JURNAL PENDIDIKAN BIOLOGI INDONESIA
[Indonesian Journal of Biology Education]

Vol. 3 No. 3, 2017; pp. 266-271
p-ISSN: 2442-3750; e-ISSN: 2527-6204
http://ejournal.umm.ac.id/index.php/jpbi

Received: 18/08/2017
Revised: 30/11/2017
Accepted: 30/11/2017

IMPROVING OF SCIENTIFIC LITERACY ABILITY USING DISCOVERY LEARNING MODEL AT THE SEVENTH GRADE STUDENTS OF STATE JHS 3 NGRONGGOT, NGANJUK-INDONESIA

Sri Ratna Dewi*, Mumun Nurmilawati, Dwi Ari Budiretnani
Biology Education Department, University of Nusantara PGRI Kediri, Indonesia
*corresponding e-mail: prosperous.srd@gmail.com

ABSTRACT

Country with good education condition can be seen through its citizen scientific literacy. This research aims to improving the students' scientific literacy ability by using discovery learning model at 7th grade students of State Junior High School 3 Ngronggot, Nganjuk-Indonesia. The instrument in this Kemmis and Taggart Model of Classroom Action Research was an essay test composed based on indicators developed by Gormaly. The results of the research showed that there were improvements on the students' scientific literacy ability from cycle I to cycle II on six of seven indicators. Those improvements are as follows: Indentifying scientific opinion increased from 0% into 64.52%, reviewing literature effectively increased from 0% into 29.03%, understanding research design and the way how its effect to the finding/discussion increased from 14.29% into 19.35%, making graphic from the data correctly increased from 0% to 58.07%, solving problems using quantitative skill including operating basic statistics increased from 7.14% to 58.07%. However, in making inference, prediction and drawing conclusion based on quantitative data, the improvement was only on the students' answer that got 1 score, it increased from 7.14% to 77.42%. In addition, for the indicator of understanding and interpreting basic statistic, it decreased from 21.43% to 12.90%.

Keywords: *Discovery learning, junior high school, scientific literacy, skill, student*

INTRODUCTION

Indonesian human resources which have high quality and readiness to face global challenge can be realized through the improvement of education quality (Rusilowati et al., 2015). In addition, high quality education not only does it prepares the students to have one profession, but also education which enable the students to solve their daily problems.

The education quality in a country can be representated by its citizen scientific literacy ability. Scientific literacy is important to be developed in several reasons such as; (1) the scientific understanding which gained by natural encompassing and learning provides personal satisfaction and pleasure, (2) every person needs information and scientific thinking to draw decisions in their daily life, (3) every person needs ability to participate in public discourse and debate about important issues that involve science and technology, (4) scientific literacy is important in the work place, because there are many jobs require high skills which make people to learn science, think, possess creative thinking, draw conclusion, and solve problems (National Research Council, 1996).

The scientific literate person has ability in applying scientific concepts, principles, laws, and theories to their environment. Moreover, they also able to implement scientific processes to solve problems, draw decisions, and understand the nature (Laugksch, 2000).

Scientific literacy is the ability to use scientific knowledge, identify questions and draw fact-based conclusions to understand the universe and make decisions of changes that occur due to human activities (PISA, 2006). The important scientific skills to be provided to students are the science literacy (Turiman et al., 2012).

The research results conducted by Astuti, 2016, science literacy are a skill that needs to be developed in the globalization. The importance of science literacy and information literacy is in personal decision making, participation, and economic productivity. Literacy of science

Citation: Dewi, S., R., Nurmilawati, M. & Budiretnani, D. A. (2017). Improving of scientific literacy ability using discovery learning model at the seventh grade students of state JHS 3 Ngronggot, Nganjuk-Indonesia. *Jurnal Pendidikan Biologi Indonesia, 3*(3), 266-271. https://doi.org/10.22219/jpbi.v3i3.4540

consists of several types of literacy such as written reading, numerical literacy and digital literacy (Information technology). In terms of learning science literacy can be applied through learning strategies that can hone students to think high otherwise multimedia-based or computer-based strategies can increase digital literacy. Thus the science literacy can be included in the curriculum for science learning, especially IPA can increase knowledge, especially scientific and technological concepts.

