident. Based on the PISA framework (2022), there are four contexts: personal, social, work, and scientific activities. Furthermore, when solving numeracy problems, mathematical processes and tools are involved (Putra, 2022).

High and low student numeracy is often associated with success or failure in achieving learning goals set by the teacher. Mathematical numeracy is the mastery of knowledge and skills developed in the field of mathematics, which is obtained through the process of students' active interaction with the subject's content, as evidenced by their mathematics learning outcomes (Sirait, 2016). Apart from that, a lot of mathematics learning material must be completed within a certain timeframe, making learning focused solely on completing the material. Teachers tend to convey it quickly and monotonously. Students take turns reading material from the book, others listen. Students are less serious about receiving mathematics lesson material. This can be seen from the attitude of students who chat and joke with their friends. This means that problem-solving in mathematics learning is viewed as a goal that must be achieved. So, solving mathematical problems in elementary school must also be optimal. Because students in elementary schools also study lessons related to everyday life and their presence is very vital in the 2013 curriculum (Yuwandra & Arnawa, 2020). Han Weilin in Sintawati & Mardari (2021) explains that in learning mathematics it is very important and necessary for students to solve mathematical problems by processing numbers correctly. Numeracy needs to be developed in elementary school so that students have the knowledge and skills to make decisions in everyday life.

One of the main topics in the Grade III mathematics curriculum for the second semester in elementary school is the perimeter of flat shapes, including squares, rectangles, and triangles. The basic competencies to be achieved are: 1) analyzing the perimeter of flat shapes, and 2) presenting and 3) solving problems related to the perimeter of flat shapes. The learning indicators include the ability to: 1) explain various types of flat shapes, 2) understand the properties and components of flat shapes, and

3) calculate the perimeter of squares and rectangles. Learning activities designed to support these goals include: 1) observing real-life problems related to the perimeter of flat shapes, and 2) measuring the sides of flat shapes and calculating the perimeter based on those measurements.

Students often struggle to fully understand flat shapes when learning is limited to teacher explanations, partly because some feel embarrassed to ask questions and prefer to consult their more capable peers. Therefore, teachers should not be the sole source of knowledge. Contextual Teaching and Learning (CTL) offers an effective alternative by encouraging students to actively engage with material that is connected to real-life situations. This approach fosters social interaction and intellectual growth, enabling students to apply mathematics to everyday problems and develop a deeper understanding beyond rote memorisation (Hoogland et al., 2018; Clarke & Roche, 2016; Arends, 2018; Gök & Erdoğan, 2017).

CTL activates existing knowledge while facilitating the acquisition of new knowledge through meaningful experiences. Grounded in constructivist theory, CTL promotes natural learning through student activities rather than passive knowledge transfer (Sa'ud, 2018; Rijal, 2015). Implementing CTL not only improves student achievement by linking learning to personal, social, and cultural contexts but also boosts motivation and numeracy skills by involving students directly in relevant, real-world tasks. Research by Astati (2016) supports that CTL effectively increases learning motivation for elementary students in mathematics and other subjects (Chityadewi, 2019).

Motivation to study is the overall psychological driving force within students that initiates and sustains learning activities, directing them toward achieving specific goals. This motivation can be observed through several indicators, such as the desire and willingness to learn, internal urges and needs, hopes and aspirations, appreciation and respect for the learning process, interest in learning activities, and a supportive learning environment (Uno, 2019). Nurhadi, cited in Sugiyanto (2018), adds that contextual learning is designed to help teachers connect academic material with students' real-world experiences. By using objects and media from students' surroundings, this approach encourages active engagement and discovery, motivating students to apply their learning in everyday life.

CTL is a learning system based on the philosophy that children learn effectively when they find meaning in academic content and school tasks by connecting new information with prior knowledge and experiences (Johnson, 2018). Research by Chityadewi (2019) concluded that: 1) the contextual approach improved mathematics learning outcomes in fraction addition both quantitatively and qualitatively, 2) the method aligns with students' preferred learning styles, and 3) CTL fosters an independent and creative learning atmosphere by linking lessons to the natural environment. Similarly, Muchtar et al. (2023) found that applying contextual learning models enhances mathematics learning outcomes.

