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The Effect of Guided Inquiry Learning Model on Student's Critical Thinking Skill in Static and Dynamic Fluid Materials

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ABSTRACT

This research was conducted on the critical thinking skills of students who still need to be critical but must still be directed to develop critical thinking. One way to encourage students to think critically is to apply the guided research learning model. Applying the guided research learning model in the learning process can support critical thinking skill of students. This aims of this study is to determine the effect of the guided inquiry learning model on the critical thinking skills of class XI Natural Science students on static and dynamic fluid materials. This type of research is quasi-experimental and only has a post-trial control group. The population for this study was obtained from students of class XI Natural Science in Islamic Senior High School. Sampling was carried out using the cluster random sampling technique. Samples were taken randomly, and Class XI natural science 1 was taken as the experimental class and Class XI natural science 3 as the control class. Data analysis was performed using a statistical t-test. The results showed that critical thinking skill of students ranged from 76.74 in the experimental class to 69.32 in the comparison class. Based on the T distribution table, obtained tbltable.04 and t count of 5.62. The condition for rejecting H_0 is if the $t_{table} < t_{count}$. H_1 is accepted because the t count value rejects H_0. This confirms that applying the model of guided inquiry learning influences critical thinking skill of students in static and dynamic fluid material.

Keywords : Guided Inquiry, Critical Thinking Skill, Static Fluid, Dynamic Fluid.

I. INTRODUCTION

The educational challenge faced in 21st-century life is that students must master various skills. In the 21st century, many skills must be implemented, as stated in Permendikbud number 21 of 2016, which reveals that 21st-century skills guide the Graduate Competency Standards in learning the 2013 curriculum; these skills contain non-technical skills or also known as soft skills. The partnership framework of 21st Century Skills defines it as "The 4C Skills". Namely creativity, critical thinking, communication and collaboration. This means that interests in the 21st-century education field require a change in the direction of education by packing students to visit a world that is increasingly selective in the struggle for creativity and thought. In this case, understanding non-technical skills (soft skills) will be more valuable than just mastering technical skills (hard skills), as previously explained [1].

The ability to think critically, solve problems, and collaborate are essential aspects that must be possessed in 21st-century education [2]. Thinking logically and transparently, focusing on deciding what to do and what to believe, is called critical thinking [3]. The school must prepare the student for active and critical process learning. In the digital literacy era, information from various sources is so rich that We still need to find out whether that is correct. Students must verify facts by adapting to life and work to prove the information obtained to be calculated valid or nope. Physics is knowledge which possible We develop ability analysis so that We can find solutions for almost every process that happenedin naturally. By because that, conceptual prowess must be developed through learning which meaning. The ability to think critically directs someone to think indirectly towards conclusions or accept some evidence, demands or decisions for granted without really thinking about it. Critical thinking clearly demands the interpretation and evaluation of observations, communications, and other

sources of information. Critical thinking skills that can be trusted and considered in decision-making are high-level thinking skills [4].

The Critical thinking skill of students can be observed with the help of the critical thinking index. Facione said that critical thinking skills have two dimensions, namely cognitive dimensions and emotional tendencies. Indicators of cognitive aspects of critical thinking are interpretation, analysis, evaluation, and reasoning [5]. In addition to the cognitive dimension, critical thingking skill is seen from the affective disposition category; namely, critical thinkers cannot only do something beyond 2 aspects. The two skills are called "explanation" and "self-regulation". These two aspects can express his mind, carry out self-assessments, apply critical thinking skills to himself, and correct mistakes in previous opinions [6].

The results of interviews with physics teachers at Islamic Senior High School regarding learning process activities at school show that learning activities at school have implemented the 2013 curriculum. Teachers have tried to use the learning model mandated by the 2013 curriculum, namely Discovery Learning, Cooperative Learning and Inquiry Learning. In this model's implementation process, the teacher has not fully implemented the learning syntax following the inquiry model because the teacher needs to understand the syntax used. The teacher evaluates the learning by giving questions at the end of the subject matter in essay form, but there is no specific measurement of students' critical thinking abilities.

