



## Discovery Learning: Learning Modules to Improve the Critical Thinking Skills of Grade IV Elementary School Students

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**ABSTRACT:** This research aims to develop discovery-based learning modules on Natural Sciences and Social Sciences (IPAS) subjects in elementary schools. Research and development uses the Brog and Gall (2003) model which consists of 3 main steps of research and development. In product development, researchers use the ADDIE development model to develop prototypes of learning modules. This research was conducted in the central part of Lampung Province, precisely at SD Negeri 5 Lempuyangan Regency, Bandar Way Pengubuan. The sampling technique uses random sampling by assigning 2 classes as subjects, namely the experimental class and the control class consisting of 25 students in each class. The results of this study showed that the average score of the experimental class was 77.83 and the control class was 69.43. Based on the results of the analysis, it was found that the experimental class was superior to the control class and had a significance value obtained through the t-test before 0.000, which means that there is a significant average difference. The results are then continued on the effect size test to see the magnitude of the influence of the product used. The effect size test result is 0.83 with a very high interpretation. Based on the results of research conducted in class IV, it can be concluded that discovery-based learning modules are effective in improving students' critical thinking skills.

**KEYWORDS:** Critical Thinking, Discovery Learning, Modules.

### INTRODUCTION

The use of teaching materials, learning media, and the creativity of an educator is very necessary, by developing their potential and applying it to learning activities (Adha & Ulpa, 2021). Teachers have the flexibility to choose various teaching devices so that learning can be tailored to the learning needs and interests of students. All subjects should contribute to the formation of attitudes, skills and knowledge. There are two learning processes that take place, namely the direct learning process and the indirect learning process. The direct learning process is the process of students developing knowledge, thinking skills, and psychomotor skills with a scientific approach. While the indirect learning process is a learning process to develop morals and behaviors related to attitudes. Students are required to be active and optimize their intelligence and talents and be able to do tasks independently at home. Modules that can provide understanding and train students' Christian thinking skills by making teaching materials, as well as learning resources in the form of modules. During the learning process, teaching materials are very helpful for educators in delivering material to increase student engagement.

Discovery learning is one of the learning models that can foster students' critical thinking skills, namely at the stages of problem identification, data collection, data processing and proof, each stage of which is guided directly by the teacher and guided indirectly through modules that have been designed based on discovery learning. learning activities that involve the maximum of all students' abilities to search and investigate systematically, critically, and logically so that they can find their own knowledge, attitudes, and skills as a form of behavior change (Firosalia Kristin). The discovery learning model trains learners to think critically, one of which is at the stage of data collection, data processing, proof, and drawing conclusions, namely students questioning and explaining something that has not been explained. From this process, students will answer questions or explain something so that they will train to speak in front of others, curiosity, mental training, confidence, and strong confidence. They will think hard about how to find a concept and form some characters. Teaching materials that can help the effective learning process in the classroom and at home are learning modules (Putri, Ariyani, & Adha, 2023). Therefore, teaching materials are needed that can help teachers to deliver material and tasks that can be understood easily and can improve students' critical thinking in understanding problems. The appropriate media,



namely discovery-based learning modules, makes it easier for students to be able to learn anywhere, in addition to being an independent learning resource, modules also have a role in assisting educators in designing learning (Aransyah, et al., 2023). Discovery Learning is one model to develop a way of learning students actively find themselves, investigate for themselves, then the results obtained will be faithful and long-lasting in memory, will not be easily forgotten by students. Children can also learn to think, analyze, and try to solve the problems faced by themselves (Puspitasari & Nurhayati, 2019).

Module is a type of unit of planned learning activities, designed to assist individual learners in achieving learning goals (Sukiman, 2012). The characteristics of a module are that the module is a unit of learning materials specifically designed so that it can be learned by students independently, modules are complete learning programs systematically followed up referring to clear and measurable learning objectives or competencies, modules contain learning objectives / competencies of materials and activities to achieve goals and evaluation tools for achieving learning objectives, Modules are usually used as self-study materials in distance education systems intended to overcome difficulties for learners who cannot follow conventional face-to-face learning activities in class. The learning module that the researchers developed is a module that contains Natural and Social Sciences subjects which are abbreviated as IPAS in one of the learning contents in the curriculum used in Indonesia. This module is considered important to be developed considering the application in a new curriculum in Indonesia which is also called the Merdeka Curriculum which is adopted from the concept of Ki Hajar Dewantara philosophy and is expected to improve students' skills in critical thinking.

