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Effectiveness of Using Learning Video Media in Improving Students' Critical Thinking Skills in Physics Learning

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Abstract

Critical thinking skills are an important aspect in learning Physics which often becomes a challenge for students. This research aims to evaluate the effectiveness of using learning videos as a tool in improving students' critical thinking skills in physics learning. This research used an experimental approach with a research sample of 50 physics education students who took the Basic Physics course at Kanjuruhan University Malang as an experimental class. The research design used was one group pre-test - post-test design. The research results show that learning videos make a positive contribution to improving critical thinking skills and student learning outcomes. The use of learning video media makes it easier for students to achieve learning goals, supports understanding of concepts, and increases students' interest and imagination. Apart from that, this research also reveals that video-based learning models, especially those that adopt the PBL (Problem-Based Learning) approach, are effective in developing students' critical thinking skills in physics. Critical thinking skills are an important element in solving physics problems in everyday life. This research concludes that learning videos are an effective tool for improving critical thinking skills in physics learning. The implication is that the use of learning videos can enrich students' conceptual understanding and problem solving abilities in physics subjects.

Keywords: *Learning videos, Critical Thinking Skills, Students, Physics learning.*

1. Introduction

The rise of global competition in the 21st century makes countries compete with each other more, which shows how important it is to improve the standard of human resources (Bastas & Altinay, 2019). This competitive time also makes it more important for people to have a deep understanding of science and technology so they can keep up with how things are changing quickly (Gao & Nakatomi, 2002). As a result, the education system needs to give students the information, attitudes, and skills that will give them power in the future and help them deal with the problems that come up because of how quickly things are changing (Amahmid et al., 2019). Besides that, students need to know how to use information, media, and technology well enough to become skilled people who can find information, use media, and use information and communication technology (ICT) (Mumtaz, 2000).

The 2013 curriculum changed the way we learn by expecting students to be more active, creative, and innovative. The goal is to give them the skills they need to deal with the difficulties of life by being able to think critically, logically, and creatively (Mihardi et al., 2013). This

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program also stresses that learning isn't just about getting ideas, theories, and facts right; it's also about using what you've learned in real life (Mulawarman, 2021). The growth of critical thinking skills is an important part of learning (Yeh, 2001).

Ennis (1985) says that the ability to think critically is one that is very important for learning. As Lai (2011) says, critical thinking is the process of weighing different arguments or ideas and then making choices that can help someone form views and act in the right way. One's success in many areas that require critical thinking skills is strongly linked to how well they can think critically (McPeck, 2016). It is also said by Brahler et al. (2002) that critical thinking skills are sometimes called higher order thinking skills.

Bailin et al. (1997) say that being able to find, analyze, and fix problems in creative ways is closely linked to being able to think critically. This helps people make the right choices and think about them. Improving students' ability to think critically is an important part of learning physics (Aji, et al., 2022). This is because learning critical thinking skills helps students think more deeply and broadly about different ways to solve Physics problems or problems that need creative approaches and analysis, based on their own knowledge and point of view (Wati & Halim, 2020).

Physics is a natural study that grows and changes over time. It starts with observations, then problem-solving, testing hypotheses, coming to conclusions, and finally developing theories and ideas (Sornette, 2006). The goal of physics education is to help students develop scientific ideas and attitudes while they learn about physics (Jimoyiannis & Komis, 2001). So, students aren't just expected to remember facts; they are also expected to be involved in the teaching and learning process at school by making their own sense of things (King, 1993).

Physics is still mostly taught in the old-fashioned way, though, without the help of technology or dynamic learning materials (Higgins et al., 2007). When you use learning media that isn't very interactive and relies on talking, it can be hard to understand what you're learning, especially when it comes to ideas that require math (Drigas & Kostas, 2014). It is possible for this problem to hurt students' ability to learn if it is not fixed.

One solution used to help students is to utilize learning media in the form of learning videos. Learning videos are visual recordings made with the aim of conveying learning material so that students can achieve learning goals (Puspitarini & Hanif, 2019). These learning videos rely on moving images, especially videos, which are recorded and played using technology. In its development, learning videos have become a product of technological advances that can be integrated into the learning process (Derry et al, 2010). The use of learning media, including videos, aims to ensure learning takes place effectively, creates active interaction in learning, and achieves learning goals better. Learning media is defined as tools or materials used to convey messages or learning content, stimulate students' thoughts, feelings, attention and abilities, and encourage the teaching and learning process (Greenhow & Robelia, 2009).

