Available online at http://journal.um.ac.id/index.php/jps/
ISSN: 2338-9117/EISSN: 2442-3904

Jurnal Pendidikan Sains
Volume 5, Number 4, December 2017, pp. 118–122

Science Processing Skill Improvement Through POGIL (*Process Oriented Guided Inquiry Learning*) Learning Model

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Abstract: This research is aimed to investigate the students' improvement through POGIL (Process Oriented Guided Inquiry Learning) learning model. It is a classroom action reesarch. The research was taken under two cycles of four steps (planning, implementing, observing, and reflecting). The data was collected through observation, interviews, and questionnaires. The result of the research shows that there is a significant improvement upon the students' science processing skill through POGIL learning model.

Key Words: students' science processing skill, Process Oriented Guided Inquiry Learning, POGIL

Abstrak: Penelitian ini bertujuan untuk mengetahui perkembangan siswa melalui pembelajaran POGIL (*Process Oriented Guided Inquiry Learning*). Penelitian ini adalah penelitian tindakan kelas. Penelitian dilakukan sebanyak 2 siklus dari 4 langkah (perencanaan, pelaksanaan, pengamatan, dan refleksi). Data dikumpulkan melalui observasi, wawancara, dan kuesioner. Hasil penelitian ini menunjukkan bahwa ada peningkatan yang signifikan terhadap keterampilan proses sains siswa melalui model pembelajaran POGIL.

Kata kunci: kemampuan proses sains siswa, *Proses Oriented Guided Inquiry Learning*, POGIL

Education nowadays shift its way into a more constructive learning model. Constructive approach led to a kind of learning where students are expected to be active in creating concept or their own knowlegde. Teachers play their role as a facilitators and motivators. Therefore, teachers are expected to create such a great and joyful situation of learning for students that these students will never feel pushed in finding their own knowledge. The learning process will be categorized as successful when teachers are capable of implementing any approach or learning model they have mastered. Thus, teachers are expected to be capable of mastering any learning aproaches and apply that to the students. Teachers should also refer to new paradigm in planning their lesson that the materials can be used well by the students. Teachers, in choosing the learning model especially in Biology teaching for senior high school level, should be capable of developing the science processing skill and master it for their life in society and continuing their education into a higher level (Puskur, 2006). Therefore, teachers are expected to be creative and innovative in developing a concept of activity to support the students during their knowledge and understanding building independently.

Based on the previous study, the fact showed some problems exist among teachers and also students, not to mention in biology class of this secondary level. According to the observation done in SMAN 1 Torjun, students had never had significant number of science processing skill development through interestingly challenging observation and experiment. The learning activity given by the teachers are less variative and contribute little to students development to their science processing skill. Science processing skill should be trained and developed through biology. According to Trianto (2011, p. 143), it is said that science processing skill in IPA/biology needs to be trained in order to develop their mind. Students are given chances to do experiments, improving their memories, and brings out the students pleasure upon learning the concept of science.

Article received 11/9/2017; Approved 17/11/2017

Reffering to the result of the observaion and interviews done with teachers at SMAN 1 Torjun shows that wihin X grade learning activity and use direct language learning. Direct learning model tend to let teacher dominate the class. Teacher give less chances to students to be invoved directly than being passively involved during the learning processes. Students can only wait for the teacher's explanations and write it down in a piece of paper. They have less involvement in a real investigation activity but got the explanation of being a scientist during the investigation. This fact is stregthen by quetionnaires results which shows 31 students (88,6%) had never done any observation, problems identification, hypothesis making, data analysis and hypothesis testing in biology class.

Based on that very explanation, a suitable model of leaning is needed the one which will involve students actively and meaningfully get them into their science processing skill development. POGIL (Process Oriented Guided Inquiry Learning) is a learning model developed suitable to the essence of science (biology) in enhancing science processing skill. POGIL is basically developed from guided inquiry model which combine guided inquiry and cooperative approach. The consideration in this research emphasize the idea of POGIL provide a real experiment in developing student's processing skill and their scientific attitude in growing their thinking skill of creating scientific concept independently. This idea was strengthened by a research done by Bilgin (2009, p. 1041) showing that guided inquiry learning model has positive effects on developping students performance. The same thing is also mentioned in Moog and Spencer (2010) that POGIL had such characterictic to help students developing their processing skill and not necessarily dependent to facility in class or laboratory.

