

Improving Students Critical Thinking Ability Through MABER Media (Multimedia Form of Interactive Energy) in Elementary School

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Abstract: This research was conducted because there are learning activities that do not use learning media, especially technology-based; teaching materials still only use books and still use the lecture method, causing students to get bored easily and less interested when learning material is explained, causing a lack of knowledge, apart from critical thinking skills. students are still relatively low. This research aims to improve students' critical thinking skills through MABER, the learning media used. This interactive multimedia contains material examples of energy and energy changes in everyday life and media in science and technology subjects in grade IV SDN 05 Ngasem Batealit Jepara. This research uses the Pre Experimental Designs type, with a research design namely One Group Pretest-Posttest. Non-test data collection techniques include observation and interviews and test techniques in the form of pretest and post-test questions. The data analysis technique uses the N-Gain test to determine the increase in students' critical thinking by giving pretest and post-test questions with MABER media. Improving the critical thinking abilities of class IV students through MABER media was carried out through One Group Pretest-Posttest research by giving questions according to critical thinking indicators before and after using MABER learning media. The aim was to determine the increase in students' critical thinking abilities. The results of the pretest and posttest were tested using the N-Gain test. This research showed an increase in the critical thinking skills of class IV students by 0.60 in the medium category. In conclusion, the existence of MABER (Interactive Multimedia in the Form of Energy) media has succeeded in improving the critical thinking skills of fourth-grade elementary school students.

Keywords: Critical Thinking; Instructional Media; Interactive Multimedia; Natural Sciences.

Introduction

Science and technology have an influence on the world of education in the current era and have developed very rapidly [1]. It has been found that learning activities today are less varied. Namely, they only use books and lecture methods, so learning is still teacher-centred. Even though in this day and age, the government recommends using technology in learning activities, the interaction between teachers and students is needed in learning so that teaching and learning activities are more active, creative and fun. Apart from that, educators can also develop competencies and search for information to be up to date. Educators can integrate the use of technology into learning activities [2]. The use of this technology can foster the expected learning [3]. An educator must also be able to innovate in learning so that he does not just deliver material, but also needs to use methods adapted to the characteristics of his students. If there is less variety in learning, it will cause students to lack understanding of the material taught by the teacher, resulting in little knowledge and the students' low critical thinking abilities, which will impact their grades. Old learning methods can cause students to lack critical thinking skills, so learning is boring. Students are passive and less student-centred [4]. Critical thinking can mean that someone can solve problems so that they have new knowledge [5]. Therefore, it is hoped that learning will be able to raise a problem so that students can solve it using their knowledge.

Along with the development of the era of education in Indonesia, the independent curriculum has been used to encourage the development of 21st-century skills such as critical thinking skills, creativity, collaboration and communication. Students can be said to have critical thinking skills, namely being able to conclude what they know logically, express their opinions, and have a deep curiosity. In this independent curriculum, teachers and students can maximise creativity in learning activities. Based on the results of observations and interviews in grade IV of SDN 05 Ngasem Jepara, teaching and learning activities were carried out using the lecture method, then the teaching materials used only books, and learning was less varied, so many students felt bored when the material was explained, thus having an impact on knowledge. that they have. Based on the results of the interview, it was said that students' critical thinking abilities were still relatively low, and when asked a question, students were not able to answer it correctly; this could also be proven by the students' low scores when given practice questions that were adapted to critical thinking indicators. Therefore, efforts need to be made to provide innovation in learning, such as using media and even learning models.

Seeing this problem, researchers took the solution that the creation of media is needed when learning, especially considering that nowadays, technological developments are rapid and have become a challenge to the world of education [6]. So, the researchers developed media equipped with text, images, animation and practice

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questions. Apart from that, local wisdom was also presented regarding the material forms of energy in science subjects to help improve students' critical thinking skills, according to [7] by introducing local regional wisdom in learning media so that students can have a sense of love for their homeland and get to know the culture in their region. One of the learning media created is MABER media (Energy Form Interactive Multimedia) which can make learning more fun and help students understand the material. This media can also help students improve critical thinking skills when presented with a problem for students to solve.

