

The Importance of Inquiry Learning for Training student's Thinking Skill in Secondary School

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Abstract. The application of inquiry based learning is important to be developed in education, because it trains the students to investigate the problems and find the solutions independently by having thinking skills. This research aims to determine the effects of usage of Inquiry learning for training students' thinking skill in Secondary school. This study is quasi-experimental design of post-test only. Two equivalent student groups in secondary school were offered a topic on material classification with different Inquiry learning methods. The Inquiry method were discussion method and PQRST (*Preview Question Read Summary Test*) method. The teacher used discussion method for the first group, while the second group used PQRST (*Preview Question Read Summary Test*) method. Effectiveness of different instructional methods was measured quantitatively by an achievement test. The analysis result of post-test showed that there was significantly different between first group and second group at a significance level of 0.05 for the interest of the second group. According to these findings, we suggest applying PQRST (*Preview Question Read Summary Test*) method instead of discussion method for training students's thinking skill in secondary school.

INTRODUCTION

UNESCO Science Report 2010 explicitly states that the key to the glory of a nation or country in the globalization era lies in the quality of its human resources that master science and technology. Developing students' thinking skill is the main goal of education in societies around the world. The ability to think critically is a basic process in a dynamic state that allows students to cope with and reduce future uncertainty [1]. The low students' critical thinking skills have an impact on the low quality of educational graduates, especially in terms of science competence and its application in daily life, and resulting in not being able to compete with other nations [2].

The curriculum 2013 uses scientific approach. The inquiry learning model is relevant with the scientific approach which is applied in the curriculum 2013. Steps in the inquiry model awaken students' curiosity towards something, produce an answer, and draw conclusions and make valid decisions to answer the problems supported by the evidence, then use conclusions to analyze new data [3].

The inquiry learning model consists of several stages, that are: *introducing, questioning, planning, implementing, concluding* and *reporting* [4]. Inquiry learning model is a series of learning activities that emphasize the critical thinking and analysis process to seek and find the answer of the problems. In inquiry learning, students are required to think critically because students have to solve their own problems by finding informations or necessary data so that the students can answer the problems and draw conclusions from the problem [5]. The advantages of using inquiry learning model is to stimulate students' desire to know, motivate them to continue their work so that they are able to find the answers and students learn to find problems independently by having critical thinking skill [6]. Inquiry learning is better used in science classes, because it allows students to learn how to think, develop process skills, and tend to participate in learning actively [7].

Teacher's correct perception of teaching methods has a key role in students' disposition to critical thinking [8]. Aside from using this model, the teachers must change the learning method that they used in the

classroom. Traditional learning method (lecture method) does not challenge students' thinking skills [9]. The method which is combined with the inquiry model is the discussion and the PQRST method. As we know that classification in science learning material and its alterations have its characteristics in the form of a lot of text and abstract so it is difficult to understand, because of that appropriate methods and its visualization are needed. Discussion and PQRST methods will be in accordance with the characteristics of the material, as both of these methods will correspond to the visualization of the classification materials and their alterations.

Discussion and PQRST methods, in its implementation in the classroom, are using inquiry approach which are suitable with the characteristics of junior high school students. Discussion and PQRST method are student-centred learning that can help students to understand different perspectives and think more critically and reflectively about their own assumptions and values in relation to doing the research [10].

Discussion method is a way of presenting a lesson in which the students are faced with a problem that can be a statement or a question which is problematic to be discussed and solved together. Discussion differs from conversation. This is because the conversation can occur freely and it is not tied only with a particular problem, but also can be with many things even if there is no relation with learning activities and in accordance with the wishes of the speaker [11].

Symmetric application of PQRST method can improve students' understanding and assimilation of teaching materials. In the application of this method, the teacher has full responsibility in the preview and read steps. In the question, state and test steps, the interaction between teacher and student is increasingly intense, and the students are actively involved in the process [12]. In this method, the students are required to think how to explain the material by using their own words either individually or in groups.

Generally, this research aims to determine the influence of the use of learning methods to train students' critical thinking skills. This analysis is very useful in providing a real portrait and the impact of appropriate learning methods (discussion methods and PQRST methods) on students' thinking skills.

EXPERIMENTAL

This method used in this study is quasi-experimental and designed with post-test only which are expressed with the symbols below.

TABLE 1. Experimental Design

Experimental Group	Intervention	Post-test
1	X ₁	O ₁
2	X ₂	O ₂

Key:

X₁ : Treatment 1 (using discussion method)

X₂ : Treatment 2 (using PQRST method)

O₁ : Post-test group 1

O₂ : Post-test group 2

The population study for this experiment includes all the seventh grade students in secondary school of SMP 1 Masaran, one of developing secondary schools in Indonesia. Sampling was done by cluster random sampling method. The participants were taken from two classes which consist of 64 students, aged 12-15 years. Both groups were taught with the same contents. The teacher used discussion method for the first group, while the second group used PQRST method.

The work was attempted to establish empirically whether the appropriate instructional methods was important for training students' thinking skill in secondary school. The efficiency was determined quantitatively by instruments (written test and archives of students' outcome). The written test was used to measure students' thinking skills after learning activity. It contained 7 questions that were matched up by indicator of critical thinking [13]: interpretation, analysis, evaluation, inference, explanation, and self-regulation. The instruments were developed to assess the research finding claims. The content of its instruments were validated by two educational experts in Sebelas Maret University.

