

The Application Of Cooperative Learning Model Of Team Assisted Individualization (TAI) Based Manipulative Media On Topics “Shape” Of Class VI Elementary School Of Tombolok Gowa

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ABSTRACT

This study aims to describe the application of the cooperative learning model of the Team Assisted Individualization (TAI) type assisted by manipulative learning media to improve student learning outcomes in shape material. This study involved 29 elementary grade VI students as a research sample and used a pre-experimental research type with a one-group pretest-posttest design. Student mathematics learning outcomes data obtained from student learning outcomes tests consisting of 10 breakdown questions and analyzed using descriptive and inferential analysis. To see an increase in student mathematics learning outcomes can be interpreted using normalized gain (N-gain). From the results of data analysis, it is obtained that: (1) the average value of student learning outcomes before applying the TAI learning model assisted by manipulative media is 42.21 with a low category; (2) the average value of learning outcomes after applying the TAI learning model assisted by manipulative media is 74.76 with a high category; (3) hypothesis test results obtained $t_{count} > t_{table}$ (13,589 > 2,048) and the significance value is 0,000 < 0.05 so that H_a ($H_a: \mu_1 < \mu_2$) is accepted; (4) increase in the value of pretest and posttest with gain index (d) of 0.56 with the medium category. Thus, it can be concluded that the application of the cooperative learning model of the TAI type can improve the learning outcomes of elementary school students in grade VI in shape material. Therefore, this type of TAI cooperative learning model can be used as an alternative learning model that can be used in order to improve student learning outcomes.

Keywords: The Cooperative Learning Model of the TAI Type, Manipulative Media, Learning Outcomes

INTRODUCTION

Equipping self with various basics skills can be done by enrolling at both formal education and informal education. In the scope of formal education institutions, the first level that shall be pursued is elementary school (SD). Education in elementary school conducted to develop behavior, skills, knowledge, and basics skills which needed to prepare our selves in pursuing the next education level.

The quality of education in Indonesia has been well attempted by the government thus it is remain improving, one of them through enhancing education facilities and infrastructure and the improvement of technology-based learning facility that leads to the Active and creative learning. Hopefully along with the improvement of the quality, teachers as learning managers are also more creative in order to improve student learning outcomes (Susanto, 2013). Teacher as the spearhead of education greatly determines the success of the education process that aims to educate the nation. Students will be intelligent if the teacher teaches

intelligently. This was reaffirmed by Djamarah & Zain (2006) who suggested that teachers are educators who deliver science in school. Teacher is an experienced person in their profession. With their knowledge, they are able to make their students a brilliant person.

Mathematics as one of the subjects in elementary school is a universal science that underlies the development of modern technology and has an important role in the development of logical skill and the establishment of students' attitudes and the improvement of students' skills in implementing Mathematical Concepts (Depdiknas, 2006). Mathematics is a variety of disciplines to sharpen human thought, hence the strong fundamentals understanding of mathematics on early ages is necessary for the future provision of students. Mathematics is given to equip students with logical, analytical, systematic, critical, and creative thinking and ability to work together (BSNP, 2006).

To achieve the objectives in mathematics learning, it is necessary to look for alternative learning models that are applied to improve the quality of learning (Syamsuddin, Jannah & Kristiawati, 2019). One of the best-suited and suitable alternatives used by teachers in the learning process is the implementation of a cooperative learning model as this model gives students the opportunity to complete the task in advance to accomplish the tasks given collectively (Zakaria & Iksan, 2007). This model of cooperative learning encourages students to be more active in learning to construct their knowledge (Webb, Troper & Fall, 1995). Cooperative learning also encourages students to interact with and communicate with peers harmoniously. In this way, cooperative learning promotes values such as honesty, cooperation, mutual respect, responsibility and tolerance during the learning process.

Completion of tasks in cooperative learning can develop the confidence of the students. Zakaria, Chin, and David (2010) suggest that cooperative learning improves student achievement in mathematics. In addition, cooperative learning is an effective approach that needs to be applied by mathematics teachers to their teaching. Cooperative learning makes it easy to master teaching materials and help students to achieve better grades (Shimazoe & Aldrich, 2010). According to Johnson and Johnson (1989), in cooperative learning, students tend to be comfortable and happy with the math subjects, this comfortable and happy sense motivates them to learn. Melihan and Sirri (2011) concluded that methods of cooperative learning are more effective than traditional teaching methods in student academic success.

