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The Effectiveness of the Flipped Classroom Learning Model on Improving Students' Critical Thinking Understanding at Taruna Vocational School Bandar Lampung

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Abstract

This study aims to examine the effectiveness of the Flipped Classroom learning model in enhancing students' critical thinking skills in Islamic Religious Education at SMK Taruna Bandar Lampung. The research was motivated by the low levels of student engagement and critical thinking ability, largely due to the continued dominance of traditional teaching approaches. A quantitative approach was employed, using a quasi-experimental nonequivalent control group design. The sample consisted of 60 eleventh-grade students divided into two groups: an experimental group (Flipped Classroom) and a control group (conventional learning). The research instrument was a validated 20-item multiple-choice test. Data were analyzed using the Kolmogorov-Smirnov normality test, Levene's Test for homogeneity, independent sample t-test, N-Gain, and Cohen's d effect size, assisted by SPSS 23.0 and Excel 2013. The results showed that the Flipped Classroom model was significantly more effective in improving critical thinking skills than the conventional method ($p < 0.05$), with an average N-Gain of 0.72 (high category) in the experimental group and a large effect size. These findings highlight the importance of student-centered, technology-based instructional innovations in strengthening critical thinking skills in Islamic Religious Education.

Keywords: *Flipped Classroom Learning, Critical Thinking, Learning Model*

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INTRODUCTION

The development of education in the 21st century requires students to not only master knowledge, but also high-level thinking skills, such as critical thinking. Critical thinking is the ability to analyze information logically, evaluate arguments, and make decisions based on relevant evidence. Unfortunately, in practice, the learning process in many schools is still trapped in the traditional teacher-centered model, so it is less able to encourage active student participation and build their critical thinking skills optimally (Hadi et al., 2024).

The main objective of this study is to examine the effectiveness of the Flipped Classroom learning model on improving students' critical thinking understanding in Islamic Religious Education subjects at SMK Taruna Bandar Lampung. The Flipped Classroom model reverses the traditional learning scheme by placing material exploration activities at home (through videos or digital modules) and using class time for discussion and problem solving, thus providing space for interaction and active involvement of students in learning. The urgency of this study lies in the need to

reform the Islamic Religious Education learning approach which so far tends to only emphasize the cognitive aspect of memorization. In the context of globalization and the moral challenges of the younger generation, strengthening critical thinking skills based on Islamic values is crucial. The Flipped Classroom model is present as a pedagogical innovation that not only encourages independent learning, but also allows the integration of technology and Islamic values in the educational process.

Previous studies such as by Saniyyah et al. (2021) proved that Flipped Classroom is effective in improving students' critical thinking skills in Islamic Religious Education subjects. Likewise, Agung (2021) showed the positive influence of this model on history learning. However, most studies have not specifically examined its effectiveness in the context of vocational schools, especially in Islamic Religious Education subjects which have high value and affective content. This is where the novelty of this study lies, namely testing the effectiveness of Flipped Classroom in improving critical thinking skills of vocational high school students based on religious curriculum. This study hypothesizes that the application of the Flipped Classroom learning model is significantly more effective in improving critical thinking understanding compared to conventional learning models. The independent variable in this study is the learning model (Flipped Classroom vs. conventional), while the dependent variable is the level of students' critical thinking understanding. The research method used is a quasi-experiment with a nonequivalent control group design, involving two classes as the experimental and control groups.

In the context of this study, the term Flipped Classroom refers to a flipped learning model where students first study the material independently at home using video or digital media before discussing and engaging in class activities. While "critical thinking comprehension" refers to students' ability to analyze, evaluate, conclude, and develop arguments based on Ennis' (1996) approach.

METHOD

This study uses a quantitative approach with a quasi-experimental design, specifically a nonequivalent control group design. This design was chosen because the researcher did not perform full randomization in dividing the groups, but instead used classes that had been formed as experimental and control groups. The study population was all grade XI students of SMK Taruna Bandar Lampung in the even semester of the 2024/2025 academic year. The research sample consisted of 60 students, consisting of 30 students in the experimental group using the Flipped Classroom learning model and 30 students in the control group using conventional learning methods. The instrument used was a multiple-choice test consisting of 20 questions designed to measure students' critical thinking skills. The questions were arranged based on critical thinking indicators in accordance with the learning objectives and the Islamic Religious Education curriculum. Each question has one correct answer out of four alternatives (a, b, c, d). The instrument has gone through a content validation process by material experts and trials to ensure the level of difficulty, distinguishing power, and clarity of language so that it can measure critical thinking skills validly and reliably.