The research results conducted by Programme for International Student Assessment (PISA) organized by Organisation for Economic Co-operation and Development (OECD) showed that the Indonesian students' scientific literacy rank, with the subject age of 15, was the 64th of 65 countries. This means that Indonesia, with its score of 382, was categorized as the the below-OECD-standard country score (500). Various other studies support to obtain a more meaningful learning model for students, such as Iswari (2010) which uses laboratory-based problem-solving activities to increase students' science literacy. In addition, Wenning (2011) study concluded that inquiry learning is an excellent way for students to understand the content of science. Then research Gormally et al. (2009) applying lab inquiry learning proves that students have improved scientific investigation skills and better science literacy than conventional learning. Lessons that are relevant to the development of students' literacy skills are life-oriented learning, building student attitudes and awareness of the environment (Rakhmawan, et al., 2015).

Various researches are conducted to find the effective and efficient learning process of science to get the learning outcomes with the best quality and quality. Holbrook (2005) argues that learning will achieve good results, if the learning is meaningful for students. In the oher words, Indonesian students' scientific literacy was low compared to the other countries.

Based on the observation conducted in the seventh grade students of Junior High School (JHS) 3 Ngronggot Nganjuk (East Java, Indonesia), it can be inferred that the material about population density was the most difficult material for the students. In the teaching process, teacher only explained the materials, thus, the teaching learning process was teacher-centered. Furthermore, it was less frequent for teachers in both employing instructional media and implementing the scientific literacy ability directly. This causes students can not understand the material. Finally, the scientific literacy indicators have not been reached optimally.

In order to solve those problems, discovery learning was applied to improve students' scientific literacy ability. Discovery learning model means understanding concept, meaning and correlation through intuitive student's process to draw conclusion. Discovery happends when each person involves in the use of their mental process to find several concepts and principals (Budiningsih, 2005).

In Discovery Learning, the students identify problems, solutions, find relevant information, develop solution strategy, and implement the chosen strategy. In collaborative discovery learning, the students are in practical activities to solve problems together (Borthick dan Jones, 2000).

METHOD

This research is Classroom Action Research (CAR) based on Kemmis and Taggart model. Classroom Action Research is a scientific activity in the classroom context which is implemented to solve the learning problems faced by teachers, to improve the quality and learning achievement (Widayati, 2008).

This CAR was implemented in two cycles with four phases in each cycle: planning, action, observation and reflection. However, in the implementation, the action and observation phases could not be separated.

The subject of the research is the seventh grade students of State JHS 3 Ngronggot Nganjuk. The research instruments consist of interview guide, questionnaire, observation sheet, and essay test composed based on indicators developed by Gormally, et al., (2012) thet are; 1) identifying scientific valid opinion, 2) reviewing literature effectively, 3) understanding the elements of research design and its effect to the finding/conclusion, 4) making graphic from the data correctly, 5) solving problems by using quantitative skill including basic statistics, 6) understanding and interpreting basic statistics, 7) making inference prediction and drawing conclusion based on the data. The collected data were then presented in percentage in order to show the improvements in each cycle clearly.

RESULTS AND DISCUSSION

Percentage of the students' achievements of scientific literacy ability in each indicator are as follows (Figure 1 to Figure 7):

Identifying Valid Scientific Opinions

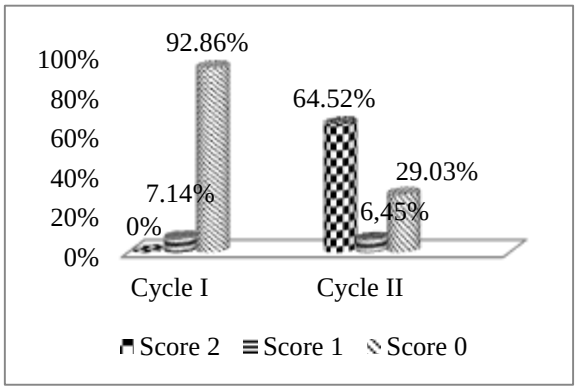

Figure 1. The percentage of students' ability in identifying valid scientific opinions

On the given test, the students were asked to identify and look for which scientific opinions that can be used as the problems cause. In cycle I to cycle II the percentage of students' answers that got 2 score increased from 0% into 64.52% (Figure 1).

