

Effect of Guided Discovery Method And Problem Solving Method fo Students' Critical Thinking Skills

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Abstract - Aim of this study was to determine the effect method of guided discovery learning and method of problem solving for student's critical thinking skills. The reason for this study is the low level of critical thinking skills. Guided discovery learning method emphasizes constructing knowledge through discovery. Meanwhile problem solving methods emphasis on learning to construct knowledge through problem solving. This research was a quasi experimental with research design called nonequivalent control group design. The study population was all students of class X SMA Negeri 1 Cikarang IIS Cikarang Utara and sample as many as 93 people were taken randomly. Data analysis using SPSS version 21 uses hypothesis testing with statistical parametric, test of mean difference (paired sample t-test) and analysis of variance. The results obtained were influence guided discovery method differs from the conventional method of influence on the critical thinking skills of students in class X IIS 3. Effect of different methods of problem solving with the influence of the conventional method of the critical thinking skills of students in class X IIS 4. The influence of different methods of guided discovery with the effect of the method of problem solving the students' critical thinking skills.

Keywords: *Critical Thinking, Guided Discovery Method, Problem Solving Method.*

I. INTRODUCTION

The issues examined on this study was the low level of critical thinking skills of students. This is due to the learning in the classroom was monotonous, less attractive, and the absorption of students to the material presented was reduced. The learning impact on the low activity of active students and resulted in a lack of ability to think critically.

Students were conditioned to their own to seek solutions and the accompanying knowledge (discovery learning) will produce meaningful knowledge [5]. In a Correspondingly suggests, in order to be successful discovery learning, learners should have the skills of the invention, including the generation of hypotheses, design experiments, prediction and data analysis, as well as regulative skills such as planning and monitoring [10]. Referring to the results of research Njoo and De Jong, the use of learning methods is important, because the impact on the successful achievement of a learning objective that discovery learning can be used to achieve maximum results.

One cause of low ability students' critical thinking is because the learning is still centered on the teacher (teacher-oriented). So learning students should involve in learning in the classroom (student oriented). Methods of student-centered learning and able to encourage students to think critically include guided discovery learning methods and problem solving methods. According to the authors, the effect of the use of this method to the ability of critical thinking could be compared with some of the reasons that these methods have in common, namely:

- This method is centered on the student (student centered)
- Aiming at solving the problem
- Built by the same learning theory (cognitive theory and the theory of constructivism).

Discovery learning method (Discovery Learning) is a learning method that emphasizes the discovery of a previously unknown principle [17]. Discovery learning is defined as a type of learning when a learner constructs their own knowledge by experimenting with a domain, and inferring rules from the result of these experiments. Teachers should provide opportunities for students to gather information, compare, categorize, analyze, integrate and organize and make their conclusions. Learning does not just want to achieve the objectives in the form of learning outcomes (products), but also can shape the learning process. At the time of learning, students should be encouraged to communicate, discuss and perform various activities.

Learning by using methods of problem solving is a way that is born of a fundamental change on student learning [7]. Learning is no longer seen as the process of receiving information to be stored in memory of students, but students learn to approach every issue with the knowledge they already have, assimilate new information and build their own understanding. Solving the problem is important in learning, because learning is in principle a process of interaction of students with their environment. The process takes place in stages starting from receiving stimulus from the environment to provide the appropriate response.

This study focused on the effect of guided discovery methods and methods of problem solving the students' critical

thinking skills. The reason the author chose this method to adjust the curriculum applied in schools where research is a curriculum of 2013. The method according to the curriculum in 2013 is the discovery method and the method that requires students to solve problems (problem solving). Hopefully, through the application of this method has an influence on the students' critical thinking skills. The reasons for selecting teaching methods have also adapted to the learning economy that requires critical thinking skills with the guidance of a teacher.

This study focused on the management of material on the grounds of material management is able to evoke the students' critical thinking skills, where the materials management presented the topic accompanied with a case that stimulate students to think critically. Material management have basic competencies, students are expected to describe the concept of management and apply the concept of manaejemen in school activities. In accordance with the basic competencies expected, then the teacher can lead students to the achievement of students' critical thinking skills. According to Beyer [6] Critical thinking is the discipline of thinking used one to evaluate the validity of the statements, ideas, and arguments.

According to Ausubel, studied are grouped into two parts [5], which relate to information or material presented teacher to student through acceptance or discovery and linking information presented on the cognitive structure that includes facts, concepts, and generalizations are studied and remembered by students.

According [5], the theory of constructivism emphasis on teaching and learning activities that played a key role in business critical thinking skills. The knowledge gained by the construction process through the stages of equilibration between schemes and new experiences. From the description, the problem in this research is to look at the findings:

- The difference between the effect of the learning method that uses guided discovery by conventional methods to the students' critical thinking skills.
- The difference between the effects of learning using problem solving methods by which using conventional methods to the students' critical thinking skills
- The difference between the effects of learning using guided discovery by using the method of problem solving the students' critical thinking skills.

