



Profile of Students' Critical Thinking Ability: Implementation of E-Modul Based On Problem-Based Learning

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ABSTRACT

Electronic module (E-module) that is based on a problem-based learning science is a teaching material made by being operated online that is simple, flexible and independent, so as to facilitate students' critical ability to solve problems in everyday life and meet global challenges that can be accessed online through certain sites. The use of this E-module supports the digital literacy movement as one of the needs of the 21st century. One of the 21st century abilities that can be trained through the use of E-Modules is critical thinking. This study aims to determine students' critical thinking ability after using E-Modules based on "problem-based learning". Method used is one shot case study. The results showed that 61.129% of students have very high critical thinking ability, 35.48% of students have high critical thinking ability, and 3.22% of students have moderate critical thinking ability. It shows the use of problem-based learning-based E-Modules is effective in training students' critical thinking ability.

INTRODUCTION

The development of ICT (Information and Communication Technology) is developing very quickly and even has penetrated into all sectors of life, one of which is the education sector. The development of ICT has an effect on shifting the learning paradigm from traditional learning to technology-based learning. Learning resources that support ICT-based learning are flip charts, games, magazines, leaflets, interactive multimedia, templates, electronic modules, power points, audio, booklets, e-books, videos, and web content (Rahmadi et al., 2018). Learning modules are very useful in the learning process aimed at generating curiosity and motivating students to learn. Module is a way of organizing subject matter that pays attention to the function of education. The use of modules in learning is able to bring students to the expected competencies. The speed and ease of presenting information as a learning resource is easily achieved if learning uses electronic media (Triyono, 2015). Learning modules in the ICT era are no longer print modules, currently a lot of electronic modules are developed or commonly referred to as E-modules.

In the field of education, the development of learning media is developing in the learning process such as module learning media rapidly. The module has been developed into an E-module. According to (Elvarita et al., 2020), E-module is an application in the learning process that has methods, materials and assessments that are made systematically and lead students to arrive at the goal of competence that should be with its level of complexity. Meanwhile, Solikin (2018) stated that E-module is a form of writing that is in electronic format and useful for learning and opinions (Laili, 2019) E-module is an independent learning media that contains learning materials. The use of interactive modules is needed in online learning that is minimally face-to-face. It is also very helpful when used on fairly abstract materials such as environmental pollution.

This material is usually only explained through drawings. Students cannot see directly. Based on the description above, supporting teaching materials are needed that can guide students during the learning process. The teaching materials can be in the form of interactive and more interesting E-Modules. The E-Module is a guide for students to learn a concept through a higher thought process. This E-module makes use of *Flip FDF* website that can be designed in such a way and equipped with videos, images, PPT slides, certain website links, as well as interactive questions (Khikmiyah, 2021).

Flip PDF Professional app is a rich flip book maker with page edit features. Flip PDF Professional pp is one of the applications used to create E-modules that can help in the learning process. Flip PDF Professional is a software that has a function of opening every page like a book. Flip PDF Professional has the potential to create E-modules and improve understanding of learning materials. In fact, in the field, the print module is not able to present the material well, so the print module is less attractive for students in learning, besides that the print module is also not able to convey historical messages through images and videos (Husniah, 2018). Moreover, Wahyuni et al. (2013) also said that the print module tends to be informative and less attractive because it cannot display colors, sounds, videos, and moving images, so as students are less motivated to learn, this leads to a lack of understanding of the learner's concept of the material contained in the print module.

2013 Curriculum focuses on modern pedagogics by applying scientific approach that includes observing, questioning, trying, presenting, concluding, and creating for all subjects. The government in the Regulation of the Minister of Education and Culture Number 65 of 2013 concerning Process Standards recommends appropriate learning models to be implemented based on the 2013 Curriculum, one of which is the model of problem-based learning (Permendikbud, 2013). Problem-based learning is an innovative learning model and can provide active learning conditions for students. Problem-based learning is a learning method that makes students the center of learning through unstructured problem-solving (Torp & Sage, 1997). Problem-based learning (PBL) assists in the construction of knowledge as students activate previous knowledge in the initial discussion (Schmidt et al., 1989). As for the steps of PBL are orienting students to problems, organizing students to learn, guiding conducting investigations or experiences individually or in groups, developing and presenting the results of work, analyze and evaluation of the problem-solving process (Kimianti & Prasetyo, 2019). One of the competencies that a teacher needs to have in carrying out an integrated science learning process is to use interesting learning models, so that students can more easily grasp the material presented by the teacher and create active students, so as the desired learning goals are achieved. PBL is a learning model characterized by the involvement of learners in solving a problem through the steps of the scientific method and the improvement of critical thinking of learners.

