



Improvement of Critical Thinking Ability Using E-learning

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Abstract. Online learning has a big influence on the learning process. The increase in learning outcomes in the era of the Covid-19 pandemic has poor results, this is due to the lack of activeness of argumentation in the classroom. This study aims to find out how the level of critical thinking ability of students uses *e-learning* learning. The type of research carried out is a descriptive study that only describes what is obtained or that occurs in a certain area that is observed. The courses in this study use the ongoing course, namely thermodynamics with a total of 20 participants. The instrument carried out in this study is a test of critical thinking skills in the form of description questions. Based on the results of data analysis, it shows an average pre test of 55.2 and an average post test of 79.6 while the average score of n-gain pre test and post test shows 0.54 with a moderate category, it can be concluded that *e-learning* learning can improve students' critical thinking skills.

Keywords: Critical Thinking Ability · E-Learning

1 Introduction

The latest program in higher education directs students to better prepare for the world of work. This system has a program which has just been released. The program encourages students to master various sciences to prepare them to enter the world of work or what is known as Merdeka Belajar Kampus Merdeka (MBKM) or we can say freedom of learning, independent campus. Freedom of learning tends to liberate students who can gain knowledge both on campus and off campus. One of the experiences from outside the campus is through learning which is mostly obtained through the internet.

Online learning has a huge impact on the ongoing learning process. Online learning or what is called online is a learning system carried out during a pandemic to reduce the number of victims exposed to covid-19. The increase in learning outcomes in the era of the Covid-19 pandemic has poor results, this is due to the lack of active argumentation in the classroom [1]. The power of the learning process decreases when available networks often run into problems. Learning activities at home are often associated with online learning (online) or e-learning. E-learning is the use of information and communication technology in the teaching and learning process [2].

Many e-learning platforms are easy to find. Edmodo, Modle, Classroom are examples of e-learning platforms that provide LMS (Learning Management System) facilities.

LMS is a system that provides information and communication technology-based classes that can be filled by lecturers with materials, assignments, learning resources and, others [3]. E-learning is the preparation of learning that uses computers or electronics in the learning process [4]. E-learning is the use of a system in the concept of education using information technology in the teaching and learning process free of the WEB or accessible through an internet [5, 6]. The use of electronics (LAN, WAN or, Internet) can be used as a learning activities.

Physics education courses, especially thermodynamics as one of the branches of science that learn the symptoms of nature to help students understand physics scientifically and be able to think critically in the search for knowledge formation by themselves. Critical thinking is a form of thinking that is used to the solve problems that require reasoning, analysis, evaluation and, mind interaction to reduce as much as possible the occurrence of errors when solving a problem [7–13] There are several studies in analyzing the thinking of students such as gives a definition of critical thinking, that is, critical thinking is reflective thinking that focuses on decision-making patterns about what to believe, and should be done. Furthermore, Ennis classified critical thinking on twelve components, four of which provide simple explanations, conclude, make further explanations and set strategies and tactics.

Seeing the problems that arise, it is necessary to analyze students' critical thinking skills first so that the solutions provided are appropriate, effective and efficient. From these problems, researchers want to know how students' critical thinking skills are in solving problems. Based on the above problems, the author proposed a study analyzing the level of critical thinking ability of students in the e-learning learning process.

2 Method

The research population is all students of the architectural education program, teacher architecture and education science. Sampling is done by purposive sampling, namely determining certain considerations using views that have a close relationship with previously known population characteristics.

The type of research used is descriptive research that explains as is the result of the study without anything being changed. This study takes a quasi-experimental research design to see how students' critical thinking skills use e-learning learning [14]. This is in accordance with the statement of Arikunto [15] that, "Descriptive research is a study that only describes what is obtained or what occurs in a certain observed area.

The data collection method used in this research is a written test in the form of an Essay test (description) about critical thinking skills. In the description test, the ability is required in terms of expressing his ideas through written language. The gain of the increase can be seen using the formulation of the n-gain equation.

$$gain = \frac{N_{postes} - N_{pretres}}{N_{maks} - N_{pretres}} \quad (1)$$

Description:

$N_{post\ test}$: Post test Score

$N_{Pre\ test}$: Pre test Score

N_{maks} : Maximum Value

3 Results and Discussion

The results of the study used tests in the instrument. The test used is a test in the form of a description question (essay) to describe students' critical thinking ability in solving learning problems. The object of this study is students using temperature and heat materials. The results of the descriptive analysis of participants' critical thinking ability are summarized in Table 1.

Statistics from the analysis of the description of students' critical thinking ability showed an average score of 55.2 pre tests and an average post test of 79.6. The minimum scores of pre test and post test are 38 and 64 with a minimum score of 0. The maximum values of pre test and post test 65 and 90 with the ideal maximum score being 100. The appearance of the average value of pre test and post test can be seen in Fig. 1.

Based on statistics, the results of the analysis of the description of students' critical thinking ability produced an average of 55.2 pre tests and an average of 79.6 post test. The minimum scores of pre test and post test are 38 and 64 with a minimum score of 0. The maximum values of pre test and post test 65 and 90 with the ideal maximum score being 100. The average n-gain score of critical thinking skills of all participants can be seen in the diagram image in Fig. 2.