The ability to think critically is needed by students in everyday life to solve a problem in social life because by thinking critically, students are expected to be able to face changes and challenges in life that are always evolving. Critical thinking is very important, therefore students today are directed to be able to think critically as the times develop more and more problems that arise, students are required to think critically to improve the ability to solve problems with strategies that have been planned on a problem.

Critical thinking is reasoned and reflective thinking with emphasis on making decisions about what to believe or do (Ennis, 1996). Critical thinking skills are also defined as activities to analyze ideas or ideas in a more specific direction, distinguish them sharply, select, identify, study and develop them in a more perfect direction according to Wijaya (2010) in the book (Mubiar and Yoga, 2022) critical thinking is a skill that must be developed for students to be able to compete in the 21st century. Critical thinking is the cognitive ability to say something with confidence because it uses logical reasons and strong empirical evidence, critical thinking skills really need to be developed, because critical thinking skills include various abilities, namely, the ability to listen, read carefully, find and determine assumptions, put forward arguments and convince an action based on good knowledge (Hadinugrahaningsih et al., 2017). Critical thinking or critical thinking is one of the 21st century skills that must be mastered by students (Winarniningsih, Adha, & Halim, 2022).

Critical thinking skills are the cognitive process of students in systematically and specifically analyzing the problems faced, distinguishing these problems carefully and thoroughly, and identifying and reviewing information to plan problem-solving strategies (Azizah et al., 2018). Some characteristics of students who are able to think critically are explained by Lau in (M. Azizah et al., 2018), among others: able to understand logical relationships between ideas, able to formulate ideas concisely and precisely, able to identify, build and reevaluate arguments, able to evaluate decisions, able to evaluate evidence and hypotheses, able to detect inconsistencies and common errors in reasoning, able to analyze problems systematically, able to identify the relevance and importance of ideas, able to assess the beliefs and values held by a person, able to evaluate one's thinking ability.

Indicators of critical thinking skills according to Ennis (1996) in the book (Hadinugrahaningsih et al., 2017) which consist of 12 indicators of critical thinking ability which are grouped into 5 aspects of critical thinking ability, the five aspects of critical thinking ability are;

**Tabel I.** Critical Thinking Instructor

Critical Thinking Skills	Sub Critical Thinking Skills
1. Provide Basic Explanation	1. Focusing Questions
	2. Analyzing Arguments
	3. Ask and answer questions
2. Give reasons for a decision	1. Assess the credibility of information sources
	2. Make observations and assess observations



3. Conclude	1. Making deductions and judging deductions
	2. Creating inductions and assessing inductions
	3. Evaluate
4. Further clarification	1. Defining and assessing definitions
	2. Identify assumptions
5. Conjecture and Cohesiveness	1. Suspect
	2. Combines

Enni (1996)

The purpose of this study is to develop modules through a discovery learning approach that can effectively improve students' critical thinking skills that are accurately tested and can meet the objectives of the research.

**METHODS**

The research method used is the research and development model of Brog and Gall (2003) using three main steps of research and development including: 1) Preliminary Studies, 2) Product Development, 3) Product Testing. At the stage of product development, researchers use the ADDIE development model (Branch, 2009). The research instrument uses test questions with plural choices that have been tested for validity and reliability. Product testing is carried out using internal tests and external tests. External test using pretest-posttest control group design (Creswell, 2018). Analysis of effectiveness data using an effect size test to see the amount of influence caused by a product applied.

This research was carried out in the central lampung area, Indonesia, precisely in Way Pengubuan sub-district, the school that was the subject of the study was SD Negeri 5 Lempuyangan Bandar by setting two classes as samples, namely class A as an experimental class and class B as a control class with the number of students from each class was 25 students. This research aims not only to develop module products, but also to test discovery-based learning modules that are effective to improve students' critical thinking skills.

**DISCUSSION**

The results of the research that has been conducted explain several points related to the development of discovery-based learning modules to improve students' critical thinking skills in natural and social science (IPAS) subjects. The process of developing this module is based on an analysis of the needs of educators and students who state the need for the development of learning modules, therefore researchers try to develop learning modules using a discovery learning approach to improve students' critical thinking skills. The results of the student needs analysis are stated based on the distribution of needs analysis with a percentage of 75% and educators state that 78% need to develop the learning module.