In this research, learning videos were designed using the PowerPoint application using screen recording techniques. This screen recording technique provides features that can be used for teaching, such as features for recording video, audio, writing, coloring, deleting, and others. So that all available features can be used for teaching purposes. Several reasons why PowerPoint media using the screen recording technique was chosen to overcome students' difficulties in solving complex physics calculation problems, including that the teaching will be more interesting so that it can foster student motivation, the learning material presented will be clearer so that it is easy for students to understand, the teaching methods will be varied. and

interactive, and students will be more active in learning activities. Therefore, this research aims to evaluate the effectiveness of using learning videos as a tool in improving students' critical thinking skills in the context of Physics learning. It is hoped that this research can help in solving problems for .

2. Literature Review

1. Critical Thinking Skills

According to Perfetti (1985), ability is the capacity, skill, and fortitude of an individual to work on themselves. In the meantime, research conducted by Dweck (2002) defines ability as a fundamental characteristic of a person that is associated with performing a task effectively or very successfully. According to research by Blakeslee and Goff (2007), abilities are divided into two categories: intellectual and physical. Intellectual abilities are the mental capacities required for various mental activities, including thinking, reasoning, and problem solving. In describing the formation of intellectual abilities, seven dimensions are frequently mentioned: numerical intelligence, verbal comprehension, speed of perception, inductive reasoning, deductive reasoning, spatial visualization, and memory. Physical ability, meanwhile, is the capacity to perform a variety of duties requiring stamina, skill, strength, or similar characteristics. This physical skill is comparable to creative skills (Goodley, 2014).

According to Huitt (1998), critical thinking is the ability of pupils to compare two or more pieces of information, such as information received from the outside with information they already possess. According to Moore and Parker (2009), critical thinking is the mental activity that enables a person to make decisions when solving problems involving multiple categories of information. According to Kennedy et al. (1991), a person's critical thinking can be determined by how they approach a problem. According to Ennis (1993), critical thinking is rational, reflective thought that focuses on deciding what to believe or do. Critical thinking, according to this definition, emphasizes rational and reflective thought. Decisions are made using rational and reflective thought.

Critical thinking also has components, Ennis (1993) mentions several components of critical thinking as follows:

1) Basic Operation of Reasoning In critical thinking, a person has the ability to explain, generalize, draw deductive conclusions and formulate reasonable steps.
2) Domain-Specific Knowledge When facing a problem, a person must know the topic and content. To resolve a personal conflict, someone must have knowledge about the person and with whom they have the conflict.
3) Metacognitive Knowledge Effective critical thinking requires a person to monitor when he is trying to truly understand an idea, realizing when he needs new information and figuring out how he can gather and learn information easily.
4) Values, Beliefs and Disposition Critical thinking means making judgments fairly and objectively, this means there is self-confidence that thinking really leads to a solution

According to Ennis (1993) states that there are six basic elements in critical thinking which is abbreviated as FRISCO, namely:

1) Focus (focus) The first step in critical thinking is identifying the problem well. In this case, the focus indicator is being able to determine the concept that will be used in solving the

problem.

2) Reason: A supporting reason is obtained from trying to find a good idea, and also having to understand the reasons given to support a conclusion and decide on an argument. Someone who has critical thinking skills can be seen when they give reasons that other people can accept. When expressing ideas, you must know and understand that the ideas expressed are good and correct ideas. With reasons accompanied by evidence, the truth value of the ideas conveyed will be stronger. From this it can be interpreted that the reason indicator is being able to provide reasons for the answers given.
3) Inference (drawing conclusions) Someone who thinks critically will be able to draw conclusions by considering various reasons that can be accepted by other people, so that we can make conclusions by considering other people's opinions along with reasonable reasons. Drawing conclusions includes the activities of deducing or considering the results of deductions, inducing and assessing the results of induction, making and determining the value of judgments. In other words, inference indicators mean making conclusions from information accompanied by completion steps
4) Situation (situation) The situation here includes the people involved, goals, history, knowledge, emotions, prejudices, group membership and their interests, as well as the physical environment and social environment. Someone who thinks critically will be able to recognize the situation that is occurring so that they can answer questions according to the context of the problem. From this it can be interpreted that the situation indicator is able to solve mathematical problems that are applied in everyday life according to the problem situation.
5) Clarity Clarity is the ability to check or ensure that the thoughts expressed do not result in multiple interpretations so that errors do not occur when concluding.
6) Overview (review) The overview step is carried out as part of an overall check. Overview can also be interpreted as someone's ability to check the truth of a problem, review what has been done and conclude. In other words, an overview indicator is able to examine what has been discovered, considered, studied and concluded.