Nurcahyono (2023) found that contextual learning in mathematics, particularly Realistic Mathematics Education (RME), effectively improves students' numeracy literacy by involving real-life problems that increase engagement and challenge students during learning activities. Similarly, Hadi and Zaidah (2021) concluded that most students showed significant improvement in numeracy literacy skills through realistic mathematics learning or contextual approaches. Patta et al. (2022) also reported that applying the RME approach enhanced numeracy literacy among fifth graders at Pasaraya 157 Elementary School, as evidenced by increased learning activities and better test results. Purba et al. (2022) explained that Indonesian Realistic Mathematics Education (PMRI), implemented within the Merdeka Belajar program, fosters student independence in accessing information and solving contextual problems, thus improving literacy, numeracy, logical thinking, and cognitive and psychomotor skills.

Contextual learning emphasizes active involvement of students, engaging both their physical and mental capacities by connecting learning to real-life experiences rather than rote memorization. It encourages students to explore, collect, and test information independently, fostering deeper understanding. This approach is particularly suitable for Grade III mathematics in the second semester, such as learning the perimeter of flat shapes. By studying outdoors and measuring the perimeter of objects like walls, rooms, and yards with rulers or measuring tapes, students actively participate in the learning process and discover the practical applications of mathematical concepts in daily life.Compared to previous studies, this research presents several novelties: 1) earlier studies did not address the perimeter of flat shapes, 2) the learning implementation was conducted both inside and outside the classroom, and 3) this study used the N-Gain Score analysis technique to assess and determine the effectiveness of improving student learning outcomes. The contribution of this research to education in

Indonesia is that it can serve as a model for teachers in applying learning models or methods. This study is also relevant in supporting government programs such as independent learning, freedom to learn, and educational policies related to the implementation of the Merdeka Curriculum. Furthermore, this research has the potential to positively impact the improvement of student literacy and numeracy at both local and national levels.

Methods

The research design used was Classroom Action Research (CAR). The design followed the model from Kemmis and Taggart (Arikunto et al., 2018), which consisted of four stages: (1) planning, such as preparing learning implementation plans, assignment sheets, learning tools, and research instruments; (2) actions, including procedures or stages in learning; (3) observations, such as observing learning implementation by teachers, student learning motivation, numeracy ability evaluation tests, and interviews; and (4) reflection, involving analyzing research data, identifying deficiencies, and determining improvement solutions for the next cycle. These four components formed one cycle. The research was conducted between January and June 2024. The subjects were teachers and Grade III students at Cawan Jatinom Elementary School, Klaten. The data collection techniques employed included tests, participant observation, in-depth interviews, and documentation. The instruments used were teacher observation sheets, student learning motivation sheets, assignment sheets (tests) to measure students' numeracy skills, and interview guidelines for teachers and students. The instruments had been validated by expert validators and declared suitable for data collection.

The data analysis techniques applied were both quantitative and qualitative. Quantitative data analysis was used for data in numerical form or for qualitative data converted into numbers, such as observation scores (the implementation of the contextual learning approach by teachers and student learning motivation) and numeracy skills. This analysis involved calculating averages, frequency percentages, and tables. The Normalised Gain (N-Gain) Score analysis technique was employed to evaluate and assess the effectiveness of improving student learning outcomes by calculating the difference between pretest and posttest scores. The qualitative data analysis employed the interactive model proposed by Miles et al. (2014), which consisted of four steps: data collection, data condensation, data presentation, and conclusion and verification. Qualitative data analysis was applied to words and sentences from interviews and observations to evaluate the success of the action, serving as a measure at the end of the cycle. This was defined as more than 75% of students achieving a score above the Minimum Completion Criteria (70) based on the test instrument.

Results and Discussion

Results

Cycle I

Implementation Learning

In Cycle I of learning, the improvement of students’ numeracy skills related to the perimeter of flat shapes showed positive progress. The teacher delivered the material well, which was evident from the students’ responses during the explanation. The teacher varied the presentation by using objects from the surroundings, preventing boredom and keeping students focused. The teacher acted more as a motivator and facilitator rather than the sole source of knowledge. Observations showed that the teacher’s performance in delivering the lesson reached a score of 72.5, which falls into the “Good” category, based on aspects such as invitation, exploration, explanation, solution, and follow-up actions.

Students’ Learning Motivation

The learning process tended to be student-centered, with the teacher acting only as a motivator and facilitator. By using objects from the surroundings, students’ learning motivation increased significantly. Based on observations, student learning motivation in Cycle I can be described in Table 1.