At the product development stage, researchers conduct analysis to plan product development, this first analysis is carried out to determine specific learning outcomes to be achieved by students, determine learning models to learning strategies. Researchers used the discovery learning learning model developed by Bruner (1966). Discovery learning is a learning process in which educators must create problematic learning situations, stimulate students with questions, encourage students to seek answers on their own and conduct experiments. Discovery learning learning model Based on Bruner's explanation, researchers concluded that this learning model is very complex process in the classroom. This learning model will encourage students to be able to find concepts or ideas in a lesson. Therefore, researchers choose this learning model to be able to improve students' critical thinking skills.

The preparation of this initial module consists of designing a discovery learning-based module product design with 6 main stages, namely 1) Stimulation, 2) Problem statement, 3) Data collection, 4) Verification, 5) Generalization (Ministry of Education and Culture 2013). Discovery Learning syntax helps many teachers and other researchers in improving their students' abilities if only the model is implemented through proper and well-prepared design related to the teacher's syntax and understanding while applying the model. This discovery learning syntax is applied by researchers as steps that must be completed by students who are involved in the learning module. The module prototype is formed and then the researcher validates experts consisting of material experts, media experts, and linguists to be able to examine the module prototype that the researcher developed. The results of expert validation state unequivocally that the developed prorotype is feasible and valid for use in the ongoing learning process, and in this case the learning module has



met the requirements proposed in the module prototype development process. The results of several experts can be seen based on the following figure.

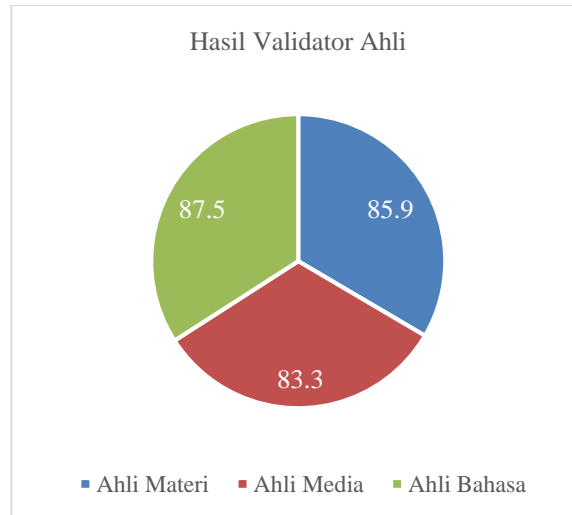


Figure I. Hasil Validator ahli.

The results of validator analysis show that the product can be said to be feasible and valid for use in the learning process. Some of the inputs provided by validators have been followed up and improved to improve the discovery learning-based learning module product. The importance of expert opinion according to researchers can provide suggestions to researchers to improve learning modules that are reviewed directly from several experts. Therefore, the reason researchers validate to several experts.

The next stage is for researchers to test the group that is the target of research, namely students by giving a pretest at the beginning, before learning takes place and a posttest at the end after giving research treatment. This is done to see the effectiveness of using learning modules developed by researchers. The results of external tests are seen from several analytical data such as t-test to see the average difference and effect size test to see the amount of product effectiveness. The results of the t-test must certainly meet the test requirements, namely the normality test and the homogeneity test. After this condition is met, it can be continued on the t-test. The results of t-test data analysis can be seen in the table below.

Table II. Test Results t-test Independent Samples Test

		Levene's Test for Equality of Variances	t-test for Equality of Means								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	Lower	Upper
Result	Equal variances assumed	.702	.404	4.598	118	.000	8.400	1.827	4.782	12.018	
	Equal variances not assumed			4.598	116.607	.000	8.400	1.827	4.781	12.019	

Based on the results of the t-test analysis, the sig (2-tailed) value was  $0.000 < 0.05$  and the tcalculate result was  $4.598 >$  the ttable was 1,657, it can be concluded that there is a significant average increase in students' critical thinking skills. The average test results in the experimental class and the control class are as follows.



