The Effect Size Test of Talking Stick Learning Model on Students' critical thinking skills

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Abstract: The backgrounds of this study are students can increase concentration when learning through talking stick, students have a low category in critical thinking skills, and students become passive because learning is only focused on the teacher. This study aimed to determine the effectiveness of the Talking Stick learning model on the critical thinking skills of the tenth-grade students of SMA N Trimurjo 1. This research was quasi-experimental. The population of this study was all tenth-grade students of SMA N 1 Trimurjo. The sampling technique used was purposive. The samples of this study were 2 classes, they were class X.Mipa1 as the experimental class and class X.Mipa2 as the Control class. The instrument used in this study was students' critical thinking skills test in the form of essay questions applied in the pretest and posttest. The hypothetical test used was the t-test with a significance level of 0.05%. Previously, the prerequisite tests were done to verify the normality and homogeneity of the tests. Based on the results of the hypothetical test, the result shows that $t_{observed} > t_{critical}$ is equal to 1.86 > 1.67. The effectiveness of the Talking Stick model can be determined by the effect size test with the obtained value of 0.3 in the medium category. It can be concluded that Ha is accepted. It means that the Talking Stick learning model is effective for students' critical thinking skills.

1. Introduction

Education is an early necessity of life that makes a difference between humans and other creatures [1]. Education as a companion tool of the learning process is useful to get new knowledge [2]. Education can also be a force in change so that conditions become better [3]. Educational science has influential in higher-order thinking skills. Higher-order thinking is associated with critical thinking, creative thinking, and metacognitive Technological advances that greatly assist the thinking process [4]. The development of technological advances and concepts of life is very influential in the branch of science known as physics [5].

Thinking logically focuses on deciding and believing what is done [6]. The skills to think critically plays a major role in the success of students during the learning process [7]. Critical thinking is an attempt to make a problem-solving decision to find the truth through the right reasons, the right thinking and have accurate evidence [8]. The skills to think critically enables students to explain phenomena more broadly and make analysis and put forward solutions to problems [9]. Teachers provide learning to train students to be able to choose decisions using critical thinking skills, especially physics learning can improve critical thinking skills of understanding cognitive aspects and
concepts of students’ critical thinking skills to strengthen when solving problems related to quality and appropriate for research.

The development of students’ critical thinking skills during the learning atmosphere, teachers have given directions to students to think critically, but students are still experiencing difficulties in the thought process. Lack of knowledge makes students inactive when learning. This is because the learning materials used by teachers have not fully used the learning model. explanation of the concept given by teachers is only focused on teachers, so students only listen. This is not yet suitable for improving students’ critical thinking skills [10].

The lack of understanding during learning can affect students’ thinking assessment because it is focused on remembering and understanding aspects only. When learning does not have to be fixed on one aspect but with several other aspects to optimize learning in the classroom [11]. Teaching and learning activities that can stimulate the learning process of students actively need the right strategy in the delivery process. For example when using methods, approaches or learning models that can motivate to continue to improve. With this model, positive emotions are established during learning so that a balance is reached between feelings and thoughts [12].

Achievement of physics concepts understanding can be seen by applying learning models, one of which is by using cooperative learning models [13]. The learning model used is very influential in the learning process [14]. Each learning model always has its characteristics [15]. The cooperative learning model is an effort to group students in class in a small group [16]. There are several types of cooperative learning models, one of which is the model learning talking stick [17]. The Talking Stick learning model makes students brave and does not involve their friends. Students must be more responsible for what he has got, students must be more confident when solving problems. The application of this model can provide a very effective learning situation. In implementing learning activities using the model, students must always be prepared. Students are required to dare to express their opinions. Students learn discipline by implementing existing regulations so that learning becomes optimal [18]. In this learning model, the students do not only listen to teachers’ explanations that make students passive [19].

2. Research Method
This study employs the quasi-experiment design with a control group that cannot function fully to control external variables that influence the experiment [20]. This research was conducted at SMA N 1 TRIMURJO, Lampung Tengah. The subjects in this study were the tenth-grade students of X Mipa 1 and X Mipa 2 at SMA N 1 Trimurjo.

