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IMPROVING UNDERSTANDING OF MATHEMATICAL CONCEPTS THROUGH CONTEXTUAL TEACHING AND LEARNING (CTL): A CASE STUDY AT JUNIOR HIGH SCHOOL 14 PEMATANGSIANTAR

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ABSTRACT

Mathematics learning at the secondary school level plays an important role in fostering a deep understanding of ideas among students. The main purpose of this research is to see how effectively SMP Negeri 14 Pematangsiantar's students understand mathematical concepts through CTL learning. This research applies a quantitative approach with a true experimental design. The study involved 30 seventh-grade students, divided into an experimental group (15 students of class VII-1) and a control group (15 students of class VII-3). The experimental group received learning with the CTL approach, which incorporated real-life problem-solving activities, discussions, and hands-on contextual exercises related to fractions. Meanwhile, the control group was taught using the expository method. Both groups were given a pre-test and post-test to measure the improvement of learning outcomes. The control group had an average post-test score of 54.00, while the experimental group had a significantly higher score of 90.33 ($p < 0.001$). Data were analyzed using an independent sample t-test, which confirmed that the difference in post-test scores between the two groups was statistically significant. The findings indicated that the CTL approach significantly improved students' conceptual understanding. The practical implications of this study suggest that integrating contextual learning strategies into mathematics instruction can enhance students' ability to comprehend abstract concepts, particularly fractions. The findings of this study support the CTL approach as an effective and recommended instructional strategy for improving students' conceptual understanding of fractions. Implementing this approach can contribute to more engaging and meaningful mathematics education at the secondary school level.

Keywords: Concept Understanding, Contextual Teaching and Learning, Fractions, Junior High School, Quantitative Research

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INTRODUCTION

Mathematics learning plays an important role in building concept understanding, critical thinking, and problem-solving skills. As a fundamental pillar of education, mathematics supports progress in various fields such as economics, technology, and social development (Prastawati & Mulyono, 2023). To achieve this, education must equip students with the necessary skills to adapt to change and compete at the international level. Understanding mathematics involves not only memorizing formulas, but also connecting the material learned to real-life contexts (Radiusman, 2020). However, many students still struggle to connect mathematical concepts with everyday life, especially in the topic of fractions. This difficulty often comes from teaching methods that are too theoretical and lack contextualization (Setiani et al., 2022). When mathematics teaching focuses only on mechanical calculations without linking concepts to practical situations, students may find it difficult to engage in learning and rely more on memorization than meaningful understanding.

Concept understanding is a fundamental goal of mathematics education. According to Siregar & Azis (2022), concept understanding is very important for students because it is the basis of all learning. Mathematics is a discipline that continues to develop and is inseparable from various aspects of human life (Fitria et al., 2024). At the junior high school level, a strong understanding of mathematical concepts is necessary to effectively solve problems in both academic and everyday contexts. However, traditional teaching methods that only focus on lectures and example-based explanations often lead to memorization without deep understanding. To overcome this problem, teachers need to implement engaging and interactive learning strategies that encourage students to think critically and apply their knowledge in different situations (Radiusman, 2020). Learning activities that incorporate discussion, problem solving and contextual applications help students understand mathematical concepts more effectively.

A contextual approach is needed to bridge this gap and improve students' understanding of math concepts. Contextual Teaching and Learning (CTL) offers a solution by allowing students to connect mathematical concepts with their real-life experiences, thus making learning more relevant and meaningful. CTL emphasizes the connection between learning materials and real-life situations, which allows students to see the relevance of what they are learning (Pendong, 2022). This approach not only increases students' motivation, but also allows them to construct their own understanding through meaningful learning experiences. By integrating real-life examples into mathematics learning, CTL helps students develop a comprehensive and practical understanding of mathematical concepts. Teachers play an important role in implementing CTL effectively by guiding students in understanding mathematical concepts and connecting them to practical applications. This method not only improves conceptual understanding but also fosters long-term retention and application of knowledge.

This research focuses on testing the impact of the CTL approach on students' understanding of fractions, especially in SMP Negeri 14 Pematangsiantar. By analysing the effectiveness of CTL-based learning methods, this study aims to provide insight into improving teaching strategies in mathematics education. The goal is to improve students' ability to connect mathematical concepts with real-world applications, fostering a deeper and longer lasting understanding. In addition, this study aims to support teachers in implementing CTL to improve students' understanding of fractions. By presenting mathematical concepts contextually,

teachers can help students reconstruct their knowledge in a way that is easier to understand and can be applied (Neno et al., 2020).