POGIL learning model has three steps to accomplish, which are: exploration, concept formation, and application. In exploration, students do some ativities like observing, experiment designing, colecting, checking, and analyzing data, also investigating and testing the hypothesis. While in concept formation, students are expected to critically thinking and analyzing the concept formation. In application, students are involved in the application of new knowledge in exercising, problem solving, or even reesrach situation. Through this activity, students work in team to build their understanding and apply it to the new concept they have (Zawadski, 2010, p. 69).

Based on that very fact, therefore, a classroom action research should be done under the purpose of knowing the improvement of students science processing skill through POGIL learning model in SMAN 1 Torjun.

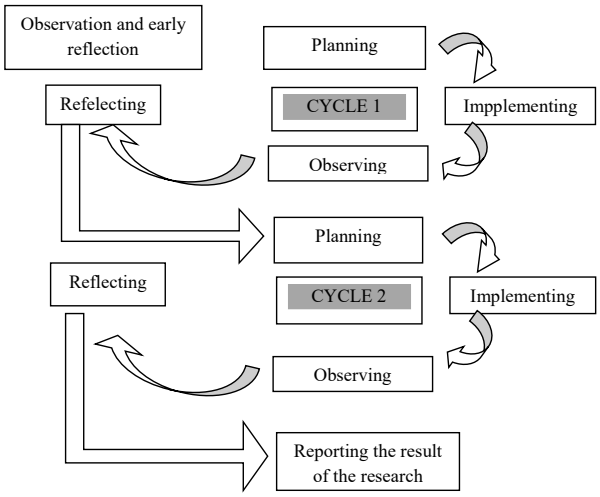

Figure 1. Steps and Implementation Procedure

(Source: Arikunto, 2010, p. 137)

METHOD

The researsch is a classroom action research supported with interview, questionnaires, and observations. The research was done in clas X-1 of SMAN 1 Torjun Sampang during the second semester year 2015/2016. The school is located in Torjun street, Torjun subdistrict, Sampang Regency, Madura, East Java Province. The subject of the research was the real condition of class X-1.

The research was done within two cycles. The cycles in doing a classroom action research and the implementation procedure is schematically provided in Figure 1.

The instrument employed in this research were: a) observation sheets of learning implementation to measure the implementation of POGIL and the quality of the learning done by the teachers. The observation was done during the teaching learning process by the observers, b) observation sheet of science processing skill, c) interview guide sheet as the teacher guidance to know the students' responses to the learning model applied. The data was collected through two kinds of observation sheet which are learning activity observation sheet and students' performance observation sheet.

The data analysis of teacher and students activity during the process of the learning observation sheet was done in every meeting during the process of the

learning. The data was collected is a qualitative data which later converted to quantitave one based on the result of the observation during the teaching and learning process in every meeting.

RESULTS

The research began with an observation through questionnaires, interviews, and learning process observation during January to May 2016 in SMAN 1 Torjun. The observation was done under the purpose of identifying the problems happened in grade X which finally taken to be the research questions. Based on the observation, the problem are identified as students are being less skilled in developing their science processing skill through field observation and challenging experiments. These problems identified are further taken to be the researcher focus to do a research and discussion with observers to talk about the approaching research.

The research consisted of two cycles with four steps each. The four steps are the action planning, action implementation, observation, and reflection. Action planning was made based on the previous observation. There are some steps within, which are: (a) preparing the research instruments like syllabus, lesson plan, students' worksheets, observation sheets of learning implementation, and observation sheets of science processing skill. In the action implementation, according to POGIL syntax learning, covers some steps to go such as: (a) orientation, as a step where teachers motivate students and dig students knowledge by playing a video suitable to the learning purposes and continued with assigning the students to formulate problems according to the video thet have watched before and also their worksheets; (b) exploration is an activity where students do observation, planning an experiment, collecting, checking, and analyzing the data, investigating any correlation exists, proposing questions and testing the hypothesis; (c) concept formation, students are presenting and communicating the result of the observation and group discussion; (d) application, students implement their new understanding into different context; and (e) closure as a step where students conclude the learning processes and do some learning reflection.

Cycle I and II were done within five meetings. The material learned is under the basic competence number 3.9 covering the idea of analyzing information/ data from an sources about ecosystem and all interactions within. Also the basic competence number 3.10 for analyzing data of environment changes and the effects to life. Teacher and students learning syntax implementation employing POGIL utilized observation sheets which were handled by three observers. The average learning implementation using POGIL learning model increase from cycle I to cycle II as much as 17,9% with 78,4% in cycle I and 96,3% in cycle II. The average learning implementation using POGIL in cycle I and II can be traced through Table I.

