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Implementation of Guided Inquiry Learning To Improve The Critical Thinking Skills of Junior High School Students

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Abstract

Science learning is expected to provide students with the provision to grow and improve critical thinking skills. Someone who has the ability to think critically can identify strategies and make the right decisions in problem solving. The results of previous studies indicate that junior high school students' critical thinking skills are in low category. This study aims to analyze the improvement of students' critical thinking skills through guided inquiry learning. Guided inquiry learning is one of innovative learning that is appropriately applied to science learning, because students can be actively involved in the learning process to search and investigate systematically with teacher guidance. The design of this study used quasi experiment with non-equivalent control group design. Students' critical thinking skills are measured using 27 multiple choices. The results showed that critical thinking skills of experiment group were higher than those control group and the improvement of students' critical thinking skills in aspects elementary clarification, basic support, inference, advanced clarification of experiment group higher than control group, while aspects strategy and tactics of experiment and control group have different increases in the same category.

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INTRODUCTION

Humans are always required to be able to adjust to the times that require the development of the quality of human resources in the field of education to be able to overcome complex problems and challenges. Thus, education must prepare a generation that has personality, skillful, skilled, critical and creative thinking, so that it is able to answer the problems and challenges it faces. The Minister of National Education Regulation Number 64 of 2013 states that improving the quality of education should be given from low levels to high levels in science learning.

Through science learning, students can learn knowledge and science process skills that can be used daily. The science learning process emphasizes providing direct experience to develop competencies in order to explore and understand the natural environment scientifically (Tias, 2017). Science learning is expected to provide students with supplies regarding critical thinking skills. Critical thinking skills are part of the higher order thinking skills (HOTS) (Ramos et al., 2013). It's also a component of 21st century intelligence in addition to creativity, collaboration and communication (Sajidan & Afandi, 2017).

Higher order thinking skills is the ability to connect, manipulate, and transform the knowledge and experience that is already owned (Rofiah et al., 2013). Information on learning outcomes if processed through higher order thinking can be recalled more clearly so that it is more possible to solve new problems encountered. The ability to think critically is needed by students to be able to compete in the world of work and personal life (Peter, 2012).

Critical thinking is a kind of ability to see events, conditions or thoughts with a careful eye and make comments, decisions, study the reliability and validity of knowledge according to logical and thought standards (Seferoglu & Akbiyik, 2006). Critical thinking ability that is owned by a person can be recognized by the characteristics of critical thinking skills possessed (Haryani, 2011). Students who think critically will always look for and apply relationships between problems discussed with problems or other relevant experiences (Dwijananti & Yulianti, 2010).

In fact, science learning that has taken place in Indonesia has not yet had a maximum impact on improving students' critical thinking skills. The results of a previous research study by Saputro et al. (2016), revealed that students' critical thinking skills were still low at 28.6%. This is known based on the answer to the question which shows that most students still have difficulty in applying the knowledge and concepts they already have to be applied in solving problems in the test questions. This opinion is reinforced by the results of research conducted by Hidayanti et al. (2016), states that the average value of critical thinking skills of students in each indicator is still relatively low, which is below 50%. This is due to the lack of students 'initial knowledge, students cannot apply the concept well, students' low ability to evaluate, inference, interpretation, and analysis.

The purpose of science learning related to improving students' critical thinking skills is achieved, it can be done by applying learning that involves students directly and is active in investigations. Critical thinking is the ability needed to identify the right strategy and decision making in solving problems effectively (Hoffman & Elwin, 2004). Learning that instills critical thinking skills can prepare students for college level, future work, and community and state life situations (Stobaugh, 2013).

The effectiveness of critical thinking is influenced by the state of the learning environment which consists of instructional variables (teaching strategies and instructional approaches in critical thinking), and to a certain extent determined by variables related to students (year level and previous academic performance) (Tiruneh et al., 2013). Professional teachers must examine more closely how to apply learning or interpret educational standards and objectives associated with the application of critical thinking across disciplines (Thompson, 2011). Indicators to find out students who have critical thinking skills: (1) elementary

clarification; (2) basic support; (3) inference; (4) advance clarivication; (5) strategies and tactics (Ennis, 1985).

