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The Effect of Using Context-Based Physics Learning Videos on Critical Thinking Skills of XI Grade High School Students

Rezza Septia Sari* and Desnita
Physics Education, Faculty of Mathematics and Natural Sciences
Universitas Negeri Padang, Padang, Indonesia
*rezzaseptiasari2709@gmail.com

Abstract

Education in the 21st century demands the readiness of students to face the ever-evolving era. This study aims to determine the effect of using context-based physics learning videos on the critical thinking skills of class XI students at SMA N 1, Suliki District. Students' critical thinking skills at SMA N 1 Suliki District are still low because the use of instructional media has not honed students' critical thinking skills. One solution to this is through the use of context-based physics learning videos. This type of research is quasi-experimental. Posttest-Only Control Design research design. The population in this study were all students from class XI SMA N 1 Suliki District for the 2021/2022 academic year. The process of taking samples is carried out through a purposive sampling technique, namely choosing two classes with the same average. The data collected is from students' critical thinking skills, including "interpretation, analysis, evaluation, and inference". The data was obtained using a written test instrument in the form of essay questions with as many as 8 items. The data analysis technique used in the hypothesis test is the t test. Based on the results of data analysis, it was found that the average ability of students' critical thinking for the experimental class was higher than the control class. The results of the t hypothesis test obtained a calculated value with a magnitude of 2.729 and a critical value for the significance level at $\alpha = 0.05$, and 67 degrees of freedom obtained a value of 2.293. Because the calculated value is greater than the critical value, the hypothesis is accepted at a significant level of 0.05. Based on the results obtained, it can be concluded that using context-based physics teaching videos has an effect on the critical thinking skills of class XI students at SMA N 1 Suliki District.

Keywords: Critical Thinking; Context-Based Physics Learning Videos; Problem-Based Learning Models

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INTRODUCTION

A balance of science and technology has defined the development of the world in the 21st century. The 21st century necessitates that human resources (HR) be able to acclimate to and utilize increasingly sophisticated technology. Rapid advancements in science and

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technology have altered humans' work, socialization, recreation, and learning processes. In every aspect of existence, science and technology are utilized. One of them is related to education (Dewantara et al., 2021; Hartini et al., 2017; Lestari, 2018)**.**

The 2013 curriculum aims to ensure that the education system not only meets objectives for increasing student knowledge but also focuses on a variety of essential skills. Consequently, the 2013 curriculum shifts from a teacher-centered learning pattern to a student-centered learning process, from a passive learning pattern to an active learning process in searching, and from a passive learning pattern to a critical learning process (Sulardi et al., 2015). In the learning process, the role of teachers is to act as facilitators, provide direction, and guide students so that they can think critically (Antoni et al., 2021; Dole et al., 2016; Sharoff, 2019). Therefore, the 2013 curriculum stipulates that students must possess 4C skills, including the ability to think critically.

Critical thinking is the ability to analyze and evaluate information obtained from observation, experience, reasoning, or communication to determine whether the information is reliable, thereby enabling a reasonable and correct conclusion. One of the higher-level cognitive skills is critical thinking. A person who thinks critically possesses the following characteristics: (1) the ability to think rationally; (2) the ability to make an appropriate decision; (3) the ability to conduct an analysis and organize and extract information that refers to existing facts; and (4) the ability to draw correct conclusions and make logical arguments (Sulistiani & Masrukan, 2016). The indicators of critical thinking are "interpretation, analysis, evaluation, inference, explanation, and self-regulation." If they have mastered these indicators, it can be said that students think critically. According to Facione, however, students already possess critical thinking skills if they have accomplished four of these indicators, namely "interpretation, analysis, evaluation, and inference," because strong critical thinkers only possess explanation and self-regulation indicators.

In critical thinking, students can obtain support for their opinions through the availability of evidence regarding the discussed issues and the provision of methods that can instill confidence that their opinion is correct. This ability to think critically can improve the outcomes of thinking using systematic methods to think and formulate the outcomes of intellectual thought on given ideas. Thinking critically can aid students in their analysis, enhancing their ability to analyze the information they receive. Students who think critically will find it simpler to move from the analysis phase to the solution-proposal phase (Hartini et al., 2020; Hasanah et al., 2019; Yani et al., 2021).

