



**THE INFLUENCE OF STAD COOPERATIVE STRATEGIES
(TEACHING AIDS AND MULTIMEDIA POWER POINTS)
AND LEARNING STYLE ON MATHEMATICS LEARNING
OUTCOMES**

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Abstract

This study aims to determine the effect of STAD learning strategies assisted by teaching aids and multimedia assisted PowerPoint with auditory and kinesthetic learning styles on mathematics learning outcomes. Sampling was chosen randomly (random class). This type of research used quasi-experimental with a 2x2 factorial research design. The instruments use a test of learning outcomes in the form of multiple-choice questions and a questionnaire for student learning styles. Data were analyzed using two-way ANOVA and multiple comparison tests. Based on the data analysis, it is concluded that: (1) there are differences in the mathematics learning outcomes of students in classes who receive STAD learning assisted by teaching aids between STAD learning assisted by multimedia PowerPoint (2) there are differences in learning outcomes between students with auditory and kinesthetic learning styles students with audio learning styles, student mathematics learning outcomes are not higher when taught with STAD learning assisted by PowerPoint multimedia compared to STAD learning assisted by teaching aids (4) For students with kinesthetic learning styles student mathematics learning outcomes are higher when taught with STAD learning assisted by teaching aid, compared to PowerPoint multimedia-assisted STAD learning and (5) there is an interaction between STAD learning strategies and auditory and kinesthetic learning styles. Therefore, it is concluded that with there is an interaction between learning strategies and learning styles, student learning outcomes are not only influenced by learning strategies. In this case, the STAD learning strategy assisted with teaching aids and STAD assisted with multimedia PowerPoint is not the only factor in making students understand mathematical concepts but must be based on learning styles. For auditory student learning styles, the appropriate learning strategy is to use STAD assisted by

Power Point multimedia, while for students who have a kinesthetic learning style using STAD assisted by teaching aids.

Keywords: *STAD, Learning Style, Teaching aids, Learning Outcomes*



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INTRODUCTION

Mathematics is a subject with concepts that are interrelated with one another. Mathematics uses several terms that can be interpreted clearly and accurately and accurately. Mathematics makes it easier for humans to be able to master and understand social, economic, and natural problems (Hartati, 2015). Mathematics learning in elementary schools is not only directed at improving students' numeracy skills but is also directed at improving students' ability in problem-solving (Cecep, 2018; Santosa, Suryadi, Prabawanto, Syamsuri, 2018) both math problems and other problems who contextually use mathematics to solve it (Ningsih 2016).

In delivering material to embed concepts, it will be easier to use media as was done by Swintari, Ali, & Murdiana (2016), with the help of media in the form of number lines for learning, especially in understanding the concept of multiplication and division of integers. Heruman (2013) states that the benefits of learning mathematics provide students with provisions to be applied in social life. Thus, mathematics plays an important role in being mastered by students since school age, especially elementary school students.

Pre-research observations carried out in the odd semester of 2019, SDN Cikerut students still think mathematics is a difficult, boring, and scary subject so

that it affects mathematics learning outcomes which are still below the Minimum Graduation Criteria (KKM). This can be seen in the average Final Semester Assessment in each class with an average value of 55. Teaching and learning activities delivered by the teacher still use conventional learning strategies only by talking to explaining the material and giving examples of questions then discussing questions with questions and answers, causing the ineffectiveness of students in taking the initiative to work on the questions confidently (Munawaroh, Santosa & Wahyuningrum, 2020).

More than half of the students achieved a minimum KKM of 80%. This shows that the achievement of learning outcomes is not pleasant, so a learning approach is needed to improve skills and critical thinking and is directly involved in every learning process (Dewi & Wardani, 2019; Santosa, Prabawanto & Marethi, 2019).

One of the lessons that must be applied is cooperative learning. Sulistiana (2015) states that by working cooperatively, the difficulties that students may face during the problem-solving process will be easier to solve. There are several types of cooperative learning, one of which is the cooperative learning strategy of the Student Team Achievement Division (STAD) type.