In addition to learning methods, appropriate learning process is needed in terms of the use of learning Media (Syamsuddin, 2018). Students' understanding will be optimal if supported by proper learning media. Thus, students' attention and motivation to the material presented to them will appear by using interesting learning media (Sundayana, 2015). Therefore, it takes the creativity of teachers to attract students' learning interest or study readiness of the students by using the right learning methods and media so that they can engage students on completing their mathematical tasks (Syamsuddin & Lukman, 2019). This is conducted as an effort to improve students' counting ability by applying effective learning methods or media, attracting and pleasing students.

Based on the results of the initial observation, conducted by researchers on 25 May 2019 in Tombolo K Elementary School, found a class atmosphere that reveals a lack of students' learning interest, it is seen that students look saturated in the learning process, also students are less excited, doing activities that are unrelated to the learning process, for example, telling a friend and less active students on asking questions related to the subject matter, as a result the mathematical learning outcomes achieved by the students are still below the standard. In the learning process, teachers do not engage students, the teacher domination in the learning process leads to more passive students, so they tend to wait for teacher's servings rather than finding and discovering their own knowledge, skills or the attitude they need. Another problem found is that teachers only do the process of learning in a monotonous sense without using models and media learning, so there is no variation in teaching and learning activities that result in students feeling saturated while studying.

Beside of that, from discussion with the teacher in class VI of Elementary School Tombolo K Pallangga District, Gowa Regency obtained information of the overview of students' condition and achievement, as follows: (1) Students in class do activities that are not related to learning process, (2) There is no students' courage in asking questions, (3) Students tend to be afraid and reluctant to answer questions given by the teacher, (4) Students' mathematical achievements or scores tend to be low, reaching the classical average of 55. This is strengthened by the study outcomes of 20 out of 33 students are still under the value of the minimum completeness criteria (KKM) determined to be 70.

Departing from this situation, researchers take a solution that is by using a learning model that can help in implementing effective learning and can improve student learning outcomes. In this case, the learning model utilizing the use of Team Assisted Individualization (TAI) cooperative learning models. The application of this learning models is expected the learning activities become more enjoyable for the students, thus increasing the interest and activity of students in improving their competitions. The learning model referred is the cooperative learning model of Team Assisted Individualization (TAI) type. TAI is a learning model that combines the excellence of cooperative learning and individual learning.

Maximizing learning activities with selected models, can utilize media as a tool in delivering learning materials. Media is an integral part of the learning process in achieving educational objectives in general and the purpose of learning in schools in particular (Arsyad, 2017). The learning process will run effectively and efficiently when supported with the availability of supporting media. One of the alternative media that can be used is the manipulative media. This learning media is very easy to be provided by teachers considering its characteristics which can be seen, touched, heard, perceived, and manipulated so that students can experience learning directly as they can use every thing around them as a learning media.

It indicates that all the things related to the daily life of the student can be used as a tremendous contextual learning media. For example drink bottle, box of soap, milk cans, ball and so on. These examples are manipulative material used as a learning media where the materials can be manipulated by hand, rotated, held, reversed, moved, arranged, or styled or cut into pieces (Muhsetyo, 2007). Not only that, Muhsetyo (2007) confirms that the activity of manipulation of objects around us is done to simplify the difficult concepts, presenting a relatively tangible material, so that we can explain a concrete concept to the students, describing certain properties related to the counting and the properties of the geometry, and exposing the facts. In relation to this, the research focuses on shape materials considering that the material is quite easily explained by using manipulative media.

Based on the explanation above, the purpose of this study is to describe the implementation of the Cooperative learning model Team Assisted Individualization type (TAI) assisted with manipulative learning media on the shape materials and identify the impact on students' mathematics learning outcome in Elementary School Of Tombolo K Gowa.

