

# Development of E-modules to Improve Critical Thinking Skills of Grade IV Elementary School Students

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## ABSTRACT

The use of science material textbooks in the digitalization era needs to be developed into supplement teaching materials that are packaged electronically. Science learning is required to contain a combination of theory and practice to improve critical thinking skills. The purpose of this study is to determine the effectiveness of E-modules in improving students' critical thinking skills. The method used is Research and Development (RD) with a 4D model with stages of define, design, develop, and disseminate. Inquiry-based e-modules using inquiry syntax, there are materials, educational games, inquiry-based student worksheets are the main characteristics of inquiry-based E-module media that are developed. Based on the results of the study, the average score percentage of the validity of inquiry-based e-modules by material experts and media experts was obtained at 91.94% with details of material expert validation of 92.38% and media experts of 90.5% so that it can be used. Teacher and student responses to the practicality of inquiry-based e-modules

**Keywords:** [E-modules, Inquiry, Critical Thinking]

## INTRODUCTION

Education in schools is organized by setting an example, building will and developing the creativity of students in the learning process (Martaida et al, 2017). Greater opportunities and expectations depend on the quality of education pursued, education can have certain qualities if students are active in the

learning process and teachers are able to directly form the values needed by students (Nurcahyo and S, 2018). In line with what is expressed by (Ersoy, 2014) The most important function of education is to train individuals who have self-confidence, curiosity, creative, innovative and are also able to understand differences / problems. The development of the world of education is very significant along with the development of science, technology, and information. One of the educational sciences that can optimize the potential of students is Natural Sciences (IPA).

In essence, IPA is viewed in terms of products, processes and in terms of attitude development. This means that learning science has a process dimension, a result (product) dimension and a scientific attitude development dimension. The science learning process needs to emphasize the provision of direct experience to develop competencies in order to explore and understand the surrounding nature scientifically (Suyatna 2017). So that science education is a knowledge gained through experimental or observation activities where science learning will be easier to remember and understand if explained through what is observed. In addition, according to Marta et al., (2020) stated that success is not only seen in efforts to select tools, approaches, and forms of learning, but teachers must use a

learning model that is in accordance with the material taught.

The implementation of the 2013 curriculum in learning in Indonesia is expected to increase the potential of graduates by honing high-level thinking skills, especially critical thinking of students so that they can compete in the era of globalization. Dewi et al., (2018) argue that critical thinking skills are very important to be developed so that students are skilled in seeing, observing and solving various problems. The ability to think critically is a way of thinking to determine the right decisions or actions by questioning things related to information logically. According to Inscription et al., (2019) states critical thinking is a process to make decisions to be able to think at a high level in solving a problem by thinking seriously, actively, meticulously in analyzing all the information received by including rational reasons. Based on the results of initial field observations on the teacher's response to the use of E-modules involving SD 2 Mlati Lor Kudus, the results for SD 2 Mlati Lor Kudus have applied E-modules in learning during the pandemic but only a few students can follow the learning optimally because there are students who do not have cellphones to follow learning effectively so that learning more often uses printed modules in the learning process.

So that a learning model is needed that can be applied to teaching and learning activities to train students' critical thinking skills. One of the models that can be applied is the inquiry model. According to Widani et al., (2019) stated that the guided inquiry learning model is a learning activity where the teacher guides students in finding and finding the answers to the problems given by themselves. With this model, students learn more oriented to the guidance and guidance of the teacher so that students are able to understand the concepts of the lesson well. Aristianti et al., (2018) states Learning using a guided inquiry learning model is considered appropriate to be applied in science learning because students can be actively involved in the learning process to

search and investigate systematically with guidance and guidance from the teacher. Inquiry is a learning model that can help learners to solve problems with various alternative solutions through thought processes and investigations and the teacher only acts as a facilitator and guide. According to Haspen et al., (2019) One of the learning models that can be combined with E-Modules is Guided Inquiry.

Based on this, to improve critical thinking skills, appropriate and innovative media such as e-module media or electronic modules are also needed. The development of electronic module media for learning needs will be adjusted to the applicable curriculum. Use of inquiry-based e-modules. As a learning medium, teachers can also use the right learning approach, so that learning objectives can be achieved appropriately. Based on the description of the divination, it can be concluded that the development of Inquiry-based E-module Media is needed by teachers and students. Identifying the problems faced by teachers, as well as looking at school infrastructure and the potential of the environment around students in schools, the researchers conducted a researcher with the title "Development of Inquiry-Based E-module Media to improve critical and interpersonal thinking skills of Grade IV Elementary School Students".