Reviewing Literature Effectively

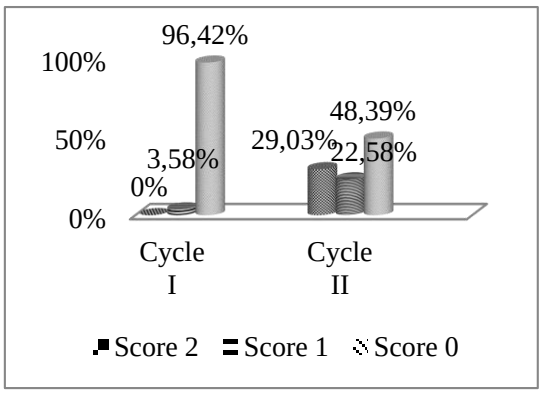

Figure 2. The percentage of students' ability to review literature effectively

On the given test, students were asked to search the trusted information that contains research results. On the first cycle to the second cycle, the precentage of the students' answer that got 2 score increased from 0% into 29.03% (Figure 2).

Understanding Research Design Elements and its Effect to the Findings/Conclusion

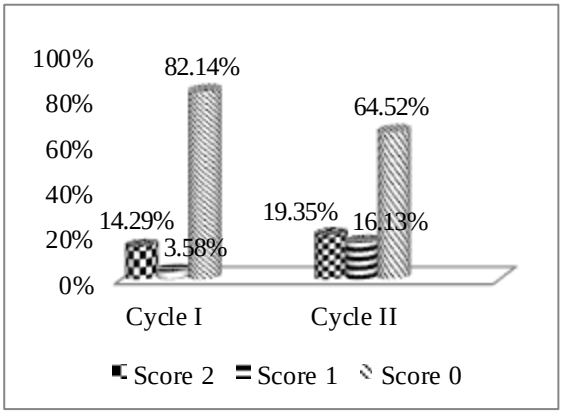

Figure 3. The percentage of students' ability in understanding research design and how its effect to the finding/conclusion

On the given test, the students were asked to find sentences in the form of theory and hipothesis. In cycle I to cycle II, the percentage of students' answers, who got 2 score, was from 14.29% into 19.35% (Figure 3).

Making Graphic from the Data Correctly

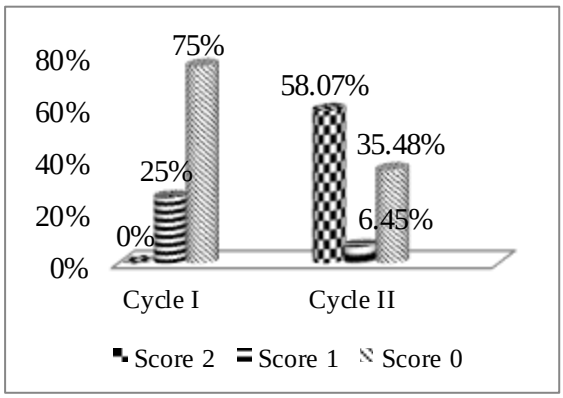

Figure 4. The students' ability in making graphic from the data correctly

On the given test, the students were asked to make a graphic based on the data in the test. In cycle I to cycle II, the percentage of students' answers, who got 2 score, was from 0% into 58.07% (Figure 4).

