Critical thinking ability junior high school student’s with process oriented guided inquiry model

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Abstract. The aim of the study was to investigate the influence of POGIL model on the student critical thinking ability. This study was conducted at a school on primary education in Pati. The theme used in this research was changing objects. The research constituted quasi experimental study with post test only design implemented in grade VII of the junior high school. The sampel was taken by random sampling technique. A total of 68 students participated, and divided in two groups, experiment group consist of 34 students and control group consist of 34 students. The data collection was done by post test for critical thinking ability students’s to the POGIL model. The students’ critical thinking test used essay questions consist of basic explanations, basic skills building, concluding, explaining further, and managing strategies and tactic. The data was analyze by t-test, biserial correlation analysis, and coefficient of determination. Based on the data it was the influence of POGIL model on critical thinking ability students’s. coefficient of determination result showed that POGIL model gived influence 30% on critical thinking ability students’s.

1. Introduction

Junior high school students still have low critical thinking skills. This is because the teacher does a lesson that does not support students to think critically. Teaching and learning activities in schools today are generally held teacher center. So the teacher gives less opportunity to the students in exploring his ability [1]. Though the ability to think critically is a necessary capability in dealing with the life of the 21st century. Critical thinking is important for the future of students to face many challenges in the life to come [2]. Therefore, a step is needed to prepare students to be able to think critically. If this is not resolved, the students will have difficulty and difficulty in facing 21st century life in the future.

Some studies have been conducted on junior high school students focusing on cognitive learning outcomes [3, 4, 5, 6, 7, 8, 9, 10, 11, 12]. So we need a study that focuses on the critical thinking skill. Critical thinking skill is to think clearly and clearly in solving problems [13]. The aspects of critical thinking indicators are (1) giving basic explanations (clarification), (2) building basic skills, (3) concluding, (4) explaining further, and (5) managing strategies and tactics [15]. Critical thinking can be made through discovery-based learning.

Learning POGIL (Process Oriented Guided Inquiry Learning) is one of discovery-based learning. In general, the results of research on learning POGIL has helped many students in achieving learning outcomes. More specific research on POGIL towards critical thinking focuses on class VII of caloric material carried out with true experimental design [14]. In educational or research studies that are
human objects, many external variables affect and cannot be controlled intensively by researchers [18]. So true experimental less appropriate to use in research Education. Therefore in this study, using quasi experimental design. The research using POGIL model that has been done shows that POGIL model has an effect on students’ critical thinking skills [15]. Advice from the research need to develop POGIL-based teaching materials. Therefore in this study was conducted to determine the effect of students’ critical thinking ability on the subject matter of change using POGIL learning model with worksheet as media.

2. Experimental Method
This study was conducted at a school on primary education in Pati. The theme used in this research was changing objects. The research constituted quasi experimental study with post test only design implemented in grade VII of the junior high school. The sample was taken by random sampling technique [16]. A total of 68 students participated, and divided in two groups, experiment group consist of 34 students and control group consist of 34 students. The data collection was done by post test for critical thinking ability students’s to the POGIL model. The students' critical thinking test used essay questions consist of basic explanations, basic skills building, concluding, explaining further, and managing strategies and tacticThe data was analyze by t-test, biserial correlation analysis, and coefficient of determination

3. Result and Discussion
The results are reported to explain the effect of POGIL model on critical thinking skill. The biserial correlation result revealed POGIL model has a positive effect (0.55) on students' critical thinking skill on material change. The results of biserial correlation significance test can be seen in Table 1.

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Based on table 1, the calculation of significance test of biserial correlation of post test data can be concluded that POGIL model has a significant effect on students' critical thinking skill in material change. From the calculation of coefficient determination, obtained KD = 30%. Thus, the POGIL learning model has 30% effect on students' critical thinking skills on material change. While 70% of students' critical thinking ability is influenced by internal and external factors. Critical thinking ability in this research as influence from implementation of POGIL learning model applied in experiment class. The POGIL learning model consists of 7 stages: Identification of needs for learning, Connecting prior knowledge, exploring, understanding and concept formation, applying knowledge practices, Applying knowledge into new concepts, and Reflection in processes [17].

Learning activities at the stage of identification of the need to learn that teachers convey the purpose of learning and presents interesting issues related to the material. At this stage students wrote down the purpose of learning and answer questions from the teacher regarding issues related to the material. The second stage is connecting the previous knowledge. At this stage, the teacher asked questions related to prior knowledge, whereas the student answers questions from the teacher based on the problems given by linking prior knowledge. Both stages, training students' critical thinking skills, provide basic explanations with indicators submitting and answering clarification questions (grouping and differentiating). This is consistent with studies that use problems to improve critical thinking skills [18].

The stage of exploration was the teacher explains the learning model used and the source of material used. At this stage students work in groups of 4. Each member had their respective duties in order to have effective skills [19]. Each member of the group served as manager, spokesman, notepad,
and analyst strategy [20]. Managers or chairs actively participate in duties, keep teams focused on tasks, distribute jobs and responsibilities, resolve disputes, and ensure that all members participate and understand.