Learning media is an intermediary tool educators use as a learning resource to facilitate the delivery of more real material to help learning. Besides, media is also able to attract students' attention so that learning is not boring; media can also provide teachers with an understanding of learning material. his students. So that you can increase your knowledge and be able to achieve the expected learning goals. Apart from that, by using learning media, it is hoped that students will be more active and interested in learning [8]. There is one multimedia-based interactive learning medium, according to [9] Interactive multimedia is a combination of text, photos, animation and video that can be accessed via laptop, computer or even cellphone and can be controlled interactively. In line with that [10] the use of interactive multimedia can create interactive and educative learning.

In achieving learning objectives, we don't just rely on models but can create media that keeps up with the times [11]. In interactive multimedia, this form of energy is also integrated with the problem-based learning model so that learning is more varied with the learning model. In line with this, according to [12] in learning, from beginning to end, it is necessary to design approaches and strategies in learning. Apart from that, problem-based learning is a learning model that provides a problem that is appropriate to the environment around the student [13]. In line with this, in the problem-based learning model, the focus of learning is on problems so that students not only learn material concepts but can solve problems to develop critical thinking patterns. So when using this interactive multimedia, students' critical thinking skills will also be sharpened apart from increasing knowledge about material forms and energy transformations in science subjects. Students can have critical thinking skills if they convey their ideas or opinions. So that students can appear active in discussions and express their opinions [14].

According to Ministry of Education and Culture, (2022) IPAS is a combination of science and social studies subjects. This science and science learning also directs students to develop critical thinking and provides experience for students to think from abstract to concrete so that they can provide direct experience and know the natural surroundings. Science learning can provide students with the opportunity to have direct experience and understand the natural surroundings [16] This MABER media (Interactive Multimedia Forms of Energy) contains material on the forms and transformations of energy in science and science subjects for grade IV elementary school. This media is also integrated with a problem-based learning model in which students will be presented with a problem so that they can train their abilities in problem-solving, which will train them. students' critical thinking skills; apart from that, this media contains local wisdom related to energy transformation

material, namely the torch war from Jepara, so apart from being able to increase their understanding of the material, students will also be able to recognize and preserve the culture in the area where they live. This media is equipped with text, animation, images, and also practice questions in it so that it will increase students' interest in learning. Therefore, this research aims to improve students' critical thinking skills through the MABER (Interactive Multimedia Form of Energy) media in the science and sciences subject in grade IV, which contains the syntax of the problem-based learning model, the student's ability to solve a problem will be improved. appeared.

This research is important to determine how much the critical thinking skills of class IV students have improved. With the MABER media, it is hoped that it will improve students' critical thinking skills accompanied by a problem-based learning model in the science and science subject on energy changes, encouraging students to be active in learning. In line with this, according [17] the existence of learning media helps explain the material that will be presented so that good communication occurs between educators and students. With the integration of the problem-based learning model, it is hoped that students will be able to play an active role in learning and solve their problems.

Apart from that, with the use of interactive multimedia and a problem-based learning model, the results of this research can later be used as a reference for educators and researchers in developing effective learning. Improving students' critical thinking skills will make them better prepared to face life challenges.

Research Methods

This research study is experimental Design, carried out on one group without a comparison group. This research design uses One Group Pretest-Posttest; the research is carried out in one group, so this research focuses on comparing the conditions before and after being given treatment. Through MABER media, when learning [18]. The following is a research design table using One Group Pretest-Posttest Design [19]

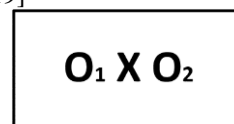


Figure 1. Research design

Information:

- O₁ : Pretest (before treatment is given)
- O₂ : Posttest (after treatment)
- X : Providing treatment

This study carried out two tests: before the test, before the treatment was given *pretest*, and after treatment, called a *posttest*. The test questions are adjusted to indicators of critical thinking. From the test results, students' scores are obtained to determine how much their critical thinking skills have improved before and after learning through MABER media; calculations are carried out to see the improvement. The results of student scores are calculated using N-Gain to measure the critical thinking abilities of grade IV students through the results of pretest and posttest questions. Here's the N-Gain formula:

$$N - gain = \frac{\text{skor posttest} - \text{skor pretest}}{\text{SMI} - \text{pretest}}$$

[20] explained that the results were then classified according to the following criteria:

Table 1. N-Gain Test Criteria

N-Gain Value	Criteria
$N\text{-gain} \geq 0.7$	Tall
$0.30 \leq N\text{-gain} < 0.7$	Currently
$N\text{-gain} < 0.3$	Low

The subjects used in this research were 20 grade IV students at SDN 05 Ngasem Batealit Jepara. The type of data used is qualitative data presented in the form of words, sentences or images [21]. This qualitative data was obtained through observation and interviews. Meanwhile, quantitative data is data that is presented in the form of numbers, and the amount can be determined [22]. This quantitative data was obtained by giving pretest and posttest questions, which will be tested using the N-Gain formula to determine how much students' critical thinking skills have improved through MABER media.