The findings from this study are expected to provide valuable insights for junior secondary school mathematics teachers, particularly at SMP Negeri 14 Pematangsiantar, in adopting CTL as an effective teaching strategy. In addition, this study can contribute to the development of creative and contextual learning programs that can improve the quality of mathematics education and increase students' academic achievement.

METHOD

The purpose of this study is to analyze the application of CTL concepts to help students understand mathematical concepts better. In particular, the research focuses on comparing the effectiveness of the CTL approach with expository learning methods in supporting students to understand basic mathematical concepts. To evaluate the level of student understanding, measurements are carried out through tests. The test was conducted twice consisting of pre-tests and post-tests designed to assess their conceptual understanding. The results of the two tests were analyzed using statistical methods to find out whether there was a significant difference between students who studied using the expository method and students who were taught using the CTL approach. Students' understanding of mathematical concepts is assessed through two tests. The test is designed to measure their level of conceptual knowledge. The data obtained from the test were statistically analyzed to determine if there was a significant difference between the two groups.

This study applies a quantitative approach with a True Experimental design which is considered appropriate to identify the relationship between teachers' teaching methods and student learning outcomes. In the conduct of the study, students were randomly divided into two groups, the first group was the experimental group and the second group was the control group. In the experimental group, students received instruction with the CTL approach, while in the control group students continued to learn with the expository method. This approach is designed to minimize confusing variables, so that the difference in observed learning outcomes can be ascertained from the learning method used, not from other factors.

Table 1. Design Research

Class	Pre-Test	Treatment	Post-Test
Experiment	O_1	X	O_2
Control	O_1	-	O_2

legend :

X = Treated with the CTL Approach

O_1 = Experimental and control class pre-test scores

O_2 = Experimental and control class post-test scores

The population of this study is seventh-grade students of SMP 14 Pematangsiantar. With a sample that includes two classes, namely class VII-1 which is an experimental group and class VII-3 which acts as a control group. The total subjects in the study amounted to 30 students, each group consisted of 15 students. Before starting the study, both groups were given tests to ensure their equivalence in terms of knowledge and initial abilities. These random assignments are designed to reduce the possibility of bias in sample selection and improve the validity of the research results.

Data is obtained through pre-tests and post-tests to assess students' understanding of mathematical concepts. The pre-test and post-test given have gone through validity and reliability tests to ensure that the questions used can measure students' understanding accurately and consistently. The validation test is carried out by homeroom teachers who are also mathematics graduates to ensure that the questions are in accordance with the learning

objectives and the level of difficulty of the students. With his expertise, he assesses the clarity, relevance, and accuracy of the questions in order to measure students' understanding of concepts accurately. In addition, reliability is also tested to ensure the consistency of test results, so that the instrument can measure student understanding accurately and reliably.

The initial test is carried out before learning begins to identify the level of students' understanding of the material to be delivered. The final test is then conducted after the learning is completed to evaluate the improvement of students' understanding. Both tests are designed in the form of 4 essay questions that focus on students' ability to apply fractional concepts in various contexts. Each question is assessed based on the following criteria: 25 points for correct and complete answers, 20 points if the answer is correct but there are minor errors in the completion step, 15 points if the answer is incorrect but shows an understanding of basic concepts, and 0 points if the answer is incorrect or irrelevant.

Through a statistical approach, the results of quantitative data from pre-test and post-test were analyzed to evaluate significant differences in mathematical understanding between the experimental and control groups. Descriptive analysis was used to show the performance of both groups in pre-test and post-test. In addition, a t-test is applied to determine whether the CTL approach significantly improves student understanding. The significance level was set at $p < 0.05$ to ensure that the differences found were statistically significant.

Various ethics related to this research are strictly adhered to. Consent from students and teachers is obtained to ensure that participants understand the research objectives and their rights. Privacy is maintained by keeping all student data confidential and no personally identifiable information is included in the analysis or reporting of research results. Participation is voluntary and no incentive is provided to ensure the ethical integrity of the research.