Table III. Average

Group Statistics					
	Class	N	Mean	Std. Deviation	Std. Error Mean
Result	Experimental Class	60	77.83	10.540	1.361
	Control Class	60	69.43	9.445	1.219

The results in the table above explain that the average value of the experimental class is 77.83 and in the control class is 69.43 this indicates an increase that occurs in the experimental class, and of course the difference can be seen in the magnitude of the effect size test. The effect size test is a follow-up test to determine the magnitude of the effect or effectiveness of a variable on other variables. Test the magnitude of the effect based on the formula (Cohen, 1988). The results of the effect calculation analysis are as follows:

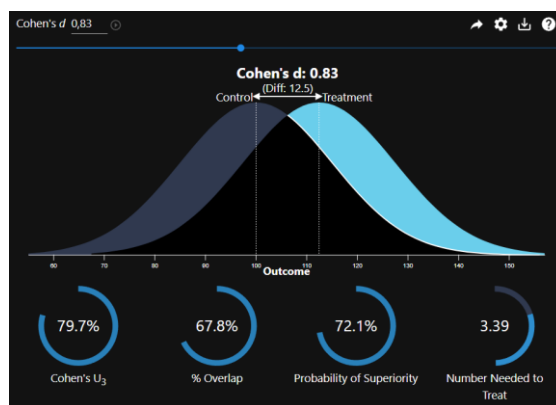


Figure II. Hasil Uji Effect Size

Based on the results of the effect size analysis conducted by the researcher, it is known that the value of Cohen's d is 0.83 with high interpretation.

The effectiveness of the Discovery Learning-based learning module was tested in external tests using experimental classes and control classes using the Pretest-Posttest Control Desing Group research design. This effectiveness test is to measure the effectiveness of a product on the variables of students' critical thinking skills. The effectiveness of this learning module is seen based on statistical data obtained from respondents, namely students who then see the average difference in the experimental class and control class, after which only the amount of effect caused by the product used using the effect size test.

Based on the results of data analysis that has been done, in the experimental class an average of 77.83 and in the control class 69.43. The data stated that there was an average difference that occurred in the experimental group and the control group. This difference can be seen from the group that uses the product, namely the experimental class which when compared to the group class that does not use the developed product. From these results, it can be seen the difference between the group that uses and the group that does not use. This average difference is then studied more deeply using the average difference test, namely the t-test.

The average difference in the experimental class and the control class was analyzed in more depth to see whether or not there was an improvement in the experiments conducted. Based on the results of the analysis carried out, there was an average difference in the experimental group compared to the control group. A significant difference can be seen in the results of the t-test output which states a significance value of  $< 0.05$ , which is 0.00 which states the difference in the increase that occurs in the test group. This difference is then seen the magnitude of the effect caused by the product used, namely by using an effect size test.

The effect size test in this study used Cohen's D formula with a calculation result of 0.83 with a very high interpretation (Cohen, 1988). These results show the magnitude of the effect caused by discovery-based learning modules on students' critical thinking skills. The results of the effect size test can be concluded that discovery learning-based learning modules are effective in improving students' critical thinking skills. Some previous studies have also proven that the use of learning modules can improve students' critical thinking





skills. research conducted by (Dani & Winahyu, 2022) and by (Anggara, 2021) similarly stated that the use of learning modules can improve students' thinking skills.

The previous theory stated that learning modules can improve the learning process independently (Prastowo, 2012). Module is a type of unit of planned learning activities, designed to assist individual learners in achieving learning goals (Sukiman, 2012). Some experts state that modules can effectively improve the quality of the learning process so that they can shape student character and students' critical thinking skills. Therefore, it can be concluded that the development of discovery learning-based learning modules effectively improves the thinking skills of students.

## CONCLUSION

Based on the analysis of research and development data entitled "Development of Discovery Learning-Based Learning Modules to improve the Critical Thinking Skills of Grade IV Elementary School Education Participants" it can be concluded that:

Discovery learning-based learning module products using the ADDIE development model can be said to be valid in content and construct. The validity of the product is proven from the results of the validity analysis which includes material experts, linguists and media experts. Researchers also assessed the use response of students and practitioners, namely educators with very good categories.

Discovery-based learning modules are effectively used in the learning process and can improve the critical thinking skills of grade IV students at SD N 5 Negeri Lempuyang Bandar. This is evidenced based on N-gain with an average of 0.42 with the medium category and effect size of 0.83 with the high category to improve students' critical thinking skills.

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