

THE IMPLEMENTATION OF INQUIRY LEARNING MODEL TO IMPROVE CRITICAL THINKING SKILLS OF 4TH SURABAYA SENIOR HIGH SCHOOL'S STUDENTS IN PHYSICS MATERIAL STATIC FLUID

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Abstract

This research aims to determine the improvement of students' critical thinking skills towards the implementation of physics learning with inquiry models in fluid physics material. This type of research is descriptive-quantitative with pre-experimental design and one group pre-test post-test design. The subjects of this study were students of class XI in academic year 2019/2020 at SMAN 4 Surabaya. The instruments which has been used to collect data were essays test, observation, and questionnaire. Based on the data analysis, the results of improvement students' critical thinking skills increased significantly and consistently with more than 50% of the students in all three classes in *n-gain* high category. The implementation of inquiry learning in all three classes obtained a very good grade in average mode and students' responses to the learning model are in good category in all three classes. This is prove that the inquiry model is very effective to be used to improve students' critical thinking skills on static fluid physics material.

Keywords: Inquiry Learning Models and Critical Thinking Skills

Abstrak

Penelitian ini bertujuan untuk mengetahui peningkatan keterampilan berpikir kritis peserta didik terhadap penerapan pembelajaran fisika dengan model *inquiry* pada materi fisika fluida. Jenis penelitian yang digunakan deskriptif-kuantitatif dengan *pre-experimental design* dan desain penelitian *one group pre-test post-test design*. Subjek penelitian ini adalah peserta didik kelas XI semester ganjil tahun pelajaran 2019/2020 SMAN 4 Surabaya. Instrumen penelitian yang digunakan soal test essay, lembar keterlaksanaan dan angket respon. Berdasarkan analisis data diperoleh hasil peningkatan keterampilan berpikir kritis peseta didik meningkat signifikan dan konsisten dengan lebih dari 50% peserta didik pada ketiga kelas berada pada kategori *n-gain* tinggi. Keterlaksanaan pembelajaran pada ketiga kelas berada pada kategori sangat baik dan respon peserta didik pada model pembeajaran yang digunakan terdapat pada kategori baik pada ketiga kelas. Hal ini menunjukkan bahwa model *inquiry* sangat efektif digunakan untuk meningkatkan keterampilan berpikir kritis peserta didik pada materi fisika fluida statis..

Kata Kunci: Model Pembelajaran *Inquiry* dan Keterampilan Berpikir Kritis

PENDAHULUAN

The education system in Indonesia has been implemented the 2013 curriculum for almost seven years. This curriculum become a reference for the process and results of an education system. The curriculum serves as a media tool to achieve a goals and also as a reference in carrying out learning for all levels of education (Arifin, 2011). This 2013s curriculum are expected to make productive, creative, innovative and affective human resources, through the strengthening of attitudes, knowledge and skills competencies (Retnawati, 2016). One of the high-level thinking skills that must be possessed

by students is the ability to think critically with various approaches based on learning methods. Therefore, students are expected to be able to master the ability to think critically to help themselves in the learning process, especially in the academic field. One of the subjects that is considered difficult to develop critical thinking skills is the science group material.

Physics is the part of science that requires an understanding of concepts and higher-order thinking abilities (Depdiknas, 2002). Many things that cause understanding of the concept of physics is still

lacking, namely one of them teaching that still uses conventional methods (Gok & Silay, 2008) and not contextual (Wahyudi, 2006). This is proven by the results of the PISA assessment in the field of Natural Sciences in 2015 which states that Indonesia is low on the academic level and Got of concepts in the scientific competence of its students, with a score of 403 Points. In addition, according to the results of the pre-research which conducted by researchers and located at SMA Negeri 4 Surabaya on October 7, 2019, the percentage of total critical thinking skills possessed by students is 31.63%, so it can be said that students' critical thinking skills are still low . Beside, knew that as much as 67.74% of students had difficulty in studying static fluid material due to the lack of learning models that were able to overcome static fluid material. As many as 40.86% of students said that teaching materials that were lacking facilitated students, causing their ability to think critically very low. So learning process is needed that is not only centered on the teacher, but active students are able to find physics concepts that can improve critical thinking skills. One alternative learning model solution offered in this study is an inquirybased learning model where the learning is based on discovery. Learning with the inquiry model puts students into dominant learning while the teacher is only a facilitator to provide instructions through questions that lead students to get solutions to the problems encountered and find concepts that they will learn independently. For critical thinking individuals that used include elementary clarification (providing simple explanations), the basis for the decision (determining the basis for decision making), inference (drawing conclusions), advances clarification (providing further explanation) and supposition and integration (estimating and combining) (Ennis, 2011). Based on the above overview, the research title research was compiled "Application of Inquiry Learning Model for Improving Students' Critical Thinking Skills at SMAN 4 Surabaya on Static Fluid Physics Materials" .