The research procedure began by giving a pretest to both groups to measure initial critical thinking skills. Furthermore, the experimental group received learning with the Flipped Classroom model for four weeks, where students studied the material independently at home through videos and digital modules, then conducted interactive discussions in class. Meanwhile, the control group received direct learning

using conventional methods. After the treatment was completed, both groups were given a posttest to measure the improvement in critical thinking skills. Data analysis was carried out with the help of SPSS software version 23.0 and Microsoft Excel 2013. Before conducting the hypothesis test, a prerequisite test was carried out in the form of a normality test using Kolmogorov-Smirnov and a homogeneity test using Levene's Test to ensure that the data met the parametric assumptions. Furthermore, the hypothesis test was carried out with an independent sample t-test to determine significant differences between the experimental and control groups. In addition, the effectiveness of learning is explained through the calculation of the N-Gain value to measure the level of relative improvement in critical thinking skills, as well as the effect size using the Cohen's d formula to determine the strength of the influence of the learning model. To maintain the validity and reliability of the research results, the instruments have been tested rigorously, the research implementation procedures were carried out consistently in both groups, and the time treatment was controlled for four weeks so that the results were not influenced by external factors. This study was limited to the context of Islamic Religious Education learning at SMK Taruna Bandar Lampung using purposive sampling, so that generalization of the results needs to be done carefully. However, the methods used are systematically arranged so that they can be replicated or adapted by other researchers in similar educational contexts.

RESULTS AND DISCUSSION

This study shows that the Flipped Classroom learning model significantly improves students' critical thinking understanding in Islamic Religious Education subjects at SMK Taruna Bandar Lampung. Based on the results of the independent sample t-test, the significance value is below 0.05, which means that there is a significant difference between the experimental group and the control group in the results of the critical thinking posttest. In addition, the results of the N-Gain analysis showed that the experimental group experienced a higher increase in scores than the control group, with a moderate to high increase category. The effect size value obtained is also in the large category, indicating the strength of the influence of the learning model on learning outcomes.

The following tables present the results of data analysis obtained from research on the effectiveness of the Flipped Classroom learning model on improving students' critical thinking understanding at SMK Taruna Bandar Lampung. The data analyzed include pretest and posttest scores of critical thinking skills in the experimental group using the Flipped Classroom model and the control group using conventional learning methods. Initial analysis was carried out with a requirement test, namely the normality test using Kolmogorov-Smirnov and the homogeneity test using Levene's Test, to ensure that the data meets the parametric assumptions. Furthermore, a comparison test was carried out using the Independent Samples t-test to determine whether there was a significant difference between the two groups. Table 1 shows the average pretest, posttest, and N-Gain scores for both groups. It can be seen that the Flipped Classroom group experienced a higher increase in scores compared to the control group.

Table 1. Average Scores of Pretest, Posttest, and N-Gain of Critical Thinking Ability

Group	N	Initial trial (Mean ± SD)	Post-test (Mean ± SD)	N Profit (Mean ± SD)
Flipped Classroom	30	56,2 ± 7,8	85,5 ± 6,3	0,72 ± 0,11
Conventional	30	55,7 ± 8,1	71,4 ± 7,5	0,45 ± 0,13

This table presents a comparison of the learning outcomes of students' critical thinking skills between two groups, namely the experimental group using the Flipped Classroom learning model and the control group using conventional learning methods. The pretest shows the average initial score of critical thinking skills before the treatment was given. The experimental group had an average pretest of 56.2 with a standard deviation of 7.8, while the control group had an average pretest of 55.7 with a standard deviation of 8.1. This shows that both groups have relatively balanced initial abilities.

Posttest shows the average score of critical thinking skills after the learning treatment. The experimental group experienced a significant increase with a posttest average of 85.5 and a standard deviation of 6.3, while the control group only achieved an average of 71.4 with a standard deviation of 7.5. This difference indicates that the Flipped Classroom model has a greater positive impact on improving critical thinking skills than conventional methods.