RESEARCH METHOD

This research is pre-experimentation studies involving a class that was used as an experimental class to implement the cooperative learning model Team-Assisted Individualization (TAI) type assisted by manipulative media learning on the shape material. This is conducted to get a description related to the implementation of the Cooperative learning model type Team Assisted Individualization (TAI) assisted by manipulative media on the shape material and its impact on the results of students' mathematical learning outcome. The design used in this study is a one-group pretest-posttest design. This research begun with the test to obtain preliminary capability data related to students' mathematical learning outcomes. Subsequently, given the treatment by implementing cooperative learning model Team Assisted Individualization (TAI) Type assisted manipulative learning media. Here are presented designs used in this research (Fraenkel & Wallen, 2003).

O₁	X	O₂
Pretest	Treatment	Posttest

Descriptions:

O₁ = Students' mathematical learning outcome before taught by cooperative learning model *Team Assisted Individualization* (TAI) type assisted by manipulative learning media (*pre-test*).

X = Teaching shape material using cooperative learning model *Team Assisted Individualization* (TAI) type assisted by manipulative learning media.

O₂ = Students' mathematical learning outcome after taught by cooperative learning model *Team Assisted Individualization* (TAI) type assisted by manipulative learning media (*post-test*).

The population in this research is 90 students of a class VI elementary school Tombolo K which divided into 3 (three) study groups. Sampling was

carried out using the random sampling technique so that one class with 29 students was selected as a research sample. The instrument used to collect data is a test of the mathematical learning outcome consisting of 10 breakdown questions. Prior to used, the instrument was first validated by 3 (people) validators consisting of 1 (one) evaluation lecturer, mathematics education lecturer and elementary school teacher. The aspects assessed by the validator are indicators of problem, presentation, language, difficulty level and allocation of time. The scale of the assessments specified in respect of the given assessment is (a) very good = 4; (b) fine = 3; (c) enough = 2; and (d) less = 1. Based on the results of the assessment of the 3 (three) validators obtained a grade score of 3.50 so that the instrument is feasible to be used.

Furthermore, the instrument is tested on 20 students who are not subjects to research in order to determine the construct validity of the instrument developed using the formula coefficient of correlation product moment (Ratumanan & Laurens, 2011). The result of the validity test of the learning outcomes test instruments shows that out of 10 questions of learning outcomes test are all valid. In detail, the following are the results of the trial of test instrument presented in the table below.

Table 1. Validity Result of Learning Outcome Test

Item No.	r_{count}	r_{table}	Description
1	0,605	0,44	Valid
2	0,765	0,44	Valid
3	0,710	0,44	Valid
4	0,629	0,44	Valid
5	0,478	0,44	Valid
6	0,636	0,44	Valid
7	0,713	0,44	Valid
8	0,671	0,44	Valid
9	0,639	0,44	Valid
10	0,587	0,44	Valid

Furthermore, a learning outcome test instrument is reliable when the scores remain the same when the instrument is administered repeatedly to the same students at different times. To find out the reliability of the instrument, researchers used the Cronbach alpha with the following formula:

$$\alpha = r_{11} = \left[\frac{n}{(n-1)} \right] \left[1 - \frac{\sum s_i^2}{s_t^2} \right]$$

Descriptions:

- $\alpha = r_{11}$: Realibility coefficient
- n : The number of items
- $\sum s_i^2$: Number of variance score per item
- s_t^2 : The total of variance score

α value or r value obtained from the calculation by using the formula of the coefficient Alpha or Alpha Cronbach above has the criteria of reliability of the instrument as presented in the following table.

Table 2. Reliability Criteria

Realibility coefficient	Interpretation
$0,80 < r$	High degree of realibility
$0,40 \leq r \leq 0,80$	Moderate degree of realibility
$r < 0,40$	Low degree of realibility

From calculating the reliability of the instrument using the Cronbach Alpha formula obtained the reliability value of 0.832 included in the category of high-realibility degree. Thus, this instrument is used as a data collection tool. The Data collected through *Pretests* and *posttest* are further analyzed by using descriptive analysis techniques and inferential analysis.