Solving Problems Using Quantitative Skill Including Basic Statistics

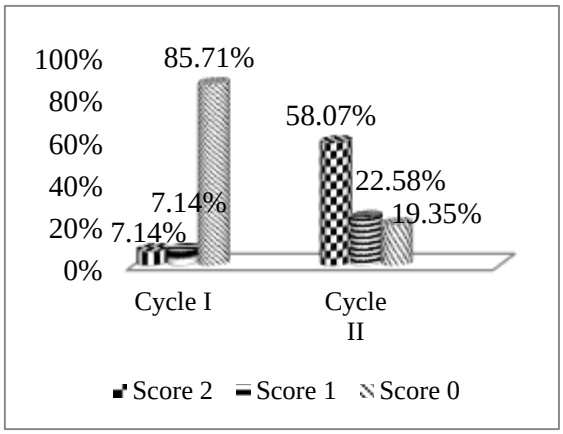

Figure 5. Students' ability in solving problem using quantitative skill including using basic statistics

On the given test, the students were asked to read and analyze the provided data. In cycle I to cycle II the percentage of students' answers that got 2 score increased from 7.14% into 58.07% (Figure 5).

Understanding and Interpreting Basic Statistics

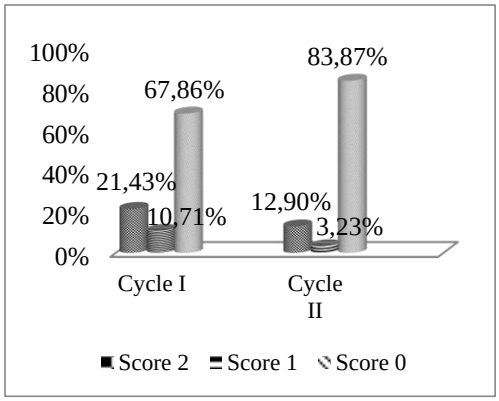

Figure 6. Students' ability to understand and interpret the basic statistics

On the given test, the students were asked to explain the reason of using statistical data. In cycle I the percentage of students' answers that got 2 score was 21.43%. However in cycle II the percentage of the students' answer that got 2 score, decreased into 12.90% (Figure 6).

Making Inference, Prediction, and Drawing Conclusion based on Quantitative Data

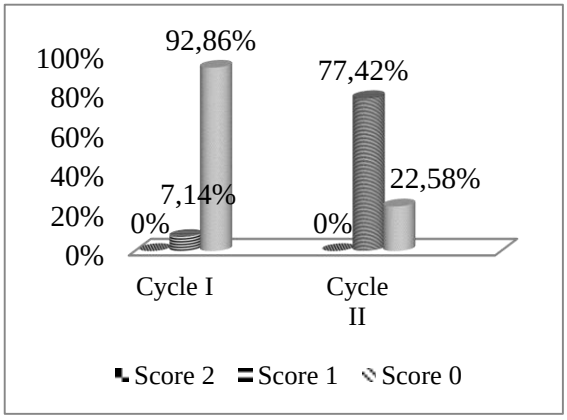

Figure 7. Students' ability to make inference, prediction and to draw conclusion from quantitative data

In this indicator, there was no increasing on the percentage of the students' answer that got 2 score. It is because the percentage of the students' answer that got 2 scores in cycle I and II was the same at 0%. However, the increasing was on the percentage on the students' answer that got score 1, it increased from 7.14% into 77.42% (Figure 7).

Application of discovery learning can explain the advantages and disadvantages at the beginning of each cycle; this deficiency arises because students are not familiar with the changing way of learning being applied. After getting used to the same learning patterns the students are able to improve those skills. Based on the percentage in cycle I, half of the indicators which have percentage of the students' answer with 2 score was 0%. It shows that the students had not understood the problems and the questions so they got difficulties on answering the questions correctly. In cycle II, there was significant improvement on each indicator. It proved that the students had been able to comprehend the problems and questions so they could answer the question correctly.

Actual action is the most dominant activity in developing students' literacy skills (Istikomayanti, et al., 2016). According Cobble (2012) students who have high literacy skills are people who are active and

progressive and able to survive and face the problems around him.

The improvement of the students' scientific literacy ability is caused by the implementation of the discovery learning. According to Cahyo (2013), in discovery learning, the students are facilitated to be able to find the concepts and principles by using their own mental process. In finding the concept, the students observe, classify, maka hypothesis, explain, and draw conclusion, etc in order to find several concepts and principles.