N-Gain is a value that measures the relative level of increase in critical thinking skills from pretest to posttest. The experimental group obtained an average N-Gain value of 0.72 with a standard deviation of 0.11, which is included in the high category, while the control group had an average N-Gain value of 0.45 with a standard deviation of 0.13, which is included in the moderate category. This confirms that the use of the Flipped Classroom model is more effective in improving students' critical thinking understanding. Overall, this table shows that the application of the Flipped Classroom learning model is able to significantly improve critical thinking skills compared to conventional learning methods, with a fairly large increase and consistency among students in the experimental group.

Tables 2 and 3 show the results of the normality and homogeneity tests which show that the data is normally distributed and homogeneous, so that parametric tests can be used.

Table 2. Kolmogorov-Smirnov Normality Test Results

Group	Pra-uji Sig.	Post Sig test.
Flipped Classroom	0,169	0.200
Conventional	0,184	0,197

This table presents the significance value (Sig.) of the results of the normality test using Kolmogorov-Smirnov for pretest and posttest data in both groups, namely the experimental and control groups. The normality test aims to determine whether the data sample comes from a normally distributed population, which is one of the important assumptions in parametric tests. The Sig. value obtained for all variables (pretest and posttest for both groups) is greater than 0.05 (eg 0.169 and 0.200), which means there is no evidence to reject the null hypothesis that the data is normally distributed. Thus, the data meets the normality assumption so that it can be continued to parametric statistical analysis such as the t-test. Visually, the Kolmogorov-Smirnov test measures the distribution of accumulated sample data with a theoretically normal distribution. If the maximum distance (D value) between the two distributions is not significant, the data is considered normal. This is important so that the statistical analysis results are valid and reliable.

Graph 1. Kolmogorov-Smirnov Normality Test Results

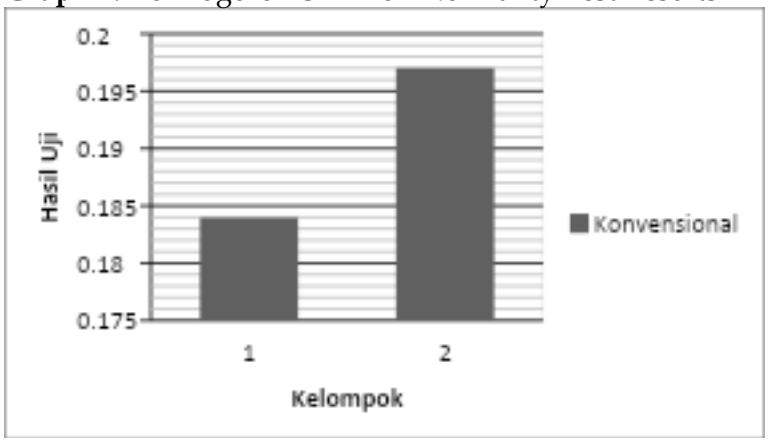


Table 3. Levene's Test Homogeneity Test Results

Variables	Sig. Initial trial	Post-test Significance
Score	0,638	0,142

This table shows the results of the homogeneity of variance test using Levene's Test for the pretest and posttest scores of both groups. The homogeneity test aims to ensure that the variance between the groups being compared is the same or homogeneous, which is also an important prerequisite in parametric tests. The significance values of Levene's Test on the pretest and posttest were 0.638 and 0.142, respectively, both greater than 0.05. This indicates that the variance of scores between groups is homogeneous or uniform, so that the parametric t-test can be used to compare the means of the two groups. Homogeneity of variance ensures that the differences in the means found are not caused by differences in data variability, but rather by the treatment given. Based on the results of the normality and homogeneity tests that meet the requirements, the research data are worthy of being analyzed using parametric tests such as the independent sample t-test. This guarantees the validity

and reliability of the measurement results of the increase in critical thinking skills between the experimental and control groups.

