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# Team Assisted Individualization Model Assisted by Wordwall Media: Elementary School Students' Understanding of Mathematical Concepts

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**ABSTRACT**

This research is driven by students' poor math comprehension. The lack of student activity and boredom in math causes this. Despite trying many learning strategies, educators have not been able to maximize math understanding. Researchers use the Team Assisted Individualization (TAI) cooperative learning paradigm to solve the problem. The purpose of this study was to determine the effect of the Team-Assisted Individualization (TAI) cooperative learning model assisted by Wordwall media on the understanding of mathematical concepts among elementary school students. The method used is quantitative with a quasi-experimental approach and a pretest-posttest control group design. The research subjects were fourth-grade students from two classes at Elementary School 1 Langkapura, with class A serving as the experimental group and class B as the control group. The instrument used was a test in the form of essay questions in the form of a posttest to measure the ability to understand mathematical concepts. The results of the study obtained a calculated value of t > ttable = 3.77 > 2.01 = 0.05, so that Ho is rejected and H1 is accepted. It can be concluded that there is an influence of the Team Assisted Individualization Cooperative learning model on the understanding of mathematical concepts in grade IV. Understanding concepts in mathematics subjects using the Team Assisted Individualization Cooperative learning model has an effect compared to understanding mathematical concepts using the Direct Instruction learning model of the Explicit Instruction type.



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## 1. INTRODUCTION

Education is an effort undertaken by every individual who possesses potential that must be fought for and developed (Dewantara et al., 2021). This is so that it can be utilized effectively to improve the quality of life in this era. Education plays a very significant role. It improves the human resources of students, making them individuals who have outstanding abilities and broad knowledge, can think critically, always demonstrate honesty and fairness, and can work well together (Samsuri et al., 2024). Furthermore, education is tasked with developing and conveying values to students, who

then pass on these values in their beautiful daily lives. Teaching can be explained as a method for changing individual and social ethics and behavior to achieve independence and human maturity through the process of education, learning, guidance, and development (Chowdhury, 2018). Therefore, it must be carried out and practiced both for oneself and for others. Therefore, learning is crucial for human survival in this world and the hereafter.

Developing student potential is a crucial aspect of education, even the core goal of education itself (Madani, 2019). Teachers play a significant role in supporting and encouraging the development of student potential through an effective learning process (Keiler, 2018). The teacher's role in the classroom is to create a pleasant learning environment for students, to motivate them, and to organize learning through careful planning. Overall, teachers play a diverse role in supporting and guiding students to achieve success in academics, personal development, and the development of their interests (Appova & Arbaugh, 2018). Teachers play a crucial role in the educational process and student development (Tatto, 2021).

Therefore, in creating an optimal atmosphere and service, it is essential for teachers to understand how students acquire knowledge through their learning activities (Toom et al., 2017). Students need to learn mathematics through an understanding approach and actively construct new knowledge based on their experiences and prior knowledge. Mathematics learning will be more effective and enjoyable if teachers understand the process of knowledge acquisition (Eronen & Kärnä, 2018; Hussein et al., 2022). With this understanding, teachers can determine appropriate learning strategies for students. This challenges mathematics teachers to continue to think and act creatively (Schoevers et al., 2019). Mathematics is one of the compulsory subjects for students at every level.

Mathematics learning is a process in which teachers teach mathematics to students (Schoenfeld, 2022). In this process, teachers strive to create a supportive atmosphere and provide services tailored to the diverse abilities, potential, interests, talents, and needs of each student (Suh et al., 2021). The goal is to achieve optimal interaction between teachers and students, as well as between students themselves.

A preliminary study conducted by the author with students at elementary school 1 Langkapura revealed that most fourth-grade students enjoyed mathematics. However, some students disliked mathematics because they found it confusing and difficult to understand. From this explanation, it can be concluded that the current focus of mathematics learning is not solely on arithmetic practice but rather on a more profound understanding of basic concepts. This learning approach aims to enable students not only to memorize formulas or steps but also to solve problems related to everyday life. A strong understanding of mathematics makes it easier for students to learn and apply mathematical knowledge in a variety of situations (Cai & Ding, 2017). Thus, students acquire not only technical skills but also new insights that connect prior knowledge with new learning experiences.

Furthermore, preliminary observations and a summary of the Odd Semester Midterm Assessment scores for the 2024/2025 academic year in fourth grade at elementary school 1 Langkapura revealed that students' mathematics learning outcomes were still

below expectations. Of the 25 students in grade IV A, only 16 (64%) achieved a math score above or equal to the Minimum Completion Criteria, which is 70. Meanwhile, in grade IV B, of the 25 students, only 16 (60%) achieved a score of 70. This means that more than 40% of students in both classes have not yet achieved the completion standard. Several factors contributing to the low mathematics learning outcomes include the teacher-centered learning model and the lack of active student involvement in the learning process. In conventional learning activities, students tend to be passive and lack opportunities for critical thinking or discussion. This results in a poor understanding of mathematical concepts.

