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Problem-based learning with iSpring assisted inquiry method on critical thinking skills

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ABSTRACT

Student's critical thinking skills that are currently still low are important to develop because they affect the way students think in solving problems. The problem-based learning model with the inquiry method used to help improve student's critical thinking skills. The iSpring learning media used can help students understand the material. The research results were obtained from the output of the paired sample t-test, a significance value < 0.05, so it was concluded that there was a difference between before applying the learning model and after applying the learning model. The results of the questionnaire responses to the media also resulted in positive responses from students.

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1. INTRODUCTION

The importance of critical thinking skills necessary to be expanded in learning and is needed in the 21st century to be an important factor in dealing with and solving problems in everyday life and in the world of education [1], [2]. Critical thinking skills are one of the factors that influence student's way of thinking in solving problems. Critical thinking skills help students think precisely and systematically. In all subjects, critical thinking skills could help students solve problems [3]. Developing critical thinking skills is important in learning to train students thinking skills and be able to identify and describe problems, do reasoning to make conclusions from a problem [4], [5]. The low critical thinking skills of students in Indonesia can be seen from the low ability of students in problem-solving [6]. The results of the estimation of students' critical thinking ability parameters show that there are no students who have the highest critical thinking skills so that students have low critical thinking skills because the ability of students who have not been trained to solve contextual problems, which requires reasoning, and creativity to solve them [7], [8]. From these data, it is necessary to develop students' thinking skills because they are still relatively low.

The development of student's critical thinking skills requires a learning model that can practice students to think critically. Problem-based learning models where learning is done in groups or individually and learns through the process of understanding problem solutions [9], [10]. Therefore, the problem-based learning model is seen as being competent to improve student's critical thinking skills [11], [12]. Learning methods that can help students actively find certain concepts through a scientific process that emphasizes maximum student activity to seek and find solutions [13], [14]. In addition to learning models and methods,

learning media can also help facilitate the use of learning models and methods. The learning process with iSpring helps students learn according to their learning style. The teaching and learning process becomes more diverse so that it is more motivating and easier to understand the material presented in the iSpring application design [15]. The use of the iSpring application can make the questions to be used more varied so that students can better understand the purpose of a given problem. The use of questions that vary from the use of audio, images, and videos will make students able to think critically by understanding the intent of the questions presented through the iSpring application.

The subject matter used is trigonometry. Trigonometry is a science in mathematics that is related to geometry, especially triangles. Trigonometry plays an important role in architecture, navigation, engineering and several branches of physics [16]. It is important to teach trigonometry to students because it is important in everyday life and is related to the angles in a triangle. With the application of trigonometry concepts, it can solve problems such as measuring distances and others.

Critical thinking skills are implemented using a problem-based learning model that can assist students in developing student's critical thinking skills [17]–[19]. The application of problem-based learning models and inquiry methods in previous studies focused on problem-solving skills [20], mathematical connection ability [21], mathematical representation ability [22], mathematics learning achievement [23]. The media used in the application of the learning model still uses media in general during learning. The iSpring application was previously used to explore mathematical representation abilities, assist the learning process, improve learning skills and motivation, and create quizzes in learning [24]. The specific difference in this study is the use of a problem-based learning model with an inquiry method that focuses on student's critical thinking skills and the use of iSpring media in the application of learning. Therefore, this research purpose is to describe the effectiveness of applying the problem-based learning model with the iSpring-assisted inquiry method used in the application of learning to student's critical thinking skills.

2. METHOD

2.1. Types of research

This research used a quasi-experimental method. Research design form the pre-test post-test one group design where the research was conducted on one research sample, namely the experimental group, which was given a pre-test and post-test treatment [25]. An explanation of the research design is in Figure 1.

$$O_1 \; X \; O_2$$

Figure 1. Pre-test post-test one group design

Where: O_1 is pretest, X is treatment, and O_2 is post test.