2. Learning Video Media

Kozma (1991) states that learning video media is a media that uses audio and visuals consisting of multiple images and sounds about a learning material that is displayed through media, specifically a projector, in an effort to create non-boring learning. and amusing. According to Meyer et al. (2017), learning video media is a combination of audio and visuals that contains educational content and employs a tool to display it. Then, according to Mudasih and Subroto (2019), learning video media is a media that uses audio and visuals to display various movements and messages, and the things displayed are either real or fictitious, educational, informational, and instructional.

Each learning media certainly has characteristics or characteristics that differentiate it from other learning media. Likewise with learning video media which has its own characteristics in learning activities. According to Stemler (1997) states that the characteristics of video media consist of several, namely:

1) Video media can enlarge small objects to make them directly visible
2) There are many objects displayed
3) You can change several parts of the image as desired
4) The displayed image can be saved for a certain time
5) The attractiveness of video media is quite high which makes students not do other activities

6) Can display objects, images, current and reliable information.

According to Stemler (1997), the advantages of video learning media are as follows:

1) Learning video media can be used to complement students' basic experiences from reading, discussion and practice.
2) Can be used repeatedly and displays things accurately.
3) Can instill attitudes and other affectives.
4) Can make students motivated in discussions and deliberations.
5) Can be used in large, small groups and individually

3. Physics Learning

According to Van Heuvelen (1991), physics describes and analyzes the structure and occurrences in nature, engineering, and our surrounding environment. Then, natural principles or laws will be discovered, which may be able to explain the symptoms based on the cause-and-effect structure. According to Seroglou & Koumaras (2001), physics is a branch of natural science whose primary objective is to investigate and provide a quantitative and qualitative understanding of various natural phenomena or processes, the properties of substances, and their applications. According to Ince (2018), physics lessons use models to explain observed phenomena, explain ideas when formulating theories, or merely aid in getting to know them. Science learning as a product signifies that it is capable of achieving learning objectives, whereas science learning as an attitude signifies that it can foster students' high curiosity, perseverance, and morals that they must employ in every aspect of their lives.

Specifically, the functions and objectives of Physics learning are as follows:

1) Form a positive attitude towards Physics by realizing the order and beauty of nature and glorifying the greatness of God Almighty.
2) Cultivate a scientific attitude, namely honest, objective, open, tenacious, critical, and able to collaborate with other people.
3) Develop experience to be able to formulate problems, propose and test hypotheses through experiments, design and assemble experimental instruments, collect, process and interpret and communicate experimental results orally and in writing.
4) Develop reasoning abilities in thinking, inductive and deductive analysis using physics material and principles to explain various natural events and explain problems both qualitatively and quantitatively.
5) Master the material and principles of Physics and have the skills to develop knowledge and a confident attitude as provisions for continuing education at a higher level and developing science and technology.

3. Method

This research used experimental research methods with a research sample of 50 physics education students who took the Basic Physics course at Kanjuruhan University Malang as an experimental class. The research design used was one group pre-test - post-test design . In collecting data, this research used two techniques, namely test and non-test. Test techniques are used to measure students' ability to solve calculation problems. Meanwhile, non-test techniques are used to measure student responses to the use of video learning media. The test instrument is in the form of 10 essay questions, while the non-test instrument is a student response questionnaire. Data analysis was carried out using quantitative analysis using the N-Gain equation. The results of the average score obtained are converted into quantitative

assessment criteria which are presented in Table 1.

Table 1 Questionnaire Assessment Criteria.

Criteria	Score Range
Very good	81% ≤ X ≤ 100%
Good	61% ≤ X ≤ 80%
Not good	41% ≤ X ≤ 60%
Not good	20% ≤ X ≤ 40%

4. Results and Discussion

Results

In this research, to evaluate the effectiveness of using learning videos in improving students' critical thinking skills in learning physics, the research used a test instrument in the form of essay questions with ten questions. The results of the pre-test and post-test carried out can be found in Figure 1. This image will show a comparison of the results before (pre-test) and after (post-test) students received treatment or used learning videos. This will help in measuring the extent of influence of learning videos on students' critical thinking abilities in learning physics.