This problem must be solved because, following the direction of the curriculum, students must have the critical thingking skill. One effort to support students' thinking skills is to create a challenging and interactive learning environment. Permendikbud No. 16 of 2022 concerning Education Process Standards states that learning in schools is recommended to build a learning atmosphere that provides opportunities for students to dare to express opinions and experiment [7]. In the 2013 curriculum, one model that is considered suitable to be applied is the guided inquiry model. This model can be used in the material taught in high school, in grades X, XI, and XII.

In order to improve critical thinking skills of students, a solution can be taken by applying a learning model that can influence students' interest in learning physics. The model must be aligned with the learning objectives and taught material. The model of guided inquiry learning has the potential to improve critical thinking skill of students. The role of teacher is to facilitate students in determining the problem and its stages of completion [8]. Therefore the model of guided inquiry learning is where the teacher actively participates in a problem and stages. This learning model is appropriate for learning where students are directly involved with the studied object [9].

The researcher chose static fluid and dynamic fluid material because these materials included material that was difficult for students to understand, as well as suggestions from previous proposal seminars to shift the material used for research and match it with the learning model used. The reason for doing research at Islamic Senior High School was because the writer used to go to school at Islamic Senior High School, and there were several problems that the writer felt when he was a student. Moreover, when observations were made at school, the problems that the author experienced as students in the past were almost the same as the problems faced by teachers now. Therefore, this research was conducted to determine the effect of the guided inquiry learning model on the critical thinking skills of students at Islamic senior high schools.

II. METHOD

The research to be carried out is quasi-experimental. Experimental research is defined as research that observes the effects of specific treatments on other people with certain diseases [10]. In this study, researchers observed the influence the model of guided inquiry learning on critical thinking skills. The populations of this study were XI Natural Science 1, XI Natural Science 2, XI Natural Science 3, and XI Natural Science 4. The sampling technique used was random cluster sampling. Random cluster sampling is based on groups randomly selected from the population.

Post-test-only control group design was the design in this study. The experimental group was treated using the guided inquiry model. In contrast, the control group was not given treatment and was then given a posttest to see the study results. Collecting data on critical thinking skills is done by doing a posttest with the same questions at the end of the lesson. The previous posttest questions were tested on classes that had previously studied static fluid and dynamic fluid material. After that, the questions were analyzed using validity and reliability tests and filtered valid and reliable questions to be tested on the sample class. After all the research data is collected, the data is processed and analyzed. Normality and homogeneity tests were carried out; then, then the data hypothesis was tested using the t-test. The formula used was as follows.

$$t = \frac{\overline{x1} - \overline{x2}}{S\sqrt{\frac{1}{n1} + \frac{1}{n2}}} \quad (1)$$

with

$$S^2 = \frac{(n1-1)S1^2+(n2-1)S2^2}{n1+n2-2} \quad (2)$$

In the formula, $\bar{x}_1$, S_1, and n_1 were the average, standard deviation, and students' number of experimental class; $\bar{x}_2$, S_2, and n_2 were the average, standard deviation, and students' number of control class [11]. To see whether the hypothesis is accepted, it should the significance level = 0.05 with dk = $n_1 + n_2 - 2$. If hypothesis was acceptep the value of $t_h > t_t$. Meanwhile, if the hypothesis is rejected, the value of $t_h < t_t$.

III. RESULTS AND DISCUSSION

This study has an experimental class that applies the guided inquiry model and a control class that applies a scientific approach. Both classes were evaluated by giving a final exam to two sample groups using an essay test consisting of eight questions, supplemented by a question grid at the end of the survey. Previously, the eight questions had been analyzed for validity and reliability. From the analysis, it was found that the eight questions were valid and reliable. The results of the evaluation can be seen in the following Figure 1.