2.2. Research Subject

The research subjects were 20 students of class X Senior High School of Muhammadiyah 1 Malang. Class X students were chosen because it suits the student's ability to think critically, and students are able to use the iSpring application to apply it to learning. The research was conducted in 3 meetings and in one meeting 135 minutes (3 hours of lessons).

2.3. Data and collection

The research data is students' critical thinking and students' responses to the media used in learning. Critical thinking data obtained through tests. The test used is in the form of a description of the problem which contains indicators of critical thinking and is given at the beginning and at the end of the application of the learning model. Student response data to the media were obtained through a closed questionnaire given at the end of the meeting.

2.4. Research instruments

The test sheets given are in the form of description questions which contain indicators of critical thinking skills. Questionnaire sheets were given about media components, content/content on media, attractiveness of media, ease of accessing media, and layout of media arrangements. The test and questionnaire validation sheets have been validated by mathematics lecturers and school mathematics

teachers, and the results are valid. Test sheets are given to find out the results for each indicator of critical thinking, while questionnaire sheets are given to students at the end of learning to find out students' responses to the media in several aspects.

2.5. Data analysis

The test results data were tested using the paired sample t-test technique where if the alpha significance value was < 0.05, it could be concluded that that there were differences in critical thinking skills before and after being given treatment. The questionnaire sheet is calculated on average from the results then it can be concluded according to the criteria. This research is said to be effective if there are differences in the results of the paired sample t-test and the results of the student response questionnaire to show an average response of > 2.5. The grouping of criteria for the average response questionnaire results is presented in Table 1.

Table 1. Criteria results average student response questionnaire

Average score	Response category
3.3 < Average ≤ 4	Very positive
2.5 <Average≤ 3.3	Positive
1.8 <Average≤ 2.5	Less positive
1 <Average ≤ 1.6	Negative

3. RESULTS AND DISCUSSION

3.1. Critical thinking

Pretest and posttest data results that have been obtained will show the conclusion that there is a difference between before and after being given treatment after being tested using the paired sample t-test. The paired sample t-test technique where if the alpha significance value was < 0.05, it could be concluded that that there were differences in critical thinking skills before and after being given treatment. The results of the paired sample t-test are presented in Table 2, and the average pretest and post-test results for each indicator of critical thinking skills are presented in Figure 2.

Table 2. Paired sample t-test results

		Paired differences			
		Std. deviation	t	df	Sig. (2-tailed)
Pair 1	Pre test–post test	13.852	-9.525	19	0.000

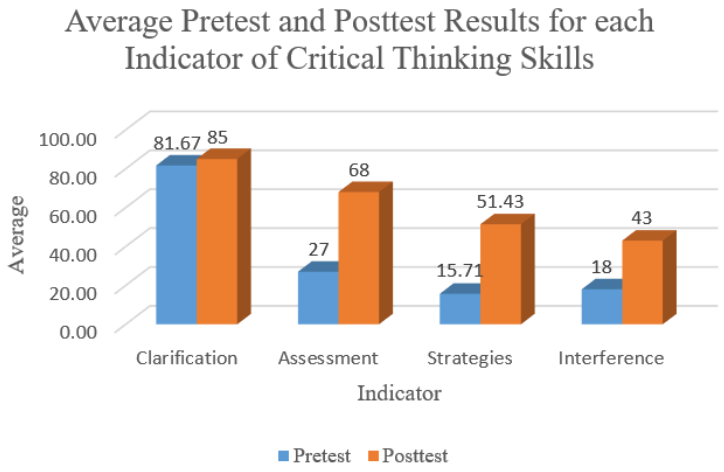

Figure 2. Average pretest and posttest results for each indicator of critical thinking skills

Based on Figure 2. The results were obtained from the output of the paired sample t-test, a significance value value of α < 0.05, meaning that there was a difference between critical thinking skills

before and after being given treatment. The average pretest and posttest results for each indicator of critical thinking skills in Figure 3 show that there is an average difference in the pretest and posttest results for each indicator. Student achievement in each clarification indicator, showing a slight difference of 3.33, assessment showing a slight difference of 41, strategies showing a slight difference of 35.72, and interference showing a slight difference of 25. The application of problem-based learning models with the inquiry method affects students' critical thinking skills because students actively discover certain concepts through scientific processes, which emphasize maximum student activity to seek and find solutions [26], [27].