Critical thinking is not a characteristic from birth but must be taught and developed. In schools, a teacher is required to be able to organize, choose and apply learning strategies that are suitable with the conditions of students and the environment being taught, so that the set learning objectives can be achieved (Maretasari et al., 2012).

An effective learning model to overcome students' low critical thinking skills is inquiry learning. Inquiry learning is a learning with a series of activities that emphasize the process of thinking critically and analytically to find and find out for themselves the answers to a questioned problem (Wiyanto et al., 2017). It's one of the innovative learning methods that is appropriate for use in science learning, because students can be actively involved in the learning process to systematically search and investigate (Aristianti et al., 2018). It does not only require students to master the subject matter, but how they can use their potential (Habibah et al., 2017).

The results of previous studies conducted by Budiarti et al. (2016) & Astuti et al. (2016) state that there is an increase in students' critical thinking skills in the classes applied in inquiry learning. Inquiry learning requires students to identify and assume, use critical thinking, logically, and considerations of explanation (Usdalifat et al., 2016).

Inquiry learning is divided into four levels based on the level of openness and cognitive demands needed. The simplest level of inquiry, namely (1) structured inquiry; (2) guided inquiry; (3) open Inquiry; (4) learning cycle (Banchi & Bell, 2008). Seeing the subject is seventh grade junior high school students, the right type of inquiry is guided inquiry. Guided inquiry is used for students who are less experienced in inquiry learning (Dewi et al., 2013).

Guided inquiry is a learning where the teacher gives problems and investigation procedures, while students in groups determine the investigation process and conclude (Zion & Mendelovici, 2012). It also allows students to move step by step from identifying problems that define hypothetical problem formulation, data collection, verification of results, and generalization to the conclusion of conclusions (Mathew et al., 2013). The role of the teacher during the guided inquiry learning process is as a nursery and facilitator. The stages of inquiry learning used in this research are: (1) investigating a phenomenon; (2) focusing on questions: (3) planning investigations; (4) investigations; (5) analyze data and evidence; (6) building new knowledge; and (7) communicating new knowledge (Llewellyn, 2013).

This study aims to analyze the improvement of students' critical thinking skills in aspects of elementary clarification, basic support, inference, advance clericalation, strategies and tactics through the implementation of guided inquiry learning. Theoretically the study of this study contributes conceptually to the progress and development of learning in schools, especially the improvement of critical thinking skills.

METHODS

Type of this research is quantitative quasi-experiment using non-equivalent control group design. This research was conducted in class VII of SMP Negeri 1 Margorejo Pati in the academic year 2018/2019. The sampling technique was done by cluster random sampling which was taken as many as two classes from five classes. One class as an experiment group which amounted to 30 students, and one class as a control group totaling 30 students. The instrument used 27 multiple choices test questions based on the ability to think critically on material classification material and its changes.

The initial step of the research is to do the pretest in the experimental and control classes. The aim is to find out students' critical thinking skills at the beginning of the two classes. The

next step, conducting learning by applying guided inquiry learning in experiment class and direct instruction learning in control class. Then, posttest was conducted to determine students' critical thinking skills after being given treatment. Data from the research results obtained in the form of pretest and posttest values. Furthermore, it was analyzed using the N-gain test and t test to determine the increase and difference in improving students' critical thinking skills through the implementation of guided inquiry and direct instruction.

RESULTS AND DISCUSSION

The results of the study are based on tests of students' critical thinking skills with aspects of elementary clarification, basic support, inference, advance clarivication, strategies and tactics. N-gain test is used to determine the improvement of students' critical thinking skills. Improvement of students' critical thinking skills based on pretest and posttest data from the experiment and control class can be presented in Table 1.

Table 1. N-gain Test Result Critical Thinking

Class	*Pretest*	*Posttest*	N-gain	Category
Control	31	61	0.41	Medium
Experiment	33	77	0.65	Medium

Table 1 shows an increase critical thinking skills of experiment class is higher than control. If viewed from each aspect of critical thinking skills, the increasing of experiment class higher than control as show in Table 2.