Table 1. Average Learning Implementation using POGIL Learning Model in Cycle I and II

No	Steps	Cycle/Average Percentage	
		Cycle I	Cycle II
1	Orientation	100	100
2	Exploration	67	82
3	Concept Formation	67	100
4	Application	83	100
5	Closure	75	100
	Average	78,4	96,3

The result of the research shows the average observation on students science processing skill is increasing from cycle I to cycle II as much as 8,5. In cycle I with the average of 77 under the detail of 10 students got ≤ 70 and 25 students got ≥ 70. Classical passing grade laid on 71,42 which means the students in cycle I were not yet passed. While in cycle II, the result shows that it reached the average score of 85,5 with classical passing grade of 100% which can basically means that all the students passed the skills objected. According to the success indicator, classical passing grade can be said to be passed if there are 85% subjects achieve ≥ 70. The average science processing skill observation score and classial passing grade in cycle I and II can be seen through Table 2.

DISCUSSION

According to the data and the result of the research, POGIL learning model implementation can increase students science processing skill. The estimated improvement of student science processing skill and

Table 2. Average Science Processing Skill Observation Scores and Classical Passing Grade Cycle I and II

No	Research Data	Cycle	
		Cycle I	Cycle II
1	Science processing skill average	77	85,5
2	Classical passing grade	71,42%	100%

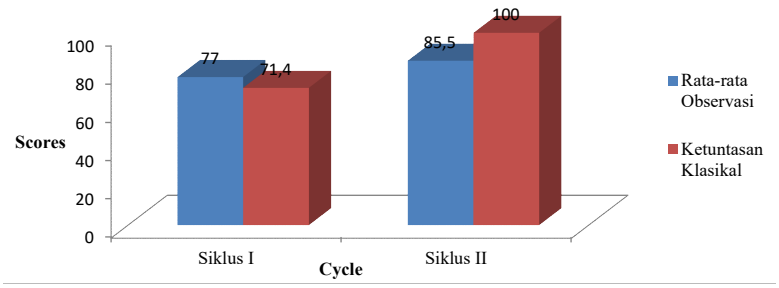

Figure 2. Estimated Improvement of Student Science Processing Skill and Its Classical Passing Grade in Cycle II and II

its classical passing grade in cycle II and II are portrayed in Figure 2.

POGIL learning model can improve science processing skill. It is proven by data as a result of the observation in cycle I and II increase its obeservation average as much as 10,2. While the classical passing grade increase its average as much as 28,6%. Science processing skill in this research measures the aspect of observing, investigating, research planning, communicating, and questions proposing. In cycle I, students are capable of observing, interpreting, planning a research, and use all their senses to gather all data or information well. In terms of interpreting the data, students should also be capable of communicating or presenting their observation results or any logical statement to create a correct conclusion. Students can also plan a research referring to the right prodecures. In cycle II, there is significant improvement on scince processing skill, especially in communicating and question proposing aspect. Students are capable of orally communicating the problem teacher guided and motivated. Students can also propose questions related to the hypothesis background.

The factor which came to be the cause of the improvement on students science processing skill is that POGIL learning model is a learning model developed appropriate to the essence of science as process and science as product. POGIL learning model is a developed model of inquiry learning model. Through inquiry learning model, students learn how to solve problems or reveal a phenomenon scientifically. Biology as part of science require scientific learning process. This learning model provides teachers with to guide the students and equiped the students to explore knowledge using scientific method like a real scientist. Processing skill is an important part of science since it represents rationality and logical thinking capability in using science. The competence in processing skill allows students to act according to the informarmation they got in solving a problem (Burns, et al, 1985, p. 170)

In every POGIL steps, students actively involved in every activity especially during the step of exploration, concept formation, and application. Students are active in doing observation, finding problems, making hypothesis, doing exploration, observing, data collecting, data analyzing, concluding, and communicating well. It is strengthen through good interviews and responses upon POGIL learning model. To sum up, students look excited and enthusiast to follow the learning process, especially during the ecosystem observation in school like forest school, TOGA, *karang kitri*, and school garden.

Students involvement inside or outside the class can positively influence the students in building their knowledge independently (student center). Students will understand the concept easily. The same questions were mentioned by Simonson and Shadle (2013, p. 4) that POGIL learning model might improve the students' knowledge retention, high level thinking, and processing skill. Those abilities are posessed when students digging deeeper knowledge by thinking, data analyzing, ideas discussing, concluding, and building knowledge through team work. The same experiement done by Ningsihm et al. (2015, p. 1) and Mohamed (2008) that POGIL can improve students learning skill and students processing skill.