Possessing the ability to think critically can provide several benefits, such as making it easier to solve problems or find the best solution, knowing one's capabilities by recognizing what is unknown, and communicating more effectively by expressing thought systematically and systematically informative manner. Students are expected to develop adequate critical thinking skills, particularly in physics. The proliferation of research on critical thinking demonstrates its importance.

Based on the results of interviews conducted at SMA N-1 Suliki District using an interview document, the teacher concluded that the student's capacity to think critically remained lacking. The teacher provides an explanation in which, during the learning process, the teacher explains the teaching material and then asks questions that lead to the analysis of the material; however, most students cannot provide more detailed and accurate answers based on the material or concepts taught. During group discussions, a subset of students still searches the internet for answers to their peers' questions. Still, these students are unable to distinguish between correct and incorrect answers.

The low critical thinking ability of students at the school can also be proven through the results of the analysis of indicators of the ability to think critically based on the results of the midterm exam for class XI, semester II, of the 2021/2022 school year. Analysis of indicators of students' ability to think critically is achieved from the results of student answers to the midterm exam through 5 questions. The results of the student answer sheet for each question were analyzed for each indicator of critical thinking ability, namely "interpretation, analysis, evaluation, and inference". The analysis results for each indicator of critical thinking ability were summed up, then averaged for each indicator so that the percentage of each indicator of the ability to think critically was obtained. The percentage of indicators of the ability to think critically of students obtained is for interpretation indicators with a large 59.26% in a low category, analysis indicators with a large 53.93% in a low category, evaluation indicators with a large 50.75% in a low category, and inference indicators with a large 8.84% in a very low category. While the average for all indicators of students' critical thinking skills is 43.19% in the low category. Based on the percentage category for the ability to think critically, it shows that the ability to think critically of students is still low.

The lack of learning media that allows for developing students' critical thinking skills during the learning process is responsible for their limited critical thinking ability. According to the results of school-based interviews, the teacher also indicated that, during the learning process, she only employs learning media that explicitly demonstrate real tools or simple tools related to the subject matter. Real or simple tools, such as those found in students' daily activities, are utilized. The lack of variety and interactivity in the teacher's learning media means that when the learning process occurs, there are still many obstacles, including groups of students who are less engaged in the learning process. The inability of the learning media employed by the teacher to hone students' critical thinking skills will result in a lack of such skills among students.

Based on the questionnaire distributed to students at SMA N 1 Suliki District, the current condition of the classroom learning process for one of the topics in the physics learning material, namely sound and light waves contained in basic competences 3.10, has been determined. Teachers use textbooks as a source of student learning in the learning process. Then, for commonly used instructional materials, namely student worksheets. This worksheet is only utilized in laboratory experiments. Teachers only use basic tools such as telephone cans as learning media for sound and light wave material. This material utilizes the problem-based learning model during the learning process.

Sound waves and light waves are observable in everyday life because numerous events and phenomena are associated. The learning process at the research school on sound and light waves has not trained students in critical thinking. According to Pangestu et al., (2019), the sound and light wave material incorporates difficult-to-explain physics material, such as a demonstration of how sound waves propagate from one location to another. The material of sound waves and light is always available in ordinary life; however, explaining the concepts of sound waves during the learning process is extremely challenging. Due to the difficulty of conveying these concepts, a learning tool is required. Consequently, the research to be conducted employs sound and light wave content in the use of physics learning videos with a context-based capacity for critical thinking from students.

Teachers do not use innovative props and media to better students' critical thinking skills when delivering learning materials, contributing to students' low critical thinking ability (Fatahullah, 2016). This leads to consequences where students will be less active in the learning process, and learning is not effective. Another cause is that the teacher has not given questions that demand students think critically, as the questions given by the teacher are mostly at the "C2 (understanding) and C3 (applying) cognitive levels. However, for questions that support critical thinking skills at cognitive levels C4 (analyze), C5 (evaluate), and C6 (create), only a few questions are given, and even then, they are rarely given ". In the physics learning process, the teacher should consider the media and learning models that are effective and efficient, as well as the questions given in the learning process that increase the ability to think critically.