Table 1. Categories Students' Learning Motivation Score in Cycle I

Category	Amount	Percentage
Very well	8	67%
Good	4	33%
Enough	0	0%
Not enough	0	0%
Very less	0	0%
Amount	12	100%

In Cycle I, eight students (67%) demonstrated learning motivation in the very good category, while four students (33%) showed motivation in the good category. Thus, the majority of students in Cycle I exhibited very good learning motivation. However, some students still showed a lack of motivation; they did not pay attention to the teacher's explanation or participate in discussions, and some even lowered their heads on the bench.

Students' Numeracy Skills

In Cycle I, student learning outcomes were observed to assess the development of their numeracy skills in understanding the mathematical concept of the perimeter of flat shapes. Based on these observations, the students' numeracy scores related to this concept are shown in Table 2.

Table 2. Categories of Students' Numeracy Skill Scores in Cycle I

Category	Mark	Amount	Percentage
Very well	80-100	3	25%
Good	66-79	9	75%
Enough	56-65	0	0%
Not enough	40-55	0	0%
Very less	<39	0	0%
Amount		12	100%

At the end of Cycle I, out of 12 students, 3 (25%) scored in the very good category, while 9 (75%) scored in the good category. This indicates that students' numeracy abilities improved by the end of Cycle I. The use of a contextual approach to teaching the mathematical concept of the perimeter of flat shapes proved effective in enhancing students' numeracy skills. This is supported by the average N-Gain Score of 0.31, which falls within the medium category. Therefore, this approach should be continued in Cycle II.

Reflection

The achievement of children's learning completion in mathematics, specifically regarding the circumference of flat shapes, in Cycle I is evident in Table 3. This data highlights the percentage of students who met the Minimum Completion Criteria (KKM in the Indonesian context) and serves as a reference for planning improvements in the next cycle.

Table 3. Students' Learning Mastery Achievement in Cycle I

Category	Mark	Amount	Percentage
KKM	>= 70	8	67%
Under KKM	< 70	4	33%
Amount		12	100%

At the end of Cycle I, eight students (67%) achieved scores at or above the KKM, while four students (33%) scored below the KKM. Therefore, the cycle continued to maximize students' numeracy abilities further. To increase the effectiveness of learning in the next cycle, a reflection was conducted on the implementation results from Cycle I. Based on discussions with collaborating teachers, several obstacles were identified, including some students lacking focus during learning and some students being disruptive to their peers. To address these issues, Cycle II will include more intensive personal approaches and mentoring to help students who struggle to concentrate, as well as those who prefer to work alone in a crowded environment.

Cycle II

Implementation Learning

In Cycle II, the enhancement of students' numeracy skills related to the perimeter of flat shapes improved as the teacher delivered the material more effectively. This was evident from the students' positive responses during the explanations. The teacher varied the material by using objects from the surroundings, which prevented boredom and kept students engaged. The teaching focused on the students, with the teacher acting only as a motivator and facilitator. Observations showed that the teacher's performance in delivering the lesson reached a score of 91.25, placing it in the very good category, based on aspects such as invitation, exploration, explanation, problem-solving, and follow-up actions.

Students' Learning Motivation

The learning process tended to be student-centered, with the teacher acting only as a motivator and facilitator. By using objects from the surroundings, students' learning motivation appeared to increase significantly. Based on observations, student learning motivation in Cycle I can be summarized in Table 4.

Table 4. Categories of Students' Learning Motivation Scores in Cycle II

Category	Amount	Percentage
Very well	11	92%
Good	1	8%
Enough	0	0%
Not enough	0	0%
Very less	0	0%
Amount	12	100%

In Cycle I, 11 children (92%) showed motivation to learn in the very good category, while 1 child (8%) showed motivation in the good category. Thus, the majority of students in Cycle I demonstrated a very high level of motivation to learn.

Students' Numeracy Skills

In Cycle I, observations were conducted to assess the development of students' numeracy skills in understanding the mathematical concept of the perimeter of flat shapes. Based on these observations, the students' numeracy scores related to this concept are shown in Table 5.

Table 5. Categories of Students' Numeracy Skill Scores in Cycle II

Category	Mark	Amount	Percentage
Very well	80-100	9	75%
Good	66-79	3	25%
Enough	56-65	0	0%
Not enough	40-55	0	0%
Very less	<39	0	0%
Amount		12	100%

At the end of Cycle II, out of 12 students, 9 children (75%) scored in the very good category, while 3 children (25%) scored in the good category. Thus, by the end of Cycle II, students' numeracy ability scores had increased. The use of a contextual approach to teaching the mathematical concept of the perimeter of flat shapes proved quite effective in enhancing children's numeracy skills. This is supported by the N-Gain Score calculation across Cycles I and II, which averaged 0.424, placing it in the medium category.