Math can be challenging for kids owing to unengaging teaching techniques or a lack of interactive learning resources (Anderson et al., 2018). Teams Assisted Individualization (TAI) cooperative learning methodology., this learning paradigm creates small heterogeneous groups with varied thinking backgrounds to help each other and other students (Tinungki et al., 2022). TAI learning encourages students to learn independently, optimizes their ability to find scientific information, explains their findings, and solves problems, not just receives, listens, and remembers (Tinungki et al., 2024). There is also hope that kids' enthusiasm in math will grow, which will improve their knowledge and learning outcomes. Teachers will find it easier to teach arithmetic with the TAI (Team Assisted Individualization) type of cooperative learning paradigm (Nurmala et al., 2021). This study found that Team Assisted Individualization (TAI) cooperative learning improves student learning (Marasabes, 2021; Rahmatina & Rosmery, 2024). This study is relevant since it uses the same TAI cooperative learning approach in teaching and learning.

Cooperative learning, especially Team Assisted Individualization (TAI), has improved student engagement and conceptual understanding. The Team Assisted Individualization cooperative learning technique works in arithmetic (Andari et al., 2023). Since math incorporates practice problems, problem-solving, and group debates, this is true. This concept encourages students to collaborate and take responsibility for their individual and group achievement. In the digital age, technology-based learning material is expanding rapidly (Alakrash & Abdul Razak, 2021). Media should be evaluated with learning methods. To help pupils understand abstract math faster, teachers use media (Muhaimin & Juandi, 2023). Teaching and learning via learning media helps boost student comprehension. One learning tool is a word wall. Word walls and other learning tools can make abstract mathematical concepts more concrete and engaging (Elhefni et al., 2023). This study used an area word wall from a simple web application. This material will help pupils grasp rectangle and square area.

One application-based learning medium that can be used in the learning process is the Wordwall application (Rahma et al., 2023; Abd Al-Aziz et al., 2024). This application can be used as an innovation in online learning to ensure the learning process is not boring. This innovation can attract students' attention and increase their interest in learning. This learning medium is an interactive application based on an official website that is useful for creating practice questions for students, including quizzes, word searches, maze chases, true or false games, matching games, sentence corrections,

and others (Anggreini et al., 2025; Dewi et al., 2025). This study aims to explore the effect of the TAI cooperative model combined with the Wordwall media on the understanding of mathematical concepts in fourth-grade students.

The researcher concludes that teaching mathematics in elementary school is crucial. With a thorough understanding of mathematics, students will find it easier to learn and solve problems that arise in everyday life. It is important for students to learn mathematics through understanding and application and to expand their insights through new experiments based on their prior knowledge. In elementary school mathematics teaching, especially in fourth grade, students often have trouble understanding the material, possibly due to unengaging teaching methods or the limited use of interactive learning media.

It is hoped that this research will provide a positive contribution to the development of more effective and enjoyable mathematics teaching methods, as well as improve student achievement in mathematics. Based on the above, this research will focus on efforts to improve the understanding of fourth-grade students' mathematical concepts through the application of the TAI cooperative model with the aid of Wordwall media. Therefore, this method is expected to be an alternative to addressing problems in mathematics learning in elementary schools. Furthermore, the use of technology-based learning media such as Wordwall can be an effective tool to support the learning process. Wordwalls provide various interactive activities that can make learning more interesting and enjoyable. By combining the TAI cooperative model and Wordwall media, it is hoped that a more active and collaborative learning environment can be created, thereby improving the understanding of fourth-grade students' mathematical concepts.

## 2. METHOD

The type of research used in this study is experimental research (quasi-experimental design). Experimental research methods are used to examine the effects of a particular treatment on the symptoms of a particular group compared to other groups receiving different treatments. A quasi-experimental design is a type of experiment in which the entire intact group is given treatment. This study employed experimental design with a pre-test, post-test, and control group design. The researcher compared the experimental group taught using the Team Assisted Individualization cooperative learning model with the aid of Wordwall media and the control group taught using the Direct Instruction model.

This research was conducted at elementary school 1 Langkapura with the aim of determining the effect of the use of the Team Assisted Individualization cooperative learning model combined with interactive Wordwall media on the understanding of mathematical concepts in fourth-grade students. Prior to the posttest, the researcher conducted a pilot test of the instrument, consisting of 17 descriptive questions measuring mathematical concept understanding. This pilot test was conducted on other fourth-grade students outside the research sample to ensure the validity and reliability of the

questions. The researchers selected two classes as samples: one experimental class and one control class, with a total of 50 students. Each class consisted of 25 students. Class IV-A was designated as the experimental class, learning through the TAI cooperative model with the aid of Wordwall media, while Class IV-B was the control class, learning through the Direct Instruction model with the Explicit Instruction model.