In order to solve the described issues and to make the learning process more effective and engaging, instruments that facilitate the delivery of information are required. Utilized instruments integrate physics-related facts and concepts into everyday life. Media for learning can aid students' capacity for critical thought. Learning media are all things used to act as intermediaries or bridges between those conveying information, such as the teacher, and those receiving information, such as students, to motivate students to participate in the learning process as a whole derive meaning from it (Hasan, 2021; Zainuddin et al., 2019). If they are designed as efficiently and effectively as feasible, learning media will help students in assimilating and comprehending learning material. The use of learning media such as audio-visual media is highly effective in enhancing students' critical thinking ability during the learning process (Muhibbin et al., 2021; Sarwinda et al., 2020). This medium is an instructional video.

Using videos in the learning process will help teachers communicate actual classroom problems while the learning process is in progress. Using contextually-based learning videos can also make it simpler for teachers to relate classroom material to students' real-world experiences or to natural phenomena encountered in everyday life (Hamida, 2020). Videos can be used to demonstrate difficult and abstract physics concepts in the classroom or as independent learning material for students at school and home (Hafizah, 2020; Yip et al., 2019).

Videos can be replayed if students require further explanation, they may help develop students' views and opinions, and they can increase students' interest and motivation to learn during the physics learning process. However, the benefits of using learning videos are as follows: (1) Videos can supplement the fundamental experiences of the learner when the student is reading, participating in discussions, conducting practices, etc. (2) Video can provide a precise overview of a process that can be viewed repeatedly. Videos can impart attitudes and other affective characteristics. (4) Videos may contain values that provoke thought and discussion among student groups. It may be utilized in large, small, diverse, and even individual groups (Hafizah, 2020).

Dr. Desnita's research team in physics has created a context-based learning video for 2020. Where instructional activities are conducted by investigating and analyzing the video's context (Desnita et al., 2020). The instructional material presented by the teacher to the students in the video employs a cooperative learning process. The video demonstrates the connection between learning content and context, or real life, in commonplace situations. This video can enhance interest and motivation for learning, allowing for more effective and efficient instruction. The validity of the instructional video has been evaluated to ensure that it is suitable for learning physics in eleventh grade. Consequently, this context-based physics education video will be utilized in this study.

Using context-based physics learning videos in the process of learning can make it simpler for teachers to deliver learning material and for students to comprehend learning, and students can relate learning material to real-world situations to create more meaningful learning. (Pratiwi et al., 2019). The video can help students overcome real-world obstacles and promote student-centered learning in and out of the classroom. In order to convey a clear message from abstract material, a learning video must relate the material to real-world or everyday situations.

This study used a context-based physics learning video and a problem-based learning model to facilitate the learning process. Students can investigate how to collect data to think critically, analytically, systematically, and logically through a problem-based learning model (Sanjaya, 2006). Problem-based learning will contribute to the development of higher-order or critical thinking in students. This learning model can improve students' ability to think critically and analytically and to solve real-world problems, thereby fostering a culture of thinking among students (Windari & Yanti, 2021).

Using context-based physics learning videos and problem-based learning models, students will be directed and guided to be more active in discovering physics concepts based on everyday phenomena. Students' capacity to think critically increases due to the use of the video and a problem-based learning model. According to the findings of research conducted by Hasanah et al. (2019), students' level of critical thinking ability is categorized as excellent. The problem-based learning model, which incorporates a video tracker, is suitable for implementation in order to enhance students' critical thinking skills. Subiki & Supriadi conducted research in 2021 which revealed that the problem-based learning type learning model accompanied by a video on a contextual basis had a significant effect on the rapid improvement of students' knowledge competence in the physics learning process of class ten at SMA Negeri Tamanan (Andriani et al., 2021).