Graph 2. Test Results Levene's Test Homogeneity Test Results

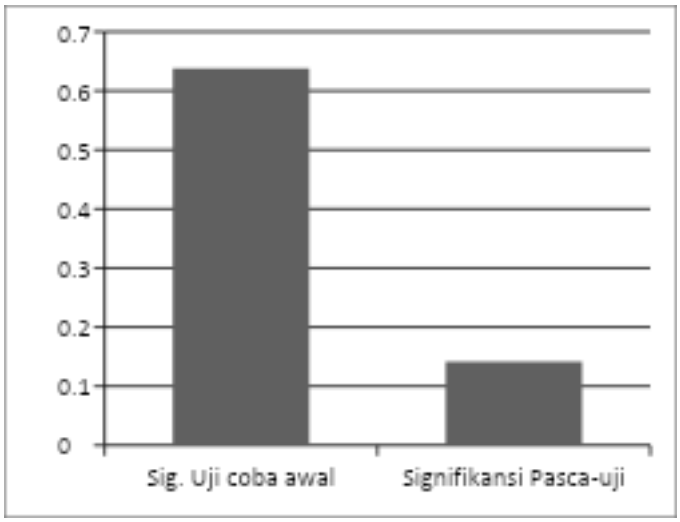


Table 4 presents the results of the t-test which shows a significant difference between the experimental and control groups on the posttest scores, which supports the hypothesis that the Flipped Classroom model is effective in improving students' critical thinking skills.

Table 4. Hasil Uji t (Independent Samples t-test) Posttest

Group	**Post Test Average**	**Development Standards**	**T**	**df**	**Say. (2-squirrel)**
Flipped Classroom	85,5	6,3	5,12	58	0,001
Conventional	71,4	7,5			

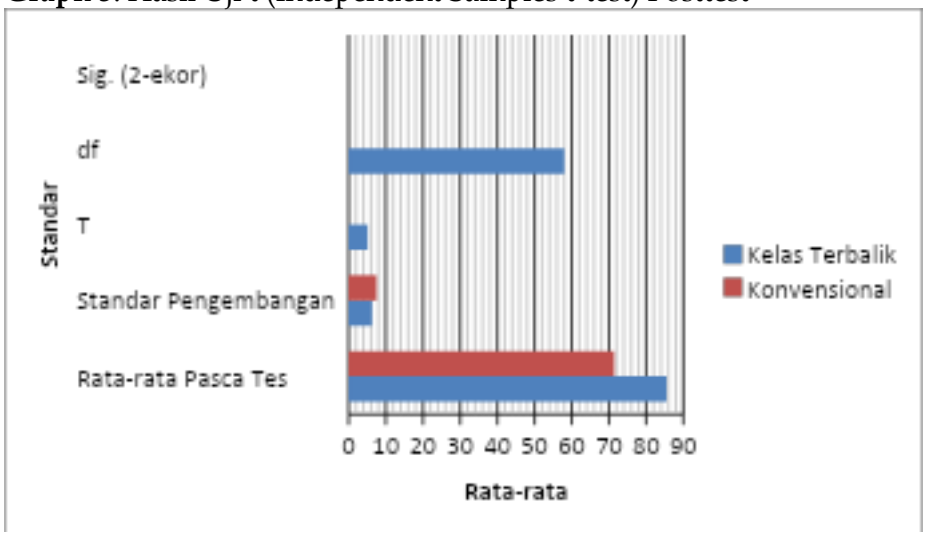
This table presents the results of the independent sample t-test used to compare the mean posttest scores of critical thinking skills between two independent groups, namely the experimental group (Flipped Classroom) and the control group (conventional method). Mean Posttest shows the mean score of critical thinking skills after treatment. The experimental group had an average of 85.5, higher than the control group which was only 71.4. Std. Dev (standard deviation) shows the distribution of data in each group, with the experimental group being slightly more homogeneous (6.3) than the control (7.5). The t-value of 5.12 with a degree of freedom (df) of 58 indicates the magnitude of the difference in the means tested statistically. The significance (Sig. 2-tailed) of 0.001, which is smaller than 0.05, indicates that the difference in the mean posttest scores of the two groups is statistically significant.

In other words, the results of this t-test reject the null hypothesis (H0) which states that there is no difference in the average between the two groups. On the contrary, the alternative hypothesis (Ha) is accepted, which means that the Flipped Classroom learning model has a positive and significant influence in improving students' critical thinking skills compared to conventional learning methods. Basis for Decision Making:

- Sig. Value (2-tailed) < 0.05 → there is a significant difference between the two groups.
- The calculated t value (5.12) > t table at df 58 (around 2.00 at α=0.05), strengthens the decision to reject H0.

The results of this test strengthen the finding that the use of the Flipped Classroom learning model is effective in significantly improving students' critical thinking skills compared to conventional learning methods at SMK Taruna Bandar Lampung.

