

Research Paper

The Effect of Physics Learning Based on Case Method on Skills in Inferences Problems Temperature and Health

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Abstract: The case method is a way of presenting subject matter using a case study flow. This study aims to examine the effect of case method-based physics learning on skills in inferential heat and temperature problems in high school. The type of research used is an experimental design with cluster random sampling data collection method. The data analysis technique used is comparative statistical analysis with the normal distribution test, homogeneity test, One-Way Anova test, and independent sample t-test. The results showed that the average value of inference indicators in critical thinking skills differed significantly between the control and experimental classes. The control class got an average of 3.24 while the experimental class got 4.62. Conclusion: physics learning based on the case method affects skills in inferential heat and temperature problems in high school.

Keywords: Case Method; Inferential; Temperature and Heat

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INTRODUCTION

Physics is part of science (IPA) which studies both micro and macro natural phenomena and their interactions, and studies the relationships between these symptoms which are presented in the form of concepts, theories, and laws (Supardi et al, 2015). So that learning physics should not ignore the nature of physics as a science, the nature in question is physics as a process and physics as a product (Sutarto and Indrawati, 2013). A similar opinion was expressed by Wartono (2003) who explained that physics is a science that studies natural phenomena in terms of matter and energy. Physics is a body of knowledge that describes the collective endeavors, findings, insights and wisdom of mankind. Meanwhile, according to Mundilarto (2010) argued that physics as a basic science has characteristics that include scientific structures consisting of facts, concepts, principles, laws, postulates, and scientific theories and methodologies. Physics is a science that is formed through standard procedures or commonly referred to as the scientific method.

According to Law. 2003 concerning the National Education System, learning is a process of interaction between students and educators and learning resources in a learning environment. According to its essence, physics has three main aspects, namely affective, process, and knowledge aspects. So that learning physics should be carried out by considering these three aspects. The physics subject in high school aims to enable students to master physics concepts and their interrelationships and to be able to use scientific methods based on a scientific attitude to solve the problems they face so that they are more

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aware of the majesty of God Almighty (Mundilarto, 2010). Still according to Mundilarto (2010), learning physics is not designed to give birth to physicists or scientists, but is designed to help students recognize the importance of thinking critically about new things they encounter based on knowledge that is believed to be true. Physics learning helps students to develop themselves into individuals who have a scientific attitude, are able to process phenomena and the knowledge gained and are able to understand how the phenomena around them work.

The case method is a way of presenting subject matter using a case study flow. The case method indicators are first, emphasizing certain cases; second, to intensively discuss the case; third, emphasis on cases in detail or in detail (Mayer, 2020). Based on this description, it can be interpreted that the case method is a teacher learning method that emphasizes a particular case which is discussed intensively in the full-time sense. Likewise, in studying it also in depth and detail. Thus, certain material or subject matter will be discussed in full which includes the nature/understanding (epistemology), how the process occurs (ontologies), and examples and benefits of these concepts in human life (axiology). Based on the description above, it is clear that the characteristics of physics are inseparable from the characteristics of science in general. The characteristics of science itself are problem-based investigations to understand a natural phenomenon so that a new law, theory, concept or problem is obtained for further research.

METHOD

The type of research used is an experimental design with data collection methods using cluster random sampling. Determination of respondents was carried out by homogeneity test with the population used were students of class XI IPA SMAN 2 Jember with 2 classes taken as samples, namely the control class and the experimental class. The research data is in the form of qualitative and quantitative data obtained from evaluating the results of case solving and discussion activities. The data analysis used in this study was a statistical comparison test with the One-Way Anova test, followed by an independent sample t-test.

The subjects of this study were class XI students who would conduct research in November 2022. The variables in this study consisted of control, independent and dependent variables. The control variable in this study is in the form of test questions, the independent variable is a case-oriented method, the dependent variable is the skills of high school students in solving problems.