## **LITERATURE REVIEW**

### **E-module**

E-module is a module with an electronic format that runs with a computer. E-modules can display text, images, animations, and videos through electronic devices such as computers Laili et al., (2019). Then according to Elvarita, et al. (2020)E-module is an electronic version of what was previously a printed module that can be read on a computer or other gadget and is designed with supporting software. E-modules are learning materials that are systematically designed based on a certain curriculum and packaged in the form of certain units of time, which are displayed using electronic devices such as Aryawan et

al., (2018). according to Muzijah et al., (2020) The perceived advantage is that this E-module is in the form of an application where to access the contents of the e-module does not require an internet connection to download the application and to access it again does not need to be connected with an internet connection anymore. E-Module has advantages in its design, where students can use it independently and with the existence of designs that can make students interested so that student motivation arises to learn.

### **Inquiry**

Inquiry Learning Model Inquiry is a problem-based learning or investigation that is carried out by looking for truth or knowledge that requires critical, creative thinking and can use the intuition of Tohir et al., (2020). Inquiry is a process of acquiring and get information by doing observasi and or experiments to find answers or solve problems to questions or problem formulations using critical and logical thinking skills Mahardika et al., (2012). Then according to Komalasari et al., (2019) the guided inquiry learning model is one of the student-centered learning models where in the learning process students are required to be active in learning, but in the process the teacher does not just let go of the activities of students in the learning process, but the teacher provides guidance. Inquiry Based Learning can also be used to arouse the creativity and curiosity of students with learning steps as follows: 1) Observation/Observation of various facts or natural phenomena related to; 2) Ask questions about the phenomana at hand; 3) Submit a conjecture or possible answer; 4) Collect data related to the allegations or questions asked; and 5) Formulate conclusions based on data that has been processed or analyzed quoted (Directorate General of Secondary Education, Ministry of Education and Culture in Diantari., 2018)

### **The ability to think critically**

The ability to think critically according to (Nugraha et al., 2018) states that critical

thinking is a habit to be able to open up to analyze, synthesize, and evaluate information to solve a problem. In line with opinion (Sukmadinata in Puspita et al., 2021) critical thinking is a skill in reasoning regularly. It means having a systematic mindset in assessing, solving problems, drawing decisions, and expressing beliefs with clear evidence. In the ability to think critically, be able to evaluate, give a careful assessment of an idea, idea, problem, or existing information, then students are given the opportunity to formulate conclusions and be able to make decisions. Roza et al., 2019)

### **MATERIALS & METHODS**

The type of research used is research and development (Research and Development). Development research is research used to produce a particular product and test the effectiveness of that product. This study used a 4D model. The stages in the 4D model are: (1) define, (2) design, (3) develop and (4) disseminate. The description of the stage is: In the define stage there are 5 main activities that must be carried out, namely (1) front end analysis. In this analysis, researchers establish the basic problems faced by students and teachers in learning. On the front end analysis, the researcher conducted an interview with the class teacher. (2) Student Analysis. This analysis aims to identify learning targets, namely students. This information is obtained through interviews with teachers. At the student analysis stage, interviews with class teachers are also conducted and distributing questionnaires to students. Based on the results of the interviews conducted, the guided inquiry learning model is suitable to be applied to the learning process of elementary school students. By knowing and understanding the characteristics of students, it will make it easier for writers to design teaching materials that are in accordance with the characteristics of students so that teaching materials are produced that are suitable for use by students. (3) Task analysis. This analysis aims to identify and analyze the abilities that students must

master through determining the content in learning units that are in accordance with the 2013 curriculum. This can be in the form of an analysis of Basic Competencies (KD) and subject matter. Furthermore, the formulation of competency achievement indicators in accordance with KD (3.8), and (4.8) is carried out to determine the competencies that must be achieved after learning. Based on the formulated indicators of achievement of competencies. (4) Concept Analysis. This analysis is carried out by identifying the entire content contained in the material of electrolyte and nonelectrolyte solutions. The final result will be included in the concept analysis. (5) Analysis of learning objectives. Analysis of learning objectives is the stage of converting the results of task analysis and concept analysis into learning objectives. This analysis is used as the basis for constructing teaching materials in the form of e-modules based on inquiry that are compiled. The design stage aims to design an inquiry-based e-module based on Basic Competencies (KD) and subject matter materials according to the 2013 curriculum. The design stages include: (1) Test preparation. In the preparation of this test, learning evaluation questions are presented, the purpose of which is to find out the abilities of students after studying the material. This is adjusted to the grid of the problem. (2) Media Selection. Selection of media to be used in the e-module renewal. The media used are image, animation, and video media. (3) Format selection. The selection of formats is adjusted to the elements contained in the module, namely: cover, foreword, table of contents, list of pictures, list of tables, learning instructions for teachers and students, competencies to be achieved, activity sheets and worksheets, as well as evaluation sheets. (4) Initial design. In this initial design, the researcher sets the title and identification of the subject matter, determines KI and KD, determines GPA, designs material according to the inquiry stages, makes exploration models in the form of animations and videos, makes critical questions according to the model presented,