It has research limitations, especially the relatively small sample size, which can affect the ability to generalize results. In addition, the research location was limited to just one school, so the results may be influenced by the specific characteristics of the students and the teaching methods in that school. Although foundation and endpoint tests are considered valid for assessing understanding of concepts, they may not fully reflect other aspects of learning, such as students with the ability to forget material in a relatively short time and apply their knowledge in different contexts.

RESULT

This study was conducted to measure the effectiveness of the application of the CTL approach to improving students' understanding of mathematical concepts on fraction material, by giving several concept understanding tests. This test is specifically designed to measure students' ability to understand and apply the concept of fractions in various contexts, especially in the real world context. To find out how big the difference in conceptual understanding between the experimental class and the control class, the test results were processed using SPSS software. The following is a synthesis of the research results.

Table 2. Statistical Description

	N	Min. Score	Max. Score	Mean	Std. Deviation	Varians
Pre-Test Experiment	15	25	55	41.00	9.673	93.571
Post-Test Experiment	15	75	100	90.33	7.669	58.810
Pre-Test Control	15	10	50	32.00	12.790	163.571
Post-Test Control	15	10	85	54.00	16.924	286.429

The data in the table shows that the experimental group had more difficulty understanding math concepts than the control group. In the experimental group, students taught with the CTL technique got a pre-test score with an average of 41.00, with a range of 25-55. After the CTL approach was carried out, the mean post-test value of the experimental group increased to 90.33 with a range of values of 25, a minimum of 75, and a maximum of 100. Whereas in the control class that did not receive the CTL approach treatment, the average value of the students' pre-test was 32.00 with a range of 40, minimum 10, and maximum 50. After conventional learning, the average value of the post-test increased to 54.00, but with a larger range, namely 75, and high standard deviation and variance. This indicates that the improvement in understanding in the control group was not consistent, and the learning method used was less effective in achieving equal understanding of the concept of fractions between students.

Validity and Reliability of Test Instruments

To ensure that the test instruments used in this study are valid and reliable, the pre-test and post-test have gone through a validation process before use. Validation is done through expert judgment to ensure that the questions given really measure the understanding of fraction concepts in accordance with the research objectives. In addition, the reliability test was conducted using a certain method to ensure the consistency of the results obtained.

Standardization of Essay Question Scoring

In this study, the scoring of essay questions was carried out with strict standards to maintain objectivity. Scores are given based on a predetermined scoring rubric, which includes aspects of concept understanding, accuracy of completion, and skills in applying fraction concepts in various contexts. In addition, to reduce bias in scoring, multiple scoring was conducted by more than one assessor, then the results were compared to reach a more objective score agreement.

Assumption Tests Before Conducting the t-test

Before conducting the t-test, several prerequisite tests are required to ensure that the test assumptions are met.

a. Normality Test

The results of the test Shapiro-Wilk for normality are shown below.

Table 3. Data Normality Test with TestShapiro-Wilk

	Statistic	Df	Significance
Pre-Test Experiment	0.928	15	0.255
Post-Test Experiment	0.923	15	0.210
Pre-Test Control	0.921	15	0.197
Post-Test Control	0.920	15	0.192

The Shapiro-Wilk test for normality assesses whether data follow a normal distribution, using the criterion that data can be considered normally distributed if the p-value exceeds $\alpha = 0.05$ (Iba & Wardhana, 2023). According to the data in the table, the test results of the Shapiro-Wilk pre-test and post-test groups are statistically significant ($p < 0.05$). Thus, we can witness that the data in each category are normally distributed. Therefore, we can conclude that the data in each set follow a normal distribution and can proceed with the t-test.

Establishing normality is a crucial step in statistical analysis, as it ensures the reliability of subsequent tests and interpretations. The normal distribution of data indicates that the sample reflects the population accurately, reducing the risk of biased results. In this study, confirming normality through the Shapiro-Wilk test strengthens the validity of the analysis, as any patterns or differences observed can be attributed to genuine effects rather than statistical anomalies.

This step not only validates the use of parametric tests like the t-test but also supports the overall integrity of the research findings, providing a solid foundation for drawing meaningful and accurate conclusions.

b. Homogeneity Test

When you want to analyze and compare student variances, you need a homogeneity test. This study used variance homogeneity test to determine the value of group homogeneity. Homogeneity is defined as a condition in which the mean-based significance value of the data set is greater than 0.05. The table of homogeneity test results is presented below.