The research instrument used in this study was a test. Tests are one of the most effective measuring tools teachers use to assess the quantity and quality of their learning. In conclusion, tests are carefully designed tools to comprehensively and realistically measure student learning outcomes, reflecting expected behavior. Comprehensive learning encompasses observable behaviors, the specific conditions under which these behaviors should be demonstrated, and the level of performance adequate to demonstrate mastery of the material. Therefore, tests play a crucial role in evaluating students' knowledge and understanding across their cognitive, affective, and psychomotor domains. Furthermore, the subjective test used in this study consisted of essay questions. This test aims to determine students' cognitive learning outcomes in mathematics. The test used in this study was a written essay test consisting of 15 questions.

The study employed inferential statistics as the data analysis technique. Inferential analysis is a broader analysis than descriptive analysis; it examines the closeness of the relationship between variables. Inferential analysis focuses on broader generalization processes, allowing conclusions to be drawn based on research results from a few samples and a larger population. Because the purpose of the study is to determine whether the cooperative TAI model assisted by Wordwall has a significant effect on student learning outcomes, inferential statistical tests are necessary to prove causal relationships. Descriptive statistics can only provide a general overview but cannot prove the existence of an influence or cause-and-effect relationship. Hypothesis testing is typically used in experimental research, with a control group (without the TAI model assisted by Wordwall) and an experimental group (using the TAI model assisted by Wordwall). To determine whether there are significant differences, a t-test or ANOVA can be used if there are more than two groups.

## 3. RESULTS AND DISCUSSION

### Results

#### Data Description

The researchers gave students a pretest to assess their mathematics knowledge before the core learning sessions. This pretest was used to generate heterogeneous study groups in the experimental class and measure conceptual comprehension improvements following treatment. Plane figures were covered in eight sessions. Students in the experimental class used Wordwall media as an engaging learning tool to adopt the TAI model, which emphasizes teamwork and individual responsibility.

***Validity Test***

The product-moment formula was used to calculate the validity of the data from the instrument trial data analysis. The instrument trial's mathematics learning outcomes investigation contained 15 legitimate essay questions. The r-value for 25 class IV A students was 0.312. We estimated pretest question validity for 15 items. 15 entries met the validity requirements with r-value > r-table, numbers 1-15. None of the items were invalid because they satisfied r-table criteria.

***Reliability Test***

Based on data analysis, the reliability interpretation categorization (r-value = 0.91, range: 0.80-1.00) indicates excellent reliability. Both classes were given a descriptive posttest after all sessions to assess students' mathematics understanding after different learning treatments. The posttest data were then evaluated to compare experimental and control class learning outcomes and evaluate the TAI model with Wordwall media in increasing students' mathematical knowledge.

**Mathematical Concept Understanding of Students in the Experimental Class**

This study analyzed the final evaluation findings from 25 fourth graders in the experimental class at primary school 1 Langkapura. This lesson utilized Team Assisted Individualization (TAI) cooperative learning and interactive Wordwall media. After studying, all students took a mathematical concept knowledge test to evaluate the learning approach. Student scores ranged from 44 to 93 on the posttest. Despite using the same learning method, pupils' ratings reflect different knowledge levels.

Descriptive statistical analysis was performed to determine the mean, median, mode, variance, and standard deviation of learning outcomes. These five factors assessed data distribution and student math comprehension after obtaining the TAI model with Wordwall. Table 1 shows all experimental class students' mathematical concept understanding posttest results.

**Table 1**. Frequency Data of Post-Test Scores of Experimental Class

| Value | Frequency | | |
|---|---|---|---|
| | Absolute | Cumulative | Percentage (%) |
| 44-52 | 3 | 3 | 12 |
| 53-61 | 4 | 7 | 16 |
| 62-70 | 4 | 11 | 16 |
| 71-79 | 7 | 18 | 28 |
| 80-88 | 5 | 23 | 20 |
| 89-97 | 2 | 25 | 8 |
| Total | 25 | 77 | 100 |

The mean post-test score on mathematical concept understanding in the experimental class of 25 pupils was 70.68. Data was analyzed and displayed as a frequency distribution in Table 1. The table shows six 9-point interval classes. The score frequency distribution shows that 28% of students are in the 71–79 range. The smallest interval, 89–97, has only 8% of the total pupils.

After data processing, the statistical results were mean ($\bar{X}$): 70.68, median (Me): 72.39, mode (Mo): 75.90, variance ($s^2$): 183.06, and standard deviation (s): 13.53. These charts quantify the distribution and central trend of student grade data after TAI cooperative learning model implementation with the Wordwall medium. The data also shows that 14 students (56% of the experimental class) received above-average grades. As many as 11 (44%) received below-average grades. Most students received grades above average, indicating significant growth in their mathematical understanding. This suggests that both the TAI learning approach and Wordwall media enhance students' understanding of mathematics. Histogram of Experimental Class Post-Test Values in Figure 1.