makes exercises and conclusions a direct application of the concept, designs e-modules using the Canva application. Development stage (Develop). At this stage, an assessment of the designed e-module is carried out. There are 2 things that are assessed, namely the validity of the e-module and the practicality of the e-module. The validity of e-modules aims to reveal the validity of teaching materials in the form of guided inquiry-based e-modules developed. In this validity is disseminated questionnaires to experts. The experts involved are 2 expert lecturers. If there is a section in the e-module that is considered inappropriate by the validator, a revision is carried out. Furthermore, practicality tests are carried out by students and teachers to determine the level of ease of use of e-modules, time efficiency and the benefits of the designed e-modules. Stage of deployment (disseminate). This stage is carried out on grade IV students at SD 2 Mlati Lor Kudus. To improve critical and interpersonal thinking skills, N-gain Test students were carried out to find out the increase in Pre-Test and Post-Test scores on the use of inquiry-based e-modules using the SPSS version 25 program. The results of the N-Gain test of thinking skills can be seen in Table 2 below. with the following gain formula.

$$N - Gain = \frac{(Skor\ post\ test) - (Skor\ pre\ test)}{(Skor\ maksimal) - (Skor\ pre\ test)}$$

The N-Gain interpretation criteria can be seen in Table 1.

Table 1. Interpretation of N-Gain Magnitude

Normalitas Gain (g)	Tafsiran
$(g) < 0,3$	Rendah
$0,3 \leq (g) \leq 0,7$	Sedang
$(g) \geq 0,7$	Tinggi

## RESULT

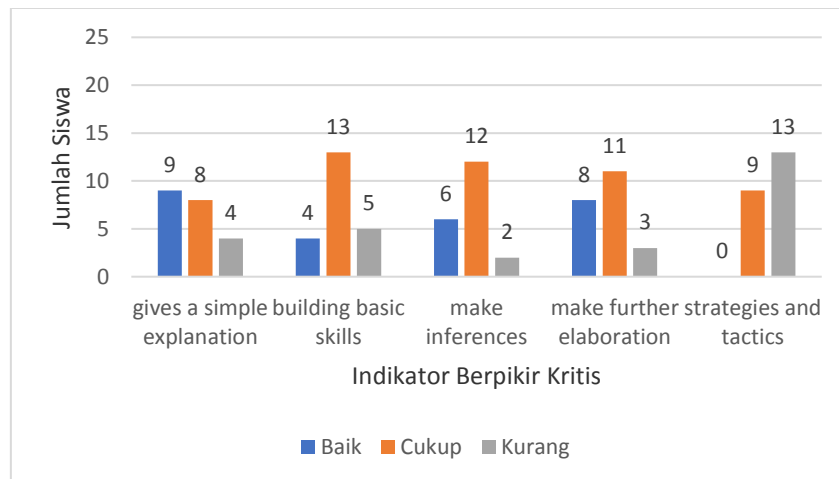
The validity test aims to determine the validity of the developed e-module. This validation is carried out by lecturers who provide criticism, suggestions, input as material for the revision of the e-module

developed. The following are the results of the recapitulation of the results of the inquiry-based e-module validasi by expert validators.

**Table 1. Interpretation of N-Gain Magnitude**

Expert	Mean	(%)	Categori
Media	4,6	92,38	Very Decent
Material	4,52	90,5	Very Decent

The study has the results of an analysis of students' critical thinking abilities. The results of critical thinking ability in the following table.



**Figure 1. Results of Critical Thinking Ability of Each Indicator**

From the picture given above, it can be seen that there are differences in critical thinking skills experienced by students during the learning process, where the results show changes in each indicator through the pre-test and post-test results that have been carried out. From the picture above, it can be seen that there are differences in learning outcomes experienced by students during the learning process, where these results show changes in each process. Furthermore, the N-Gain test was carried out with the help of SPSS software, the results were as follows:

**Table 2. Interpretation of N-Gain Magnitude**

Data	Mean	Criteria
Pre-test	62,52	-
Post-test	72,15	-
N-Gain	0,56	Medium

The table above shows that there is an average of 62.52 post-test values of 72.15. So that the N-Gain of critical thinking ability is 0.56.