Table 1. Statistical Table of Critical Thinking Ability

Statistics	Statistical Value	
	Pre test	Post test
Sum	22	22
Average score	55,2	79,6
Maximum Score	65	90
Minimum Score	38	64
Standard Deviation	7,591662	5,918494

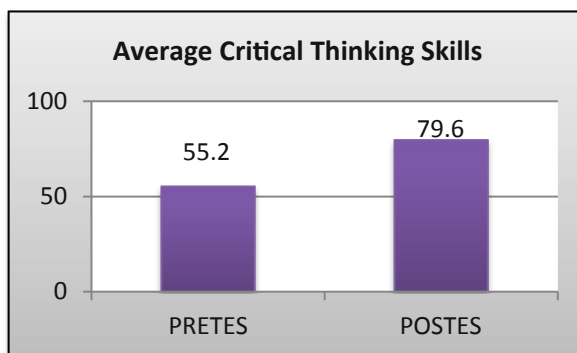


Fig. 1. Average pre test and post test of critical thinking

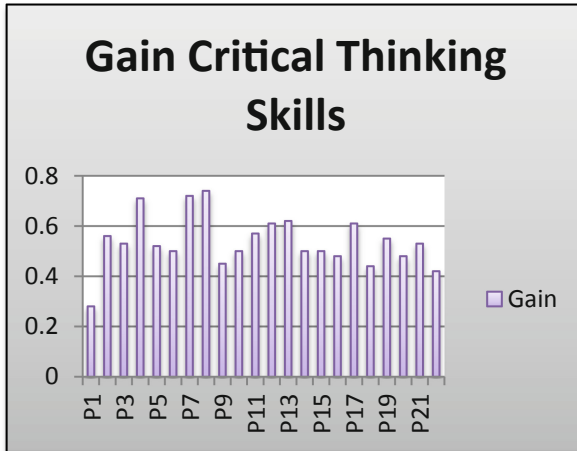
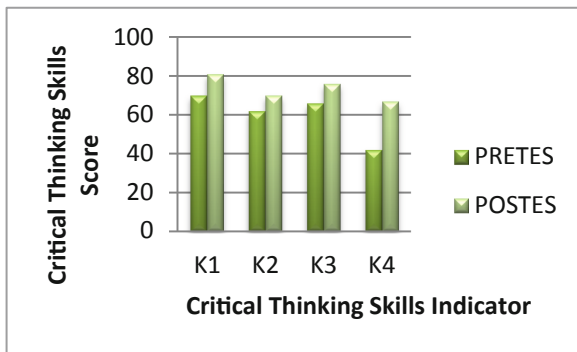


Fig. 2. The value of N-gain critical thinking of all participants

The n-gain score of the participants' critical thinking ability was on average in the medium category position. This happens because participants become more active after being held with cooperative learning. The improvement of participants' critical thinking skills is calculated into a diagram image that shows the improvement of each indicator in Fig. 3.

The critical thinking ability that has been answered by the participants is analyzed per point of the question. This analysis is useful to see on which indicators are difficult for participants. The data analyzed were pre test and post test data on participants'



- Description:
- K1: Providing a Simple Explanation
 - K2: Summing Up
 - K3: Creating Further Explanations
 - K4: Setting Strategies And Tactics

Fig. 3. Analysis of initial and final scores of critical thinking ability

critical thinking ability. Based on the analysis of each indicator of critical thinking ability obtained each value. The indicator in providing a simple explanation obtained the highest average score of post test of all, namely 81 where learners were asked to focus, analyze and answer questions. Similar to those of Tju and Murniarti [16] and Kempirmase et al. [17]. The indicator concludes displaying an average score of 70 post test, learners assess the quality of conclusions, assuming reasons to be accepted or students make conclusions appropriately and students choose the right ones to support conclusions while the ability to make further explanations has an average score of 76 this happens because learners are required to provide definition to the guesses thought of ensuring that the language is clear or students provide more explanations advanced and the ability to set strategies and tactics has an average score of 67 where learners are able to determine what will be done. Looking at the score results, good expectations for each indicator are at least in the medium category. This also happened to some researchers such as Nora et al. [18] that it is necessary to increase critical thinking and provide practice questions that support the improvement of students' mathematical critical thinking skills which are also in line with Rohmat and Lestari's research [19]. Related to the critical thinking skills of participants in the online learning process, making participants more active. Participants are more skilled in arguing by showing conclusions, providing further explanations and arranging strategies and tactics. Learning using e-learning helps the learning process of students in the need for materials and teaching materials that will be found. The benefits of e-learning are also to help the interaction of students and teachers in sharing the information they want to pour into learning. Teaching materials can be placed in the assignment column in the form of power points, Microsoft words to learning videos. So that students are trained in high-level thinking, including critical thinking. This research is in line with Misba et al. [20] with the results of schoology-based e-learning development research suitable for use in learning. The increase in science literacy of students experienced using e-learning learners is the result of research by [21].

4 Conclusion

The explanation of the results of data analysis can be concluded that e-learning learning can foster students' critical thinking skills. The availability of space for uploading materials in the form of materials and videos supports students in critical thinking. The increase in critical thinking skills obtained the average pre test and posttest values of 55.2 and 79.6 and the gain score was 0.54. Based on the value obtained, the critical thinking ability of students has increased which is in the medium category. Value obtained, the critical thinking ability of students has increased which is in the medium category.

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the concept of physics in the Covid-19 era. Both authors analyzed the data with permission to research and write scientific articles.

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