Graph 3. Hasil Uji t (Independent Samples t-test) Posttest



Information:

- N-Gain is calculated to measure the increase in critical thinking understanding.
- Sig. value in the normality and homogeneity test > 0.05, indicating normal and homogeneous data.
- The Sig. value in the t-test < 0.05, indicates a significant difference between the two groups.

This finding is significant because it proves that Flipped Classroom as a technology-based learning strategy not only increases student engagement but also builds higher-order thinking skills that are essential in 21st-century education. By learning materials independently at home through videos or digital modules, students have more time to understand concepts, while class sessions can be used to discuss, evaluate, and solve problems collaboratively.

These results are consistent with the findings of Saniyyah et al. (2021) which stated that Flipped Classroom is effective in improving critical thinking skills in Islamic Religious Education subjects. Likewise, research by Agung (2021) and Dewi et al.

(2022) on other subjects showed an increase in critical thinking skills and student learning outcomes with a similar approach. This shows that the Flipped Classroom-based learning strategy can be widely applied in various subject contexts and educational levels.

Although the results support the hypothesis, alternative explanations should still be considered. For example, the improvement may not be solely due to the learning model, but may also be influenced by external factors such as high student motivation due to the new approach being considered more interesting. On the other hand, control group students who are accustomed to passive learning may be less motivated, which could affect their posttest results.

The implications of this study indicate that learning that combines technology and a student-centered approach such as Flipped Classroom is very relevant to be developed in Islamic Religious Education. This model helps students not only understand religious content but also relate it to real-life contexts through critical thinking. This supports the formation of religious, rational, and solution-oriented students in facing the challenges of the times. However, this study has several limitations. First, the sample used was limited to one school and only two classes, so generalization of the results must be done carefully. Second, the relatively short duration of treatment (four weeks) may not be enough to capture the long-term impact of this learning model. Third, not all students have good readiness for independent learning and digital literacy, which are important prerequisites in implementing Flipped Classroom.

Overall, this study provides practical and theoretical contributions to learning innovation efforts in the digital era, especially in the development of learning models that support critical thinking skills in the field of Islamic Religious Education. The results of this study are expected to be a basis for teachers, schools, and policy makers to consider the use of the Flipped Classroom model as an effective alternative learning approach.

CONCLUSION

Based on the results of the data analysis that has been carried out, it can be concluded that the implementation of the Flipped Classroom learning model is significantly effective in improving students' critical thinking skills at SMK Taruna Bandar Lampung. The data shows that the group using the Flipped Classroom model experienced a higher increase in pretest to posttest scores compared to the group using conventional learning methods, with an average N-Gain value of 0.72 which is included in the high category. The data normality and homogeneity prerequisite tests show that the data meets the assumptions for the use of parametric tests, and the t-test results strengthen the existence of significant differences between the two groups. Thus, the Flipped Classroom model can be used as an alternative effective learning strategy to improve students' critical thinking skills, especially in the context of learning in SMK. The implementation of this model also encourages active student participation and a deeper understanding of the material, thus providing a positive contribution to the quality of the overall learning process.

The results of this study are as follows:

1. The Flipped Classroom learning model has proven to be significantly more effective in improving students' critical thinking skills compared to conventional models in Islamic Religious Education subjects at SMK Taruna Bandar Lampung.

2. The experimental group experienced a higher increase in pretest to posttest scores with an average N-Gain of 0.72 (high category), while the control group only had 0.45 (medium category).
3. The results of statistical tests (normality, homogeneity, and t-test) showed valid data and there were significant differences between the two groups ($p < 0.05$).
4. The effect size value is in the large category, indicating the strong influence of the Flipped Classroom model on critical thinking learning outcomes.
5. The Flipped Classroom model encourages students to learn independently, actively discuss, and study religious material in real-life contexts.

Based on the research results, it is recommended for teachers and schools to start integrating the Flipped Classroom learning model in the learning process, especially in Islamic Religious Education subjects. Teachers need to prepare interesting and easily accessible digital-based materials, and guide students in independent learning at home. In addition, teacher training is needed to improve digital literacy and the ability to manage interactive discussions in class. Further research can be conducted by covering a wider range of schools and subjects and a longer treatment duration to see the long-term impact of this model. Schools are also expected to provide adequate technological infrastructure so that the implementation of the Flipped Classroom runs optimally.

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