It has 5 stages to implement this research, (1) selecting experimental group, (2) discussing inquiry learning in secondary school to the teachers, (3) implementing discussion and PQRST methods, (4) implementing post-test, and (5) analyzing the data and presenting the results.

RESULTS AND DISCUSSION

The critical thinking instruments that have been validated by the experts were tested in SMP N 1 Masaran in order to know the influence of the use of inquiry learning for training students' thinking skills. After the instruments were tested on the students, the data were obtained in the form of post-test of students' performances after they learnt using inquiry learning (discussion method for the first group and PQRST method for the second group). The pre-requisite test that must be done in this research is normality and homogeneity test. The statistics used in the comparative test is parametric statistical, if the data is normally distributed and homogeneous, but if the data is not normally distributed or not homogeneous, the statistics used in the comparative test is non-parametric statistical. The data were called normally distributed and homogeneous if the probability value or significance value calculation data is greater than 0.05 (Sig.> 0.05). The summary of the results of normality and homogeneity test are presented in Table 2 and Table 3.

TABLE 2. Results of normality test

Research group	Kolmogorov-Smirnov		A	Conclusion
	N	Sig.		
1	32	0,108	0,05	Normally distributed
2	33	0,150	0,05	Normally distributed

TABLE 3. Results of homogeneity test

N	Levene test			α	Conclusion
	Statistic	Df	Sig.		
64	2,753	62	0,417	0,05	Homogeneous

Based on normality and homogeneity test, the type of comparative test statistics used in this research is parametric statistical with independent sample t-test analysis. The data can be said to have a significantly difference between the first group and the second group on students' thinking skills, if the value of the calculation of significance (sig.) is smaller than the significance level used in this research ($\alpha = 5\%$ (0.05)). The summary of the results of independent t-test are presented in Table 4.

TABLE 4. Results of independet t-test

Research groups	N	Mean	Sig.	A	Conclusion
1	32	64,68	0,518	0,05	There is significantly different between the first group and the second group on students' thinking skills.
2	32	68,19			

Based on the results above, it can be seen that the students in the first group who used PQRST method showed that their post-test scores were significantly higher than the scores of the second group which were used discussion method. It can be happened because using appropriate teaching methods will influence students' outcomes. [14] stated that presenting a research-based learning model, it meant that the students built their own knowledge, students freed to choose learning materials during the investigation on the schoolyard's habitat, and contacted with peer during the investigation, discussed the findings and utilized learning resources to enhance learning. In this research, classroom was used as learning facility in conducting learning activities. Classroom learning can use instructional methods and learning technologies by familiarizing with student-centered thinking and training [15]. Discussion and PQRST methods are student-centered learning methods and it has both advantages and disadvantages, so supervision is needed in the implementation so that the desired learning objectives can be achieved.

Inquiry activities provide the best opportunity to build knowledge through discovery. Inquiry science is composed from discovery process by practicing calculating, analyzing and illustrating the conclusions of events [16]. [17] suggest that inquiry learning models can improve the invention of the concept , sharpen students' thinking skills and increase their learning outcomes. The inquiry learning model has a syntax that engages students in active teaching, trains their thinking skills and draws conclusions based on the existing data[18]. Inquiry teachers used waiting time, questions, silence, and other techniques to initiate and extend students thinking. Inquiry teaching is an approach that is combining students' wonder and curiosity which inspires them to observe and give reasons, and it also helps them to sharpen their critical-thinking and

communication skills. Without a skilled-teacher guiding the students in their learning, however, inquiry would not be able to happen [19].

Inquiry learning model combined with PQRST method will train the students to think because it has systematic steps and in its implementation, it influences the learning outcomes. In addition, PQRST method is a method that is able to increase students' creativity. The PQRST method is a creative learning method; PQRST provides an opportunity to think critically and systematically in working on the text [20]. The students who learn using PQRST method are having the opportunity to define hypotheses, identify variables, collect the informations and collect the data. The activities contained in this PQRST method will create a meaningful process of learning, so that not only can improve understanding of science discourse, but also the students can maintain their long-term understanding in order to be meaningful in daily life [21]. Where as the students who learn using discussion method do not have the opportunity to do direct activities.

Discussion methods are likely to dominate the collective features of classroom learning and it may prevent individuals from practicing critical thinking at the classroom level, also, it will give less opportunities for the students to observe their critical thinking behavior in the class [22]. Teachers' understanding on using appropriate teaching methods and its factors that influence an effective learning are important in the learning activities as it will improve the students' performance and many motivational variables of the students such as the tendency to think critically [8].

As one of the higher-order thinking activities, critical thinking is one of the metacognition processes of a person [23]. It is because critical thinking is part of an active process whereby a person is trained to analyze, evaluate and make the conclusion. A person who has critical thinking skill tends to get better learning outcomes when active learning approaches like inquiry [24]. Therefore, if a person is continuously trained to think critically, it is likely to increase his/her skill to conclude something logically on the fact-based problem that occurs.

CONCLUSION

This research showed that the appropriate inquiry learning for training students' thinking skill on secondary school is PQRST method over discussion method. It is referred the finding of this research that students who used PQRST method showed a significantly higher post-test scores than the students who used discussion method. This research is limited by the setting, the small sample size, and various issues (students' prior knowledge, students' learning style, students' learning process, number of students in the class, time limitation, etc.) that have to be concerned for successful implementation. This learning activities should be repeated with another group of students in order to get more conclusive results. Also, implementation in a longer period would be satisfied.

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