Table 2. N-gain Test Result Every Aspect of Critical Thinking

Indicator	N-gain				Description
	Control	Category	Experiment	Category	
Elementary clarification	0.38	Medium	0.62	Medium	N-gain experiment class > control class
Basic support	0.42	Medium	0.63	Medium	
Inference	0.27	Low	0.54	Medium	
Advance clarification	0.21	Low	0.72	High	
Strategies and tactics	0.43	Medium	0.49	Medium	

Table 2 shows the magnitude of the increase in critical thinking skills of the experiment class students on aspects of elementary clarification, basic support, inference, strategies and tactics having an increase medium category, in aspect advance clarification increasing high category. In control class on aspect of elementary clarification, basic support, strategies and tactics has increased with the medium category, the aspects of inference and advance clarification have increased low category.

The t-test was used to determine the difference in average and increase the critical thinking skills of the experiment and control class students. The data used for t-test were the values of pretest, posttest, and N-gain the experiment and control class on material classification material and its changes. The results t-test analysis are presented Table 3.

Table 3. t-test Result Critical thinking

Value	Experiment	Control	t_{count}	Sig 5%	Description
Pretest	33	31	0.64	1.67	Insignificant
Posttest	77	61	6.19	1.67	Significant
N-gain	0.65	0.41	5.94	1.67	Significant

Table 3 shows the average value of the pretest experiment and control class showing insignificant differences. The posttest and N-gain average values of the experiment and control classes showed significant differences. The average values of pretest, posttest, and N-gain in each aspect are presented in Table 4.

Table 4 shows the average values of the experiment and control class pretest showing insignificant differences in each aspect. This means that both classes have initial critical thinking skills in every aspect of the same. This fulfills one of the characteristics of experiment research proposed by Duda (2010), that the equivalence of subjects in different groups needs to be present, so that if the results obtained differ by groups it is not due to the non-equivalence of the groups, but because of treatment.

The difference in average value of the experiment and control class posttest on aspects elementary clarification, basic support, inference, advanced clarification showed significant differences, whereas in aspect strategy and tactics showed insignificant differences. Increasing students' critical thinking skills in aspects elementary clarification, basic support, inference, advanced clarification have significant differences, while in aspect strategy and tactics have insignificant differences.

According to Chebii et al. (2012), the difference in improvement of significant critical thinking skills between the experiment and control class because students learn better when teaching methodologies allow students to be actively involved in classroom activities, so students do not get bored and easily absorb what is learned. Activities in guided inquiry learning are more appropriate and effective facilities because they provide more opportunities for students to develop their thoughts (Falahudin et al., 2016).

Table 4. t-test Result Every Aspect of Critical Thinking

Indicator	Pretest		Sig 5%	t_{count}	Description
	E	K			
Elementary clarification	37	34	1.67	0.78	Insignificant
Basic support	28	28	1.67	0	Insignificant
Inference	34	33	1.67	0.79	Insignificant
Advanced clarification	39	27	1.67	0.74	Insignificant
Strategies and tactics	32	33	1.67	-0.13	Insignificant
Indicator	**Posttest**		**Sig 5%**	**t_{count}**	**Description**
	E	K			
Elementary clarification	77	60	1.67	4.36	Significant
Basic support	75	64	1.67	1.99	Significant
Inference	73	62	1.67	2.14	Significant
Advanced clarification	87	54	1.67	4.69	Significant
Strategies and tactics	69	64	1.67	1.04	Insignificant
Indicator	**N-gain**		**Sig 5%**	**t_{count}**	**Description**
	E	K			
Elementary clarification	0.62	0.38	1.67	4.08	Significant
Basic support	0.63	0.42	1.67	2.08	Significant
Inference	0.54	0.27	1.67	1.76	Significant
Advanced clarification	0.72	0.21	1.67	3.09	Significant
Strategies and tactics	0.49	0.43	1.67	0.62	Insignificant

The component used in the aspect of elementary clarification is to focus on the question. Focusing on the question is the critical thinking skills of students in identifying a question or problem in a focused and directed manner so that the perceptions that are obtained do not deviate from the subject matter being addressed. The improvement of the ability to think critically in the aspect of elementary clarification of the experiment and control class has the skills to focus on relatively the same questions.