II. LITERATURE REVIEW

A. Critical Thinking

Ennis [18] to introduce critical thinking as reflective thinking that is focused on making decisions about what is believed to be or do. Critical thinking is a process of expressing objectives include explicit reason of a trust and the activities that have been carried out. According Helpen [14] defines critical thinking as the use of cognitive skills and

strategies that increase of the probability of desirable outcomes.

Critical thinking is thinking skills that require cognitive process and invites students to think reflectively on the issues. Limitation of critical thinking that a more comprehensive forward by [19] as a self-regulating in deciding (judging) something that results in interpretation, analysis, evaluation and inference or exposure using a proof of concept, methodology, criteria or considerations of contextual as the basis for decisions in critical thinking.

Critical thinking activities include:

- Pay attention to the details thoroughly
- Identify trends and patterns, such as mapping the information, identifying similarity and dissimilarity
- Repeating the observation to make sure nothing is missed
- Looking at the information from various viewpoints
- Choose solutions preferred objectively
- Consider the impact and long-term consequences of the chosen solution

The characteristics of people who have the critical thinking skills can be described as follows:

- Know in detail the parts of the whole.
- Clever in detecting problems.
- Being able to distinguish between ideas that are relevant to irrelevant.
- Being able to distinguish fact from opinion.
- Be able to identify the differences.
- Can distinguish logical and illogical arguments.
- Able to develop criteria or standards of assessment data.
- It can collect data for factual verification.
- Can distinguish between constructive criticism and destructive.
- Being able to test the assumptions carefully.
- Being able to examine the idea that conflict with events in the environment.
- Being able to identify the attributes of human beings, places and objects such as in nature, shape, form and other
- Ability to register all the possible consequences or alternative solutions to problems, ideas and situations.
- Being able to make a connection sequence between one problem with another problem.

- Being able to draw conclusions from the existing data and selected.
- Able to provide proofs conducive.

B. Guided Discovery Method

Hamalik, [17] states that guided discovery learning is a two-way system where the learning process involves students and teachers. Students perform the invention (discovery) and teachers play in providing guidance (guided) by analyzing the difficulties in solving the problems faced by students. Syntax guided discovery include: 1) Orientation 2) Hypothesis generation 3) Hypothesis testing. 4) Conclusion 5) Regulation. Teachers have a number of competencies and behaviors that can be observed in the conduct guided discovery learning such as 1) Organize the physical unit in teaching in order to encourage the emergence of the idea of the students in learning discovery. 2) Assist students in explaining the roles that need to be done through a process of deliberation. 3) check student understanding of a given problem to start learning discovery. 4) Provide opportunities for the student to put the knowledge they have found to his friends to collect and reconstruct the data, so that they gain new understanding. 5) Listen to and provide a learning experience that allows students to develop their own responses-responses. Model guided discovery learning is a learning model that the implementation is done by the students based on the instructions of teachers.

According [22], guided discovery learning model measures specifically are as follows:

- Formulate the problem that will be given to students with the data sufficiently, the formulation must be clear, avoid statements that led to the wrong so that the direction the student is not wrong.
- From the data provided by the teacher, students compile, process, organize, and analyze data. In this case, the guidance teachers can be given only to the extent necessary. This guidance should lead students to move in the direction you want addressed, through questions, or LKS.
- Students prepare conjecture (forecasts) on the results of the analysis done.
- If deemed necessary, a conjecture that students have made the above is checked by the teacher. It is important to convince the truth forecasts of students, so that will be the direction to be achieved.
- When have gained certainty about the truth of the conjecture, the conjecture verbalization should be submitted also to the students to menyusunya. Besides, it should be remembered that the induction does not guarantee 100% the truth of the conjecture.
- After students find what they need, teachers should provide exercises or additional questions to examine whether the findings were true.

C. Problem Solving Method

Problem solving method is a method that would stimulate students to think, analyze an issue so as to find a solution. This method can prevent someone make hasty conclusions, weighing a variety of possible solutions, and suspend the decision until there is sufficient evidence [20]. Using the methods of problem solving in learning activities can help students to have the ability to think in solving certain problems either individually or in groups [21]. Importance of learning strategies for problem solving that put pressure on solving a problem through the ability to think logically.

There are three main features of the solution according to Suwito [2], namely: 1) problem solving is a series of learning activities, in practice problem solving has a number of activities that must be performed by students. Students listen, take notes, and memorize material and is expected to be actively thinking, searching, processing data, and concluded, 2) learning activities directed to resolve the problem, 3) issue was dealt with using the approach to think scientifically.