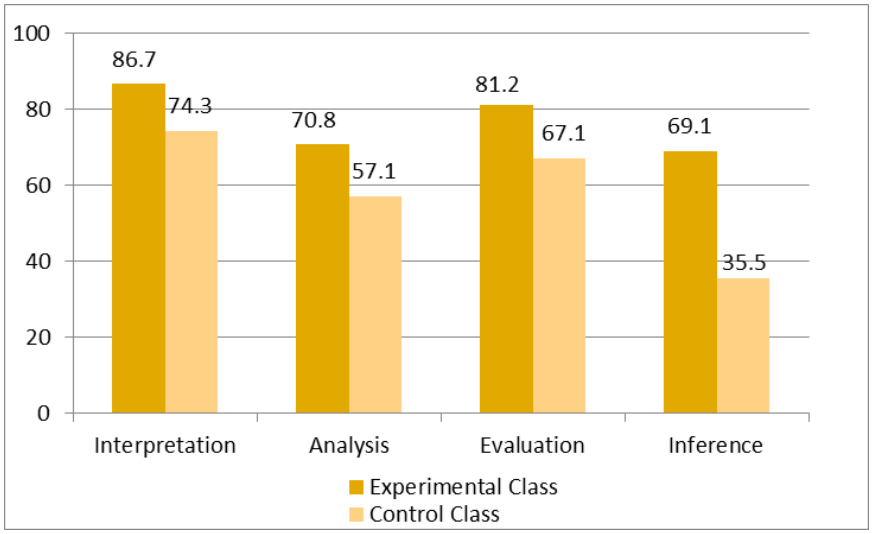

Fig 1. Critical Thinking Skill of Students Based on Critical Thinking Skill Indicators

Based on figure 1, critical thinking skills observed from the 4 indicators, which include interpretation, analysis, evaluation and inference. The percentage of critical thinking skills in the experimental class for interpretation indicators is 86.70%, analysis indicators are 70.80%, evaluation indicators are 81.20%, and inference indicators are 69.10%. While the control class for interpretation indicators is 74.3%, analysis indicators are 57.10%, evaluation indicators are 67.10%, and inference indicators are 35.50%. Based on the figure, the critical thinking skills of the experimental class for each indicator are higher than the control class. Based on the data obtained from critical thinking skill of students, a t-test was conducted to test the research hypothesis through the average final critical thinking skills score.

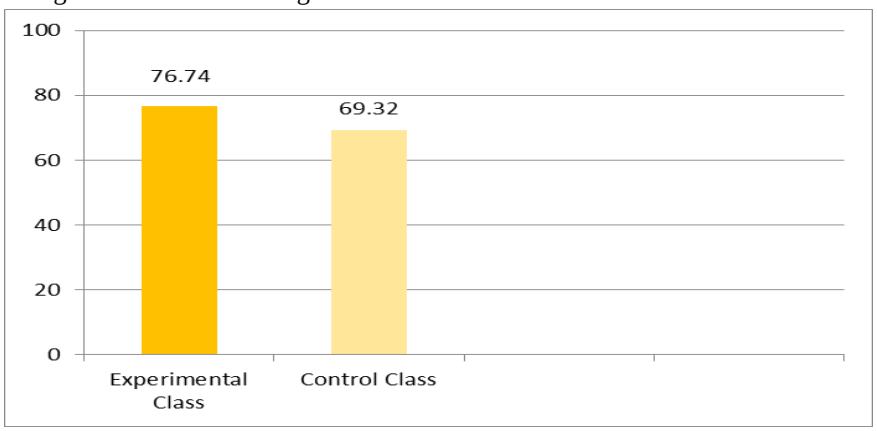

Fig 2. The average value of the sample class post-test

From Figure 2, the average experimental class posttest is higher than the control class. The average value of the experimental class is 76.74 and the control class is 69.32. This shows that learning with guided research models can influence and develop the critical thinking skill of students. Based on the average comparison class, the scores of critical thinking skill of students also increased, but many students still must meet school readiness standards.

Based on the analysis, there are differences between the experimental class and the control class. This was obtained because the experimental class was given a differentiator using a guided survey design. After all, students are guided to learn more actively. Meanwhile, the control class didn't use the model of guided inquiry learning but a scientific approach and the teacher's role was still dominant compared to the students. Normalized student critical thinking tests were calculated using the Liliefors test statistic. After ensuring that the reported data is orderly and homogeneous, we perform a t-test. The followings were the results of the postttest and critical thinking skill of students.