Reflection

The achievement of children's learning completeness in mathematics, specifically regarding the circumference of flat shapes, in Cycle I is evident in Table 6. This data reflects the students' mastery of the material and serves as a benchmark for evaluating the effectiveness of the instructional cycle.

Table 6. Students' Learning Mastery Achievement in Cycle II

Category	Mark	Amount	Percentage
KKM	>= 70	12	100%
Under KKM	< 70	0	0%
Amount		12	100%

At the end of Cycle I, all 12 students (100%) had achieved the KKM score or higher. Therefore, the cycle was stopped as the learning in this cycle was effective. Based on discussions with collaborating teachers, no significant obstacles were identified. Students were focused on the learning process, and there were no disruptive or distracting behaviors among peers.

Enhancement from Cycle I to Cycle II

Implementation learning

In Cycle I, the teacher demonstrated good performance in delivering the lesson by employing a contextual approach and utilising teaching aids. The success of Cycle I was evident as students began to respond positively to the teacher's delivery of the learning material. In Cycle II, the teacher's delivery improved even further, as reflected in the observation results. Specifically, the teacher's skill score in delivering the lesson increased from 72.5 in Cycle I to 91.25 in Cycle II, placing it in the very good category. This improvement was observed across several aspects, including invitation, exploration, explanation, problem-solving, and follow-up actions.

Students' Learning Motivation

To determine the increase in student learning motivation from Cycle I to Cycle II, refer to Table 7. The data presented illustrates a clear improvement in students' motivation levels across the two cycles, highlighting the effectiveness of the implemented interventions.

Table 7. Increase in Students' Learning Motivation from Cycle I to Cycle II

Mark	Cycle I	Cycle II	Go on	%
Average	80.42	88.96	8.54	10.82
Max Score	88	98	17.50	21.88
Min Score	73	80	2.50	2.86

Based on the observation results of students during learning activities from Cycle I to Cycle II, the average score of student learning motivation in Cycle I was 80.42, which increased to 88.96 in Cycle II. The average increase reached 8.54 points or 10.82%. The highest score in Cycle I was 88, and in Cycle II it increased to 98, with the highest individual gain being 17.50 points or 21.88%. The lowest score in Cycle I was 73, which rose to 80 in Cycle II, representing a 7-point gain, or 9.59% increase.

Students' Numeracy Skills

After applying the contextual approach, along with meter props and surrounding objects in the mathematics learning design, students' numeracy skills in Cycle II showed improvement compared to Cycle I. This increase is evident in Table 8, which illustrate the enhancement in students' numeracy abilities from Cycle I to Cycle II.

Table 8. Increase in Students' Numeracy Skills from Cycle I to Cycle II

Mark	Cycle I	Cycle II	Go on	%
Average	74.31	84.72	10.42	14.19
Lowest	66.67	75.00	8.33	10.00
Highest	83.33	91.67	16.67	25.00

Based on the analysis results, it is evident that in Cycle I, the average student score was 74.31, and in Cycle II, it increased to 84.72. The average score increased by 10.42 points, representing a 14.19% rise. The lowest score on Cycle I was 66.67, while on Cycle II, it rose to 75.00, representing an increase of 8.33 points, or 12.5%. The highest score in Cycle I was 83.33, which increased to 91.67 in Cycle II, with an improvement of 8.34 points or 10%.

Discussion

Based on the results of this study, the use of a contextual approach and meter teaching aids proved quite effective in improving students' numeracy skills in the mathematical concept of the perimeter of flat shapes. Real-world or surrounding objects made it easier for students to understand this concept. Student learning outcomes improved from Cycle I to Cycle II, as indicated by the N-Gain Score effectiveness level of 0.42, which falls into the moderate category. This improvement is attributed to the teacher's enhanced delivery of the material in Cycle II, as shown by the observation results: the teacher's skill score increased from 72.5 in Cycle I to 91.25 in Cycle II, categorized as very good based on the aspects of invitation, exploration, explanation and solution, and action planning. During the learning activities, students' learning engagement also improved, with the average score of student activity increasing from 79.69 in Cycle I to 86.88 in Cycle II. Additionally, the average learning motivation score rose from 80.42 in Cycle I to 88.96 in Cycle II. The average numeracy ability also increased, from 74.31 in Cycle I to 84.72 in Cycle II.