There are five steps in the resolution of problems, especially in the learning economy, namely:

- define the problem, to formulate the problems encountered in the learning process of the economy with the aim that students clearly know what problem will be assessed.
- Diagnosing problems. Learners define clearly what the problems, the causes of these problems and to analyze what factors should be held to resolve the problem.
- Formulate alternative strategies. Learners lays out alternatives that can be used as a strategy to solve the problem. Learners are encouraged to participate actively in class to express their opinions regarding the alternative which is owned and organized by the diagnosis of a problem that had been predetermined.
- Define and implement a strategy of choice. The decision on the strategy that has been formulated applied in the troubleshooting process.
- To evaluate the process and the evaluation of the results of all activities to solve problems and the results have been obtained.

III. RESEARCH METHODOLOGY

This study use quasi-experimental research design with nonequivalent control group design study. The object of research involved 93 students who are students of class X IIS 3, X IIS 4 and IIS 5 X SMAN 1 Cikarang Utara. Instruments in the collection of data is formed form test of critical thinking skills.. Statistical testing is done by using the average difference test (paired sample t-test) using SPSS 21 software for which data were tested for normality and homogeneity.

IV. RESULTS AND DISCUSSION

The first will be seen that there is the effect of the treatment on the ability to think critically.

TABLE 1. TESTS OF BETWEEN-SUBJECTS EFFECTS

Dependent Variable: G1G2Gc

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	100.543 ^a	2	50.271	12.453	.000
Intercept	2197.590	1	2197.590	544.355	.000
KODE8	100.543	2	50.271	12.453	.000
Error	367.372	91	4.037		
Total	2680.000	94			
Corrected Total	467.915	93			

a. R Squared = .215 (Adjusted R Squared = .198)

From Table 1, the value of sig. <0.05. It can be concluded that there is a significant treatment effect on the ability to think critically. Furthermore, it will be seen whether each treatment the experimental class and control class had a significant difference.

TABLE 2. MULTIPLE COMPARISON

Dependent Variable: G1G2Gc

Scheffe

(I) KODE8	(J) KODE8	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
E1	E2	2.0232	.50835	.001	.7831	3.2833
	C	2.3135 [*]	.50835	.000	1.0534	3.5736
E2	E1	-2.0232	.50835	.001	-3.2833	-.7831
	C	.2903	.51035	.851	-.9797	1.5604
C	E1	-2.3135	.50835	.000	-3.5736	-1.0534
	E2	-.2903	.51035	.851	-1.5604	.9797

Based on observed means.

The error term is Mean Square(Error) = 4.037.

*. The mean difference is significant at the .05 level.

From Table 2, differences in the effect of each treatment was described as follows:

- For E1 and C, sig. <0.05, so H₀ is rejected. It can be concluded that there are significant differences between the treatment effect in the experimental class 1 and class control of students' critical thinking skills.
- For E2 and C, sig. > 0,05 so that H₀ is accepted. It can be concluded that there is no significant difference between the treatment effect of the experimental class 2 and class control of students' critical thinking skills.
- For E1 and E2, sig. <0.05, so H₀ is rejected. It can be concluded that there are significant differences between the treatment effect in the experimental class 1 and class 2 experiments to the students' critical thinking skills.

A. *Effect of Guided Discovery Method To The Students' Critical Thinking Skills*

From the research results can be seen that there are differences in the average significantly on the average critical thinking skills between before treatment and after treatment.

The presence of the average difference in the meaning that the treatment guided discovery method significantly affect students' critical thinking skills. Critical thinking skills of students before being treated have differences with the ability to think critically after a given treatment. This is consistent with previous studies [9] as saying that the method of guided discovery learning significantly affect students' critical thinking skills.

B. *Effect of Problem Solving Method To The Students' Critical Thinking Skills*

From the research results can be seen that there are differences in the average significantly on the average critical thinking skills between before treatment and after treatment. The presence of the average difference in the meaning that the treatment problem solving methods significantly affect students' critical thinking skills. Critical thinking skills of students before being treated have differences with the ability to think critically after a given treatment. This is consistent with previous studies [4] [16] [2] which says that the problem solving learning method significantly affect students' critical thinking skills.

C. *Differences In The Effects Of Discovery Learning Methods, Problem Solving Methods And Conventional Methods On The Students' Critical Thinking Skills*

Differences in the effect of each treatment on each of the experimental and control classes showed that the influence exerted by each of the treatment of the students' thinking skills are not the same. Critical thinking skills of students in the classes taught by the guided discovery method has differences with the critical thinking skills of students in the classes taught by the problem solving method.

V. CONCLUSION

The results of this study concluded that the application of the method of guided discovery and problem solving method is a method of learning had an influence on the students' critical thinking skills. Based on the formulation of the problem and the hypothesis of the proposed research and the results of data analysis and discussion presented, it can be concluded that there is a difference in treatment effect significantly by using guided discovery method and problem solving method. The effect of guided discovery method is different from the effect of the method of problem solving the students' critical thinking skills.

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