METHOD

This type of research is a pre-experimental design using descriptive-quantitative analysis replication with one group pretest-posttest design using one experimental class and two replication classes. Provision of pre-test questions (O1) for the first time to students before given treatment to see the initial abilities of students. Then students are

given treatment (X) which is the application of inquiry learning model on the subject of static fluid. Then, after learning activities students are given a post-test (O2) to find out the influence arising from the application of inquiry learning model.

The sample selection uses purposive sampling, the consideration of researchers to determine the efficiency of critical thinking skills with inquiry learning models on static fluid material and based on the characteristics of academic abilities possessed by students. The research subjects used three classes which is XI MIPA 1, XI MIPA 2 and XI MIPA 3. Each class have 35 students of SMAN 4 Surabaya The following is the research design table that has been used in this research..

Table 1. Research Design

Class	Class Category	Pre-test	Treatment	Post-test
XI-IPA 3	Experiment	O ₁	X	O ₂
XI-IPA 1	Replication 1	O ₁	X	O ₂
XI-IPA 2	Replication 2	O ₁	X	O ₂

Data collection was used by three types of instruments, which were critical thinking skills test questions, observation sheets for the implementation of inquiry learning, and students' questionnaire responses. Test questions contain items with critical thinking indicators according to Ennis (2011) which aims to measure students' critical thinking skills on static fluid material both before (pre-test) and after the application of inquiry learning (posttest). Data analysis of the results of the pre-test and post-test was used to find out the improvement in students' critical thinking skills using the n-gain and t-test paired with the pre-test that is normality test and homogeneity test (Sugiyono, 2015). Observation sheet implementation to find out whether the learning is done well or not analyzed by observation assessment criteria (Ridwan, 2012). Response questionnaires to determine students' responses to inquiry learning models were analyzed using a Likert scale (Ridwan, 2012).

RESULTS AND DISCUSSION

1. The results of Students' Critical Thinking Skills

The results of students' critical thinking skills on fluid material were measured by essay test questions with 6 questions with critical thinking indicators. The following table compares the average scores of pre-test and post-test in the three replication classes

Table 2. Comparison of the average value of pre-test and post-test of students in all three classes

Poin	XI MIPA 3	XI MIPA 2	XI MIPA 1
Pre-test	39,0	20,0	25,6
Post-test	84,5	82,4	80,6
N-gain	0,75	0,78	0,74
Category	High	High	High

From this table there is a significant difference between pre-test and post-test scores and is in the high n-gain category which indicates an increase in students' critical thinking skills. To further analyze the researchers also conducted a paired t-test to find out the difference between the pre-test and post-test scores that indicate an improvement in critical thinking skills. But before that the normality test and homogeneity and n-gain normality tests were performed. The normality test results table is shown in table 3.

Table 3. Recapitulation of Normality Test Results

Class	X ² table	X ² count		Keterangan
		Pre-test	Post-test	
XI MIPA 3		8,84	8,17	Normal Distributed
XI MIPA 2	11,07	9,47	2,96	Normal Distributed
XI MIPA 1		10,61	4,97	Normal Distributed

From Table 3 it can be seen that the results of the pre-test and post-test normality test values of X² count < X² table with a significance level of 0.05 so that it can be concluded that the sample population used is normally distributed. Then homogeneity tests were performed on all three classes to determine whether the sample used was homogeneous. The following table shows the results of homogeneity tests of the three classes shown in Table 4, where H₀ is a homogeneous sample and H₁ is a heterogeneous sample with a significance level of 0.05.

From the table below shows that the calculated X² < X² table then H₀ is accepted then a conclusion can be drawn on the three classes that are the subjects used in homogeneous research. So then a paired t-test is performed, to find out how the difference in students' critical thinking skills increases before and after the learning model is applied using the inquiry model.

Table 4. The results of Homogenitas test

Class	X ² table	X ² count		Information
		Pre-test	Post-test	
XI MIPA 3				
XI MIPA 2	11,07	1,40	4,74	Homogen
XI MIPA 1				

A paired t-test is performed, to find out how the difference in students' critical thinking skills increases before and after the learning model is applied using the inquiry model. T-Test results are in table 5

Table 5. The results of Uji-T berpasangan

Class	t table	t cpunt	Hypothesis
XI MIPA 3		28,49	
XI MIPA 2	2,03	41,01	H ₀ denied H ₁ accepted
XI MIPA 1		30,15	

Table 5 found tcount ≥ ttable obtained by the three classes using a significance level of 0.05. So it can be interpreted that H₀ is rejected and H₁ is accepted, which shows that there is a difference between the pre-test and post-test scores which indicate the posttest value is greater than the pre-test value. So it can be said that the application of learning with the inquiry model can improve students' critical thinking skills on static fluid physics material. Then the ngain normality test is performed to analyze the magnitude of the increase in students' critical thinking skills. The n-gain results can be seen in table 6.