The sampling technique used in this study was purposive sampling. Purposive Sampling is the determination of respondents as a sample because it is based on the existence of certain objectives or certain criteria, not based on random and literary [21]. This research instrument was an essay test that consisted of 11 questions for critical thinking skills. Before the questions were used for research on critical thinking skills, the validity, difficulty level, and discrimination index were tested first. Microsoft Excel was used to test the normality, homogeneity, and hypothesis.

The effectiveness of the Talking Stick model was tested using the effect size test which measures the magnitude of the effect of a variable on a variable. Variables that are often related are usually independent variables and dependent variables [22]. Effect size can be calculated with Cohen’s formula. The formula is as follows [21].

\[
d = \frac{m_A - m_B}{\left[(sd_A^2 + sd_B^2)/2\right]^{1/2}}
\]

Note:
- \(d\) = Effect size
- \(m_A\) = The average score of the experimental class gain
m_b = The average score of the control gain
sd^2_A = Standard deviation of the experimental class
sd^2_B = Standard deviation of the control class

The effect size criteria can be seen as follows:

| Effect Size | Category |
|-------------|----------|
| D < 0.2     | Low      |
| 0.2 < d < 0.8 | Moderate |
| D > 0.8     | High     |

3. Result and Discussion

3.1 Research Results Data

The study was conducted using the talking stick learning model to see its effect on critical thinking skills. The instrument used was in the form of an essay test with 36 questions. The instrument was tested and calculated through the calculation of the validity test, reliability test, level of difficulty, and discrimination index to see the problem can be used or not. After carrying out these calculations, 11 questions that were declared as valid.

3.2 Data Analysis

1. Implementation of the Talking Stick Learning Model

The talking stick learning model is more effective than using the PBL model. The results of each meeting can be seen on the table.

| Meeting | Percentage (%) |
|---------|----------------|
| 1       | 80%            |
| 2       | 85%            |
| 3       | 95%            |

2. The Results of Critical Thinking Skills

A pretest was done to find out the initial level of students' critical thinking skills and a posttest was used to find out whether there is a change in students' critical thinking skills. The following is the acquisition of CBC values of experimental and control classes that can be seen in Table 3 and Table 4 below:

| Test  | Pretest | Posttest |
|-------|---------|----------|
| Total Score | 936,00  | 2337,50  |
| Average | 31,2    | 77,9167  |

| Test  | Pretest | Posttest |
|-------|---------|----------|
| Total Score | 775,00  | 2237,50  |
| Average   | 25,83   | 74,58    |
Judging from the increase in the average pretest and posttest scores of the experimental class, the talking stick learning model for physics learning on work materials and energy is said to be effective in increasing critical thinking skills.

3.3 Prerequisites Tests for Data Analysis

1. Normality test
   The normality test used is the Liliefors test, with a significant level of \( \alpha = 0.05 \). The calculation can be seen in the account. The results of the pretest and posttest normality test table 5 below:

   - If \( L_{\text{obs}} < L_{\text{crit}} \) then \( H_0 \) is accepted and the sample is normally distributed
   - If \( L_{\text{obs}} > L_{\text{crit}} \) then \( H_0 \) is rejected and the sample is not normally distributed

   Test results for pretest and posttest normality table 5, below:

   | Statistics | Experimental | Control  |
   |------------|--------------|----------|
   | Pre        | Post         | Pre      | Post     |
   | Σ X        | 940.50       | 2337.5   | 765.0    | 2237.0   |
   | X bar      | 31.2         | 77.91    | 25.50    | 74.58    |
   | S          | 12.85        | 6.95     | 13.79    | 6.92     |
   | \( L_{\text{obs}} \) | 0.117       | 0.137    | 0.142    | 0.124    |
   | \( L_{\text{crit}} \) | 0.161       | 0.161    | 0.161    | 0.161    |
   | Conclusion | Normal       | Normal   | Normal   | Normal   |

   In table 5, the data from the \( L_{\text{obs}} \) pretest experimental class is 0.117 and the posttest is 0.137 with the normal distribution of interest. While the results of the pretest \( L_{\text{obs}} \) results of the control class were 0.143 and the posttest was 0.124 with the normal distribution of interest. Both classes can meet the \( L_{\text{obs}} < L_{\text{crit}} \) criteria and it can be concluded that the results of the pretest and posttest of the two classes are normally distributed.

