ISSN Online 2527-5933
MATH-EDU: Journal of Mathematics Education
Volume 10, Nomor 3, Desember 2025, pp. 271-283

Efforts to Improve Students' Mathematics Learning Outcomes through the *Contextual Teaching and Learning (CTL)* Learning Model on Cube and Block Materials in Class VIII A Christian Junior High School

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Article Information

Received:
September 23rd 2025

Accepted:
February 06th 2026

Published:
December 31st 2025

Keywords
Contextual Teaching And Learning (CTL)
Learning Outcomes
Cube and Beam
Learning Mathematics

Abstract

Masalah dalam penelitian ini adalah rendahnya hasil belajar matematika siswa kelas VIII A SMP Kristen Kefamenanu pada materi kubus dan balok. Siswa mengalami kesulitan dalam memahami langkah-langkah penyelesaian soal, menggunakan rumus yang tidak tepat, serta kurang memahami simbol-simbol matematika. Hal ini menunjukkan perlunya model pembelajaran yang dapat membantu siswa mengaitkan materi dengan pengelaman nyata. Tujuan dari penelitian ini adalah untuk meningkatkan hasil belajar siswa kelas VIII A SMP Kristen Kefamenanu melalui pembelajaran *Contextual Teaching And Learning (CTL)*. Penelitian ini merupakan penelitian tindakan kelas (PTK) yang dilakukan dalam dua siklus dengan subjek penelitian 26 orang siswa. Teknik pengumpulan data menggunakan observasi dan tes hasil belajar. Hasil penelitian menunjukkan peningkatan hasil belajar dari siklus I dengan ketuntasan klasikal 57,69% dan rata-rata aktivitas siswa 2,00 (kategori cukup baik), menjadi 80,76% pada siklus II dengan rata-rata aktivitas siswa 3,00 (kategori baik sekali). Dengan demikian, penerapan model pembelajaran *Contextual Teaching And Learning (CTL)* terbukti efektif dalam meningkatkan hasil belajar matematika siswa pada materi kubus dan balok.

Abstract

The problem in this research is the low mathematics learning outcomes of grade VIII A students at SMP Kristen Kefamenanu in the topic of cubes and rectangular prisms. Students experienced difficulties in understanding problem-solving steps, used incorrect formulas, and had a limited undersanding of mathematical symbols. This indicates the need for a learning model that can help students connect the material to real-life experiences. The objective of this study is to improve student learning outcomes through the implementation of the Contextual Teachung And Learning (CTL) approach. This research is a classroom action research (CAR) conducted in two cycles involving 26 students as subjects. Data collection techniques included observations and learning outcome tests. The results showed an improvement in learning outcomes from cycle I, with a mastery level 57.69% and an average student activity score of 2,00 (categorized as low), to 80,76% in cycle II with an average activity score of 3.00 (categorized ad good). Thus, the implementation of the Contextual teaching and learning (CTL) learning model proved to be effective in improving students' mathematics learning outcomes in the topic of cubes and rectangular prisms.

How to Cite: Edita, Nolceana Elisabeth. Bete, Hendrika. and Bone, Dominifridus. (2025). Efforts to Improve Students' Mathematics Learning Outcomes through the *Contextual Teaching and Learning (CTL) Learning Model* on Cube and Block Materials in Class VIII A Kefamenanu Christian Junior High School. *Math-Edu: Jurnal Ilmu Pendidikan Matematika*, 10 (3), 271-283.

Introduction

Learning is a process that a person does to obtain a new behavior change as a whole, as a result of their own experience in interaction with their environment (Slameto, 2015). According to Ihsana (2017), learning is an activity where there is a process from not knowing to knowing, not understanding

to understanding, not being able to achieve optimal results. Syaiful and Aswan (2014), learning is behavior change thanks to experience and practice. This means that changes in behavior, both related to knowledge, skills and attitudes, even include all aspects of organisms or individuals.