Seen from the components of CTL learning, the above can be explained as follows:

1. Constructivism: The process of building and compiling new knowledge in contextual teaching and learning can be observed through students' experiences using a meter prop to help calculate the circumference of flat shapes (mathematics). Students try to recognise and understand the object carefully from their own perspective. Students will directly capture the message or meaning of what they observe.
2. Asking: Through contextual teaching and learning in learning the mathematical concept of measurement, providing opportunities for students to ask questions, both before students use the meter prop, discussing the results of calculations, and after using the meter prop, has encouraged students to have the courage to express opinions or ask questions, both to the teacher and to their group members.
3. Inquiry: In the process of observing an object (objects around), students try to find and discover knowledge based on a systematic thinking process. Students identify the measuring instrument to help understand the mathematical concept of the circumference of a flat shape. Thus, the learning process is more meaningful because it is related to the surrounding environment.
4. Learning community: Through group work and the contextual teaching and learning model, students have been encouraged to exchange ideas, discuss to solve problems or assignments given in groups. Thus, the knowledge gained by students is largely formed by communication with other people (friends).
5. Modelling: By learning the mathematical concept of measurement through the use of objects around them, students can help understand the circumference of flat shapes. Therefore, the subject matter they learn is not only verbal (theory-abstract) but has a real meaning in their living environment. Thus, modeling in this learning is related to the surrounding world.
6. Authentic assessment: In contextual teaching and learning, the success of learning is not only determined by the development of intellectual abilities, but also the development of all aspects. In the process of learning the concept of the circumference of flat shapes using objects around them, students' activities in learning can be observed directly. Thus, in this learning, the success of learning can be seen from several aspects such as cognitive (knowledge), affective (attitude), and psychomotor (skills) aspects.
7. Reflection: Through reflection, students will be able to reinforce the knowledge they have acquired and expand their understanding. In learning the concept of the circumference of flat shapes using meter teaching aids, students gain direct experience with objects in the natural environment, communicating during discussions. Through this process, students can deposit their knowledge or experience to gain an understanding that is achieved, whether it is positive or not (negative). Through reflection, students will be able to renew the knowledge they have formed and add to their knowledge.

The results of this research support the findings of previous studies. Surdin (2018) concluded that the Contextual Teaching and Learning (CTL) model has a positive influence on learning outcomes. Similarly, Syaifuddin et al. (2021) found that the application of the CTL model can improve students' learning outcomes, with an increase of 7.08% in Cycle II. This is also in line with the research by Ridwan et al. (2021), which concluded that CTL effectively enhances student learning outcomes, with an average score of 83.92 and a student mastery level of 89.8%.

Maslahah et al. (2019) stated that CTL-based teaching materials are suitable for teachers who educate students in functional skills such as reading, writing, and arithmetic. Triwahyuningtyas et al. (2022) emphasized that using numeracy literacy in fraction division helps elementary students learn mathematics more effectively. Additionally, Rakhmawati and Mustadi (2022) reported that student literacy increased significantly, with assessment results improving from the "low" to the "very good" category.

The application of a contextual approach in learning helps improve student achievement by enhancing their understanding of subject matter through connections with real-life contexts—personal, social, and cultural (Chityadewi, 2019). Learning becomes more meaningful when it uses authentic contexts familiar to students. Delyana et al. (2023) highlighted that the CTL approach assisted by e-modules allows students to construct their understanding more easily. Therefore, mathematics teachers must possess strong problem-solving skills, including time management and effective methods (Özreçberoğlu & Çağanağa, 2018). Moreover, e-modules based on inquiry—such as those involving cubes and blocks—can improve students' contextual abilities (Triwahyuningtyas et al., 2022). In conclusion, contextual learning has been shown to improve student learning outcomes (Yusron & Sudiyatno, 2021).

Contextual themes can positively influence students' understanding of mathematical concepts, especially when integrated through collaborative, brain-based learning models and open-ended approaches (Suharja et al., 2024). Among the critical elements of contextual learning, Culturally Responsive Teaching (CRT) aspects are the most dominant in creating meaningful learning experiences. As highlighted by Murti (2023), CRT aspects in textbooks—such as conceptual explanations and illustrative examples—reflect mathematical representations that align with thematic learning objectives. However, teachers should supplement these materials with additional CRT elements that are still lacking in current textbooks.