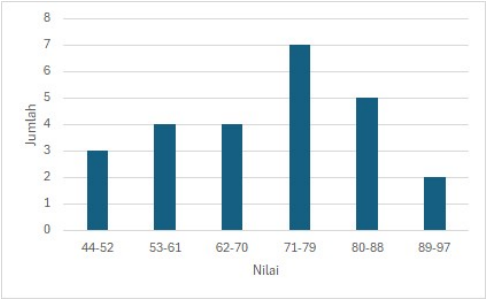


**Figure 1**. Histogram of Post-Test Values of Experimental Class

**Mathematical Concept Understanding in the Control Class**

The control class in this study was a group that received mathematics instruction using the Direct Instruction model (Explicit Instruction), without the use of the Team Assisted Individualization (TAI) cooperative learning model or supporting media such as Wordwalls. After completing the learning process, students were given a test to measure their understanding of mathematical concepts.

**Table 2**. Frequency Distribution of Post-Test Scores for the Control Class

| Value | Frequency | | |
|---|---|---|---|
| | Absolute | Cumulative | Percentage (%) |
| 34-42 | 2 | 2 | 8 |
| 43-51 | 8 | 10 | 32 |
| 52-60 | 6 | 16 | 24 |
| 61-69 | 4 | 20 | 16 |
| 70-78 | 4 | 24 | 16 |
| 79-87 | 1 | 25 | 4 |
| Total | 25 | 99 | 100 |

Table 2 shows that students scored 34–84 on the test. This suggests that direct instruction and explicit instruction affect student learning results. Most student scores were medium to poor, with a majority in the lower middle range. A descriptive statistical examination of posttest findings revealed key indicators: average score ($\bar{X}$) of 57.08, median (Me) of 55.28, and mode (Mo) of 49.25. The variance of 150.66 and the standard deviation of 12.27 show that pupils' results vary widely, indicating poor class comprehension. Figure 2: Control Class Post-Test Value Histogram.

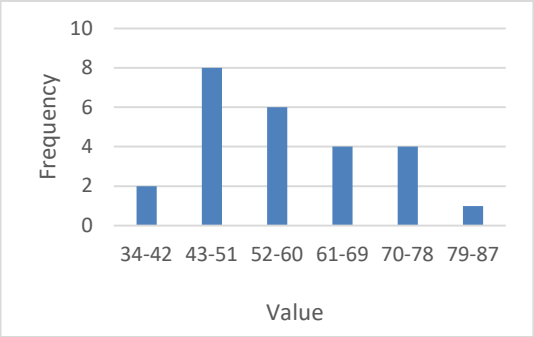


**Figure 2**. Histogram of Post-Test Values of Control Class

Out of 25 pupils that took the test, 12 (48%) scored above the norm and 13 (52%) below. These findings show that over half of the control class did not grasp. This suggests that standard learning methods are less effective in helping students understand mathematical ideas than more interactive and innovative methods like the TAI model with Wordwall media.

**Comparison of Mathematical Concept Understanding in the Experimental and Control Classes**

The results of the statistical analysis of the mathematical concept understanding test showed a significant difference between students who participated in the Team Assisted Individualization (TAI) cooperative learning model assisted by Wordwall media and students who received Direct Instruction (Explicit Instruction) learning. Numerous statistical indicators of both groups' posttest results reflected this difference.

**Table 3**. Comparison of Understanding of Mathematical Concepts

| Descriptive Statistics | Class | |
|---|---|---|
| | Experiment | Control |
| Number of Students | 25 | 25 |
| Maximum | 93 | 84 |
| Minimum | 44 | 34 |
| Mean ($\bar{X}$) | 70,68 | 57,08 |
| Median (Me) | 72,39 | 55,28 |
| Mode (Mo) | 75,90 | 49,25 |
| Variance (s2) | 183,06 | 150,66 |
| Standard Deviation (s) | 13,53 | 12,27 |

Table 3 shows that the experimental class employing TAI scored the highest, 93. Control class students scored 34, the lowest. This suggests that the experimental class's learning method improved pupils' mathematical understanding. The experimental class averaged 70.68, while the control class averaged 57.08. This 13.6-point difference shows that TAI students learn better. The experimental class also had higher median, mode, variance, and standard deviation scores than the control class, indicating that in addition to better learning outcomes, the distribution of scores was more even, with a predominance of high scores.

This difference shows that the TAI cooperative learning paradigm backed by Wordwall media can make learning more dynamic and collaborative and engage students individually and in groups. This improves arithmetic comprehension, unlike the Direct Instruction paradigm of Explicit Instruction, which is one-way and less interactive.