The spokesperson (or presenter) actively participates in and presents class reports and discussions. Notulen actively participates, keeps track of tasks and what the team has done, and prepared reports in consultation with others. An analyst (or reflector) strategy actively participates in finding strategic models for problem solving, identifying what teams did well and what needs improvement, and preparing reports.

The division of tasks of each group was conducted with the aim of enhancing cooperation, exchanging opinions, and individual responsibilities. In this case each group member has their respective duties with the aim of improving teamwork skills, working critically, responsibly, exchanging opinions, drawing conclusions, and solving problems. Division of tasks in rolling each meeting [21].

The stages of understanding and concept formation, teachers guided students to discover concepts. Teachers as learning facilitators provided assistance to students to discover concepts. Concepts are not given explicitly, but teachers encourage and encourage students to be able to make conclusions and make Hanson’s predictions [22]. At this stage, students discussed guided by the teacher and answer questions in the worksheet on the understanding and concept formation. At this stage, train students’ critical thinking skills to conclude. Indicator of critical thinking skill that is done is using deductive reasoning and balance result deduction. Students answer a variety of questions to develop an understanding of a concept [23].

The practice of applying knowledge is the fifth stage of POGIL learning. At this stage, the teacher guided students to answer the concept application section of the worksheet. Students together one group answered questions in the worksheet on the concept application section. At this stage, train students’ critical thinking skills to manage strategies and tactics. Indicator of critical thinking skill that is done is decided action in solving problem part of concept application. In this case problem solving in teams helped developing key process skills such as critical thinking and communication [24].

The stage of exploration, understanding and concept formation, as well as applying knowledge is evidenced from the work of student's worksheet. In this research, worksheet used is worksheet based POGIL. This is in accordance with the research undertaken by developing POGIL-based worksheet attention to the learning stages of POGIL [25]. Worksheet is one of the learning resources that teachers can develop as a facilitator in learning activities [26]. Learning activities in POGIL are designed in a learning cycle. The learning cycle in POGIL consists of three stages: exploration, concept or formation invention, and application [27].

Students write down all the concepts that have been obtained on the notebook. This is the stage of applying knowledge into new concepts. The teacher guided students to write additional concepts and explanations on the notebook. This is evidenced from the student's record of the concepts already obtained. At this stage, training students' critical thinking skills provided further explanation. Indicators of critical thinking skills are defined defining terms and considering definitions in three dimensions (form, strategy, and content).

The final stage of POGIL learning is reflection in the process. The teacher asked students to write reflections and responses to the learning process. Students wrote their reflections and responses to the learning process. At this stage, train students’ critical thinking skills to conclude. Indicator of critical thinking ability that was done is using deductive reasoning and balance result deduction. Students evaluated their learning performance, what has been obtained and what has not been obtained to improve their ability in the next opportunity [28]. The results of the reflection stage was evidenced from the student's reflection sheet after each lesson. Through this stage train students to think critically about their performance and evaluate the learning process. Response to the learning process derived from this, obtained the results of most students interested in the model given the reasons to invite students more active, many train them to work together and think and responsible.

The implementation of learning in the control class is carried out with the inquiry learning model according to the teacher's book in the curriculum of 2013. This learning model is the usual learning model used by science teachers of SMP in one school in Pati district in the curriculum 2013. Students
are familiar with this learning model. In this learning the students work in groups. Students find concept through demonstration guided by teacher.

Differences in the critical thinking skill of the experimental class with the control class because the experimental class used worksheet based POGIL model. This worksheet is oriented towards process and inquiry stages. Students use the worksheet to train critical thinking in an attempt to find concepts. While in the experimental class using the worksheet in accordance with the 2013 teacher book. In the worksheet class control students find the concept up to the conclusions and done in a demonstration. This is in accordance with the statement of differences in problem-solving skills between the experimental class and the control class is due to the control class conducted learning activities by practicum method using ready-to-serve worksheet, while in the experimental class conducted learning activities with guided inquiry laboratory practice method using worksheet inquiry guided by questions that serve students to discover the concept itself [29].

The POGIL model learning is done with students studying in groups through activities designed to improve the mastery of the concepts of subjects and develop skills in learning, thinking, problem solving, communicating, teamwork, management and evaluation. After finding the concept, students solve the problem which is a concept application. This statement is also supported by the results of research, POGIL learning is able to influence students' critical thinking skills [30].

Activities in POGIL are designed in a guided inquiry process. The inquiry model enables students to understand the abilities and potentials they possess. Thus students can be creative to complete the lab to find the concept in accordance with its role in the group. So that students are more motivated to think critically in finding concepts. The POGIL model has provided an opportunity for all students to gain and build their knowledge, so that what the students get becomes more meaningful. This is consistent with the group's conceptual discovery statement making knowledge more meaningful [31].

4. Conclusion
This research concluded that POGIL learning model was effective and gave influence 30% on students' critical thinking skill in object material changes.

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