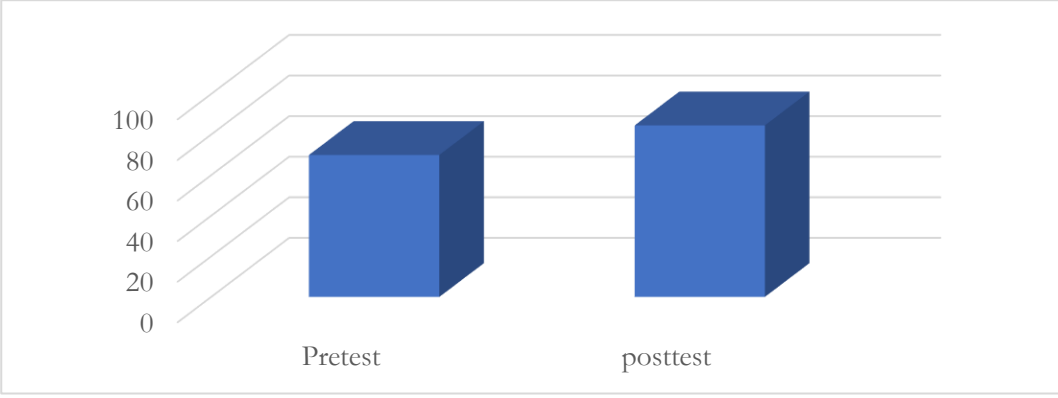

Figure 1 Pretest and Posttest Graph.

Based on the results from Figure 1, it can be seen that there was a very significant increase in student abilities after giving treatment using learning videos. The average pre-test score was 69.93, increasing to 84.51 in the post-test. This indicates that the use of learning videos is effective in improving students' critical thinking skills in learning basic physics courses, as well as having a positive impact on their learning outcomes.

Furthermore, the N-Gain equation was used to measure the increase in students' critical thinking abilities before and after treatment with learning videos. The N-Gain value from the pre-test and post-test for each student can be found in Table 2. This data provides a more detailed picture of individual improvement in critical thinking abilities.

Table 2 Pretest and posttest N-Gain Criteria.

Data	Mean N-Gain	Category
Pretest and Posttest Values	0.51	Currently

In addition, in this research, student responses to the use of learning media in the form of videos have also been evaluated, and the results are presented in Table 3. Analysis of student

responses can provide additional insight into how students feel about the use of video as a learning aid in the context of physics courses. base.

Table 3 Student Responses to the Use of

No	Aspect	Score (%)
1	Video View	90.00
2	Video Attractiveness	89.50
3	Material suitability	91.50
4	Clarity of Material	90.50
5	Ease of Use	92.00
6	Use of Language	91.50
	Mean	90.83

Based on the results of student responses to the use of learning videos which had an average of 90.83, it can be concluded that students gave a positive response to the use of videos as a learning tool in basic physics courses. This indicates that they feel learning videos are effective in helping their critical thinking skills.

The hypothesis in this research consists of two parts. First, the alternative hypothesis (Ha) states that there are significant results from the use of learning videos on students' critical thinking abilities in basic physics courses. Meanwhile, the null hypothesis (Ho) states that there are no significant results from the use of learning videos on students' critical thinking abilities.

To test this hypothesis, a t test was carried out. The results of the t test are presented in Table 4. This data provides information regarding the effectiveness of using learning videos on students' critical thinking abilities. Thus, this research provides empirical evidence that supports or rejects the hypothesis that has been proposed, and the results can be a valuable contribution in understanding the effectiveness of learning media such as videos in improving students' critical thinking in learning basic physics courses.

Table 4 T Test Results.

Paired Samples Test				
Pretest-Posttest	Mean	St Deviation	Df	Sig. (2-tailed)
	-14.583	4.193	49	0.001

Based on Table 4, the results of the t test above show a significance value (2-tailed) of .0001 < 0.005, meaning that Ha is accepted. Because Ho is rejected and Ha is accepted, it means that there are significant results from the use of learning videos on students' critical thinking abilities in learning basic physics. So the use of learning videos is effective in improving students' critical thinking skills.