Learning activities are inseparable from learning. The learning process becomes an inseparable system in learning. Learning itself is a process of change that is realized and maintained, referring to the existence of system activities to change for the better of an individual (Setiawan, 2017). Meanwhile, according to Sudjana (2012), learning is an effort maintained by education to motivate students to be involved in learning activities. Learning and learning objectives have a very important role, in general learning objectives are aspects that need to be considered in a learning plan (Setiawan, 2017). Meanwhile, according to Simanjuntak (2021), the purpose of learning is to achieve a change in students' behavior or abilities after carrying out learning activities.

Based on the results of the author's interview with a mathematics teacher at Kefamenanu Christian Junior High School on October 10, 2024, it was stated that the main problem with the learning outcomes of grade VIII A students is the difficulty in completing the steps to solve the problem and there are also students who work on the problem using perfunctory formulas or formulas that they make themselves. In addition, several other obstacles were also found, such as: 1) Students could not distinguish cubes and blocks. 2) Students find it difficult to determine the formula to solve the problem of volume and surface area of cubes and blocks. 3) Students do not know mathematical symbols. When faced with practice questions such as volume, surface area, and the relationship between sides, length and height, students do not understand how to solve the problem even though the same form of question is often presented in the textbook, students are not so sure whether the answer is correct or wrong. Therefore, student learning outcomes in mathematics subjects do not show maximum results.

According to Dhiyaurrahmah et al. (2024) Factors that affect students include learning methods that only dominate teachers, less interesting learning models, and also a lack of motivation to learn in students, such a learning model makes students tend to feel bored and the situation in the classroom becomes monotonous. To overcome this, teachers must selectively choose the right learning model so that students can be interested in learning mathematics. One of the methods that teachers can use in the learning process that aims to improve student learning outcomes is the contextual theaching and learning learning model.

Based on the results of research conducted by Rianawati (2013), based learning (CTL) can improve student learning outcomes and is also able to design and construct their own knowledge, conduct questions and answers critically, systematically, analytically, and logically, collaborate with friends between groups to solve problems and apply the knowledge they have. Based on the results of Markus (2017's research), it shows that there is an increase in cycle 1 which means that the learning model (CTL) can make learning more active and the context or learning that is close to the real life of students can also improve learning outcomes.

Based on the description above, the researcher wants to conduct research, as the purpose of the research is to improve student learning outcomes by using the *Contextual Teaching and Learning (CTL)* learning model with the title "Efforts to Improve Students' Mathematics Learning Outcomes through *the Contextual Teaching and Learning (CTL)* Learning Model on Cube and Block Materials in Class VIII A SMP Kristen Kefamenanu"

Methods

The type of research used in this study is classroom action research (PTK). Classroom Action research is a research activity carried out by teachers to improve the quality of learning implementation in their classrooms (Suparno, 2006).

Subjects in this research were even semester grade VIII A students totaling 27 students. It consists of 17 male students and 10 female students. Academic Year 2024/2025. The place and time of this research are as follows: Research will be carried out in class VIII of ASMP Christian Kefamenanu. Research time was carried out in the even semester of the 2024/2025 Academic Year.

The data collection tools and techniques used in this study are data types, data collection tools. This can be described as follows;

1. Data types

   The type of data used in this study is primary data in the form of observation data in the form of observation sheets of students and teachers and mathematical test scores from students as research subjects.

2. Research Instruments

   a. Data collection tools

      1) Observation sheet

         Observation sheets are used as a technique to collect data about student and teacher activities during the learning process.

      2) Test Questions

         The test in this study is a test of mathematics learning outcomes on cube and block materials in grade VIII A Kefamenanu Christian Junior High School. This study uses written test questions in the form of descriptions.

   b. How data is collected

      In this study, the method of data collection uses 2 methods, namely:

      1) Observation or observation (attached).

         In this study, the researcher used an observation sheet (attached). The researcher was assisted by the research partner to fill out the observation sheet. This observation sheet is used as a reflection material for the next teaching and learning process.