**Hypothesis Analysis and Testing**

***Normality Test***

In this study, data normality was tested using the Lilliefors Test. The purpose of this test was to determine whether the posttest data obtained from both groups, the experimental and control classes, came from a normally distributed population. Based on the calculation results, the calculated L value was 0.12 for both the experimental and control classes. Meanwhile, based on the Lilliefors Test critical value table for n = 25 and $\alpha = 0.05$, the obtained L value was 0.17. Because the calculated L value ≤ L value, it can be concluded that the distribution of the posttest data from both groups is normal. Therefore, the data obtained meets the assumption of normality, meaning that further analysis can use parametric tests such as the t-test to compare the effectiveness of the TAI learning model assisted by Wordwall media and the Direct Instruction model with Explicit Instruction in improving students' understanding of mathematical concepts.

***Homogeneity Test***

The homogeneity test is essential before parametric hypothesis testing like the t-test. The t-test assumes equal variance between groups. The Fisher exact test determines that the two groups have homogenous variances if the estimated F value is less than or equal to the F table. The F value was 1.22 after calculation. The F distribution table yielded a value of 1.98 at a significance level of $\alpha = 0.05$, with degrees of freedom for the numerator and denominator based on group sample size. The estimated F value is <= the F table ($1.22 \leq 1.98$), so the two groups had similar variances. Results from the experimental and control groups are homogeneous. This suggests that both groups have equivalent data variety, fitting the conditions for comparison testing like the t-test to determine how the TAI learning approach supplemented by Wordwall media affects students' mathematical concepts.

***Hypothesis Testing***

After the normality and homogeneity tests showed that the experimental and control classes had normally distributed populations and homogeneous variances, a hypothesis test was performed. This study tested the hypothesis with an independent samples t-test. This t-test examined whether the average mathematical concept understanding of students in the Team Assisted Individualization (TAI) cooperative learning model with Wordwall media (the experimental class) and those in the Direct Instruction model with Explicit Instruction (the control class) differed significantly. This test evaluates how well the TAI learning model improves mathematical concept understanding. The following hypothesis test results are in Table 4.

**Table 4**. Hypothesis Test Results

| Data | Experiment | Control |
|---|---|---|
| N | 25 | 25 |
| Average ($\bar{X}$) | 70,68 | 57,08 |
| T-hitung | 3,77 | |
| T-tabel | 2,01 | |
| Conclusion | H0 is rejected and H1 is accepted | |

According to Table 4, the t-count was 3.77. With a significance threshold of 0.05 and a df of 48 (n1 + n2 – 2), the t-table value was 2.01. Since t-count > t-table (3.77 > 2.01), the experimental and control groups differ significantly. The null hypothesis ($H_0$) with no difference in average mathematical understanding between groups is rejected, whereas the alternative hypothesis ($H_1$) is accepted. We found that the TAI cooperative learning model with Wordwall media improves fourth graders' mathematics understanding more than the Direct Instruction model of the Explicit Instruction kind.

**Discussion**

This study was performed at Elementary School 1 Langkapura, Bandar Lampung City. This study selected class IV A as the experimental group, employing the Team Assisted Individualization (TAI) cooperative learning model supplemented by Wordwall media, whereas class IV B functioned as the control group, utilizing the Direct Instruction technique. Both classes examined identical content and conformed to the educational objectives for mathematics. Fifty students engaged in this study, comprising 25 students from class IV A and 25 students from class IV B. This study sought to assess the impact of the Team Assisted Individualization (TAI) cooperative learning approach, supplemented by Wordwall media, on fourth-grade students' comprehension of mathematical topics. The subject covered was fractions, consistent with the curriculum and educational objectives for fourth-grade children. Data for hypothesis testing was gathered from five instructional sessions in each class. Following the treatment, students participated in a posttest to assess their conceptual comprehension. The posttest has been evaluated for validity, reliability, difficulty, and discriminatory power. This research employed a posttest-only control group design.

The experimental class of 25 pupils averaged 70.68 on the mathematical concept knowledge post-test. Table 1 shows the frequency distribution of studied data. The table shows six 9-point interval classes. The frequency distribution reveals 28% of students score 71–79. Only 8% of pupils are in the narrowest interval, 89–97. Data analysis yielded statistical results: mean (α): 70.68, median (β): 72.39, mode (β): 75.90, variance (β): 183.06, and standard deviation (β): 13.53. These charts show student score dispersion and central trend following TAI cooperative learning with Wordwall media. Additionally, 14 pupils (56% of the experimental class) scored above average. Overall, 11 (44%) students scored below average. Most children scored above average, demonstrating math growth. It appears that TAI and Wordwall media boosted pupils' mathematics understanding.