Table 4. Homegenity Test with TestHomogeneity Of Variance

	Levene Statistic	df1	df2	Significance
Based on Mean	2.101	1	28	0.158
Based on Median	1.879	1	28	0.181
Based on Median and with adjusted df	1.879	1	16.801	0.188
Based on trimmed mean	1.916	1	28	0.177

The table shows that the significance value of Base on Mean is about 1.58. A significance level of more than 0.05 indicated by the base on mean proves that there is no variation between the two groups (experimental and control). Therefore, it can be concluded that the data is homogeneous.

Data homogeneity is a crucial aspect of experimental research as it ensures that variability between groups does not interfere with the validity of the research results. In this study, since the data has been proven to be homogeneous, further analysis such as the t-test can be conducted to compare the effectiveness of the Contextual Teaching and Learning (CTL) method with the expository method in improving students' understanding of mathematical concepts. The conclusions of this study are more reliable because the differences in learning outcomes between the two groups are more likely to be caused by the applied treatment rather than unidentified external factors.

c. Hypothesis

To determine whether there was a statistically significant difference in students' understandinof mathematical concepts between the two teaching methods, a hypothesis test was conducted. The null hypothesis (H_0) states that there is no difference in conceptual understanding between students taught using the expository approach and those taught using the Contextual Teaching and Learning (CTL) approach. In other words, both groups are assumed to have the same level of understanding of fractions, indicating that the teaching method does not significantly impact students' comprehension.

Conversely, the alternative hypothesis (H_1) posits that there is a meaningful gap in conceptual understanding between the two groups. This hypothesis suggests that students taught using the CTL approach exhibit a higher level of understanding of fractions compared to those taught through the expository method. If the statistical test results indicate a significant difference, it would imply that the CTL approach effectively enhances students' comprehension of mathematical concepts, providing empirical evidence in support of its implementation in the classroom.

d. t-test

To find out whether the experimental group had a better post-test score than the control group, an was usedindependent sample. The t-test results are shown in the following table t-test.

Table 5. t-test

	T	Df	Significance Two-Sided p	Mean Difference
Equal variances assumed	7.573	28	< 0,001	36.333
Equal variances not assumed	7.573	19.516	< 0,001	36.333

The findings of the study reveal that students in the experimental group, who received instruction through the Contextual Teaching and Learning (CTL) approach, demonstrated significantly higher learning outcomes than those in the control group, which was taught using the expository method. This conclusion is supported by the t-test results, which produced a t-value of 7.573 and a p-value of less than 0.001. Since the p-value falls below the 0.05 threshold, it confirms that the difference in learning achievements between the two groups is statistically significant. These results indicate that the teaching method employed had a substantial influence on students' comprehension of mathematical concepts.

Due to this significant disparity, the null hypothesis (H_0), which asserts that there is no notable difference in conceptual understanding between students taught through CTL and those using expository learning, can be definitively dismissed. Conversely, the alternative hypothesis (H_1) is validated, demonstrating that the CTL approach has a greater effect on students' mastery of mathematical concepts. This impact is evident in the post-test results, where the experimental group achieved an average score that exceeded the control group's performance by 36.333 points. This substantial difference further reinforces the effectiveness of the CTL method in enhancing students' conceptual grasp, particularly in the area of fractions.

DISCUSSION

Students' understanding of the concept of fractions at Junior High School of State 14 Pematangsiantar has significantly improved through the implementation of CTL strategies. This improvement is particularly evident in students' ability to connect abstract mathematical concepts with real-world applications, allowing them to develop a deeper and more meaningful understanding of fractions. The effectiveness of CTL in enhancing students' comprehension aligns with the findings of Kumanireng et al. (2024) and Neno et al. (2020), which emphasize that the CTL approach helps overcome the limitations of traditional learning methods that rely solely on rote memorization. By encouraging students to relate mathematical principles to everyday experiences, CTL fosters active engagement and long-term retention of knowledge. Furthermore, CTL-based learning not only supports cognitive development but also enhances students' problem-solving skills, as they are required to analyze real-life situations and apply their mathematical understanding in a practical context. This leads to a more thorough and relevant grasp of the material, as supported by Fauziyah et al. (2023), who highlight the positive impact of CTL on student learning outcomes.