      2) Test

         In this study, the researcher used a written test in the form of a description (attached).

Research Procedure was carried out in 2 cycles where each cycle lasted for 1 week with 2 meetings.

Cycle 1

This research cycle is in the form of a work procedure in a class action research that is taken in stages. The stages of this research include the planning stage, implementation, observation, and reflection, which are arranged in a cycle.

a. Planning

Before conducting the research, the researcher first made preparations which included:

1) The researcher plans to determine the learning process that will be used at each meeting using the CTL learning model.
2) The researcher plans to develop a learning implementation plan (RPP) and syllabus using the CTL learning model.
3) The researcher prepares the LKPD, teacher and student observation sheets, and also test posts.
4) The researcher compiled a series of comprehensive learning activities that in the form of a cycle of class action.

b. Execution or action

1) The teacher conveys the indicators, learning objectives and importance of the lesson and prepares students to learn.
2) The teacher informed about the learning method used, namely the Contextual Theaching and *Learning* (CTL) learning model.
    a) The teacher opens the lesson by greeting the students and then shows the real objects in the classroom in the form of cubes and blocks (for example, the city of donates and books). The Master asked, What do you know about these things? and What is the difference between a donation box and a book? Students are asked to share what they already know, which will connect their old knowledge with new concepts about cubes and blocks. ***(constructivism)***
    b) After students do constructivism activities, teachers encourage students to ask questions about things they don't understand. For example, how to find the volume of cubes and blocks or what differentiates cubes and blocks in terms of size and shape. This way, students learn more deeply by asking relevant questions and gaining a better understanding. ***(Questioning)***
    c) In this step, the teacher gives students the opportunity to explore and discover the concepts of cubes and blocks through direct activities. For example, students are asked to measure the sides, length, width and height of a box or block around them and calculate the volume or area of the surface. In this way, students discover the

mathematical relationships that exist on cubes and blocks through hands-on experience. ***(Inquiry)***

d) In this stage, teachers create an environment that supports collaboration between students. can be done by dividing students into small groups to work (LKPD). The teacher distributes student worksheets (LKPD) which contain questions for calculating the volume and surface area of cubes and blocks that direct students to work in groups. Each group was given a cube-shaped object and a block that they had measured (e.g. donation boxes and tables). Students are asked to observe the object further, so that they can discuss with each other and gain various knowledge. Collaborative learning techniques, where students teach each other, can also strengthen their understanding. **(*Learning Community*)**

e) In this step, the teacher shows the correct way or method in calculating the volume and surface area of cubes and blocks. Teachers can use physical objects such as donation boxes and books) to model the calculation process. This modeling is important so that students can see firsthand the correct steps and understand the related concepts. **(*modeling*)**

f) After the lesson, the teacher invites students to reflect on what they have learned. Students may be asked to write down what they understand about cubes and blocks, as well as how the concept can be applied in daily life. ***(Reflection)***

g) Authentic reasoning can be done by assigning assignments that allow students to apply mathematical concepts in the context of everyday life. For example, calculating the volume and surface area of a box or container that is cube- or block-shaped, such as a packaging box or food container. **(*authentic assessment).***

c. Observation

Observation of learning activities is carried out at the time of implementation to find out the course of the learning process in the form of student activities and teacher performance. At the end of cycle 1 a test is held, whether the student is doing it himself and really understands what he has done or not. Based on the results of observations and test results, the next stage can be carried out.

d. Reflection

After the observation results and test results are analyzed collaboratively by researchers and collaborators, the next step is to reflect on whether the learning is successful. If the results are not in accordance with the indicators that have been set, the research is decided to continue in the second cycle.

Cycle ll

Cycle II takes place after observation and reflection on the implementation of cycle I, so that the implementation of cycle II is guided by the results of planning and improvement carried out in cycle II. The implementation steps of cycle II are the same as the implementation steps of cycle I.