In this research, researchers carried out data collection techniques through non-tests and tests. Non-test data collection techniques were carried out through mela through observation, interviews and documentation [22]. The test data collection technique is carried out by providing pretest and posttest questions. In this research, a test technique was carried out to determine whether there was an increase in students' critical thinking abilities through the use of MABER (Interactive Multimedia Form of Energy) media. The pretest is carried out before using teaching media, while the posttest is done after use. teaching media. A test is a procedure or tool applied for measurement and assessment purposes.

Results and Discussion

Results from the initial stages of this research began with non-test data collection techniques, namely through observation and interviews. Based on the results of observations, researchers observed that when learning in the classroom did not use learning media, especially technology-based. When explaining the material only using books, without the help of learning media, this causes students to get bored easily; some students play with their classmates, which impacts students' knowledge; when asked questions by the teacher, they just remain silent. Apart from that, the results of interviews with grade IV teachers show that students' critical thinking abilities are still relatively low. This is proven by the teacher giving questions adapted to critical thinking indicators to students who still get results below the KKTP or the abbreviation for criteria for achieving learning objectives, is 75. Apart from that, some students are less active when learning in class, and less interested when listening to learning material. Apart from not using learning media to deliver the material, not using appropriate learning strategies and models will also result in less effective learning. Therefore, a solution is needed to overcome the problems that occur through the use of MABER, which is the learning media used in this research. MABER is an abbreviation for (Multimedia Interaktif Bentuk Energi) in this interactive multimedia contains material examples of

energy and energy changes in everyday life. This media contains material on the forms and transformations of energy integrated with the problem-based learning model when using the media during teaching and learning activities in the classroom, which is appropriate for improving students' critical thinking abilities.

To determine the increase in students' critical thinking skills, the researchers conducted a pretest and a posttest test. Due to the problem of students' low critical thinking abilities, as seen from students' lack of knowledge and ability to express their opinions on the material being taught, there is also no availability of learning media. This is then supported by the results of interviews, which state that when students learn, they get bored easily. Students just memorize the material instead of knowing it, so they lack knowledge of the material taught by their teacher, which impacts students' grades.

During the lesson, researchers introduced interactive multimedia in the form of energy. Before carrying out material explanation activities, researchers conducted a pretest intending to determine students' critical thinking abilities. Then, after the learning material about forms and transformations of energy is explained to students, they are given posttest questions to measure their critical thinking skills according to critical thinking indicators.

Based on the results of the pretest scores, 4 out of 20 students got the lowest score, namely getting the lowest score of 28, while the highest pretest score was only 1 out of 20 students with a score of 57. Judging from the pretest scores obtained by the students, it was still very far from the KKTP score, namely 75. So there is a need for learning that aims to improve students' critical thinking skills by providing solutions, one of which is by using MABER learning media during teaching and learning activities, which is then tested to determine the increase in critical thinking skills through pretest and posttest questions before and after learning according to the indicators. students' critical thinking abilities. Furthermore, after being given treatment using learning media, the next step was to conduct a posttest to determine the increase in students' critical thinking skills. The results of the post-test score were 1 out of 20 students who got the lowest score, namely 60, then for the highest score on the post-test, namely 85, 1 out of 20 students, but only 7 out of 20 students were still below the KKTP score. This trial was carried out by 20 students, who explained the material using MABER media. After students carry out these learning activities, they are asked to work on pretest and posttest questions in the form of description questions, totalling seven questions that follow critical thinking indicators.