This learning model requires students to be more active and involve other students so that handling student learning difficulties is easier (Sunilawati, Dantes, & Candiasa, 2013). According to Harsanti (2017), to teach calculation and exact science subject matter such as mathematics, STAD learning strategies are more suitable to use.

STAD cooperative learning model refers to group learning, group discussion is a very important aspect because it plays a role in group actualization. Students will feel more comfortable and easy to learn with their friends. There are even students who find it easier and happier to learn if they help teach their friends (Kukuh, Setiani, & Fakhrudin, 2014). The STAD type of cooperative learning model allows students to be active and have a sense of collective and creative responsibility in optimally improving mathematical learning outcomes (Tiantong & Teemuangsai, 2013). Research results Baktiar, Yusrizal, and Khaldun, (2016), on average 95% of students' positive responses to the use of the STAD type cooperative model, while 5% of students think negatively.

Apart from the aspects of the learning model, another thing that needs to be considered is the use of learning media. The media is expected to be able to reduce the abstract nature of mathematics (Nurhasanah, 2010). For this reason, the learning process will run effectively if the teacher can use and process teaching aids or learning media properly (Gunawan, Harjono, & Imran 2016). Nurdyansyah and Fahyuni (2016) state that learning must provide

opportunities for students to construct knowledge.

Romadiyah (2014) and Suprapti (2016) state that learning mathematics using media makes teaching and learning activities more active and fun and motivates them to understand abstract material concepts. Besides, Purwanti (2015) suggests that the aid of teaching aids can convey messages more clearly and easily understood by students.

However, with the development of technology, the use of teaching aids can be replaced by other media, for example in the form of multimedia. One of the multimedia software that is easy to use is Microsoft PowerPoint. This software can be used as one of the learning media that the teacher presents to students (Juwita, 2012).

The thing that is no less important in learning is the learning style. Sundayana (2016) states that mathematics learning outcomes can increase if students are positive about mathematics and can combine their learning styles.

Furthermore, Amir (2015) states that each student has different learning methods in understanding information or subject matter, one of which is influenced by differences in student learning styles. Because of the different and unique characteristics of students that can be caused by age, learning environment, and social attitudes. This is also expressed by Widyawati (2016), that learning styles need to be used as another factor in learning success. Still, according to Widyawati (2016), there are at least three types of learning styles, namely auditory, visual, and kinesthetic.

The three of them have different characteristics.

For this reason, although many studies have revealed the effect of STAD on learning outcomes (Lubis, 2012; Suniawati, Dantes & Candiasa, 2013; Putri & Sutriyono, 2019; Ketut, 2011; Mustika & Candiasa, 2017; Sari, 2017) and the influence of learning styles on learning outcomes (Iriani & Leni, 2013; Bire, Geradus, Bire, 2014; Chandra, 2015; Anas & Munir, 2016; Budiarti & Jabar, 2016), not many involve these two factors simultaneously.

So, to reveal simultaneously this research needs to be done to reveal the effect of STAD learning strategies and learning styles on student learning

outcomes in elementary school mathematics in grade V.

METHODS

This type of research uses a quasi-experimental method, researchers cannot regulate or manipulate independent variables Wati (2018). The population of this study were students of SDN Cikerut, Cilegon city, the sample of class groups was randomly selected, the experimental class 1 used the STAD type cooperative learning strategy assisted with multimedia PowerPoint and the second experiment class used the STAD type cooperative learning strategy assisted by teaching aids.

Table 1. 2 x 2 Factorial Research Design (Putrawan, 2017)

Learning Style	<i>PowerPoint Multimedia Assisted STAD (A₁)</i>	<i>STAD Assisted with Teaching Aids (A₂)</i>
Auditory (B ₁)	(A ₁ B ₁)	(A ₂ B ₁)
Kinesthetic (B ₂)	(A ₁ B ₂)	(A ₂ B ₂)

Notes:

- (A₁B₁) : Groups of students who learn with STAD type cooperative learning strategies assisted with PowerPoint multimedia and auditory student learning styles.
- (A₂B₁) : Groups of students who learn with STAD cooperative learning strategies assisted by teaching aids with auditory student learning styles.
- (A₁B₂) : Groups of students who learn with cooperative learning strategy type STAD assisted by multimedia PowerPoint with kinesthetic student learning styles.
- (A₂B₂) : Groups of students who learn with cooperative learning strategies type STAD assisted by teaching aids with kinesthetic learning styles.