Students who received instruction through the CTL approach demonstrated significantly better performance on post-tests compared to those taught using the expository method. This considerable improvement suggests that CTL effectively strengthens students' conceptual understanding while also increasing their ability to apply their knowledge in various evaluation contexts (Damhudi et al., 2023). Unlike the expository method, which primarily focuses on memorization and procedural learning, CTL emphasizes comprehension, critical thinking, and the ability to transfer knowledge to real-life problems. As a result, students become more adept at analyzing mathematical problems rather than merely recalling formulas. The stark contrast between the two teaching methods underscores the limitations of traditional rote-learning approaches, which often fail to provide meaningful context for students. Without a contextualized learning experience, students struggle to grasp the fundamental principles of

mathematics, leading to gaps in their understanding and difficulties in application. By integrating real-world examples and encouraging active participation, CTL bridges this gap, making mathematics more accessible and relevant to students.

The positive impact of CTL is further reinforced by studies conducted by Aruan et al. (2022) and Chotijah & Susanto (2019), respectively, provide strong empirical evidence supporting the effectiveness of the CTL approach. Both studies found that the calculated t-value (t_{count}) was significantly higher than the critical t-table value (t_{table}), specifically 6.4975 > 2.080 and 5.96 > 1.68, respectively. These findings indicate that students who learned through CTL experienced a notable improvement in their mathematical concept comprehension compared to those taught using traditional methods. The statistical significance of these results underscores the reliability of CTL as an effective instructional strategy that enhances students' understanding by fostering active learning and meaningful engagement with mathematical concepts.

In addition to improving academic performance, students who were taught using the CTL approach exhibited increased engagement and motivation toward learning mathematics. They found the subject to be more enjoyable, interactive, and directly connected to their daily experiences. This shift in perception played a crucial role in fostering a more dynamic and participatory classroom environment, where students were encouraged to explore mathematical concepts through inquiry and problem-solving activities. Unlike traditional teaching methods that often result in passive learning, the CTL approach actively involves students in constructing their own understanding, making them more confident in applying mathematical principles beyond the classroom. As a result, students developed not only a stronger grasp of mathematical concepts but also a more positive attitude toward learning the subject. Moreover, studies suggest that this increased engagement can help reduce students' anxiety and fear of mathematics, ultimately leading to higher motivation and better academic outcomes.

The benefits of CTL for students' conceptual understanding are closely related to the role of teachers in implementing this approach effectively. As cited in Novitri & Roza (2022), guided reinvention in mathematics education is a crucial principle, where students actively reconstruct mathematical concepts under the teacher's guidance. This principle is a fundamental component of the CTL approach, which emphasizes inquiry-based learning and encourages students to rediscover mathematical ideas through hands-on experiences. Afriani (2018) further supports this perspective, arguing that students learn best when they are actively involved in exploring and internalizing concepts rather than simply receiving information passively. Through this guided reinvention process, students become more independent learners, capable of drawing connections between mathematical theories and real-world applications. This approach not only strengthens their conceptual understanding but also enhances their critical thinking and problem-solving abilities, which are essential for academic and professional success.

In practical applications, the role of teachers in integrating CTL into daily mathematics instruction is essential. According to Nababan (2023), the CTL approach redefines learning as an active process of discovery rather than a passive exercise of listening and memorization. This approach aims to develop students holistically, encompassing cognitive, affective, and psychomotor aspects of learning. By engaging students in hands-on experiences, discussions, and collaborative activities, CTL fosters a deeper and more meaningful understanding of mathematical concepts. Furthermore, the knowledge gained through CTL is not merely stored in short-term memory but becomes a lasting resource that students can apply in real-life situations. This long-term retention is particularly beneficial for subjects like mathematics, where conceptual clarity is crucial for advanced learning and problem-solving. By shifting the focus from memorization to comprehension, CTL prepares students to think critically and adapt mathematical principles to diverse contexts.

To maximize the impact of CTL in the classroom, teachers need concrete strategies for implementation. One effective approach is using real-world problems to contextualize fraction concepts. Instead of presenting abstract fraction exercises, teachers can design problems based on everyday situations. For instance, a relatable problem could be: "You and three friends order a large pizza that is divided into 8 equal slices. If each person eats 2 slices, how much of the pizza is left?" This problem not only reinforces the concept of fractions but also allows students to visualize and apply mathematical reasoning in a familiar setting. Similarly, a teacher might ask, "If you have a pizza cut into 12 slices and you eat 1/4 of it, how many slices remain?" These types of problems help students connect fractions with their daily experiences, making the concept more relatable and easier to grasp.