Table 2. Student Pretest and Posttest Scores Results

Mark	Many Students		Criteria
	Pretest	Posttest	
80-100	-	7	Very good
60-79	-	13	Good
40-59	8	-	Enough
0-39	12	-	Not enough
Maximum Value	57	85	
Minimum Value	28	60	

As a result of the number of students who obtained pretest and post-test scores, it can be concluded that the lowest pretest score is 28, and for the highest score of 57, it can be said that it is still below the KKTP, namely 75. Then, a posttest was carried out after learning activities via MABER media, and the lowest posttest score was 60. The highest score was 85. The results of the recapitulation of the scores for the pretest and posttest questions can be seen as follows:

Table 3. Pretest and Posttest Recapitulation Results

Student Pretest and Posttest Recapitulation Results		
	Lowest Value	The highest score
Pretest	28	57
Posttest	60	85

This can also be proven by the scores obtained in the student pretest-posttest results table using the N-Gain calculation via SPSS version 23, which aims to test the increase in student knowledge results that are more accurate before and after learning with MABER (Interactive Multimedia Form of Energy), through providing pretest and posttest questions. The results of the N-Gain test using SPSS are as follows.

Table 4. N-Gain Test

	Descriptive statistics				
	N	Minim	Maxi	Mean	Std.
		um	mum	s	Deviation
Don't do it	20	.28	.72	.6058	.10552
Valid N (list)	20				

Source: Researchers' N-Gain test results (2024)

Research shows increased critical thinking skills through MABER media (Interactive Multimedia in the Form of Energy). The conditions for decision making in N Gain are if the N-gain value ≥ 0.7 means there is a high increase, the value $0.30 \leq N\text{-gain} < 0.7$ means moderate increase and if the N-gain value is < 0.3 , it means a low increase [23]. This N gain test aims to determine how much students' critical thinking abilities have improved before and after using MABER (Energy Form Interactive Multimedia) media. Based on Table 4. The results of the N Gain test calculation show that the minimum value of N Gain is 0.28, while the maximum value is 0.72. Then, the average value is 0.6058. So, if we look at the criteria for increasing the N Gain value between $0.30 \leq N\text{-gain} < 0.7$ with a result of $0.30 \leq 0.60 < 0.7$, it can be said that increasing students' critical thinking skills from the pretest and post-test scores is a category medium, namely 0.6058.

It can be seen from the N Gain test results that the average N Gain test result obtained a score of 0.6058. Based on the gain index criteria, it is in the medium category, so it can be said that the increase in students' critical thinking skills has increased moderately according to the gain criteria of $0.3 \leq N\text{-gain} < 0.7$. The increase in the results of the average score of 20 students through the pretest and posttest of grade IV students at SDN 05 Ngasem Jepara obtained an increase in the medium category. This is proven by comparing the results of the average score of 20 grade IV

students, who obtained a pretest score of 57 and then improved their thinking skills. critical thinking through MABER media in learning; after these learning activities, students were given post-test questions, which were adjusted to indicators of critical thinking ability; the results of the average post-test score for grade IV students were 85. This means that the average pretest-posttest score has increased, but the ability to increase students' critical thinking obtains moderate comparisons. This is also because students are not yet accustomed to in-depth problem-solving. Apart from that, there is limited training for students in operating learning media in depth because some of them are using technology-based learning media for the first time; besides that, there are some of them who express their opinions when learning is not optimal, so in answering questions, they lack depth. Besides that, this research only uses pre-experimental design research, with a one-group pretest-posttest design design. It only conducts one research and aims to determine the increase in students' critical thinking abilities before and after learning through teaching materials. In this design, subjects are given treatment, and then the results are measured without a comparison class [24]. So, by using MABER (Interactive Multimedia Forms of Energy) media, you can improve critical thinking skills in the medium category.

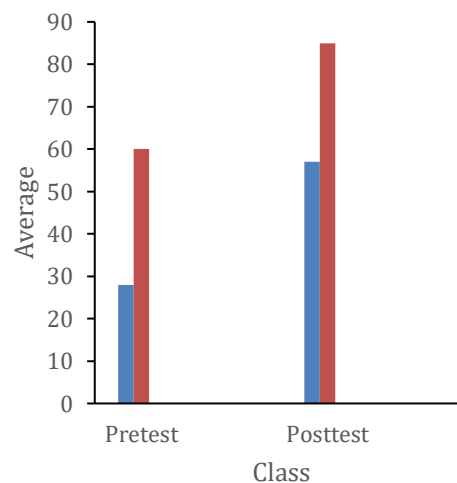


Figure 2. Diagram of Improving Critical Thinking Abilities for Class IV Students

The use of learning media is important to apply in the learning process because it can facilitate the learning process and increase students' motivation and critical thinking abilities [25]. In line with this [26] Media use can be a solution for students' independent learning and improve students' critical thinking skills. The use of multimedia in learning will, of course, be more able to attract students' attention to make it easier to understand the material. The use of technology in the world of education is necessary; apart from that, every teacher has more opposition because they must be able to master technology and then use learning media in classroom learning.[27].