Table 6. Recapitulation of N-gain

Class	Category	Amount of Students	N-gain score	Persentase
XI MIPA 3	Rendah	0	-	-
	Sedang	11	0,63	30,55%
	Tinggi	25	0,79	69,44%
XI MIPA 2	Rendah	0	-	-
	Tinggi	31	0,79	88,57%
XI MIPA 1	Rendah	0	-	-
	Tinggi	23	0,80	65,71%

From the table above it can be seen that almost 50% of students in each class are in the high category in increasing critical thinking skills so that it can be said that the application of inquiry inquiry models is efficient in improving critical thinking skills. This is relevant to the research conducted by Nur Baity

(2018) and Rani Triwinda (2018) who say that students' critical thinking skills have significantly improved after being given inquiry inquiry models. The difference in n-gain found in the three classes can occur because the level of cognitive ability of each individual is different, even though the material is organized with the same teacher and learning hours, but the learning outcomes of each student are different (Arrends, 2012). In addition, it is also caused by each individual having different perception of observations or information absorption (Prahastara, 2014) and also the effectiveness of learning is strongly influenced by several factors, one of them is conditional and students' readiness for learning (Djamarah, 2002).

2. The results of Learning Observations

Observations carried out to record the activities of students during the learning process. This observation is to find out how learning has been done well or not. Observations carried out by the two observers, namely the physics teacher at SMAN 4 Surabaya and one of the physics students at Surabaya State University. From the table it can be seen that overall learning takes place very well in all aspects of learning activities, namely at the opening, each phase in the core activities, and closing. The average results of learning management can be seen in table 7.

Tabel 7. Recapitulation od Learning Observations

No	Aspect	Class		
		XI MIPA 3	XI MIPA 1	XI MIPA 2
1	Opening	3,67	3,67	3,67
2	Syntax Fase 1	3,75	3,75	3,63
3	Syntax Fase 2	3,50	3,33	3,33
4	Syntax Fase 3	3,67	3,67	3,67
5	Syntax Fase 4	3,83	3,67	3,67
6	Syntax Fase 5	3,83	3,67	3,50
7	Syntax Fase 6	3,83	4,00	3,83
8	Closing	3,83	3,67	3,33
Category		Very Good	Very Good	Very Good
Persentase		93,50 %	91,75 %	89,50 %

The highest score in all three classes is in phase 6 which is where students are asked to communicate the results that cause the classroom atmosphere to be more alive when compared with the other phases. The lowest score is found in phase 2, namely giving problems where students are asked to discuss so that

the class is less conducive. But it can be seen from the three classes in the excellent category, it can be said that the inquiry learning model is efficiently applied to all three classes

3. The results of Students' Questionnaires

The response of students is done to determine the response by using a questionnaire given to students, aims to determine the response of students to learning using the inquiry model. The student response questionnaire sheet that was applied in this study consisted of 20 statements that would be assessed by each student in all three classes. The statement contains about the learning process that will be experienced by students, and students can answer with "Strongly Agree", "Agree", "Disagree", "Very Disagree". The results of recapitulation of students' questionnaire responses can be seen in table 8

Table 8. Recapitulations of Students' Questionnaire

Class	Students' Response (%)	Category
XI MIPA 3	82	Very good
XI MIPA 2	74	Good
XI MIPA 1	78	Good

The results of the responses of these students show that learning by applying the inquiry model is effective if used in physics learning. This study is consistent with research conducted by Jazilatul (2017) which also considers students' responses to inquiry learning models to improve critical thinking skills and obtain an average percentage of 79% in the good category.

CONCLUSION

Based on the research that has been done, it can be concluded that the inquiry learning model is effectively used to improve students' critical thinking skills, especially in static fluid physics material. This can be seen from more than 50% of students in all three classes experiencing an increase in n-gain in the High category, which proves that there is a significant increase in critical thinking skills in all three classes and is consistent. In addition, observations of the implementation of learning in the three classes are also in the excellent category, which shows that the inquiry learning model has been implemented well. The results of students' responses in all three classes are also in the average of good categories which indicate that

students are enthusiastic about the inquiry learning model applied by researchers.

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