



The Effect of POGIL Learning Model on HOTS Students of Elementary School Teacher Education Program

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Abstract. *This research aims at determining the effect of the process oriented guided inquiry learning (POGIL) model on odd semester higher order thinking skills (HOTS) students. The research applied quasi-experimental research with nonequivalent groups pretest-posttest design. The population is all the students the elementary teacher education program (PGSD) of STKIP Muhammadiyah Enrekang in the academic year 2017/2018. The sample was chosen by using purposive sampling technique. The data was collected through the test technique in order to find out the score of the higher-order thinking skills (HOTS) students. The data was analyzed through Independent T-Test with a significance level of 0.05. The results of this study significantly influence the increase in HOTS students (0.924) which shows > 0.05 α .*

Keywords: POGIL, HOTS, Learning Models

INTRODUCTION

Millennial Era has brought great changes in various fields of life, including in the world of education. To face the challenges and problems that are increasingly requiring technology and science in the global community in this world, education must be oriented on preparing the young generation to have 21st Century Skills. The Assessment and Teaching of 21st Century Skills (ATC21S) categorizes these skills into 4 categories, namely way of thinking, way of working, tools for working and skills for living in the world (Griffin, McGaw & Care, 2012). These skills need to be integrated or even designed (by design) in learning.

Development of 21st century skills is felt to be very helpful to students in facing life's challenges both in the present and in the future. In order to realize 21st century learning, lecturers are challenged to accelerate the development of information and communication. The progress of information technology has increased flexibility in the acquisition of knowledge for each individual both lecturer and student. Consequently, lecturers are required to be able to develop learning approaches and strategies that are in line with environmental developments.

The Elementary School Teacher Education (PGSD) Study Program at STKIP Muhammadiyah Enrekang as a

study program that prepares elementary school teacher candidates should prepare graduates to have the skills needed to have HOTS and thus they are able to think critically, research, solve problems making decisions, and having good character. According to Heong, et.al (2011) higher order thinking is using the thinking widely to find new challenge. Higher order thinking demands someone to apply new information or knowledge that he has got and manipulates the information to reach possibility of answer in new situation. By having HOTS, someone will be able to learn, give reasons correctly, think creatively, make decisions, and solve problems (Robinson, 2000). Then it is expected that later by developing HOTS, the PGSD study program can print elementary school teacher candidates who are able to face the development of science and technology and solve the problems they face.

Increasing HOTS is not only centered on students, but also influenced by lecturers' understanding and strategy during the lecture process. Kamin & Chinedu (2015) stated that HOTS thinking should be an integral part of teaching and learning, thinking skills lessons should be part of curriculum. Hence, the lecturer strategy is very important in integrating students' thinking skills during lectures in class. This shows that lecturers are required to have sufficient understanding in developing HOTS, and thus they will be able to design appropriate strategies to familiarize students with HOTS thinking.

HOTS can be achieved if students are active in understanding and integrating knowledge with their experiences (Anderson & Krathwohl, 2015). In line with that, Vui (Kurniati, 2014: 62) explained that HOTS will occur when

someone associates new information with the previous information stored in his memory and then associates and/or rearranges and develops that information to achieve a goal or to find a solution of a problem.

The fact is the teaching and learning process is usually conducted in the form of teacher-centered. The lecturer explains and the students sit listen. The teaching becomes less dynamic, consequently the students do not show their participation in the process of teaching and learning activities. This certainly causes problems related to students' mastery of lecture material. From the six cognitive stages, students are still dominant at the stage of knowing (C1), understanding (C2), and applying (C3). While a small percentage of students are able to get on the analysis stage (C4). The interview result shows that most of the students still have difficulty in solving problems at the cognitive stage of concluding (C5) and creates (C6). This is because at the lecture time, the dominant cognitive aspect applied is to knowing and to understand. This causes the high level of students' thinking ability is still low.

Based on these problems, Lie (2005: 8) suggests that learning that allows students to actively interact with others will give them opportunity to work together in discussing a problem, determining problem-solving strategies, and associating the problem with the previous related problems that have been solved. Then there must be a transition from individual learning to cooperative learning and from teacher centered learning to student centered learning. The selection of the right learning method will affect HOTS students. Process Oriented Guided-Inquiry Learning (POGIL) is one of the

learning models that is students-centered and allows students to actively interact with adults or peers.

The POGIL learning model is process-oriented learning. It is a student-centered which implements a learning cycle in guided inquiry activities. Hanson (2006) explains that POGIL is "a strategy because it provides a specific methodology and structure that is consistent with the way people learn and leads to desired outcomes". This, of course, guides students to develop skills, and helps students discover or develop their own understanding of the processes they have done. This model was chosen because the learning stages reflected learning that emphasized HOTS.

Hanson (2006: 29) explains the steps of the POGIL learning model. They are 1) Orientation, the teacher provides general knowledge about the material to be learned; 2) Exploration, the students are given a series of tasks that lead to learning objectives, collect data and carry out experiments; 3) Concept formation, the teacher directs and guides students in developing concepts through key questions and connects data obtained with their duties; 4) Application, students apply the concepts that have been given to solve the questions asked by the teacher; and 5) Closure, the teacher provides reinforcement and guides students to reflect and evaluate the performance of the group. Based on this description, it is necessary to conduct research, as an effort to find out whether the POGIL learning model influences the Higher Order Thinking Skills (HOTS) of PGSD students.

METHOD

This study uses a quantitative approach with a quasi-experimental method aiming at comparing two different treatments to the research subjects. This study used a nonequivalent group pretest-posttest control group design. The population of this study was all students of PGSD Study Program in academic year 2017/ 2018. The sampling technique used is the purposive sampling with a total sample of 50 people. PGSD A class was taken as an experimental class which consists of 25 students while PGSD B was taken as control class which consists of 25 students. The lecture applied POGIL Learning method in the experimental class while the control class applied conventional learning.