The implementation of learning in the classroom has several goals that must be achieved. It requires educators to design learning activities in such a way that learning objectives are achieved. Students are learning subjects with higher thinking abilities, therefore teaching materials are also needed that can make students work more deeply in thinking. These teaching materials take the advantage of technological advances and remain concerned with a scientific approach (Santi, 2018). Critical thinking is a thought in which a person always feels curious about information to gain a deeper understanding. The ability to think critically is considered very important to prepare students who are appropriate in competence and ready to face future challenges.

Thinking critically is needed in science learning because students are required to see the situation, formulate questions, formulate hypotheses, collect data, and draw conclusions (Nikita, 2018). Advances in science and technology have an influence on the development of education in the world, especially in Indonesia. In line with advances in technology and information, developments in the world of education must undergo better changes as well. In this regard, the development of the world of education requires teachers to know how to package learning to be more interesting and the skills needed by students can also be facilitated in the 21st century. In the 21st century is an era where the dynamics of the growth of science, technology, and social are happening very quickly. The 21st Indonesia century skills are facilitated in the world of education through the 2013 Curriculum. Currently, Indonesia is aggressively developing the 2013 curriculum that is designed as a national curriculum, where the curriculum has been partly used by schools in Indonesia (Fauziah et al., 2013). The advancement of science and technology of the 21st century is creeping in various sectors of life including education. One of the things that needs to be developed is the ability of students, one of which is digital literacy, namely the ability of students to use communication and information technology. Its purpose is to make students ready to face future challenges. In line with this, there are several thinking skills that need to be developed to keep up with technological advances, it is the ability to think critically (Paramitha et al., 2021).

The results of observations and interviews that researchers have conducted, several problems were found, such as the learning material used by teachers was found in student books. However, in the learning process, there are still students who do not bring books. From the existing problems, there must be a new break through, specially using an electronic module that includes more interesting productive material and has additional contents such as images and videos. The use of E-modules with a more attractive appearance and additional content in them will make it easier for teachers to deliver learning materials and can assess the extent of students' understanding of the learning material through the results of evaluation by students, the use of E-module is expected that students can better explore the knowledge and information conveyed. And one of the teachers at Islamic junior high school Al-Istikmal stated that learning during the COVID-19 pandemic was carried out online and only used ppt slides or textbooks. Teachers have not provided E-modules that can support learning independently. The existing learning only contains practice questions and less varied. Students will focus on working on the questions only and lack the initiative to think critically about the material studied (Khikmiyah, 2021).

Based on the results of a survey conducted by PISA (Program for International Students Assessment) shows that Indonesia's position is still far below the international average. Indonesia is ranked 3rd from the bottom (Rahayu et al., 2018). Critical thinking ability are indispensable in learning physics (Rahayu et al., 2018). The importance of critical thinking ability is indicated by the many studies that discuss critical thinking ability. Research conducted by Aufa et al shows that the use of e-modules with an environment-based PBL model has a positive effect on students' critical thinking ability and environmental care attitudes (Aufa et al., 2021). In addition, it is relevant to what was conveyed by Puspitasari (2019) which stated that problem-based learning is learning that makes real life an open authentic problem that must be solved by students in increasing their abilities, one of which is the ability to think critically.

RESEARCH METHOD

This research was conducted at Islamic junior high school Al-Istikmal addressed at Bindang Pasean Pamekasan. The implementation of this research is in the second semester of 2021/2022 academic year for Integrated Science Subjects. The population of the study was the entire VII grade of Islamic junior high school students of the institute. The sampling technique used was random sampling and 31 students of seventh grade were obtained.

The research method used in the study is pre-experimental. This method uses only 1 experimental class without a control class. Pre-experimental is a study that is not yet a real experiment because there are external variables that also affect the bound variables of the research design used is a one shot case study. In this design, there is a class that is given treatment, then at the end of each meeting, a description test will be given with critical thinking indicators (Saputri et al., 2016). The design of the one shot case study research is in Figure 1.