RESULT AND DISCUSSION

Result

We present research data in the form of graphs and data analysis tables as follows

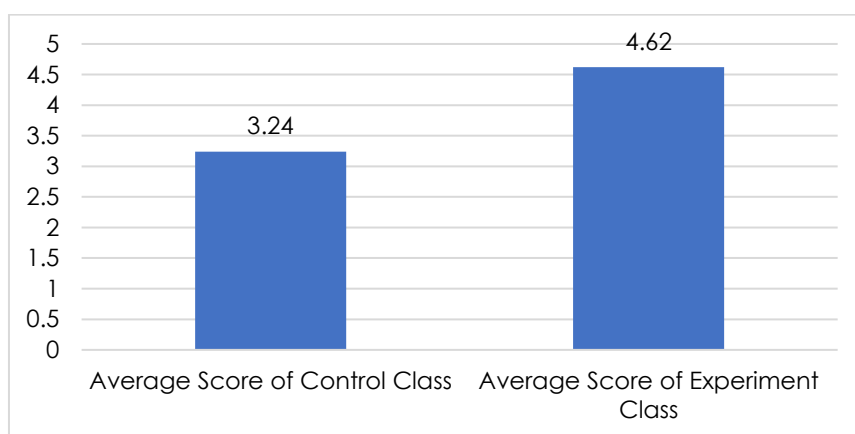


Figure 1. Mean Score of Thinking Skills in Inferential Control and Experiments

Based on the graph above, the inference indicator obtained an average value of 3.24 for the control class with a standard deviation value of 1.71 while the experimental class average value of 4.62 with a standard deviation value of 2.52.

Table 1. Results of Analysis of Control Group Normal Distribution Test (One-Sample Kolmogorov-Smirnov Test)

N	34
Test Statistic	.265
Asymp. Sig. (2-tailed)	.010 ^c

Based on the normal distribution test in table 4.1 it is known that the significance value of Asymp.Sig(2-tailed) is 0.010 greater than 0.05. So according to the basis for decision making in the Kolmogorov-Smirnov normality test above, it can be concluded that the data is normally distributed.

Table 2. Results of Analysis of Experience Group Normal Distribution Test

N	34
Test Statistic	.179
Asymp. Sig. (2-tailed)	.017

Based on the normal distribution test in table 4.2 it is known that the significance value of Asymp.Sig(2-tailed) is 0.017 greater than 0.05. So according to the basis for decision making in the Kolmogorov-Smirnov normality test above, it can be concluded that the data is normally distributed.

Table 3. T-Test Analysis Results (Independent Samples Test)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Inferensi	Equal variances assumed	5.764	.076	-2.646	66	.001	-1.382	.522	-2.425	-.339
	Equal variances not assumed			-2.646	57.974	.001	-1.382	.522	-2.428	-.337

Based on the output above, it is known that the value of Sig. Levene's Test for Equality of Variances is $0.076 > 0.05$, it means that the variance of the data between the control group (non-case method) and the experimental group (case method) is homogeneous or the same. So that the interpretation of the Independent Samples Test output table above is guided by the values contained in the "Equal Variances Assumed" table.

Based on the output table "Independent Samples Test" in the "Equal variances assumed" section, it is known that the value of Sig. (2-tailed) of $0.001 < 0.05$, then as a basis for decision making in the independent samples t test it can be concluded that H_0 is rejected and H_a is accepted. Thus, it can be concluded that there is a significant difference between the average critical thinking skills of students in the inference indicator in the control group (non-case method) and the experimental group (case method).

Table 4. Results of One-Way ANOVA Analysis of the Control Group (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15.715	8	1.964	.611	.000
Within Groups	80.403	25	3.216		
Total	96.118	33			

Based on the ANOVA table, the Sig. (0.000) $< (0.05)$ then H_0 is rejected, so the indicator of critical thinking skills in inferential in the control group has an average test score that is significantly different.

Table 5. Results of One-Way ANOVA Analysis of the Experience Group (ANOVA)

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	27.406	6	4.568	.675	.001
Within Groups	182.623	27	6.764		
Total	210.029	33			

Based on the ANOVA table, the Sig. (0.001) < (0.05) then H_0 is rejected, so the indicator of critical thinking skills in inferential in the control group has an average test score that is significantly different.