Many studies have investigated using videos or other media to enhance critical thinking, but none have utilized context-based learning videos to assess students' critical thinking abilities. In fact, learning videos that employ a context-based approach are entertaining and can enhance the learning process by guiding students in analyzing various cases through the lens of the taught theory. In addition, students can make connections between the learning process and real-world situations. This study aims to determine whether the use of context-based physics learning videos affects the capacity of 11th-grade students to think critically about sound and light waves.

METHOD

The study conducted includes quasi-experimental research (quasi-experiment). Posttest-Only Control

Design is the research design used. The research design can be seen in Table 1.

Tabel 1 Posttest-only control research design

Group	Treatment	Posttest
Experiment	X	O_2
Control	-	O_4

Description:

O_2: The final test (Posttest) of the experimental group after taking the treatment.

O_4: The final test (Posttest) of the control group in which no treatment was taken.

X: The treatment proposed in the experimental group is through the use of context-based learning videos.

The research design explains that the experimental class uses context-based learning videos while the control class uses YouTube or non-contextual videos when conducting research. However, both subjects were taught using a problem-based learning model.

The population in the study were 11th-grade students of SMA N 1 Suliki District in the 2021/2022 school year. This study had 3 research variables, including the independent variable, namely the use of context-based learning videos. The context-based physics learning video that would be used includes basic competencies, learning indicators, learning objectives to be achieved and learning instructions. With these components, the learning process would be carried out in an organized and systematic manner. This video contained real learning materials in daily life that can help students to understand the learning delivered. This context-based video was interactive because there were several questions and cases that would be given to students so that the video can invite students to actively participate in learning. The dependent variable was the ability to think critically of students, and the moderator variable was the problem-based learning model.

This research was conducted in stages that included "the preparation stage, the implementation stage, and the completion stage." The research instrument was a written test consisting of eight essay questions that have been validated and evaluated to ensure that the instrument is a reliable measuring device. This study employed the "normality test, homogeneity test, and hypothesis testing" method of data analysis to determine the impact of context-based physics learning videos on the critical thinking skills of class 11 students studying sound and light waves. Treatment diagram for conducting research showed in Figure 1.

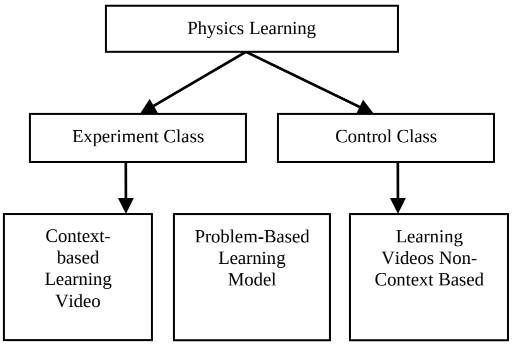

Figure 1 Treatment diagram for conducting research

RESULT AND DISCUSSION

Based on the research that was conducted, the results of research on the effect of using context-based physics learning videos on the ability to think critically of grade 11 students for sound and light waves were obtained. The first research result was the result of the ability to think critically demonstrated by students through answer sheets after a written test and the implementation of a final test in the form of essay questions at the end of the research activities in the class for the experiment and the class for the control. The results of the student's ability to think critically can be seen in Figure 2.