Researchers found that pupils scored 34–84 on the test. This shows that direct and explicit instruction affected student learning. Most kids scored moderate to bad, mostly lower-middle. Descriptive statistics of posttest data showed a mean score ($\bar{X}$) of 57.08, a median (Me) of 55.28, and a mode (Mo) of 49.25. Student outcomes varied greatly, indicating poor classroom understanding, with a variance of 150.66 and a standard deviation of 12.27. Of 25 exam takers, 12 (48%) scored above the norm and 13 (52%) below. This suggests over half of the control class didn't comprehend. This suggests that interactive and innovative ways like the TAI model with Wordwall media help students understand mathematical concepts better than typical learning methods.

Additionally, the hypothesis test yielded a 3.77 t-value. A significance criterion of 0.05 and a df of 48 (n1 + n2 – 2) yield a t-value of 2.01. Experimental and control groups differ considerably because 3.77 > 2.01. The null hypothesis ($H_0$) of no difference in average mathematical understanding between groups is rejected, whereas the alternative hypothesis ($H_1$) is supported. The TAI cooperative learning methodology with Wordwall media enhances fourth graders' arithmetic understanding more than direct instruction with explicit instruction. The results of this study indicate that the application-based learning media that can be used in the learning process is the Wordwall application (Rahma et al., 2023) and is in line with the results of previous studies, which show that the Wordwall application can improve students' mathematics learning outcomes (Abd Al-Aziz et al., 2024; Anggreini et al., 2025; Dewi et al., 2025).

***Experimental Class***

The lesson begins with the teacher opening the teaching and learning activities by greeting the students, asking how they are, and recording their attendance in the attendance book. Thereafter, the class leader is invited to lead a prayer together, followed by an ice-breaking activity to make the classroom atmosphere more pleasant and conducive. The teacher then conveys the learning objectives and benefits of the material to be studied, namely the introduction of the concept of area and area units in flat shapes, especially rectangles. In the core activity, the teacher delivers the material using the Team Assisted Individualization (TAI) cooperative learning model, where students are grouped and guided to help each other in understanding the material. The teacher introduces the concept of area as a measure of space within a flat shape and explains that area units are expressed in square units such as $cm^2$, $m^2$, or $km^2$. Next, the teacher explains how to calculate the area of a rectangle and provides simple examples so that students can understand it concretely. Thereafter, students are divided into small groups of 4–5 people to discuss and work on quizzes related to the material, both conventionally and through Wordwall media as an interactive tool to strengthen their understanding. Each group was responsible for the assigned problem and assisted each other in completing it, including measuring the length and width of a real object to calculate its area. The teacher distributed problems to each group for discussion, and each group presented their discussion results to the class. Other students were provided the opportunity to respond to the other groups' presentations as a form of critical and independent thinking practice.

In the closing activity, the teacher gave appreciation or recognition to the groups that actively contributed, then conducted another icebreaker to lighten the mood after the discussion. The teacher and students summarized the lesson about the area and units of a rectangle, followed by a reflection on the learning process. To gauge students' understanding, the teacher provided practice problems as a formative assessment and to motivate them to continue learning. The lesson concluded with a group prayer led by one of the students.

***Control Class***

The lesson begins with the teacher greeting the students, asking how they are, and recording their attendance in the attendance book. The class leader is asked to lead a prayer before the activity begins, then the teacher invites students to do a simple icebreaker to create a pleasant classroom atmosphere and be ready to learn. The teacher explains the learning objectives and benefits of the material to be studied, namely the concept of area and an introduction to area units in flat shapes, especially rectangles. In the main activity, the teacher delivers the material directly through a lecture and question-and-answer method, starting with an explanation that area is a measure of the amount of space contained in a flat shape, and illustrates commonly used area units such as square centimeters, square meters, and others. The teacher explains in detail how to calculate the area of a rectangle based on basic formulas and provides several example problems that are worked on together as a class on the board. Students are asked to pay attention to the work steps and then try to work on similar problems independently in the assignment book. The teacher guides students directly, provides feedback if there are errors, and asks questions to test their understanding individually. Discussion activities continued in a classroom setting, with the teacher posing questions and several students given the opportunity to answer verbally in front of the class. Afterward, students were tasked with measuring the length and width of objects around them (such as books or tables) and were asked to calculate their areas independently as a way of applying the material they had learned. The teacher monitored this activity and provided guidance as needed.

In closing, the teacher rewarded students who actively responded and demonstrated their best efforts in learning. The teacher and students summarized the material discussed and reflected on what they had learned, followed by practice exercises for reinforcement. Finally, the teacher motivated students to continue studying diligently and closed the learning activity with a group prayer.

***Practical Implications:***

1. Application of Learning Models: This research can provide an example of the effective application of the Team Assisted Individualization (TAI) learning model with the aid of Wordwall media to improve elementary school students' understanding of mathematical concepts.

2. Development of Learning Media: The results of this research can be used as a reference for developing more interactive and effective learning media to improve students' understanding of mathematical concepts.

3. Improving Learning Quality: This research can help improve the quality of mathematics learning in elementary schools by using the TAI learning model and Wordwall media.