CTL can significantly impact students' conceptual understanding. To achieve this, teachers must be equipped with and master a variety of CTL strategies that effectively enhance students' mathematical comprehension (Yudha et al., 2018). Priyadi et al. (2021) concluded that: (1) the CTL model, especially with an outdoor approach, significantly improves students' mathematical representation abilities more than conventional or standard CTL learning; and (2) the improvement levels for students' mathematical representation abilities using CTL with outdoor settings, standard CTL, and conventional learning fall into the high, medium, and low categories, respectively.

In the implementation of contextual learning for the topic of flat shapes in Grade III at Cawan Jatinom Klaten Elementary School, teachers connected the taught material with students' real-world situations. This was done by using surrounding objects as media, making it easier for students to relate mathematical concepts to tangible items. This aligns with Sugiyanto's (2018) view that learning media composed of everyday objects emphasize active student involvement in discovering material and connecting it with real-life situations—thereby encouraging them to apply knowledge in their daily lives.

CTL can be used to connect real-world situations with mathematics so that students better understand and solve problems. It is recommended as a strategy to help students use their mathematical knowledge in understanding, solving, and communicating solutions. However, many teachers are still unaware that students' mathematical literacy can be enhanced through CTL. Learning mathematics through real-life contexts is essential for improving students' mathematical knowledge. When mathematics is linked to daily life, students feel more engaged and supported in the learning process. Therefore, the use of contextual learning strategies is crucial for both teachers and students in developing mathematical literacy (Afni & Hartono, 2020).

The combination of mathematical and computational thinking is not only crucial for effectively supporting students' conceptual understanding of mathematics, but also for developing their computational thinking skills. This integration provides students with a more realistic perspective on how mathematics is practiced both in the real world and professional settings, better preparing them for careers in related fields (Pei et al., 2018). A proposed approach to engage young learners with theoretical group ideas involves combining hands-on (contextual) activities with computational thinking tools. As a result, mathematics education is evolving to include real-world tools and methodologies that help students explore the power of disciplinary ideas (Gadanidis et al., 2018).

CTL can be successful if it incorporates collaborative interaction among students, high levels of learning engagement, real-world connections, and integration of scientific content with other disciplines and skill areas. Therefore, CTL is highly applicable for teaching mathematics in elementary schools (Selvianiresa & Prabawanto, 2017). Furthermore, student performance tends to be higher in outdoor learning activities compared to classroom learning. Exploratory studies have shown that outdoor teaching enhances students' mathematical skills (Otte et al., 2019). Outdoor learning includes field activities conducted outside the classroom and is considered both a field study and a learning strategy. For this reason, it must be treated like any other subject, taught by experienced educators. When viewed as a methodology, context, or instructional approach—not as a separate discipline—attention should focus on the learning process, pedagogy, and outdoor approaches applied across subject areas (Dyment et al., 2018).

CTL are seen as strong alternatives for enhancing students' skills (Hoogland et al., 2018). Mathematical abilities, including representation, develop more effectively when learned in real-world contexts (Clarke & Roche, 2016). The CTL model engages students actively during the learning process, increasing their academic achievement. This happens because the social interaction between teachers and students, or among students themselves, facilitates the construction of new understanding and promotes intellectual growth (Arends, 2018). Learning environments should promote a mathematics culture that encourages multiple problem-solving strategies using real-life examples from students' own experiences (Gök & Erdoğan, 2017).

CTL is a model that connects the learning process with students' daily life experiences, enabling them to apply what they learn to real-life situations. One of the characteristics of contextual learning is that it activates prior knowledge and encourages the acquisition of new knowledge. This knowledge is not meant to be memorized, but to be internalized, practiced, and reflected upon in daily life experiences (Sa'ud, 2018).

In the application of contextual learning for the topic of flat shapes in Grade III at Cawan Jatinom Klaten Elementary School, students were fully engaged both physically and mentally. This supports Rijal's (2015) view that learning should not be a rote memorization activity, but rather a real-life process. In contextual learning, the learning environment is open and becomes a space for obtaining and testing information. Students investigate data from the field, and the material is discovered by the students themselves, not handed over directly by the teacher.