The data analysis techniques used in this study are as follows:

1. Analysis of Observation Data

   The results of observations on students and teachers were obtained based on observation guidelines carried out at each meeting at the end of each cycle with the following formula:

   $$P=\frac{\textbf{Total score obtained}}{\textbf{Experienced many aspect}}$$

   With the following categories:

   With the following categories:

   1.00 - 1.49 = very less

   1.50 – 2.49 = less

   2.50 – 3.49 = good

   3.50 – 4.49 = very good

   4.50 – 5.00 = excellent

   (Sudjana, 2015: 133)

   A class is said to have been successful if the level of student activity is in the good category.

2. Test Result Data Analysis

   The data collected in each cycle is analyzed to determine the level of student completeness as follows:

   a. Individual Completeness

      A student is said to have succeeded (achieve learning completion) if he has reached a minimum mastery target of 75 or with a score (stipulated by the school).

      Formula used :

      Percentage of Individual Completeness = $\frac{Total\ score\ obtained}{Total\ score} \times 100\% =$

      $$\frac{SP}{ST} \times 100\%$$

      (Sudjana, 2002: 133)

   b. Classical Completeness

      A class is said to have been successful if at least 75% of all students in the class score above the Minimum Completeness Criteria (KKM). Here's how to calculate the percentage of completeness

Percentage of class completion = $\frac{Number\ of\ students\ who\ completed}{Number\ of\ students\ in\ class} \times 100\% = \frac{S}{T} \times 100\%$

(Lie, 2005: 85)

Indicators of success if in a class, the completeness is more than or equal to 75%, then the learning carried out can be said to be successful, but if the learning completeness is less than 75%, then the learning carried out has not been successful and continues with the next cycle.

Research and Discussion

Results

Based on the results of the research, it is shown that *the Contextual Teaching And Learning (CTL) approach* has a positive impact on improving student learning outcomes. This is evidenced by the increase in the completeness of test results and the results of observation of student and teacher activities from cycle I to cycle II.

Results of Cycle I

Learning in cycle I is carried out in accordance with the action plan. The CTL learning model began to be introduced to students. However, because this approach is still new to them, some students still experience confusion in following the learning flow. The results of the observation show that the activities of teachers and students are still in the low category. Students have not been able to respond optimally to learning, the activeness of the discussion has not appeared optimally, and the courage to present the results of the group's work is also still minimal.

Table 1. Results of Observation of Student Activities Cycle I

No	Student Inquiry	Observation Results			
		1	2	3	4
1.	Can students relate cube and block material to everyday life?			√	
2.	Do students follow the steps taught by the teacher in understanding the formula of the surface area of cubes and blocks?			√	
3.	Can students ask relevant questions to understand more about cubes and blocks?			√	
4.	Are students able to ask clear questions about aspects that are not yet understood about cube and block matter?			√	
5.	Do students collaborate with their classmates to recite malah or recite about cubes and blocks?			√	
6.	Are students able to apply the knowledge of cubes and blocks in their daily lives?			√	
7.	Are students able to integrate the learning that has been done and identify the application of the concept of cubes and blocks in daily life?			√	

Total	14
Average	2,00
Category	Pretty Good

Based on the table above, it can be seen that the average student activity in the first cycle is 2.00 with a fairly good category where students are not used to the learning model given.

Table 2. Hail Test Cycle I

No	Student's Initials	Value	Value Description
1.	AGB	80	T
2.	AM	45	TT
3.	AT	82	T
4.	ACK	46	TT
5.	CHCM	85	T
6.	CSO	76	T
7.	CT	38	TT
8.	DMN	77	T
9.	DPM	79	T
10.	IRN	83	T
11.	GEP	75	T
12.	GN	54	TT
13.	JT	81	T
14.	JB	32	TT
15.	JTS	80	TT
16.	MRT	45	TT
17.	NE	55	TT
18.	RK	76	T
19.	RL	78	T
20.	FB	47	TT
21.	WSL	82	T
22.	KP	39	TT
23.	FM	32	TT
24.	FT	78	T
25.	AO	81	T
26.	LJT	82	T
	Total Values	1.708	
	Average	65,69	
Classifiable Completeness Presentation		57,69%	

Remarks: students are declared complete if the score is greater than or equal with KKM 75.