Descriptive analysis is intended to provide an overview of students' mathematical learning outcomes by considering the highest value aspects and lowest values, average value, standard deviation, frequency table. Researchers gave 10 breakdown questions on the maths learning outcomes test. Each answer will be given score based on the difficulty level of the question. After the data is obtained, then the next step is to process and analyze the data using the following formula.

$$\text{Students' grade} = \frac{\text{Achieved score}}{\text{Maximum Score}} \times 100$$

The spread of data score is presented in the form of frequency distribution after being converted to five scales based on the categorizing of the Department of National Education (2009). Detailed categorizing of student learning outcomes is presented in the table below.

Table 3. Guidelines of Categorising Student Learning Outcomes

Grade	Category
$86 \leq x \leq 100$	Very high
$71 \leq x \leq 85$	High
$56 \leq x \leq 70$	Medium
$41 \leq x \leq 55$	Low
$0 \leq x \leq 40$	Very low

Analysis of the learning outcomes was directed at the achievement of individual and classical learning outcomes. Each student is declared successful individually if they earn a minimum value of 70 (KKM to be achieved in the class VI Tombolo K Elementary School on mathematics subjects) and is completed classively at least 80%.

While inferential statistics are used to testing hypotheses. The hypothesis testing was conducted with a mathematically formulated left-party test $H_0 : \mu_1 \geq \mu_2$ dan $H_a : \mu_1 < \mu_2$. It presented descriptively as follows:

H_0 = The average students' *pretests* is higher than or equal to the average of student *posttest*.

H_a = The average students' *pretests* is lower than the average of student' *posttest*

For hypothesis testing used T test analysis (data analysis was conducted with the help of SPSS 20.0 for windows). Criteria for rejecting H_0 is if $t_{count} > t_{table}$ and significance value $< 0,05$. Moreover, improved learning outcomes through pretests and posttest can be known through gain index calculations. The gain index is used when the average value before and after the treatment is different. The gain index formula (d) presented as follows.

$$gain (d) = \frac{Pretest\ score - Posttest\ score}{Maximum\ score - Pretest\ score}$$

Furthermore, in order to know the gain index criteria obtained then is used and presented in the following table (Hake, 1999).

Table 4. Gain Index Interpretation Criteria

“d” Gain	Interpretation
$d > 0,7$	High
$0,3 \leq d < 0,7$	Medium
$d < 0,3$	Low

RESULT AND DISCUSSION

This research data includes the data of learning outcomes consisting of *pre-test* and *post-test* data obtained through the test of the learning outcomes where the test instruments are developed based on the shape material in essay form. Student learning outcomes are categorized into five categories, which are very high, high, medium, low, and very low which are based on student learning categorization outcomes of the Department of National Education (2009). The description of students' learning outcomes can be outlined in the table below.

Table 5. Data of Students Learning Outcomes

Statistical value Category	Pre-test	Post-test
Sample size	29	29
Mean	42,21	74,76
Median	43	73
Mode	25	70
Standard deviation	11,9	8,69
Highest value	65	93
Lowest value	25	60

According to the table above, it can be explained that the data on the students' learning outcome of class VI students of Tombolo K Elementary School before applied Cooperative Learning model of Team Assisted Individualization (TAI) type with manipulative media assistance was in low category with the average results of pretests study is 42.21. Meanwhile, data on students' learning outcomes after applying cooperative Learning model of Team Assisted Individualization (TAI) with the help of manipulative media for *Posttest* obtained an average score of 74.76 where the score was in high category. It can therefore be suggested that by implementing a Team-Assisted Individualization (TAI)

cooperative learning model with manipulative assistance can improve student learning outcomes. This can be proved from the average value of student learning outcomes increased from the low category to the high category. Students' learning outcomes in *pretests* and *posttest* activities can be seen in the table below.

Table 6. Description of Student Learning Outcomes Completeness on Pretest and Posttest

Score	Category	Pretest		Posttest	
		f	%	F	%
0 – 69	Not complete	29	100	5	17,24
70-100	Complete	0	0	24	82,76
Total		29	100	28	100

From the table above, it can be explained that student learning outcomes before applying cooperative learning model type Team Assisted Individualization (TAI) with manipulative media assistance was 100% incomplete. It indicates that the classification of students' learning completeness is not reached. In contrast, students' learning outcomes after implementing cooperative Learning model type Team Assisted Individualization (TAI) with manipulative media assisted reach 82.76% that achieve complete so that the students' learning completeness is classically fulfilled.