Discussions

The process of learning physics in class, especially in class XI, is one of the processes of interaction between students and educators and learning resources in a learning environment. Learning is assistance provided by educators so that the process of acquiring knowledge and knowledge, mastering skills and character, as well as forming attitudes and beliefs of students can occur. In other words, the learning that has been implemented is one of the processes to help students learn well. In the case method-based physics learning process, for example, the development of an atmosphere of equality through transparent, tolerant and non-arrogant dialogic communication is manifested in learning activities. An atmosphere that provides broad opportunities for each student to dialogue and question various matters relating to self-development and their potential. This is very important because educators are leaders who must accommodate various questions and needs of students in a transparent, tolerant and not arrogant manner, by opening up the widest possible opportunities for dialogue with students.

Whereas in the t-test the inference indicator can be explained that the data between the two groups are equally homogeneous and have significant differences so that case method-based physics learning has an effect on improving critical thinking skills on the inference indicator. Inference is an indicator that must be mastered by students. With the inferential indicators measured by the book, Isa sees the extent to which students or respondents who carry out case method-based physics learning can conclude the results of their case studies correctly and coherently. So far, students tend to only answer questions by being asked and answered, besides that students often do not answer systematically. Physics learning based on the case method or case study is used to see how far students are able to understand a given context of material. By using the case method, students are more emphasized on understanding symbols and units, being able to determine the formula specified in a case study, being able to perform calculations, and students are even able to conclude from everything that has been studied in a case study.

Some of the results of previous studies have found that Islamic elementary schools are able to foster various forms of critical thinking skills for their students through multi-method learning and varied classroom management (Prastowo, et.al., 2018). This proves that case method-based physics learning conducted at SMAN 2 Jember is very suitable to be applied in class because through case method-based physics learning students are more active and students' understanding skills improve. The results of Roza, et.al., 2022's research also show that the project-based learning model in service marketing courses using the case method can improve students' ability to think critically. This can be seen from the skills of critical thinking in analyzing cases, namely analysis on the facts of service marketing. This means that learning physics using the case method is very supportive in the learning process in high school.

Windarti, et.al., 2013 the results of his research showed that student activity was in accordance with the stages of guided discovery, good student responses, showed an increase in learning outcomes and critical thinking skills as well as guided discovery learning, the subject matter of the human role in effective environmental management to train students' critical thinking skills Junior High School. The results of this study are related to the context taken in the research using the case method where the context of the case study is taken from the problems that exist in the surrounding environment. The case method research that has been carried out is the case study topic given by students in the form of problems from the surrounding environment, oneself, and everyday life phenomena. The problem raised on the topic of the surrounding environment is that students measure the temperature of food in closed and open spaces for 3 consecutive days. Problems with students themselves analyzing and observing temperature changes in their friends' bodies at certain times. And the problem of the phenomenon of events in students' lives observing the process of loose heat and absorption of Moringa in a liquid.

Inferential skills are not often measured in the physics learning process. Inferential indicators put more pressure on students to conclude from what has been analyzed, understood, and explained. It tends that students know more only in the aspect of understanding and explaining, besides that the inferential is still not. In physics learning based on this case method students have been given a case study and then students are required to conclude from data or a problem. Between the control class that was not treated and the experimental class that was treated using the case method, there was an impact on learning, especially on its inference skills. Students who were given the case method method had a superior mean score than those who were not given the treatment. This proves that learning using the case method-based

method must be implemented in learning so that students' knowledge increases, especially in learning physics in the context of temperature and heat material.

CONCLUSION

The average critical thinking skills in the experimental class inference indicator is higher than the control class average. The average of explaining indicators and inference in the experimental class is 4.62 while that of the control class is 3.24. Thus, physics learning based on the case method affects students' critical thinking skills in inferential problems of temperature and heat.

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