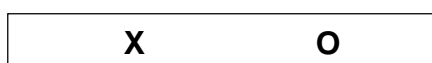


Figure 1. One shot case study research design (Sugiyono, 2019).

Information:

- X : Treatment in the form of the use of E-modules based on *problem-based learning*
 O : Students' critical thinking ability

Data collection uses documentation, observation, and test methods. The methods of documentation carried out are the recording of the learning process, the use of the student's name and assessment. The observation method is carried out to determine the implementation of learning carried out by 1 or 2 observers. While the test method carried out is a critical thinking ability test in the form of a description question. Critical thinking ability test instrument has been tested and analyzed beforehand first before use. Test analysis these include validity and reliability. The critical thinking indicators used are formulating the subject matter, revealing the facts needed in solving a problem, choosing logical, relevant, and accurate arguments, detecting bias based on different points of view, and drawing conclusions. The data analysis used is descriptive quantitative to describe students' critical thinking ability. The percentage of students' critical thinking ability can be calculated using the following formula :

$$\text{Critical thinking skills} = \frac{\text{Score that is gained}}{\text{Overall score}} \times 100 \% \quad (1)$$

Classification of students' critical thinking abilities based on the Table 1.

Table 1. Criteria for critical thinking ability.

Percentage	Criteria
80, 1-100	Very High
60, 1-80	High
40, 1-60	Average
20, 1-40	Low
0, 20	Very low

(Fuad et al., 2017).

After the researchers reviewed in depth the opinions of experts about the module, the researcher concluded that the module is an independent teaching material that is compiled digitally whose purpose is so that students can learn with teacher guidance and learn independently efficiently. The module entitled Environmental Pollution contains material and is strengthened with learning reinforcement elements such as exercises, and videos. The overall research scheme can be described as shown in Figure 2.

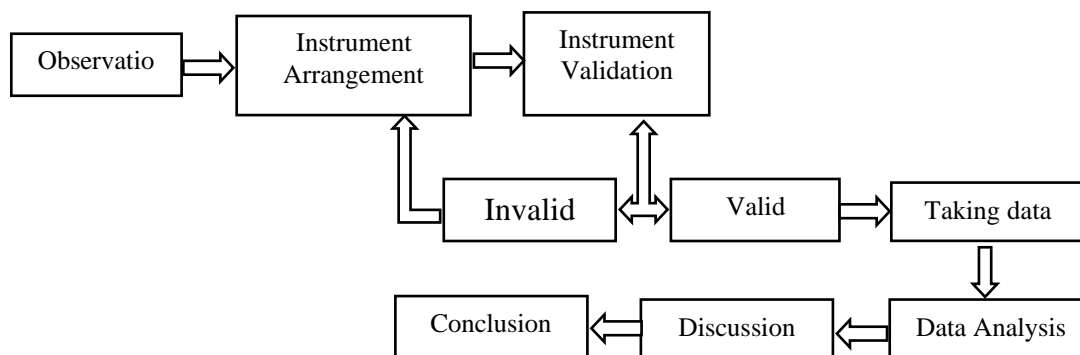


Figure 2. The reseach flowchart.

RESULTS AND DISCUSSIONS

Currently, the learning process is enough at home or done online. The government's recommendation to stay at home was forced to change circumstances and policies (Khasanah et al., 2020). In addition to changing situations and conditions, in recent years the world of education is experiencing a phase where it must be able to face the demands of the 21st century, namely by the characteristics of several demands that students must have. Students are not only required to have high grades or learning outcomes, but are also required to have several high-level thinking skills which include problem-solving skills, creativity, decision-making abilities, communication and argumentation skills, and critical thinking skills (Ambar et al., 2018). The fact that is often found in the field is that students are less involved in the learning process (Malik et al., 2016). In addition, learning is monotonous because of the lack of variety in the chosen learning model. The learning model that is often used is usually the conventional learning model. Another problem is that students tend to be required to hone aspects of memory without being invited to think, one of which is the ability to think critically (Nurmayani et al., 2018).