Further hypothesis testing was conducted to determine if there was an increase in student mathematics learning outcomes by using the t-test of left side correlation. The hypothesis testing criterion is H_a acceptable if $t_{count} > t_{table}$. However, if the $t_{count} < t_{table}$ then H_0 is accepted with a significant level of $\alpha = 0.05$. From the results of the calculation using SPSS 20.0 for Windows obtained the value of t_{count} 13, 589 while the t_{table} in significance $\alpha = 0.05$ and the degree of freedom (DK) = 28 is 2.048 and the significance value is 0.0000. From the data can be explained that $t_{count} > t_{table}$ ($13.589 > 2.048$) and its significance value $0.000 < 0.05$. Hence H_0 rejected and H_a was accepted with the conclusion that the average student *pretests* is lower than the average *posttest* student. It means that there is an increase in the mathematics learning outcomes of students in Class VI Tombolo K elementary School after applying cooperative learning model of Team Assisted Individualization (TAI) with the help of manipulative media.

Moreover, to identify the increase of learning outcomes through pretests and posttest, gain index is used. The gain index of this study can be seen in the following table.

Table 7. Description of Student Learning Gain Index

Pretest Average	Posttest Average	Maximum score	Gain Index (d)	Category
42,21	74,76	100	0,56	Medium

Based on gain index calculation results (d) it is obtained that the average gain index derived from this study is 0.56 where the gain index value is in medium category. This shows that there has been an increase in learning outcomes in mathematics learning in shape material after being taught with a Team Assisted Individualization (TAI) cooperative learning model with manipulative media assisted. This is because by implementing the Team-Assisted Individualization (TAI) type cooperative learning model with the help of manipulative media causes

students to be more active in learning activities. Students get information not only from teachers, but also from the discussions they conducted.

Sari *et al.* (2015) suggests that implementation of TAI cooperative learning model can be done because students enter the classroom with their knowledge, ability, motivation and diverse characters. As an adjustment between TAI's weaknesses is that a group of passive and unwilling members who rely solely on their peers, the teacher's job is to make the learning process as interesting as possible to maintain all students are active and motivated. This is align with the opinion of Shoimin (2014) stating that one of the advantages of TAI-type cooperative learning is to involve students to be active in the learning process. In addition, Huda (2013) suggests that the development of TAI type Cooperative learning models can support classroom practices, such as student groupings, grouping skills in the classroom.

One of the efforts to maximize the implementation of TAI-type cooperative learning model is to utilize media that can attract students' attention. Therefore, beside using TAI learning models, the learning process in the classroom also uses media that supports the learning process, which is manipulative media. The use of learning media in learning activities causes the learning to be not monotonous, but it can attract students' interest that lead to the increase of student learning outcomes. During the learning process, students seem to pay attention to both the teacher's explanation and the explanation from the friend, so that the student's opportunity to play and do other activities is very small. Therefore, the combination of TAI type Cooperative learning model with manipulative learning media can create math learning becomes interesting and fun. Students become more active and interested in learning mathematics, hence the student learning outcomes are also increasing.

CONCLUSION AND SUGGESTION

Conclusion

Based on the study results obtained that the implementation of TAI type cooperative learning model with manipulative learning media in shape material can improve students' mathematics learning outcomes. This can be shown with the average students' learning score after applying a Team Assisted Individualization (TAI) type cooperative learning model with manipulative media assistance is in high category. Whilst before applying the learning model, the average score of students learning outcomes is in a low category. In addition, the increase of learning outcomes average in general is in a medium category based on the gain index calculation results. So, it can be argued that by implementing the Team Assisted Individualization (TAI) cooperative learning model with the help of manipulative media on the shape material can improve students' mathematics learning outcomes.

Suggestions

To obtain a more detailed picture of the implementation of the cooperative learning model type Team Assisted Individualization (TAI) with the help of

manipulative media in elementary school, it is necessary to conduct research with other materials such as numbers, data processing and other problems where its solution requires high order thinking skills. This research can also be developed using different instruments, such as the posing problem using review of thinking style or mathematical communication skills and other reviews.

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