In Orientation, students are capable of developing science processing skill aspect like observing, interpreting the observation result through demostration, and investigating knowledge through video on a case study of ecology and enironment changes. In Exploration, students are given the chance to develop planning a research aspect, experiment designing aspect, collecting and analyzing the data, answering the questions by analyzing the theory and the result. In Concept Formation, students are capable of developing the indicator of communicating the result of the research or

group discussion in front of the class. While in Application, students seems to learn how to broad questioning aspect through the application of new concept to different context.

In POGIL learning model, teachers are only facilitators in guiding and taking the students to the right learning appropriate with the purpose of the learning, POGIL learning model can motivate students to participate actively and give them rooms for creatively exploring the subject as the requirement of the learning (learning by doing). The same thing was mentioned by Hanson (2013) that POGIL can make the students active in learning processes and discussing in class. Zawadski (2010, p. 69) said that in POGIL learning model, students can work in team and involved actively in looking, finding, and building their new knowledge. Therefore, it can be said that POGIL is an alternative learning model which can push students to develop their processing skill.

CONCLUSION

According to the result of the discussion above, it can be concluded that POGIL learning model can improve students' processing skill in grade X SMAN 1 Torjun. Therefore, some suggestions are coming as follows. (1) POGIL learning model can improve science processing skill that this learning model should be an alternative for biology learning in secondary school level. (2) Teachers should master and understand POGIL learning model syntax deeply. (3) School is suggested to make training for teachers more often to talk and study learing models that their knowledge might increase and capable of applying any learning models well during the teaching and learning process.

REFERENCES

Suharsimi, A. (2010). *Prosedur Penelitian Suatu Pendekatan Praktik*. Jakarta: Rineka Cipta.

Bilgin, I. (2009). The Effects of Guided Inquiry Instruction Incorporating a Cooperative Learning Approach on University Students Achievement of Acid and Bases Concepts and Attitude Toward Guided Inquir-y Instruction. *Scientific Research and Essays*, *4*(10), 1038–1046.

Burns, J. C., Okey, J. R., & Wise, K. C. (1985). Development of an Integrated Process Skill Test: TIPS II. *Journal of Research in Science Teaching*, *22*(2), 169–177.

Hanson, D. M. (2006). *Instructor's Guide to Process-Oriented Guided-Inquiry Learning*. Lisle, IL: Pacific Crest.

Minner, D. D., Levy, A. J., & Century, J. (2010). Inquiry Based Science Instruction—What is It and Does It Matter? Results From a Research Synthesis Years 1984 To 2002. *Journal of research in science teaching*, *47*(4), 474–496.

Mohamed, A. R. (2008). *Effects of Active Learning Variants on Student Performance and Learning Perceptions.* Center for Teaching, Learning, & Scholarship at Georgia Southern University, Statesboro, Georgia, USA.

Moog, R. S., & Spencer, J. N. (Eds.). (2008). *Process Oriented Guided Inquiry Learning (POGIL)*. American Chemical Society.

Ningsih, P. E., Siswoyo, S., & Astra, I. M. (2015, October). Pengaruh Metode Pogil (Process Oriented Guided Inquiry Learning) terhadap Keterampilan Proses Sains Siswa pada Materi Suhu dan Kalor Kelas X SMA. In *Prosiding Seminar Nasional Fisika (E-JOURNAL)* (Vol. 4, pp. SNF2015-I).

Puskur. (2006). *Panduan Pengembangan Pembelajaran IPA Terpadu*. Jakarta: Pusat Kurikulum, Balitbang Depdiknas.

Simonson, S. R., & Shadle, S. E. (2013). Implementing Process Oriented Guided Inquiry Learning (POGIL) in Undergraduate Biomechanics: Lessons Learned by A Novice. *Journal of STEM Education: Innovations and Research*, *14*(1), 56.

Trianto. (2011). *Mendesain Model Pembelajaran Inovatif-Progresif*. Jakarta: Kencana Prenada Media Group.

Zawadski, R. (2010). Is Process-Oriented Guided-Inquiry Learning (POGIL) Suitable As A Teaching Method In Thailand's Higher Education? *Asian Journal on Education and Learning*, *1*(2), 66–74.