The instrument used a test of learning outcomes in the form of 10 multiple

choice questions and a questionnaire for auditory and kinesthetic student

learning styles. The validity test of the test questions was obtained through the results of field trials and the consideration of two supervisors who were one of the mathematics lecturers. The two supervising lecturers at the Open University and one competent expert teacher in the City of Cilegon. The validation of the learning outcome test instrument was tested using the point biserial validity test which was declared valid because the $r_{pbv} > t$ table and the KR 20 reliable test was 0.735 greater than the reliability criteria, namely 0.70, then it was reliable. While the learning style instrument uses the Pearson product-moment validation test, the value of $r_{count} > r$ -table, so the questions are declared valid and the test is reliable using the alpha

formula. the test result of 0.869 is greater than the reliability criteria, namely 0.60, which is reliable. The instruments were given after the research was carried out. Two-way ANOVA hypothesis testing is carried out because it relates to a comparison of more than two group averages, to examine the effect of the interaction between the STAD type learning method and student learning styles on learning outcomes and multiple comparative analysis is multiple comparisons to find out more about the group average which is significantly different or between groups with the highest average learning outcomes and also a significant interaction effect (Putrawan, 2017).

RESULTS AND DISCUSSION

Hypothesis testing is carried out after the analysis requirements test.

In this study, if the data is normally distributed and has a homogeneous variant, then it uses parametric statistics and further hypothesis testing through the two-way ANOVA test. With the Kolmogorov-Smirnov test and the homogeneity test through the Bartlett test statistical data processing software (Peck, 2012) to obtain data

the results of the normality test and homogeneous variance of mathematics learning outcomes with a significant level of $\alpha = 0.05$.

After it is stated that the data is normally distributed and has a homogeneous variety, the next step is to test the hypothesis with the two-way ANOVA test using applications from the Microsoft Office Excel program through statistical data processing software and the results of the ANOVA test conclusions are shown in Table 2.

Table 2. Two-way ANOVA Test Results

Source of Variance	JK	DK	RJK	F count	F Table	
					0.05	0.01
Between Groups	1571.429	3	523.810	7.857	3.01	4.72
In Groups	1600.000	24	66.67			

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Effect A (Learning Strategy)	700.000	1	700.000	10.500
Effect EA (Learning Style)	514.286	1	514.286	7.714
Int. A x EA (Learning Strategy x Learning Style)	357.143	1	357.143	3.357
Error	1600.000	24	66.67	
Total	169800.000	28		

In the two-way ANOVA test, the criteria for testing the hypothesis is that if $F_{count} > F_{table}$ then H_0 is rejected and if $F_{count} < F_{table}$ H_0 is accepted. If seen in Table 2 for effect A, between the lines of the learning strategy the F value count is $10.50 > F_{table}$ is 4.72 for the 0.01 significance level, then H_0 is rejected and it can be concluded that there is a very significant average difference in the learning strategy Overall, between the STAD learning strategies assisted with teaching aids compared to the STAD learning strategies assisted with PowerPoint multimedia. This is in accordance with previous research which proved that 95% of students' responses were positive while 5% of students thought negatively about the use of the STAD cooperative model, and with the help of teaching aids it can improve mathematics learning outcomes (Baktiar, Yusrizal, & Khaldun, 2016); (Adeline, 2016), According to Swintari, Ali, & Murdiana (2016), increasing understanding in mathematics with the treatment of STAD type cooperative learning strategies through the help of teaching aids by following the stages, namely

(1) before learning begins to convey learning objectives, (2) with the help of teaching aids the teacher provides material (3) forming study groups, (4) guiding students (5) evaluating or quizzes (6) giving awards but this is not in accordance with the analysis at the development stage Suprapti (2016), cooperative type STAD with the help of Microsoft PowerPoint, it fulfills the criteria well, meets the specified conditions, namely student responses to active learning and completeness of classical learning outcomes is achieved and the learning outcomes test used is sensitive, valid, and reliable.