## DISCUSSION

The validity of the Inquiry-Based E-module is obtained from validation testers by media

expert validators and material expert validators. Media expert validation is known that validators provide an assessment score of 91 out of a maximum score of 100, an average of 4.55 and a percentage of 91%. Meanwhile, material experts are known that validators provide an assessment score of 87 out of a maximum score of 90, an average of 4.83 and a percentage of 97%. The results of expert validation and responses from teachers and children in accordance with suryadi (2013) stated that game tools are tools specifically designed as tools to help learn and can optimize child development according to the level of child development. According to (Ariawan and Pratiwi, 2018) educational game tools are everything that can used as a means or game tool that contains value and can improve all aspects of a child's developmental ability. Based on the validation test results, the Inquiry-Based E-module learning media obtained an average score of 93.5 with the category "Very Feasible". Utariyani (2015), stated that there are three aspects assessed in the Inquiry-Based E-module, including appearance, attractiveness of content/ content, and



completeness of media. Referring to these opinions, an assessment sheet was developed for media expert validators that are based on aspects of content/content display, and completeness of Inquiry-Based E-modules.

The effectiveness of inquiry-based E-modules is known based on the results of the pre-test / post-test on students' critical thinking skills. As supporting data for pre-test and post-test results on students' critical thinking skills, observations were made to determine the changes in attitudes shown by students.

The average increase test (gain) was carried out to determine the increase in critical thinking ability scores and environmental caring characteristics. Testing is carried out through two stages, namely the initial test before being given (pre-test) and the final test after being given treatment (post-test). Based on the analysis of pre-test and post-test results, students' critical thinking ability increased from the original 62.52 to 72.15, with an N-Gain score of 0.56. Mulyasa (2007:254), stated that learning is declared elective if it gains a gain value of  $> 0.3$  to  $< 1.0$ . So it can be concluded that inquiry-based E-module media is effective for improving students' critical thinking skills.

The N-Gain of critical thinking ability in pretest results is greater than that of post-test results. This means that the increase in critical thinking from the pretest is more than the post-test results. This is in accordance with the results of research by Asyahri., *et al* (2013) which shows that the use of e-modules in learning has an influence on student learning outcomes. Also, research by Wati *et al.*, (2019) which states that inquiry-based teaching materials are able to improve students' critical thinking skills. This activity is in the form of syntax from the inquiry learning model, namely solving problems, formulating hypotheses, collecting data, testing hypotheses and drawing conclusions, students are presented with problems related to the material. Through these activities' students gain knowledge about the material being taught. This is in accordance with the opinion of Wakidah (2015) which states that

activities on inquiry syntax are able to improve students' critical thinking skills.

The critical thinking ability of elementary school students on indicators of formulating problems shows that students can give an opinion from cases or information that occurs on natural resource materials. This is possible for several reasons: (1) because students can understand the explanations contained in inquiry-based e-modules, (2) in the literature study contained in the given e-modules so as to allow students to express their thoughts in answering problems given from various points of view, (3) the inquiry process contained in the e-module shows that the learning provided can train students to provide arguments

The low increase in the ability to think critically on indicators provides further explanation because there are several explanations where in this inquiry-based e-module there is syntax whose level of difficulty is in the difficult category is in the syntax of formulating hypotheses. It is likely that students have difficulty in putting forward reasons in the form of descriptions. Because it requires a lot of words to clarify the giving of opinions. To overcome it requires repetitive exercises to accustom students to the formulation of hypotheses or conjectures as follows. Ardinto and Rubini (2016) state that when students relate to the phenomenon that occurs, they are actually involved in the process of improving students' critical and interpersonal thinking skills.

Through project activities, students are also required to learn directly or independently in finding a concept through scientific work procedures using inquiry steps to train and develop critical thinking skills. This is in accordance with the research of Izzatunnisa *et al.*, (2019) which states that inquiry-based learning can improve students' critical thinking skills. Likewise, with the research of Widyatoyana *et al.*, (2018) which states that learning through discovery can improve students' critical thinking skills.

## CONCLUSION

The results of the feasibility test in which there are validation tests and practicality tests. validation by media and material validators, obtained a percentage score of 96% and was categorized as "Very Decent". Then on the results of product validation by material expert validators, obtained a percentage score of 94% and was categorized as "Very Feasible". Both results show that inquiry-based E-module media is already very feasible to use in learning. The results of the practicality test of inquiry-based e-module media obtained an average practicality percentage of 97% with the category of 97% "Very Practical". The acquisition of this practicality value shows the enthusiasm of students towards inquiry-based E-module media. Assessment of media practicality based on student responses

is based on several aspects, namely attractiveness, convenience, and language. Based on these results, it can be concluded that the media can be concluded that inquiry-based E-module media is practical for use in learning. Inquiry-based e-modules contribute to the improvement of critical and interpersonal thinking skills of grade IV students of Basic Literature, on Natural Resources material shown and proven by the N-gain value on critical thinking ability of 0.56 medium criteria. The N-gain value of critical thinking ability of 0.59 has moderate riteria.

### Declaration by Authors

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