2. Homogeneity Test
   The homogeneity test was used by using Fisher’s test. The homogeneity test was performed after it was known whether the data were normally distributed or not. Fisher’s test calculations can be seen in the appendix. The criteria of homogeneity are:

   - If \( F_{\text{obs}} < F_{\text{crit}} \) then \( H_0 \) is accepted and the sample is homogeneous
   - If \( F_{\text{obs}} > F_{\text{crit}} \) then \( H_0 \) is rejected, the sample is not homogeneous

   Homogeneity test results pretest and posttest table 6. below:

   | Statistics | Experimental | Control |
   |------------|--------------|---------|
   | Pre        | Post         |
   | S\(^2\)    | 160.94       | 182.96  |
   | \( F_{\text{obs}} \) | 1.066       | 0.995   |
   | \( F_{\text{crit}} \) | 4.00        | 4.00    |
   | Conclusion | Homogeneous   | Homogeneous |

   Based on table 6 above, pretest results of the experimental class and the control class obtained \( F_{\text{obs}} \) 1.066 and posttest results \( F_{\text{obs}} \) 0.995, as well as the results of \( F_{\text{crit}} \) 4.00.
data from both classes obtained $F_{\text{observed}} < F_{\text{critical}}$, it can be concluded that both samples have the same variant and are declared homogeneous.

3. Hypothesis Test
After the prerequisite tests had been done, the hypothesis test was carried out using the t-test. So that the calculation of the results of the data from the two groups was further analyzed to see whether there is an influence or not. T-test calculations are in the appendix. T-test has the following criteria:

1. $H_0$ is accepted if $t_{\text{observed}} < t_{\text{critical}}$
2. $H_0$ is rejected if $t_{\text{observed}} > t_{\text{critical}}$

The results of hypothesis testing in the experimental class and the control class are in table 7 below:

| Class      | N  | $\bar{x}$ | SD  | $t_{\text{tab}}$ | $t_{\text{count}}$ | Conclusion |
|------------|----|-----------|-----|------------------|---------------------|------------|
| Experimental | 30 | 77.9      | 6.95| 1.861            | 1.67                | Influential |
| Control    | 30 | 74.5      | 6.19|                  |                     |            |

Based on table 7 above, hypothesis test results obtained that the total of values $t_{\text{observed}} > t_{\text{critical}}$ i.e. 1.67 > 1.861. If the null hypothesis $H_0$ is rejected and alternative hypothesis $H_a$ is accepted, then there is a significant influence in using the Talking Stick learning model on the critical thinking skills.

4. N-Gain Test
The average gain value from the results of the test is in table 8:

| Class      | Pre | Post | N-Gain | Category |
|------------|-----|------|--------|----------|
| Experimental | 31.35| 77.92| 0.69  | Medium   |
| Control    | 25.50| 74.58| 0.66  | Medium   |

The average value of N-gain in the experimental class was higher compared to the control class. With an average category of N-gain in the experimental class in the medium category and the control class is also in the medium category. This was carried out to obtain test data on critical thinking skills in class X.Mipa1 as an experimental class and class X.Mipa2 as a control class.

5. Effect Size
Research using the Effect Size is used to measure the effectiveness of a variable on other variables. This effect size test was conducted to determine the effectiveness of the Talking Stick learning model on critical thinking skills. The results of the Effect Size calculation can be seen in the table 9:

| Class      | Average N-Gain | Standard Deviation | Effect Size | Category |
|------------|----------------|--------------------|-------------|----------|
| Experimental | 0.68           | 0.050              | 0.3         | Medium   |
| Control    | 0.66           | 0.035              |             |          |
The effectiveness of the use of the Talking Stick learning model is effective for students' critical thinking skills. The results of the calculation of Effect Size with a value of 0.3 that the use of the Talking Stick learning model can be used in the critical thinking process.