***Theoretical Implications:***

1. Development of Learning Theories: This research can contribute to the development of more effective learning theories to improve elementary school students' understanding of mathematical concepts.

2. Application of Technology in Learning: The results of this research can provide an example of the effective application of technology in learning to improve students' understanding of mathematical concepts.

3. Development of Mathematical Skills: This research can help improve elementary school students' mathematical skills by using the TAI learning model and Wordwall media.

## 4. CONCLUSION

The results of this study indicate a significant effect of the Team Assisted Individualization (TAI) cooperative learning model with the aid of Wordwall media on the understanding of fourth-grade students' mathematics concepts at Elementary School 1 Langkapura. This is evidenced by the results of an independent t-test, which showed a calculated t value of 3.77, greater than the t table value of 2.01 at a significance level of 0.05. Therefore, the null hypothesis (H0) is rejected, and the alternative hypothesis (H1) is accepted. This indicates that learning using the TAI approach and Wordwall media can create a more interactive, structured, and enjoyable learning process, thereby improving the overall understanding of mathematical concepts.

As a recommendation for relevant parties, it is recommended that teachers integrate the TAI cooperative learning model with the aid of Wordwall media in mathematics learning. This combination has been proven to improve students' conceptual understanding through a combination of individual activities and group work, along with interactive media that enhances student learning motivation. Further research is highly recommended, both in the context of different mathematics learning materials and other subject areas, such as science or social studies, and at other school levels, such as lower grades or junior high school. In addition, research can examine other aspects of learning, such as the influence on students' learning attitudes, social skills, or learning motivation, to obtain a more comprehensive picture of the effectiveness of using digital media-based TAI models such as Wordwall.

## REFERENCES


Abd Al-Aziz, T., Salha, S., & Sarah, A. A. (2024). The Effect of Using Wordwall on Academic Achievement and Motivation Towards Learning Mathematics among Sixth Grade Students in Nablus District. *An-Najah University Journal for Research-B (Humanities)*, *39*(1), 43-52. https://doi.org/10.35552/0247.39.1.2305

Alakrash, H. M., & Abdul Razak, N. (2021). Technology-based language learning: Investigation of digital technology and digital literacy. *Sustainability*, *13*(21), 12304. https://doi.org/10.3390/su132112304

Andari, A. M., Andriani, M., Habibi, M., & Risnawati, R. (2023). Application of the team-assisted individualization learning model to improve students' critical thinking skills in mathematics in fourth grade elementary schools. *Journal of Educational Sciences*, 224-232. https://doi.org/10.31258/jes.7.2.p.224-232

Anderson, R. K., Boaler, J., & Dieckmann, J. A. (2018). Achieving elusive teacher change through challenging myths about learning: A blended approach. *Education Sciences*, *8*(3), 98. https://doi.org/10.3390/educsci8030098

Anggreini, N., Putri, D., Indriani, D., & Adinata, H. (2025). Efforts to Increase Student Concentration in Mathematics Learning Difficulties Using Wordwall Application Media for Class IV Elementary School Students. *Jurnal Ilmiah Wahana Pendidikan*, *11*(2. C), 299-304. https://www.jurnal.peneliti.net/index.php/JIWP/article/view/11010

Appova, A., & Arbaugh, F. (2018). Teachers' motivation to learn: Implications for supporting professional growth. *Professional development in education*, *44*(1), 5-21. https://doi.org/10.1080/19415257.2017.1280524

Cai, J., & Ding, M. (2017). On mathematical understanding: perspectives of experienced Chinese mathematics teachers. *Journal of Mathematics Teacher Education*, *20*(1), 5-29. https://doi.org/10.1007/s10857-015-9325-8

Chowdhury, M. (2018). Emphasizing morals, values, ethics, and character education in science education and science teaching. *MOJES: Malaysian Online Journal of Educational Sciences*, *4*(2), 1-16.

Dewantara, J. A., Hermawan, Y., Yunus, D., Prasetiyo, W. H., Efriani, E., Arifiyanti, F., & Nurgiansah, T. (2021). Anti-corruption education as an effort to form students with character humanist and law-compliant. *Jurnal Civics: Media Kajian Kewarganegaraan*, *18*(1), 70-81. https://doi.org/10.21831/jc.v18i1.38432

Dewi, M., Apriza, B., & Dinata, K. B. (2025). The Effectiveness of Wordwall Interactive Media in Teaching Mathematics in Elementary School: A Systematic Literature Review. *MIMBAR PGSD Undiksha*, *13*(1), 127-137. https://doi.org/10.23887/jjpgsd.v13i1.92352

Elhefni, E., Adib, H. S., Ariani, R., & Safitri, R. (2023). Use of word wall learning media to improve learning outcomes indonesian learning in elementary schools. *AL-ISHLAH: Jurnal Pendidikan*, *15*(2), 1556-1562. https://doi.org/10.35445/alishlah.v15i2.1447