On the effect of EA (between rows) learning style, the value of F count is $7.71 > F_{table}$ of 4.72 for a significance level of 0.01, then H_0 is rejected and it can be concluded that there is a very significant average difference between the learning styles of auditory students. and kinesthetic student learning styles. The results of this study are also supported by the results of data analysis by Yurizki, Halim, & Melvina (2017) which show that at a significant level of 5% the value of $t_{count} > t_{table}$ ($2.78 > 2.05$)

hypothesis testing is accepted, which means it is significant between learning styles. students and there is a positive relationship with mathematics learning outcomes. There needs to be an understanding and creativity of teachers in delivering mathematics subject matter so that learning is interesting and fun to create active students in learning with the different learning styles that each student has because it will provide different learning outcomes.

And referring to the interaction line of learning strategies and learning styles, the value of F count is $5.36 > F$ table of 4.72 for a significance level of 0.01, there is a very significant average difference, so there is an influence of the interaction between STAD learning strategies and student learning styles on learning outcomes. This is by the results of Ahriani's (2014) research, which states that there is an interaction between the STAD cooperative learning strategy and learning styles so that it can affect student learning outcomes and the average learning outcomes with kinesthetic learning

styles are higher than students who have higher learning styles visual and auditory learning. So it can be concluded that the research carried out is between cooperative learning strategies and student learning styles interacting with learning outcomes. This is following by researchers that there is an interaction of STAD cooperative learning strategies with student learning styles on mathematics learning outcomes.

In Table 2, the ANOVA test results obtained that the F-count was 7.86, greater than the F-table (0.05) (3) (24) of 3.01 at $\alpha = 0.05$. This shows that there is a difference in the average between groups, thus the next step is to find out between the four groups which is the most dominant on average student learning style and significant interaction effects, then the analysis is continued by applying the Multiple Comparison analysis Putrawan (2017) one of them is using the "Tukey" method along with the order of the average and the calculation of q in table 3.

Table 3. Order of Average and Calculation q

STAD Audio Teaching Aids	STAD Kinesthetic Teaching Aids	STAD Multimedia Powerpoint Audio	STAD Kinesthetic Powerpoint Multimedia
74.29	90	71.43	72.86
\bar{X}_2	\bar{X}_1	\bar{X}_4	\bar{X}_3
Ordered from the largest average			
$q_{table} = q(0,05)(24)(4) = 3,90$			
\bar{X}_1	\bar{X}_2	\bar{X}_3	\bar{X}_4
90	74.29	72.86	71.43

$q_1 = \bar{X}_1 - \bar{X}_4 = 90 - 71.43 / \sqrt{66.67/7}$ $= 18.57 / 3.086 = 6.017$	q1 is greater than 6.02 from q-table 3.90, so it is significant
$q_2 = \bar{X}_1 - \bar{X}_3 = 90 - 72.86 / \sqrt{66.67/7}$ $= 17.14 / 3.086 = 5.55$	q2 is greater than 5.55 from q-table 3.90, so it is significant
$q_3 = \bar{X}_1 - \bar{X}_2 = 90 - 74.29 / \sqrt{66.67/7}$ $= 15.71 / 3.086 = 5.09$	q3 is greater than 5.09 from q-table 3.90, so it is significant
$q_4 = \bar{X}_2 - \bar{X}_4 = 74.29 - 71.43 / \sqrt{66.67/7}$ $= 1.43 / 3.086 = 0.46$	q4 is smaller than the q-table 3.90 so it is not significant
$q_5 = \bar{X}_3 - \bar{X}_4 = 72.86 - 71.43 / \sqrt{66.67/7}$ $= 1.43 / 3.086 = 0.46$	q5 is smaller than 0.46 q-table 3.90 so it is not significant