Data collection technique used is test techniques. The test was conducted to measure the HOTS by analyzing the results of the pretest and posttest. Descriptive and inferential statistics are used to analyze the data. Hypothesis testing was carried out with the Independent T-Test with the help of computers using the SPSS 20 for Windows program. Before carrying out the data analysis and hypothesis testing, the data obtained need to be tested for the assumptions first which is done by testing the normality and homogeneity of variance.

RESULTS AND DISCUSSION

The results of the study were in the form of HOTS pretest and posttest score of PGSD Study Program students. Shortly, the data is stated in the form of mean (M), mode (Mo), median (Md), deviation standard (s), and variance (s²). The score can be seen in the following table.

Table 1. Pretest and Posttest Results of HOTS PGSD Students

		Pretest of Experimental Class	Posttest of Experimental Class	Pretest of Control Class	Posttest of Control Class
N	Valid	25	25	25	25
	Missing	0	0	0	0
Mean		62.40	80.40	62.00	71.60
Median		60.00	80.00	60.00	70.00
Mode		60	80	60	70
Std. Deviation		14.514	12.069	11.902	11.431
Variance		210.667	145.667	141.667	130.667
Sum		1560	2010	1550	1790

Based on Table 1, there is a difference between the mean score of the Experimental Class (EC) and Control Class (CC). This shows that there was an increase in student HOTS on CE after the application of the POGIL learning model. The results can be clearly seen through polygon shown in Figure 1.



Figure 1. Histogram of the Pretest-Posttest Average of PGSD Students

The results of the analysis of the average value of pre-test and post-test based on the learning model of HOTS at the level of analyzing (C4), evaluating (C5), creating (C6). The following are the HOTS students' average PGSD study programs can be presented in tabular form.

Table 2. Average Value of HOTS of PGSD Student

HOTS	Average Score of HOTS of PGSD Student			
	Experimental Class		Control Class	
	Pretest	Posttest	Pretest	Posttest
C4	31,6	34	30	35,5
C5	18,4	22	18,4	25,2
C6	12	15,6	14	20

It is known that the experimental class shows an increase in the average score of HOTS students at the analyzing level (C4) from 30 to 35.5 compared to the control class from 31.6 to 34. This skill is increase because the students are trained to respect the opinions of their friends with various solutions from each group, then the lecturer directs students to find out the concepts that are being studied. It is in accordance with the stages of the POGIL learning model which students answer various kinds of questions to develop an understanding of a concept at the exploration stage, (Hanson, 2006).

At the level of evaluating (C5), the experimental class obtained an average score of 18.4 to 25, 2 which was significantly higher than the control class which only obtained an average score of

18.4 to 22. This skill develops because students have discovered the concept themselves by making direct observations or group observations so that students are able to learn independently and with this activity can provide direct and real experience to students so they can build and be able to find their own knowledge.

At the level of creating (C6), the average value obtained by students in the experimental class is 14 to 20 while the control class is from 12 to 15,6. This ability is increase because it is seen that students are able to create new ideas or information based on what they have learned through the POGIL learning model. However, they still need guidance of the lecturer in developing their understanding and exchanging ideas with group members in solving problems. This is in line with what was stated by Vygotsky (Raes, Schellens, & De Wever, 2011) that thinking skills at a higher level will be enhanced when the learners receive guidance from someone or colleagues who are more expert in the field being learned. As a result, the fact shows that there is an increase of HOTS students in the experimental class after applying the POGIL learning model which makes students experience the learning process in groups and thus they can be trained to solve a problem through discussing. In addition, the POGIL learning model is also able to help students to improve their skill in doing the process, asking questions, communicating knowledge, and getting on having a wide-range of subject matter (Zawadzki, 2010).

Based on the results of the Independent T-Test values obtained Sig. As much as 0.924 which shows greater than 0.05 α , it can be concluded that H1 is accepted and H0 is rejected or it can also be said that the application of the Process Oriented Guided-Inquiry Learning (POGIL) model

can have a better influence on student HOTS compared to learning conventional commonly applied by lecturers.

The application of the POGIL learning model has been verified to have a significance influence on students' HOTS. This is because the POGIL learning model emphasizes on the interactive process of thinking carefully, discussing ideas, perfecting understanding, training skills, and reflecting learning enhancement. Thus, it trigs students to learn actively through the group interactive process in solving a problem. In line with that, Hanson (2006) explained that POGIL is an inquiry learning which is process-oriented and student-cantered in an active learning that uses study groups, guided inquiry activities to develop knowledge, questions to improve critical and analytical thinking skills, problem solving, metacognition, and individual responsibility. It can provide opportunities for students to actively construct their understanding in discussion groups through cooperative learning combined with guided inquiry activities.

CONCLUSION

Based on the results of the data analysis, it can be concluded that there is a significant difference of the influences between the application of the POGIL learning model and the conventional learning model towards the HOTS students of PGSD study program of STKIP Muhammadiyah Enrekang. Based on these results, the researcher gives suggestions for lecturers or teaching staff in universities who want to apply the POGIL learning model. The first is the lecturers should be able to recognize and know the characteristics of students because the level of understanding of student characteristics will greatly affect the

success of the learning process. The second is the lecturers in the PGSD study program are expected to develop their evaluation instruments based on students' cognitive levels by paying attention to the appropriate material, and thus the students learning process can be effective and in accordance with the students' level of thinking. The third is the lecturers optimize the group discussion by giving responsibility to the students to learn together.

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