MABER (Interactive Multimedia Forms of Energy) learning media produced by researchers can improve critical thinking skills and train students to solve problems contained in material forms and energy transformations. In line with this, [28] argues that interactive multimedia is useful for making learning more interesting and interactive and can

help teachers design learning and provide interesting and interactive learning resources for students. Apart from that, this media is integrated with the problem-based learning model. Problem-based learning is a learning model that provides a problem that is appropriate to the environment around the student [13]. Using this media, which is integrated with the learning model, can improve students' critical thinking skills because they are presented with problems in their environment through the material presented so that students can solve problems according to their knowledge of the learning material. The syntax in the problem-based learning model, according to [29], includes) Problem orientation: in this step, the educator raises problems related to the material, and students are encouraged to solve problems so that students are involved in problem-solving. 2) Organizing students to learn, educators help students to organize and guide learning related to the problem. 3) Guiding individual and group investigations, educators divide students into several groups and conduct investigations in the form of experiments. 4) Developing and presenting work results, educators assist students in planning and preparing appropriate work such as reports and help them share assignments with their friends. 5) Analyzing and evaluating, educators help students to reflect or evaluate their investigations and the processes they carry out.

The MABER (Interactive Multimedia Form of Energy) learning media also includes pictures, moving animations, and practice questions. So it can attract students' attention. Presenting it in pictures will increase students' knowledge, which was initially abstract to concrete so that students will have a more real picture and knowledge than just using books and explaining using the lecture method during teaching and learning activities in class. Then, apart from that, it is reinforced with opinions [30] Interactive learning multimedia is a new finding suitable to be applied in the current era, namely when technological developments are increasingly advanced, so it is hoped that education can be in harmony with technological developments. Apart from that, in the MABER media, there is reading about local wisdom related to material forms and energy transformation; apart from being able to solve problems in the surrounding environment, students can also get to know the cultural diversity that exists in the environment where they live. According to [7] by introducing local wisdom so that students can have a sense of love for their homeland and get to know the culture in their region. Here, students will be given a problem through the presentation of pictures. Then, they can answer it logically according to the material being taught. In this way, students will be trained to have the ability to solve problems so they can increase their knowledge.



Figure 3. Media Cover Display



Figure 4. Media Menu Display



Figure 5. Pbl Syntax In Media

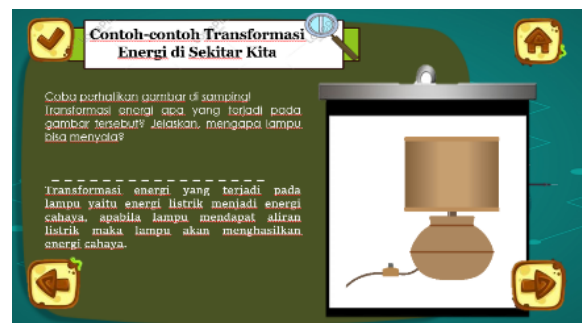


Figure 6. Examples Of Critical Thinking Practice Questions

This statement is strengthened by research conducted by [31] states that the use of multimedia in the learning process is very effective. Using multimedia in the learning process will foster a comfortable and interesting learning atmosphere so that students will be more interested in the learning process, better understand the material provided, and develop students' critical thinking skills. Using multimedia based on this research, it can be concluded that MABER media has potential and is suitable for future use in the learning process because learning becomes more interesting and interactive, so it can improve students' critical thinking abilities. Students' critical thinking abilities can be improved through learning activities that are more student-centred and do not emphasize students using a lot of memorization, but students are given a problem in delivering learning material so that they can improve their critical thinking abilities [32]. Students can be trained to improve their critical thinking skills in learning by inviting them to explore, carrying out experiments, and being given problems that often occur in their surrounding environment. So, with students knowing directly, they will convey their opinions according to the knowledge they have.