In Table 3, it can be concluded that the average difference between \bar{X}_1 is the average of the kinesthetic visual aids STAD group and \bar{X}_4 the average kinesthetic STAD multimedia group is significant, between \bar{X}_1 and \bar{X}_3 the mean difference is significant in the STAD group of teaching aids kinesthetic with auditory PowerPoint multimedia STAD with $q_2 = \bar{X}_1 - \bar{X}_3 \sqrt{(66.67/7)} = 5.55$ greater than q-table 3.90 so that for students with kinesthetic learning styles student mathematics learning outcomes are higher when taught with cooperative learning type STAD assisted with teaching aids, compared to cooperative learning type STAD assisted with multimedia PowerPoint, this is under the results of Hartati's research (2015), the average mathematics learning outcomes in the kinesthetic learning style group was 66.80 higher than the result value. learning in the visual learning style group with an average of 65.45 and in the auditory group with an average learning outcome value of

65.25. And the result is sig 0.047 (sig <0.05), which means that H_0 is rejected at the 5% significance level. So it can be concluded that the different learning styles of students will have different mathematics learning outcomes. In this research, in-class with cooperative learning strategy type STAD assisted by teaching aids in the form of unit cubes and space objects which are often encountered by students by practicing to fill the space to understand the contents or volume of cubes and blocks, it is more likely Learning outcomes are higher for students who have a kinesthetic style because they understand the volume of cubes and blocks by doing something that involves moving limbs compared to students with auditory learning styles. So that students' mathematics learning outcomes are higher when taught by cooperative learning type STAD assisted by teaching aids with a kinesthetic learning style, compared to

cooperative learning assisted with multimedia Power Point.

In the data \bar{X}_1 and \bar{X}_2 the mean difference are significant between the STAD kinesthetic props and STAD audio props groups. And none of the mean difference between \bar{X}_2 to \bar{X}_4 is significant so there is no need for further testing of the STAD group of auditory aids with kinesthetic PowerPoint multimedia STAD, the group of audio learning styles is not significant with $q_4 = \frac{\bar{X}_2 - \bar{X}_4}{\sqrt{(66.67 / 7)}} = 0.46$ is smaller than q -table 3.90, so for students with audio learning styles, students' mathematics learning outcomes are not higher if taught by cooperative type STAD assisted by multimedia PowerPoint compared to strategy cooperative learning type STAD assisted with teaching aids. According to Amir (2015b), students can know the focus of the problem, which is known and asked, and analyzes problems in mathematics learning outcomes that have an auditory learning style by reading and answering questions again. Whereas students with a kinesthetic learning style to find and analyze a problem, through the limbs and writing instruments often being moved. Widyawati's research (2016), it shows the same learning outcomes between visual learning styles and kinesthetic learning styles and is better than learning outcomes that have an auditory learning style.

Research by Gunawan, Harjono, & Imran (2016), it is known that the use of learning strategies with multimedia on heat material with students' kinesthetic learning styles

cannot be more optimal and they do not benefit in classroom learning, to be able to optimize so that the kinesthetic learning style benefits more from multimedia. There are multimedia modifications, for example with touchscreen technology, so that there are student activities to move the limbs. Likewise, in this study, the kinesthetic learning style does not provide higher mathematics learning outcomes when taught with the use of multimedia compared to the use of teaching aids because it plays a greater role in the auditory learning style that accommodates the delivery of learning material visually and auditory verbally accompanied by interesting pictures, animation, and sounds or music that encourage learning.

The data $\bar{X}_3 - \bar{X}_4$ shows a mean difference that is not significant between the kinesthetic PowerPoint multimedia STAD group with the STAD audio props.

After obtaining the further test results of the multiple comparative analysis, the group with the highest average difference among the four groups was the STAD class group assisted by teaching aids with a kinesthetic learning style.

CONCLUSION

Based on the findings and discussion, it can be concluded that with the influence of the interaction between learning strategies and learning styles, student learning outcomes are not only influenced by learning strategies. In this case, the STAD learning strategy assisted with

teaching aids and STAD assisted with multimedia Powerpoints is not the only factor in making students understand mathematical concepts but must be based on learning styles. For auditory student learning styles, the appropriate learning strategy is to use PowerPoint multimedia assisted STAD, while for students who have a kinesthetic learning style using STAD assisted teaching aids.

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