Discussion

The findings of this study indicate that the provision of instructional films can enhance students' ability to think critically when solving physics calculation problems, hence leading to improved academic performance. The efficacy of utilizing instructional videos is evidenced by the response questionnaire administered to students for assessing their utilization of the provided instructional videos, encompassing many dimensions. The utilization of instructional video media facilitates the attainment of educational objectives and enhances students' comprehension of the intended topics. The integration of various

educational media, such as videos and instructional materials, to foster the development of critical thinking abilities. Moreover, empirical evidence has demonstrated that the utilization of interactive multimedia, such as films, can enhance students' capacity for critical thinking and the formulation of conclusions (Peppler & Kafai, 2007). Video learning media is a form of instructional media that combines audio and visual elements to convey information. It utilizes mechanical projection of images in frames to create a dynamic and engaging learning experience. This medium has been found to enhance students' interest in learning, expand their learning resources, and stimulate their curiosity and creativity (Winarto et al., 2020). One possible approach to integrating text, images, audio, and animated images is through the creation of a multimedia learning video that provides practical guidance on a specific topic. This video would utilize audio-visual elements, such as images and sound, to deliver the content. Additionally, the video would include a clear and easily comprehensible Indonesian language guide. To facilitate accessibility and convenience, the video would be packaged in an autorun program, allowing students to engage in independent learning at their own convenience. This multimedia approach has been identified as a valuable tool for enhancing material comprehension and supporting students' in-depth understanding (Abdulrahaman et al., 2018).

Furthermore, the utilization of instructional films has proven to be an efficient strategy for enhancing critical thinking abilities within the field of physics. The research findings indicate that the video-based problem-based learning (PBL) instructional approach is efficacious in enhancing students' critical thinking abilities. The acquisition of knowledge in the field of physics facilitates the cultivation of critical thinking abilities and the ability to effectively address challenges encountered in daily life (Trúsiková & Velmoská, 2020). The cultivation of critical thinking abilities is an essential aspect of students' educational development. The cultivation of critical thinking skills can facilitate the development of students' abilities to analyze problems, articulate them effectively, and generate innovative ideas within the realm of critical thinking. According to Halpern (1998), engaging in these critical thinking exercises might enhance students' ability to discern and respond to situations with greater sensitivity. The capacity to effectively address and resolve problems is considered a complex cognitive faculty, situated at a higher level of thinking known as critical thinking. This stage of cognitive development is classified within Bloom's taxonomy of cognitive stages. This demonstrates that critical thinking capabilities encompass advanced cognitive capacities. The inclusion of critical thinking within the physics curriculum is of significant importance as it enables students to effectively utilize their existing knowledge and skills in the learning process, hence fostering the development of critical thinking abilities (Bailin, 2002).

According to empirical evidence, instructional movies have been found to be efficacious in enhancing critical thinking abilities within the domain of physics. The utilization of instructional videos falls into the highly commendable classification. Additionally, it is indicated that the utilization of PowerPoint screen capturing techniques in educational videos can enhance students' proficiency in critical thinking within the domain of physics. The aforementioned finding is supported by prior research that has indicated the beneficial utilization of instructional videos in the process of learning (Brame, 2016). According to Rosdiana and Ulya (2021), the utilization of instructional videos has proven to be efficacious in enhancing students' comprehension of various subjects. According to van der Meijj and van der Meijj (2016), instructional videos have been found to have a beneficial influence on students' learning endeavors, including facilitating subject demonstrations, enhancing motivation, providing tutorials, and promoting time efficiency. The anticipated outcomes of

this study are projected to enhance students' capacity for critical thinking within the context of introductory physics education.

5. Conclusion

In this research, the use of learning videos has been proven to be effective in improving students' critical thinking skills in solving physics problems and also in improving their learning outcomes in basic physics courses. The research results are supported by questionnaire data which shows positive responses from students towards the use of video as a learning tool. Some of the positive aspects found include ease in achieving learning goals, better understanding of concepts, as well as increased critical thinking skills and the ability to formulate conclusions. In addition, interactive multimedia-based learning videos have been proven effective in increasing students' interest in learning, enriching their learning references, and stimulating students' imaginations. Combining text, images, audio and animation in learning videos becomes a very effective learning resource. In the context of tutorials, learning videos provide students with the flexibility of independent learning, enriching the learning process. These findings confirm that the use of learning videos is an effective approach in improving students' critical thinking abilities and their learning outcomes in basic physics courses. This strengthens understanding of the benefits of learning videos as learning aids that can support active and effective learning in the world of education.

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