Additionally, teachers can facilitate group discussions where students collaborate to solve contextualized problems, encouraging peer learning and the exchange of ideas. Project-based learning can also be an effective strategy, where students apply fractions in real-life situations such as budgeting for an event, dividing materials for a classroom project, or analyzing statistical data. Another engaging example is having students plan a class party, where they must determine how many pizzas are needed if each student eats a fraction of a pizza. By using relatable contexts, students can develop a stronger conceptual foundation and see the practical applications of mathematics.

Furthermore, visual and hands-on learning aids, such as fraction strips, number lines, and pie charts, can help students better visualize fraction relationships. The integration of digital tools and interactive simulations can also provide dynamic ways for students to manipulate and explore fractions more intuitively. Teachers might use an online pizza-sharing game or an interactive fraction calculator to demonstrate how fractions work in different scenarios.

Another key strategy is promoting self-assessment and reflection, allowing students to evaluate their understanding and recognize areas for improvement. Teachers can encourage students to write short reflections on how they applied fractions in a real-life scenario, such as sharing a pizza with friends or dividing a cake among family members. By implementing these approaches, teachers can create a more engaging and meaningful learning environment that aligns with the principles of CTL.

Thus, the implementation of CTL in mathematics education has proven to be highly effective in making learning more engaging, enjoyable, and accessible, particularly for challenging topics such as fractions. The success of CTL in this study reinforces the idea that contextualized learning serves as a fundamental pedagogical strategy that enables students to construct knowledge in a way that is both meaningful and sustainable. By integrating real-world connections into mathematical instruction, CTL represents a progressive shift in teaching methodologies—one that prioritizes active student participation, conceptual understanding, and real-life applicability over passive absorption of information. As educational paradigms continue to evolve, the adoption of CTL and similar student-centered approaches can play a crucial role in enhancing the quality of mathematics education and preparing students for future academic and professional challenges.

CONCLUSION AND SUGGESTIONS

This study has shown that the implementation of CTL can significantly make students' concept understanding increase. This is proven by the learning outcomes of the control group using the expository method getting an average of score 54.00 scores, while the experimental group using the CTL approach has an average post-test post-test of 90.33. In both groups there is a significant gap according to the t-test ($p < 0.001$). The CTL method improved students' concept understanding and fostered positive attitudes among students towards mathematics, making the subject more enjoyable and understandable. Therefore, it is recommended for

educators to use the CTL approach in teaching mathematics to improve students' concept understanding.

Based on the findings of this study, it is recommended that teachers start applying the Contextual Teaching and Learning (CTL) approach in mathematics learning on fraction materials to help students understand concepts better through linking to real situations. Schools can also organize training for teachers to improve their understanding in applying CTL strategies effectively in the classroom. In addition, the development of CTL-based teaching materials that are in accordance with the curriculum and student needs needs to be done so that learning is more structured and easy to understand. To strengthen the results of the study, further research is needed with larger samples and broader materials to test the effectiveness of this approach in various aspects of mathematics learning. With proper implementation, CTL can be a more innovative and meaningful learning method for students.

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REFERENCES

Afriani, A. (2018). Pembelajaran Konseptual (Contextual Teaching and Learning) dan Pemahaman Konsep. *Jurnal Al-Muta'aliyah STAI Darul Kamal NW Kembang Kerang*, 1(3), 80–88. https://doi.org/http://ejournal.kopertais4.or.id/sasambo/index.php/mutaaliyah

Aruan, N. F., Panjaitan, D. F., Aruan, E. F., & Manik, E. (2022). Pengaruh Model Pembelajaran Contextual Teaching and Learning (CTL) Terhadap Pemahaman Konsep Matematika Siswa Kelas VII SMP Swasta Imelda Medan. *SEPREN: Journal of Mathematics Education and Applied*, 16–25. https://doi.org/https://doi.org/10.36655/sepren.v3i2

Chotijah, S., & Susanto, A. (2019). Efektivitas Contextual Teaching and Learning (CTL) dalam Meningkatkan Pemahaman Konsep Peserta Didik. *Jurnal Tadris Matematika*, 2(2), 195–206. https://doi.org/https://doi.org/10.21274/jtm.2019.2.2.195-206