According to Sulistiyawati & Andriani (2017), differences in abilities that are relatively the same in both treatment classes can be caused by relatively similar learning experiences. According to Syah et al. (2016), the learning process in control class of students is given a problem and the teacher explains in detail and in order to solve the problem so that when given a test students can provide a simple explanation of the problem with the desired answer. Different from experiment class after giving a problem, students are invited to find their own solutions to a problem and not all problems are discussed in detail by the teacher, the teacher only explains when there is a concept error so that more students train in giving a simple explanation.

The component used in the aspect of basic support is to consider the source of whether it can be trusted or not, observe and use the observation report. Improving the ability to think critically in aspects of basic support in the experiment and control class has the skills to consider the sources of whether they can be trusted or not, observe and use relatively similar observational reports.

Learning carried out in both classes is relatively the same, students together in groups are invited to observe, investigate and search for information then consider the results of investigations obtained to arrange problem solving. Broadbear (2003) argues, investigative activities that demand observation of phenomena will develop students' critical thinking abilities. According to Curto & Bayer (2005), critical thinking can be developed by enriching meaningful student experiences.

Components used in the aspect of inference are skills in inducing and considering an induction, and making or determining valuable judgments. Increasing the ability to think critically in the aspect of inference from the experiment class an increase medium category, and the control class an increase low category. These results indicate that there is a significant effect due to the treatment carried out in both classes towards conclusions.

According to Masitoh et al. (2017), the difference is caused by guided inquiry learning students obtain information independently through several literatures, several investigative activities and group discussions to prove hypotheses with teacher guidance so that students are better at mastering and applying concepts. When given a question, students are able to identify and choose the elements needed to make conclusions. In the control class, students obtain information on mastery of the concept through teacher explanation as a source of information, several investigative activities and group discussions to prove the hypothesis, so students are less able to master and apply the concept well. According to Syah et al. (2016), group discussion of exchange of opinions between students in groups also gives influence in decision-making deliberations.

The component used in the aspect of advance clarification is the skill in defining terms and identifying assumptions. The increase in the ability to think critically in the aspect of advanced clarification on the experiment class an increase high category, and the control class an increase low category. These results indicate that there is a significant effect due to the treatment carried out in both classes on the skills of providing further explanation.

The significant difference is due to guided inquiry learning, through discussion and analysis activities students are required to be able to identify assumptions and state whether there are links or not between these assumptions, so students can be involved optimally because they build their own understanding and are active in discussion, so students don't just get knowledge passively. In

the control class students are less able to master and apply the concept properly so that the results of discussion and exchange of opinions with the group are not optimal. According to Rahma (2012), learning that requires students to be optimally involved in the learning process can improve students' critical thinking skills.

Components used in managing aspects of strategy and tactics are determining actions. Students in determining an action are faced to be able to choose criteria in considering solving a problem. Students are asked to analyze what happened, determine and decide on an action in solving the problem by considering the existing criteria. The increase in the ability to think critically in aspects regulating the strategies and tactics of the experiment and control class experienced a relatively similar increase.

Learning carried out in both classes was implemented by conducting discussions. When viewed from the activities carried out, the two kels did not conduct activities that were much different, except that in the experimental class students designed an investigation with their own ideas to answer questions or resolve problems. This aspect can be trained through discussion activities to arrange strategies and tactics in answering questions or overcoming problems. In the control class discussion activities did not run optimally, but not individually. There were several students in the group who now understood, but the next day confused again. According to Kim et al. (2012), the lack of follow-up in the form of individual exercises causes students to be less trained independently.

CONCLUSION

Based on the results of research and discussion above, it can be concluded that the increase in critical thinking skills of the experiment and control class on aspects elementary clartification, basic support, inference, advance clarification has a significant difference in improvement. The experiment class students obtained a higher increase than the control class. In the aspect strategies and tactics of the experiment and control class, there were differences in non-significant increases.

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