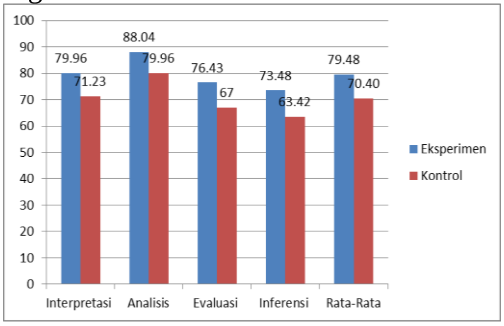

Figure 2 Results of students' critical thinking skills

Based on Figure 2, it can be seen that the ability to think critically of students who were observed on the indicators of "interpretation, analysis, evaluation, and inference". The first indicator of critical thinking ability was interpretation; on this indicator, the experimental class obtained a large 79.96% in the high category, and the control class obtained a large 71.23% in the moderate category. In the interpretation indicator, students were given demands to master the ability to understand the meaning of a problem or problem statement by writing down what is known and what is a question in the problem. The interpretation indicator of the ability to think critically from students in the class for experiments was included in the high category because students were dominant and could understand the problem statement well, and each student could write the question correctly. This is in accordance with the results of research conducted by Hasanah et al. (2019), who found that the level of ability to think critically among students for the interpretation indicator is good because, on average, students can provide an overview of the problem clearly and precisely and can also write what the question is clearly and precisely. The interpretation indicator of the ability to think critically from students in the control class was still in the moderate category because students only understood the meaning of the problem statement, but a group of students sometimes only wrote known by not writing what the question of the problem or vice versa, or by writing known and what was the question of the problem incorrectly. This is in accordance with the research conducted by Suriati et al., (2021), which provides an explanation where students fall into a fairly critical category or a moderate category because students only understand the meaning through writing an explanation of the problem towards the physics quantity variable for the problem obtained but can only write the known correctly while what is the question is not written.

The second indicator of the ability in critical thinking from students was analysed, on this indicator for the class for experiments obtained 88.04% in a very high category and the class for control with a large 79.96% in a high category. In the analysis indicator, students were given demands to identify the relationship between information and concepts by linking the relationships of concepts that would be used in solving problems, which enabled them to write the physics equations that would be used in solving problems. The indicator of analyzing the ability to think critically from students in the class for experiments was in the high category because many were able to find links to concepts that had links to be used in solving problems and knew the equations of physics that would be used. As given the explanation by Suriati et al. (2021), students whose analysis indicators are very critical when students understand the questions given can find the relationship between the concepts used by determining the formula used in solving the problem. The analysis indicators of the ability to think critically from students in the class for control fell into a moderate category because a group of students only understood how to solve the problem but could not find the relationship between the concepts and determine the physics equation that would be used in solving the problem. As explained by Suriati et al. (2021), students who have indicators of analyzing the ability to think critically in a moderate category are due to students who understanding how to solve problems and are systematic when working on problems but are mistaken when using formulas.

The evaluation was the third indicator of the capacity to use critical thinking; the experimental group scored 76.43% in the high category and the control group scored 67% in the moderate category. In the evaluative indicator, students were required to employ problem-solving strategies and execute the calculation procedure accurately. The criterion for evaluating the critical thinking ability of students in the class for experiments was placed in the high category because a significant number of students were able to use the correct strategy for solving problems with physics equations through the correct calculation process. According to Suriati et al. (2021), students whose evaluation indicators are in the high or critical range can solve problems systematically using the correct approach. The evaluation indicators of the students' critical thinking skills in the control class remained in the moderate category as a result of a group of students who had used the correct problem-solving strategy but were unable to solve the problem until the correct calculation process was applied or made a calculation error. In accordance with the explanation provided by Suriati et al. (2021), students whose evaluation indicators fall into the category of moderate or adequate are due to a group of students who used the correct method when solving problems but were not complex when completing the calculation process.

The final indicator of critical thinking ability is making inferences demonstrating critical thinking. On this indication, the experimental class earned a score of 73.48% in the high category, while the control class earned a score of 63.48 % in the medium group. In the inference indicator, students were required to be able to draw suitable inferences from a problem-specific inquiry. Many students have been able to conclude a question, placing the inference indicator of critical thinking skills for experimental students in the highest group. The inference indicator in the control class remained in the medium range since a subset of students could not conclude a question logically and suitably according to the context of the problem, and some students had provided the correct but insufficient conclusion. According to Kamalia & Wasis (2021), pupils can derive inferences from provided questions but are less capable of explaining the concepts that support these conclusions. The experimental class averaged 79.48% in the high category for the capacity to think critically, while the control class averaged 70.40% in the medium group. After incorporating context-based physics learning videos into the learning process, the average critical thinking capacity of students in the class for high-level experiments could be deemed critical. Due to the fact that students in the experimental class appeared to be engaged in the learning process when using the learning video medium, the average critical thinking ability of the class is included in the medium category, making students quite critical after applying learning videos from YouTube. This indicates that the average critical thinking skills of students in the experimental class were higher than that of students in the control class. For experiments with a big

79.48% in the high category and a large 70.40% in the moderate category, the class average of all indicators was determined based on the descriptions of each indicator.