T= Complete

TT= Incomplete

Improvements that occurred in cycle I

1. Students are not used to the learning model provided and students are still confused so that students have not focused on the material presented by the researcher.
2. Researchers must pay attention to every student who has not been active in discussion.
3. Students are less likely to ask questions about the surface area of cubes and blocks because students feel embarrassed, and students are not confident when conveying the results of group work in front of the class or in front of their peers, and also students are still lacking in answering questions given by other groups because of the diverse abilities of students so that they demand special attention from teachers.

Results of Cycle II

In cycle II, the researcher made improvements based on the evaluation from cycle I. At the beginning of the lesson, the researcher gave a brief explanation of the CTL learning model to provide a better understanding to students.

Table 3. Results of Observation of Student Activities Cycle I

No	Student Inquiry	Observation Results			
		1	2	3	4
1.	Can students relate cube and block material to everyday life?			√	
2.	Do students follow the steps taught by the teacher in understanding the formula of cube and block volume?			√	
3.	Can students ask relevant questions to understand more about cubes and blocks?			√	
4.	Are students able to ask clear questions about aspects that are not yet understood about cube and block matter?				√
5.	Do students collaborate with their classmates to recite malah or recite about cubes and blocks?			√	
6.	Are students able to apply the knowledge of cubes and blocks in their daily lives?			√	
7.	Are students able to integrate the learning that has been done and identify the application of the concept of cubes and blocks in daily life?			√	
	Total			**21**	
	Average			**3,00**	
	Category			**Good**	

Based on the observation data in cycle II, it shows that teachers' activities during mathematics learning activities are in the good category with an average score of 3.71

Table 4. Hail Test Cycle II

No	Student's Initials	Value	Value Description
1.	AGB	87	T
2.	AM	76	T
3.	AT	86	T
4.	ACK	79	T
5.	CHCM	88	T
6.	CSO	75	T
7.	CT	78	T
8.	DMN	80	T
9.	DPM	80	T
10.	IRN	84	T
11.	GEP	55	TT
12.	GN	80	T
13.	JT	85	T
14.	JB	57	TT
15.	JTS	90	T
16.	MRT	60	TT

17.	NE	75	T
18.	RK	83	T
19.	RL	78	T
20.	FB	77	T
21.	WSL	85	T
22.	KP	63	TT
23.	FM	58	TT
24.	FT	78	T
25.	AO	81	T
26.	LJT	82	T
	Total Values	2.000	
	Average	76,92	
Classifiable Completeness Presentation		80,76%	

Remarks: students are declared complete if the score is greater than or equal with 75

T= Complete

TT= Incomplete

Improvements that occurred in cycle II

1. Students already have the ability to respond to learning by using the CTL learning approach, because students feel that the learning model used is new, so before starting learning, the researcher must briefly explain about the CTL learning model
2. The activeness of students individually and in groups in group discussions, namely interactive, is good because students have the courage to ask questions or express their opinions or ideas. Through the results of this study, it is shown that learning using the CTL learning approach can be said to have reached the specified success indicator of 75%. This can be seen from the results of the second cycle test with a class completeness rate of 80.76% and the observation results show that the average observation results of 3.00 are good criteria, so there is no need to continue in the next cycle or cycle III.

Discussion

Based on the results of the research carried out in two cycles, it can be shown that learning using the learning approach *Contextual teaching and learning (CTL)* achieving a specified success indicator of 75%. In cycle I based on the results of observations and test results, there were 26 students who participated in learning, there were 15 students who completed and 11 students who did not complete, with a percentage of completeness of 57.69% and the results of the observation cycle I showed that the average observation results were 2.00 with less criteria, so it needs to be improved in cycle II or the next cycle.