The presence of the COVID-19 pandemic in Indonesia requires each sector to carry out tasks from their respective homes, including educational activities (Siahaan, 2020). This is not a barrier for educational subjects to carry out effective learning. Educators can apply certain innovations in learning so that learning goals can be achieved. Innovation in learning needs to be done considering that learning in the midst of a pandemic is carried out online. This study aims to determine the ability of class VII students in Islamic junior high school Al-Istikmal. Based on the test results that have been given, the following results are obtained in Table 2.

Table 2. Average student critical thinking test results.

No	Average	Category	No	Average	Category
1	87.50	Very High	17	77.50	High
2	77.50	High	18	75.00	High
3	82.50	High	19	90.00	Very High
4	87.50	Very High	20	80.00	Very High
5	87.50	Very High	21	42.50	Medium
6	85.00	Very Hgh	22	87.50	Very High
7	72.50	Very High	23	82.50	Very High
8	85.00	Very High	24	72.50	High
9	75.00	High	25	82.50	Very High
10	82.50	Very High	26	85.00	Very High
11	75.00	High	27	87.50	Very High
12	82.50	Very High	28	77.50	High
13	75.00	High	29	77.50	Very High
14	87.50	Very High	30	85.00	Very High
15	87.50	Very High	31	87.50	Very High
16	77.50	High			
Average		80.56	Category		Very High

Table 2 shows that the average critical thinking ability of students is 80.56 with very high categories. In the Table 2, there are three groups of critical thinking criteria obtained by seventh grade of Islamic junior high school AL-Istikmal students. The group can be seen in Table 3.

Table 3. Classification of critical thinking abilities.

Category Percentage	
Very High	61.29 %
High	35.48 %
Medium	3.22 %

Based on Table 3, it can be seen that students with very high critical thinking categories are 61.29%, students with high categories are 35.48%, and students with medium categories are 3.22%. As for the questions given to students, there are as many as 5 description questions. The questions are arranged based on indicators of critical thinking ability, those are: 1) formulating the main points; 2) uncovering the facts needed in solving a problem; 3) choosing logical, relevant, and accurate arguments; 4) detect bias based on different points of view; and 5) draw conclusions (Ennis, 1996). Ennis states "No test honestly can give you score range categories like Superior, Good, Poor etc. You must decide for yourself" Because This Cornell Critical Thinking Test is not has a standard category for determine the level of critical thinking a person (low, medium and high), then to know the profile improvement of critical thinking skills Induction in this study is used grouping by Arikunto (2010). The percentage of student achievement according to these indicators is in Figure 3.