Eronen, L., & Kärnä, E. (2018). Students acquiring expertise through student-centered learning in mathematics lessons. *Scandinavian Journal of Educational Research*, *62*(5), 682-700. https://doi.org/10.1080/00313831.2017.1306797

Hussein, M. H., Ow, S. H., Elaish, M. M., & Jensen, E. O. (2022). Digital game-based learning in K-12 mathematics education: A systematic literature review. *Education and Information Technologies*, *27*(2), 2859-2891. https://doi.org/10.1007/s10639-021-10721-x

Keiler, L. S. (2018). Teachers' roles and identities in student-centered classrooms. *International journal of STEM education*, *5*(1), 34. https://doi.org/10.1186/s40594-018-0131-6

Madani, R. A. (2019). Analysis of educational quality, a goal of education for all policy. *Higher Education Studies*, *9*(1), 100-109.

Marasabessy, R., Hasanah, A., & Angkotasan, N. (2021). Efforts to improve students' mathematical critical thinking ability by using Team Assisted Individualization learning model. In *Journal of Physics: Conference Series* (Vol. 1882, No. 1, p. 012051). IOP Publishing. https://doi.org/10.1088/1742-6596/1882/1/012051

Muhaimin, L. H., & Juandi, D. (2023). The role of learning media in learning mathematics: a systematic literature review. *Journal of Mathematics and Mathematics Education*, *13*(1), 85-107. https://doi.org/10.20961/jmme.v13i1.74425

Nurmala, W., Tiro, M. A., & Sanusi, W. (2021). The Effect of Team Assisted Individualization (TAI) Cooperative Learning on Mathematics Learning Outcomes. In *International Conference on Educational Studies in Mathematics (ICoESM 2021)* (pp. 57-61). Atlantis Press. https://doi.org/10.2991/assehr.k.211211.010

Rahma, T. K., Nurcahyo, A., Ishartono, N., Setyaningsih, R., Setyono, I. D., Putra, D. A., & Fitrianna, A. Y. (2023). Using wordwall as a gamification-based mathematics learning material to support students' learning activities. *Proceeding Of International Summit On Education, Technology, And Humanity 2021*, *2727*(1), 020043. https://doi.org/10.1063/5.0141610

Rahmatina, D., & Rosmery, L. (2024). The influence of the tai type cooperative learning model on student learning outcomes in social arithmetics. *Jurnal THEOREMS (The Original Research of Mathematics)*, *9*(1), 22-33. https://doi.org/10.31949/th.v9i1.8433

Samsuri, T., Atmadja, A. T., Tika, I. N., & Suastra, I. W. (2024). Human Resource Development: A Philosophy of Education Perspective. *Path of Science*, *10*(11), 3001-3016. https://www.ssoar.info/ssoar/handle/document/98667

Schoenfeld, A. H. (2022). Why are learning and teaching mathematics so difficult?. In *Handbook of cognitive mathematics* (pp. 763-797). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-031-03945-4_10

Schoevers, E. M., Leseman, P. P., Slot, E. M., Bakker, A., Keijzer, R., & Kroesbergen, E. H. (2019). Promoting pupils' creative thinking in primary school mathematics: A case study. *Thinking skills and creativity*, *31*, 323-334. https://doi.org/10.1016/j.tsc.2019.02.003

Suh, J., Matson, K., Seshaiyer, P., Jamieson, S., & Tate, H. (2021). Mathematical modeling as a catalyst for equitable mathematics instruction: Preparing teachers and young learners with 21st century skills. *Mathematics*, *9*(2), 162. https://doi.org/10.3390/math9020162

Tatto, M. T. (2021). Developing teachers' research capacity: The essential role of teacher education. *Teaching Education*, *32*(1), 27-46. https://doi.org/10.1080/10476210.2020.1860000

Tinungki, G. M., Nurwahyu, B., Hartono, A. B., & Hartono, P. G. (2022). Team-assisted individualization type of the cooperative learning model for improving mathematical problem solving, communication, and self-proficiency: Evidence from operations research teaching. *Education Sciences*, *12*(11), 825. https://doi.org/10.3390/educsci12110825

Tinungki, G. M., Hartono, P. G., Nurwahyu, B., Islamiyati, A., Robiyanto, R., Hartono, A. B., & Raya, M. Y. (2024). Exploring the team-assisted individualization cooperative learning to enhance mathematical problem solving, communication and self-

proficiency in teaching non-parametric statistics. *Cogent Education*, *11*(1), 2381333. https://doi.org/10.1080/2331186X.2024.2381333

Toom, A., Pietarinen, J., Soini, T., & Pyhältö, K. (2017). How does the learning environment in teacher education cultivate first year student teachers' sense of professional agency in the professional community?. *Teaching and teacher education*, *63*, 126-136. https://doi.org/10.1016/j.tate.2016.12.013