From the test results and observation results in the first cycle, there are the following shortcomings in the first cycle: students do not have the ability to respond to learning by using the learning approach *Contextual teaching and learning (CTL)* and there is also the activeness of students individually and in groups in interactive group discussions that have not yet appeared, students are still hesitant in presenting the results of group work and also students are still lacking in answering questions

given by other groups because of the diverse abilities of students so that they demand special attention from teachers. After the researcher finds out that there are deficiencies in the learning process in cycle I, the researcher will try to correct these deficiencies in cycle II.

In the second cycle, it was shown that 26 students who participated in learning there were 21 students who completed and 5 students who did not complete with a completeness presentation of 80.76% and the observation results showed that the average observation results were 3.00 with good criteria. From the results of the research in cycles I and II, the increase in student learning outcomes from classroom learning can be said to be better than cycle I because researchers can correct errors in cycle I, this can be seen from students who already have the ability to respond to learning by using a learning approach *Contextual teaching and learning (CTL)* and the activeness of students individually and in groups in interactive group discussions is good because students have the courage to ask questions or express their opinions or ideas.

Based on the description in the discussion above, it can be said that with a learning approach *Contextual teaching and learning (CTL)* can improve the learning outcomes of students in grade VIII A SMP Kristen Kefamenanu for the 2024/2025 school year, this is in accordance with the opinion of Kaif (2021), the application of the learning model *Contextual Teaching And Learning (CTL)* in cube and block material, it can significantly improve student learning outcomes. In the research carried out, student learning outcomes increased from 45.94% in cycle I to 89.18% in cycle II. This shows that CTL is able to increase students' engagement and understanding of the concept of volume contextually. According to llahyah (2020) also proves that the learning model *Contextual Teaching And Learning* Effectively used to improve students' mathematics learning outcomes on cube and block materials. In the classroom action research carried out, the percentage of student class completeness increased from 67.80% in the first cycle to 83.87% in the second cycle where the CTL approach was applied consistently. This increase is supported by learning engagement associated with real life. Meanwhile, according to Nuraini (2021), it is also said that the application of the *Contextual Teaching And Learning* It is proven to improve students' skills in determining cube and block nets. In the classroom action research conducted, student learning outcomes increased from 39.88% in cycle I to 80.65% in cycle II. These results prove that CTL can be an effective alternative to overcome students' learning difficulties in understanding building spaces. This is in line with the latest research by Farhatin which shows an increase in learning outcomes from cycle I to cycle II through the application of CTL to cube and block materials. Furthermore, according to Farhatinl (2025), the results of the research in the first cycle the average value of student learning outcomes in the first cycle was 70.85%, while in the second cycle it increased to 90.62% of students. This proves that the application of CTL, through constructivism steps to authentic assessment, is able to improve students' understanding of cube and block material.

Conclusion

Based on the results of the research carried out, it is concluded that the use of the *Contextual Teaching And Learning (CTL) model* can improve the learning outcomes of students in grade VIII A of SMP Kristen Kefamenanu for the 2024/2025 school year. This learning model is carried out in two cycles, and the achievement of student learning outcomes shows an increase from the initial condition that is not complete to complete and the score of observation of student activities. The results of the study showed that the average score in cycle 1 was 65.69 and the percentage of learning completeness was 57.69% with less criteria and also the observation results showed that the average observation was 2.00 with less criteria. Then in cycle 2 the average score of students increased by 76.92 and the percentage was 80.76% with very good criteria and the observation results showed that the average observation results were 3.00 with good criteria. Efforts to Improve Students' Mathematics Learning Outcomes Through *the Contextual Teaching and Learning (CTL)* Model in Cubes and Blocks in Class VIII A SMP Kristen Kefamenanu, with a *Contextual Teaching And Learning (CTL) learning model* that relates the material to the daily lives of students based on learning experience, so that students can more easily understand the concepts learned.

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