Damhudi, D., Fakhruddin, & Idris, M. (2023). Pendekatan Contextual Teaching Learning Dalam Meningkatkan Kreativitas Belajar Pada Pembelajaran Akidah Akhlak Di Min 1 Lebong. *Jurnal Literasiologi*, 9(3), 29–41. https://doi.org/https://doi.org/10.47783/literasiologi.v9i2

Fauziyah, R. I., Sutriyani, W., & Zumrotun, E. (2023). Efektivitas Model Contextual Teaching and Learning (Ctl) Berbantuan Media Papan Pintar Terhadap Hasil Belajar Matematika SD. *JagoMIPA: Jurnal Pendidikan Matemaika dan IPA*, 4(2), 407–417. https://doi.org/https://doi.org/10.53299/jagomipa.v4i2.717

Fitria, R., Zulhendri, & Ediputra, K. (2024). Pengaruh Pendekatan Contextual Teaching and Learning terhadap Kemampuan Pemahaman Konsep Matematis Peserta Didik SMA. *Jurnal Pendidikan Mipa*, 14(1), 99–107. https://doi.org/https://doi.org/10.37630/jpm.v14i1.1478

Iba, Z., & Wardhana, A. (2023). *Transformasi Data Ordinal Ke Data Interval*. Eureka Media Aksara.

Kumanireng, N. L., Dhiki, Y. Y., & Mbagho, H. M. (2024). Efektivitas Contextual Teaching and Learning Terhadap Hasil Belajar Matematika Siswa. *Jupıka: Jurnal Pendidikan Matematika Universitas Flores*, 7(1), 62–69. https://doi.org/https://doi.org/10.37478/jupika.v7i1.3174

Nababan, D. (2023). Pemahaman Model Pembelajaran Kontekstual dalam Model Pembelajaran (CTL). *Jurnal Pendidikan Sosial Dan Humaniora*, 2(2), 825–837. https://doi.org/https://publisherqu.com/index.php/pediaqu/article/view/190

Neno, W. A., Daniel, F., & Taneo, P. N. L. (2020). Pemahaman Konsep Matematis Siswa pada Pembelajaran dengan Pendekatan CTL. *Pembelajar: Jurnal Ilmu Pendidikan, Keguruan, dan Pembelajaran*, 4(1), 12–16. https://doi.org/10.26858/pembelajar.v4i1.12356

Novitri, R., & Roza, S. (2022). Pengaruh Model Pembelajaran Contextual Teaching And Learning (CTL) Terhadap Hasıl Belajar Matematıka di Kelas V SDN 12 2x11 Enam Lıngkung. *Jurnal Pendidikan Nasional*, 2(1), 29–35. https://doi.org/https://doi.org/10.55249/jpn.v2i1.21

Pendong, D. F. (2022). *Pembelajaran Botani Tumbuhan Tinggi Berbasis Contextual Teaching and Learning dan Penilaian Diri*. CV. Bintang Semesta Media.

Prastawati, T. T., & Mulyono, R. (2023). Peran Manajemen Pembelajaran Dalam Meningkatkan Prestasi Belajar Siswa Melalui Penggunaan Alat Peraga Sederhana. *Didaktik : Jurnal Ilmiah PGSD FKIP Universitas Mandiri*, 9(1), 378–392. https://doi.org/https://doi.org/10.36989/didaktik.v9i1.709

Radiusman, R. (2020). Studi Literasi: Pemahaman Konsep Anak Pada Pembelajaran Matematika. *Fibonacci: Jurnal Pendidikan Matematika dan Matematika*, 6(1), 1–8. https://doi.org/https://dx.doi.org/10.24853/fbc.6.1.1-8

Setiani, N., Roza, Y., & Maimumah. (2022). Analisis Kemampuan Siswa Dalam Pemahaman Konsep Matematis Materi Peluang Pada Siswa SMP. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 06(02), 2286–2297. https://doi.org/https://doi.org/10.31004/cendekia.v6i2.1476

Siregar, B. H., & Azis, Y. K. (2022). Pengembangan BahanAjar Digital Berbasis Pendekatan Saintifik Terhadap Kemampuan Pemahaman Konsep Matematis Siswa di SMP Negeri 38 Medan. *Ruang Cendekia : Jurnal Pengabdian Kepada Masyarakat*, 1(4), 257–265. https://doi.org/https://doi.org/10.55904/ruangcendekia.v1i4.407