The application of the contextual learning approach involves four main stages: 1) invitation, 2) exploration, 3) explanation and solution, and 4) taking action (Johnson, 2018). These four stages can be described as follows:

1. Invitation

   In the implementation of contextual learning in the mathematics lesson on the topic of flat shapes in Grade III at Cawan Jatinom Klaten Elementary School, it was observed that the teacher encouraged students to express their prior knowledge about the concepts being discussed. The teacher prompted students by asking problem-based questions related to everyday life phenomena, linking these real-world contexts to the mathematical concepts, and encouraging students to share their own opinions. Opportunities were provided for students to communicate their understanding, and the teacher gave feedback on their ideas. This aligns with Johnson (2018), who explains that in the *invitation* stage of contextual learning, students are encouraged to express their initial knowledge of the concepts, with teachers stimulating thinking through problem-oriented questions related to daily life and connecting them to students' prior understanding. During the learning process, students actively responded to the questions, asked their own questions, and engaged in peer interaction by giving feedback and sharing their opinions about the concepts being discussed.

2. Exploration

   In the implementation of contextual learning in the mathematics lesson on the perimeter of flat shapes in Grade III at Cawan Jatinom Klaten Elementary School, it was observed that the teacher provided opportunities for students to investigate and discover concepts by collecting data through activities designed by the teacher. Students were encouraged to process and interpret the data as part of these activities. The teacher divided the class into several groups to carry out the tasks and discuss the problems collaboratively. This approach successfully fulfilled students' curiosity about real-life phenomena in their surrounding environment. This aligns with Johnson's (2018) explanation that during the *exploration* stage, students are given the opportunity to investigate and discover concepts by collecting, organizing, and interpreting data in activities designed by the teacher. In groups, students actively engaged in the tasks and discussions, which overall satisfied their curiosity about life phenomena around them. Throughout the learning process, students were actively involved in collecting data, processing information, coordinating with group members, and discussing the issues at hand, demonstrating high curiosity and engagement with their environment.

3. Explanation and solution

   In the implementation of contextual learning in the mathematics lesson on the perimeter of flat shapes in Grade III at Cawan Jatinom Klaten Elementary School, it was observed that the teacher provided reinforcement when students explained their findings based on their observations. The teacher also reinforced students when they offered solutions to problems derived from their observations. Additionally, the teacher encouraged students to express their ideas and to summarize the results of their observations. This aligns with Johnson's (2018) explanation that during the *explanation and solution* stage, students present explanations and solutions based on their observations, supported by teacher reinforcement, which enables them to convey ideas, create models, and summarize their findings. Throughout the learning process, students actively explained their observations, provided problem-solving solutions, communicated their ideas, and created summaries of their results.

4. Taking action

   In the implementation of contextual learning for the mathematics lesson on the perimeter of flat shapes in Grade III at Cawan Jatinom Klaten Elementary School, it was observed that teachers effectively encouraged students to apply their knowledge, skills, and various information and ideas related to problem-solving. Teachers motivated students to ask follow-up questions and offer suggestions, both individually and in groups, regarding problem-solving tasks. This aligns with Johnson's (2018) explanation that at the action-taking stage, students are expected to make decisions, utilize their knowledge and skills, ask further questions, and provide suggestions individually and collaboratively. During the ongoing learning process, students actively engaged in using knowledge, applying problem-solving skills, asking follow-up questions, and submitting individual and group suggestions. Additionally, real-world problems presented at the start of learning helped students recognize the relevance of the material. Romar et al. (2018) also emphasized that learning outside the classroom using real objects as media facilitates students' understanding of lesson materials..

The results of this study contribute to increasing students' sensitivity to understanding mathematical concepts in everyday life, encouraging other teachers to enhance their competence in applying contextual learning models to other subjects, and improving the quality of education both locally and nationally. However, in applying the contextual learning model, things that need to be considered include: the formation of student groups must consider student characteristics seen from various aspects so that the learning groups formed have relatively balanced equality between one group and another, teachers need to encourage students in each group to be actively seen in group activities and completion of tasks, and not only rely on their smart friends.

Conclusion

Based on the research results and discussion, it can be concluded that: (1) the implementation of a contextual learning approach effectively increased students' motivation and numeracy skills in mathematics, particularly in understanding the concept of the perimeter of flat shapes; (2) incorporating real-world objects and measuring tools both inside and outside the classroom enhanced students' engagement and comprehension, fostering a more student-centered and motivating learning environment; and (3) following corrective actions through Cycle II, students' numeracy skills demonstrated significant improvement, as the contextual approach facilitated a deeper and more meaningful understanding of mathematical concepts.

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