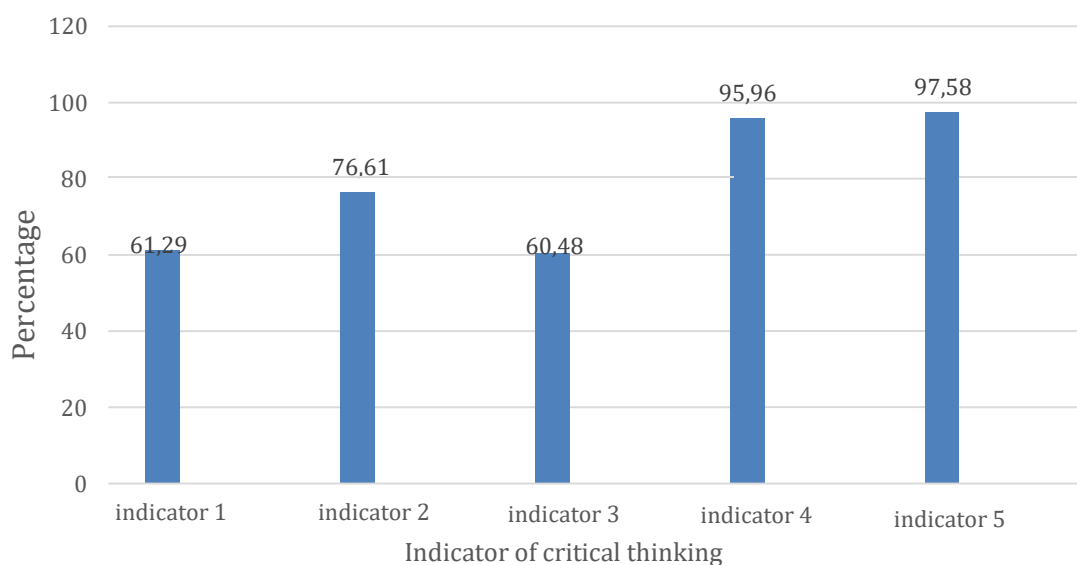


Figure 3. Percentage of student achievement in each indicator

Figure 3 shows the percentage of student achievement in each indicator. The 5th indicator, which draws the conclusion, obtained the largest percentage, which is 97.58%. It shows the ability of students to convey ideas achieved at the end of learning (Andini et al., 2020). This is because in the learning process students use a problem-based learning E-module where at the end of each phase and the end of learning, generalizations or drawing conclusions are always made from the material that has been studied. The material studied is environmental pollution, and students can conclude material related to environmental pollution properly. The indicator with the lowest percentage is the third indicator that is choosing logical, relevant and accurate arguments. The percentage obtained was 60.48% with a high category. This indicator shows the student's ability to critically and logically relate to the relationship between a concept and a particular situation, so that it can explain a relationship, a concept, a fact, or a method that intersects with each other (Fatmawati et al., 2018). In this question with the 3rd indicator, students are less able to relate the problem to the subject in the question.

The indicator with the lowest percentage value number two is the 1st indicator, which is to determine the main points of the problem. In the matter of critical thinking, this indicator is in question number 5 on the 2nd indicator obtained a percentage of 76.61 with a high category. On the question with the 2nd indicator. The 4th indicator gained a percentage of 95.96% with a very high category. this indicator shows the student's ability to detect possible errors through the given critical thinking questions (Aziz et al., 2016). Efforts to improve critical thinking skills for students can be done in several ways. One of them is by selecting a learning model. As one of the supporting factors for the success of the learning process, educators need to help students improve their learning outcomes and critical thinking skills through learning models that can support students to learn actively (Amijaya et al., 2018). This is in accordance with Bruner's learning theory which reveals that good learning is when students learn by finding, in which case students play an active role in learning so that they are able to analyze the material and think deeply (Winarti & Suyadi, 2020).

In the same line, Khikmiyah's research (2021) that the product that has been developed in the form of a problem-based learning science, E-module after being implemented on a large scale is expected to improve students' critical thinking ability, as previous research conducted by Wulandari & Sholihin (2015), that the implementation of the problem-based learning model can significantly improve critical thinking ability. PBL can be used to stimulate students' interest in global and surrounding issues. The application of PBL can improve students' critical thinking ability because in essence PBL is a constructivist-based learning model, with the result that it can help students in maturing their abilities. Thus, PBL can train and help students' critical thinking ability (Imanintyas et al., 2017). Ahsan (2016), in the same line with it, explained that an electronic learning media developed can be effectively applied in teaching and learning activities compared to ordinary learning in his research. In another study conducted by Rusman (2016), regarding E-learning where E-learning can improve learning outcomes. In accordance with David Ausubel's learning theory of meaningful learning which states that the subject studied by students must be meaningful, and meaningful learning is a process of linking new information to relevant concepts contained in a person's cognitive structure (Harahap, 2017). This is in accordance with Vygotsky's Scaffolding theory which states that the learning process should provide a large amount of assistance to students during the early stages of learning, then these students take on greater responsibility after being able to do it independently (Suardipa, 2020).

CONCLUSION

The presence of the Covid-19 pandemic in Indonesia is not a barrier to implementing innovative learning. One of them is by utilizing a problem-based learning E-module that can be added to video, audio, PPT, or certain website links. This E-module can be integrated with various models and approaches resulting in a more attractive E-module. The results of the implementation of problem-based learning E-modules affect students' critical thinking skills. The percentage of students with high critical thinking ability category was 61.12%, students with high critical thinking ability were 35.48%, and students with medium high critical thinking ability were 3.22%. This shows that the use of problem-based learning E-modules is effective in training students' critical thinking ability and Learning by applying the problem based learning e-module model is effective to train critical thinking ability. In further research are expected to be able to develop an electronic module of problem-based learning models that are packaged into a teaching materials or learning tools with the type of R&D research. According to the results and discussions that have been presented, the advice for researchers is to be able to implement products that have been developed on a wide scale, so that the improvement of critical thinking ability by the product can be seen significantly.

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