3.2. Student response to media

The average results of the student response questionnaire to the media used are presented in Figure 3. The average results in the aspects of media components, content/content in media, media attractiveness, and ease of accessing media show an average result of 2.83 which falls into the positive response category according to Table 1. The use of media in learning facilitates students in understanding the material, and ease of accessing the media also helps students in terms of learning. The use of the iSpring application during learning is effective in helping students learn to understand, The use of the iSpring application can be in the form of displays such as video, audio, and also audiovisual, which can be adapted to learning needs can be realized in the form of flash or hypertext markup language (HTML) which can help make it easier for students in learning [28].

The results of previous research show that the used of problem-based learning models to student's critical thinking skills increases because students learn to find strategies in solving problems and practice thinking in solving problems. The application of this learning model, as previously studied, also shows that there are differences between before and after the learning model is applied. The application of the problem-based learning model compared to before the used of the learning model showed a significant difference in the process of student's critical thinking skills. The problem based learning model assists students in developing skills in solving a given problem [21]. Learning with the inquiry model can improve students' critical thinking skills because inquiry-based learning educates students to discover their knowledge in their own way so that their critical thinking skills become habits that must grow [29]. Critical thinking skills can be used so that students have a better level of reasoning. Students who have good thinking skills will be able to receive information and draw conclusions properly and accordingly. Based on the description above, it needs to be conveyed that there is a need for further research regarding the used of learning models to media-assisted student's critical thinking skills during the learning process.

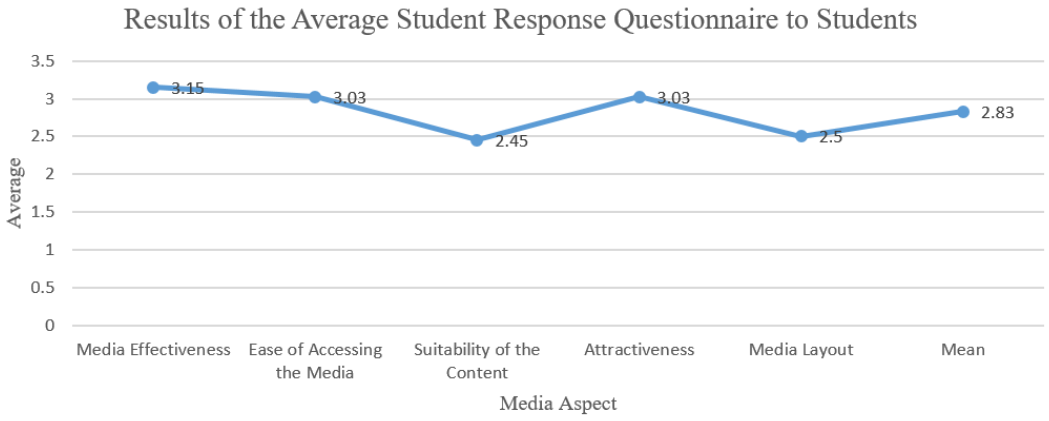

Figure 3. Results of the average student response questionnaire to students

4. CONCLUSION

Student's critical thinking skills before the application of problem-based learning with the iSpring application assisted inquiry method and after application there is a significant difference. This is indicated by the results of a significance value <0.05 in the paired sample t-test so that there is a difference between before and after the learning model is applied. Student's ability before applying the problem-based learning model with the inquiry method has a fairly low average value. The results of the student response questionnaire to the media used in learning resulted in a positive response. This shows that the application of the problem-based learning model with the inquiry method assisted by the iSpring application is effective in influencing

student's critical thinking skills. For further research, it is expected to be able to examine this matter more broadly and examine more deeply about the learning model for student's critical thinking skills.

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