The researcher gave pretest and post-test questions to improve students' critical thinking skills before and after

learning activities. The aim is to determine how much students' critical thinking skills have improved through MABER media (Energy Form Interactive Multimedia). In designing test questions, researchers adjusted to critical thinking indicators according to Ennis, including) Providing a simple explanation. Students are given a problem, and it is hoped that they can provide a simple explanation. 2) By building basic skills through students' ability to answer a problem, their basic skills in critical thinking will emerge. 3) Making conclusions, students will be presented with problems. They are expected to be able to provide conclusions from the problems presented. 4) Providing further explanation, students will be given the problem in the question, and then they will be asked to provide further explanation regarding the problem. 5) Arranging strategies and tactics: Students are expected to know a series of ways to solve a problem, even through experimental activities.

Critical thinking skills were improved based on research conducted by researchers using MABER (Interactive Multimedia in the Form of Energy) media by uncovering solutions to existing problems by presenting material in this media. In line with the opinion [33] Learning in schools can train students to think critically; learning not only transfers knowledge but also presents a problem in learning, and students can solve it by answering according to their abilities. Besides that, media or learning models will involve students playing an active role during the learning process. So, students will have more real knowledge when the teacher explains learning material using media or learning models, rather than just using books and listening. Apart from that, when using media or learning models in which students are presented with a problem, they will express their opinions according to their knowledge with their teacher's guidance so that when they solve the problem given, their critical thinking skills will emerge. In line with research conducted by [34] explains that critical thinking skills can be started by asking a question or asking each other questions and answers, discussing a problem, and analyzing the material being discussed. In this research, to improve students' critical thinking skills, apart from using the problem-based learning model, MABER media is also used to increase students' knowledge from abstract to concrete. In line with this, research conducted by [5] In his research, it is explained that implementing the problem-based learning model assisted by learning media can increase students' motivation to improve critical thinking skills, but using this media also needs to be applied to various learning materials. Meanwhile, research conducted by [35] the results of his research explain that the use of the problem-based learning model is effective in improving students' critical thinking skills because this model contains a problem to be solved by students, so it encourages students to solve problems and obtain information which will later be evaluated by the teacher or get an explanation addition.

Therefore, through this research, there was an increase in critical thinking skills, marked by before using MABER media, student scores were still far below the KKTP, then after using MABER media, there was an increase in student scores which were already above the average KKTP, namely 75. This is proven by the results of the N-Gain test, which showed that there was an increase in students' pretest and posttest results, namely 0.60 in the medium category. Therefore, MABER (Interactive

Multimedia in the Form of Energy) media in fourth-grade elementary school science and science lessons have improved students' critical thinking skills. Similar research was also carried out by [36] in his research, which developed an E-Module Based on Problem-Based Learning for Students' Critical Thinking Abilities. The results of this research showed that the results of trials in class using e-module learning media based on problem-based learning on students' critical thinking abilities were better than those using conventional learning models for geometry material.

Seeing the phenomenon of students' relatively low critical thinking abilities, therefore students' critical thinking abilities need to be improved. One of the efforts that an educator can make is using media or learning models so that learning, which is initially monotonous and lacks active involvement of students in learning, becomes better, creative, and fun. With the MABER learning media integrated with this learning model, it can improve students' critical thinking skills, which were initially low, and experience improvement. Researchers chose the problem-based learning model because students' critical thinking skills can be developed in learning through the steps of this learning model [37]. By presenting problems, students are required to be able to solve these problems. This is also in the 21st-century context. Students are expected to be able to face various challenges in their lives. In line with research conducted by [38] that one of the successful factors in forming students' critical thinking abilities is the teacher's expertise and skills in choosing media and learning models, so in his research, applying augmented reality media can improve critical thinking abilities in fifth-grade elementary school and in learning it is not teacher-centred but instead involves students to learn. Apart from that, it is supported by research conducted [39] With interactive learning media based on critical thinking skills that educators can use as an innovation in learning, it can become an effective learning tool and resource. The results of research conducted by [40] it was explained that the use of technology-based interactive learning media was able to improve students' critical thinking skills, and the i-spring-based media was able to produce quiz types so that there was a significant influence on students' critical thinking skills.

Conclusion

Based on the results of research that has been carried out through the use of interactive multimedia in the form of energy, students' critical thinking skills can be improved through the use of MABER media (Interactive Multimedia in the Form of Energy) when learning is integrated with the problem-based learning model which is then tested by giving pretest questions before learning. and posttest after learning for grade IV students at SDN 05 Ngasem Batealit Jepara, which is adjusted to indicate critical thinking skills. Next, data analysis was carried out using the N-Gain test. The results of the N-Gain test obtained an average score of 0.60 in the medium category so that it can improve students' critical thinking skills.

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