Table 1. Results of Analysis of the Average Final Value of the Two-Sample Classes

Types of Statistics	Statistical Parameters	Class	
		Experiment	Control
Descriptive Statistics	Average ($\overline{X}$)	76.74	69.32
	Standard Deviation (S)	14.69	16.28
	Variance (S^2)	215.79	265.03
	Maximum	96	87
	Minimum	33	28
Normality test	N	31	34
	Real Level (α)	0.05	0.05
	L_0	0.147	0.144
	L_t	0.159	0.151
	Information	Normal ($L_0 < L_t$)	
Homogeneity Test	F_h	1.22	
	F_t	1.82	
	Information	Homogeneous ($F_h < F_t$)	
t test	T_h	5.62	
	T_t	2.04	
	Information	H_0 is rejected ($t_h > t_t$)	

A normality test is done to see whether the two classes were normal to be equally selected as the sample class. Thirty-one students in the experimental class and thirty-four in the control class normality test were carried out to obtain L_0 and L_t values at the significant level of 0.05. So get value $L_0 < L_t$ in both sample classes, and the sample of data can be categorized as usual. The L0 value in the experimental class was 0.147, the control class was 0.144, the L_t value in the experimental class was 0.159, and the control class was 0.151, so they are both normally distributed. After the normality test, then the next is the homogeneity test. The homogeneity test determines whether the two sample classes have a homogeneous shape. If $Fh < F_t$, both sample classes have a homogeneous shape and vice versa. The F_h value was 1.22, and the F_t value was 1.82. So both classes have homogeneous interpretations because of $F_h < F_t$.

The hypothesis test was done, after the results of the normality test and homogeneity test were obtained, indicating normal and homogeneous. Table 1 shows that the th value is 5.62 and the t_t value is 2.04, which suggests that H_0 is rejected ($t_h > t_t$). Therefore, it is accepted that students of Islamic Senior High School 2 Bukittinggi are on static fluid material and dynamic fluid. The model of guided inquiry learning has an effect on critical thinking skill of students.

In this research, it is necessary to know whether static and dynamic fluid teaching materials with guided inquiry learning models affect the critical thinking skills of students. Critical thinking indicators measured are interpretation, analysis, evaluation and reasoning. Learning in the experimental class follows the existing learning method. The learning steps used with the guided inquiry model in the experimental class are orientation, problem formulation, hypothesis formulation, data collection, hypothesis testing and conclusion [12].

The data obtained in this study are from [13] The average value of the final test for the experimental class was 62.94 in the critical category, while the control class was 56.84 in the less critical category. This increase in average value indicated that the application of the guided inquiry learning model had an effect on critical

thinking skills. The research results are in line with research conducted by [14] which shows that the guided inquiry learning model for high school students influences the development of critical thinking skill in Physics [14]. The model of learning used in the experimental class is the guided inquiry. This guided research model involves self-inquiry from experimentation, observation, and discussion, so suitable for application in the learning process. Guided inquiry model allows students to think independently to solve problems, thereby enabling them to develop their critical thinking skills [15].

The successful implementation of this model of guided inquiry is inseparable from the constraints encountered when conducting research. These obstacles include, first, the arrangement of the laboratory space, which is rarely used so that the day before the research, the researcher has to check the equipment in the class, such as tables, chairs, markers, and erasers. Second, more time is needed because some students arrive late to the laboratory. Learning objectives can be optimally achieved if all the existing factors in this learning can be managed and appropriately prepared. The obstacles above can be overcome so that researchers can complete this research.

IV. CONCLUSION

Based on data analysis, researchers can conclude that critical thinking skill of students in static and dynamic fluid Physics learning using guided inquiry models show a significant increase. This research is expected to be a guide for teachers to use the guided inquiry model in learning activities so that students' critical thinking skills can be increased. This research is expected to be a guideline for future research.

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