After the data results are obtained. If students have the ability to think critically, then a prerequisite test has been carried out before testing the hypothesis, namely "normality test and homogeneity test". The results of the normality test carried out through the Liliefors test the results of the normality test in this study can be seen in Table 2.

Table 2 Normality test results

Class	N	A	L_O	L_t	Description
Experiment	35	0.05	0.146	0.150	Normal
Control	34		0.105	0.152	Normal

Based on the data in Table 2, it can be seen that Lo<Lt is at a real level of 0.05 for both sample classes. This shows that each sample class has a normal distribution.

After the data is found to have a normal distribution, proceed to the homogeneity test. The results of the homogeneity test in this study can be seen in Table 3.

Tabel 3 Results of homogeneity test

Class	N	$\overline{X}$	S	S^2	F_h	F_t	Description
Experiment	35	79,42	13,08	171,09	1,204	1,777	Homogenous
Control	34	70,40	14,35	205,92			

Based on the data in Table 3, it can be seen where Fh<Ft for the two sample classes. This shows where the sample class has a homogeneous variance.

The next stage, after the data has a normal distribution and a homogeneous variant, we can proceed to hypothesis testing. In this study used hypothesis testing via t test. The results of hypothesis testing in this study can be seen in Table 4.

Tabel 4 Hypothesis test results

Class	N	$\overline{X}$	S	S^2	t_h	t_t	Description
Experiment	35	79.42	1308	171.09	2.729	2.293	Have the same initial ability
Control	34	70.40	14.35	205.92			

Based on the data in Table 4, the results of the equality test of the two means of the final data show the price of t_{count} =2.729; however, for t_{tabel}=2.293, thus $t_h>t_t$, means the tcount price is in the Ho rejection area so that H1 is accepted at a real level of 0.05. Thus, it was clear that using a context-based physics learning video affected the student's ability to think critically in class XI at SMA N-1 Suliki District.

In the study, both sample classes participated in the learning process using the same learning model, but the videos used differed. The experimental class used a context-based physics learning video. Still, the control class used a physics learning video that was not context-based or a physics learning video that was searched on YouTube. The use of learning videos in learning activities has an effect where students will be more active in the learning process and provide stimulation for students' interest in learning to be more independent in the learning process. This is in accordance with the explanation given by Indayani et al. (2021), where learning media through videos can affect the ability to think critically because it can encourage to know more for students, make them more active, and motivate them to learn. Moreover, using context-based learning videos, the learning material is linked to real life and encourages for students to create a connection between knowledge and its application in everyday life. As explained by Yuberti et al. (2021), using learning videos on a contextual basis can train students to improve their ability to think critically, with each indicator increasing. Based on this opinion, it is consistent with the study's results, where the use of context-based learning videos influences students' ability to think critically. In the learning process, through the use of a problem-based learning model in both sample classes, students are given they can do problem-solving so that they can be active and train their ability to think critically in the learning process. According to Hasanah et al. (2019), from the research results, the application of the problem-based learning model accompanied by videos raised the level of students' critical thinking skills in the good category. Students who can solve a problem will be able to assist students to train their critical thinking skills.

CONCLUSION

Based on the results of research on the effect of physics learning videos with a context-based context on the ability to think critically class XI students for sound and light wave material, the results of research in the form of critical thinking skills of class XI high school students at SMA N 1 Suliki District refer to assessment indicators of the ability to think critically from students obtained for the average of all indicators in the class. This study concludes that employing physics learning videos with a context-based approach affects the critical thinking skills of class XI high school students at SMA N-1 Suliki District. Using context-based physics learning films in the classroom might enhance students' critical thinking abilities.

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