3.4 Discussion
Knowing the students' critical thinking skills, an essay test of 10 questions was carried out. The skills to think critically from the value of pretest and posttest. To see the achievement of tests of critical thinking skills begins with the identification of problems, evaluation of problems. If students can answer problems that exist in the aspects of remembering, analyzing, evaluating, so students have a very high test and can answer problems correctly than students who cannot solve problems through thinking that can be said to below.

At the first meeting the students were given a pretest of work material and energy to find out the critical thinking skills of students at the beginning of learning, where the questions given had been tested through the calculation of validity, risk skills, level of difficulty and distinguishing power, after giving treatment through the use of models that have been determined in experimental class and control class. The results of the test in the experimental class obtained a low score of 10.00 and a high score of 47.50. While the prettiest results in the control class obtained a low score of 5.00 and a high score of 45.00. After doing the pretest at the first meeting, then directly through learning through a predetermined learning model.

In the last meeting, each class gave a posttest by using a model that was determined to see whether there was an increase in the students' critical thinking skills in the experimental class and the control class. For low posttest scores done in the experimental class that is 62.50 and the highest score of 92.50. As for the lowest posttest value performed in the control class that is 60.00 and the highest value is 85.00. From the average posttest results of each class so that students' critical thinking skills increase. This happens because there is a mismatch of treatment that has been determined, the experimental class uses the Talking Stick model and the control class uses the Problem Based Learning model.

The average posttest and pretest scores at each meeting always increase after being given treatment. The results of N-gain calculations in the two classes showed a difference in the value of N-gain in the experimental class that is equal to 0.68 with low criteria. then from the N-gain test in the control class of 0.66 with low criteria. then students' critical thinking skills increase by using the Talking Stick learning model compared to using a problem-based learning model. The posttest normality test of the experimental class showed that $L_{observed} = 0.137$ with $L_{critical} = 0.161$. Based on the calculation results that have been obtained show $L_{observed} < L_{critical}$ where hypothesis $H_0$ is accepted. the conclusion of a normally distributed population. The Talking Stick model is effective compared to the Problem Based Learning model.

From the statements that have been described, the results of all classes are normally distributed and homogeneous. After that, the next step is to test the hypothesis, with a significant level $\alpha = 0.05$ the count is obtained $t_{observed} 1.86$ and $t_{critical} 1.67$ where $t_{observed} > t_{critical}$ then the hypothesis is accepted. Then the data obtained obtained differences in the average value of critical thinking skills in students with the Talking Stick model to be improved compared to the critical thinking skills of the Problem Based Learning model. The appropriateness of the value of the research carried out that learning using the Talking Stick model makes all students actively involved. Therefore, the Talking Stick model can easily support the critical thinking process. The above understanding found a theory that is the link between the Talking Stick model can be improved through critical thinking skills so that the Talking Stick learning model can be used to create critical thinking through answering questions through the stick so that it makes students more active. The learning phase so that it is easy to understand is very necessary for learning so that students are not obstructed through difficult stages.

The study was conducted to determine the effectiveness of the model used when learning. It can be concluded that the research using the Talking Stick model is effective in critical thinking skills. Through the calculation of the effect size, it was obtained a value of 0.3 which means that there is an
effect of the model on critical thinking. Indicator analysis of critical thinking skills represents that the indicators were correctly done by looking at the average post-test scores of all students which are in the good category. Thus, the use of the Talking Stick model on energy and work material has a positive impact on critical thinking skills.

4. Conclusion
Based on the results of research that has been carried out at SMA N 1 Trimurjo Central Lampung class X in academic years 2018/2019. The results of data analysis and discussion that have been presented can be concluded that: There is an influence of the Talking Stick learning model on the critical thinking skills of these students as evidenced from the results of the hypothesis test obtained $t_{\text{observed}} > t_{\text{critical}}$, i.e., $1.86 > 1.67$ which means $H_0$ is rejected and $H_1$ is accepted. The Talking Stick learning model is effective toward students' critical thinking skills. This is evidenced from the results of the effect size test which is 0.3 in the medium category.

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