Furthermore, the obvious learning principal in discovery learning is the instructional materials that are presented are not in the final form, but they are in the active process. The students are facilitated to identify what they have known, continue finding the information by themselves, after that they organize what they have known and comprehended as the final form. The students actively construct their own experience by relating the new knowledge with the internal capacity or the cognitive structure that they have got (Cahyo, 2013).

From the explanation above, it can be seen that discovery learning model is the suitable model to improve the students' scientific literacy ability, because the steps of the discovery learning have the same direction as the indicators of the scientific literacy, that the writer used in this research (Gormally et al., 2012).

CONCLUSION

Based on the explanation above, it can be concluded that the use of discovery learning in science subject in the topic of population density to the environment can increase the students' scientific literacy ability on the VII-1 students of State JHS 3 Ngronggot. The improvements were on the six out of seven indicators, especially on the percentage of the students with 2 score that can be explained as follows: identify the valid scientific opinion increased 64.52%, reviewing literature effectively increased 29.03%, understanding research design and its effect to the research finding/ conclusion increased 5.06%, making graphic from the data correctly increased 58.07%, solving the problem using quantitative skill inclusing using basic statistics increased 50.93%. However, on the indicator understanding and interpreting the basic statistics decreased 8.53%. Finally for the last indicator such as making reference, prodiction, and drawing comclusion based on quatitative data increased on the students' answer that got 1 score 70.28%.

It is important for the future researcher to add the CAR cycle when implementing discovery learning, so all of the indicators in the scientific literacy measurement can be achieved. Scientific literacy is a curriculum mandate; students should get the skills to be ready to face changes and problems everyday, because education is always changing in accordance with civilization. One way to improve scientific literacy skills using discovery learning model.

REFERENCES

Astuti, Y. K. (2016). Science literation in learning IPA. *Gema Wiralodra***.** *7*(3b), 67-72.

Borthick, A. F. & Jones, D. R. (2000). Motivation for collaborative online learning invention and its application in information systems security course. *Issues in Accounting Education*, *15*(2), 181-210.

Budiningsih, C. A. (2005). *Belajar dan pembelajaran*. Jakarta: Rineka Cipta.

Cahyo, A. N. (2013). *Panduan aplikasi teori-teori belajar mengajar teraktual dan terpopuler*. Jogjakarta: Diva Press.

Cobble, S. (2012). *Encouraging environmental literacy on campus*. Professional Paper Requirement for Hawaii Pacific University's College of Humanities and Social Sciences. Retrieved from http://www.kukuicup/org/vision.

Gormally, C., Brickman, P., Hallar, B. & Armstrong, N. (2009). Effects of inquiry-based learning on students' science literacy skills and confidence. *International Journal for the Scholarship of Teaching and Learning*, 3(2,) Available at: https://doi.org/10.20429/ijsotl.2009.030216.

Gormally, C., Brigman, P. & Lutz, M. (2012). Developing a test of scientific literacy skills (TOSLS): Measuring undergraduates' evaluation of scientific information and arguments. *CBE-Life Sciences Education*, *11*, 364-377.

Holbrook, J. (2005). Making chemistry teaching relevant. *Chemical Education International*, *6*(1), 1-12.

Istikomayanti, Y., Suwono, H., & Irawati, M.H., (2016). Experential learning group investigation as effort to developt environmental literacy ability at 5th Grade Students of Madrasah Ibtidaiyah. *Jurnal Pendidikan Biologi Indonesia*, *2*(1), 57-71.

Iswari, Y. D. 2011. Problem solving problem-based laboratory activities on soluble matter and solubility times to improve student's science literacy (*Unpublished Thesis*). Bandung: SPS UPI.

Laugksch, R. C. (2000). Scientific literacy: A conceptual overview. *Sci. Ed, 84*, 71-94.

National Research Council. 1996. National Science Education Standart. Retrived from:http://www.nap.edu/catalog/4962.html.

OECD. (2006). *Assesing scientific, reading and mathematical literacy (A framework for PISA 2006)*. Retrieved from http://www.oecd.org/edu/school/assessingscientificreadingandmathematicalliteracyaframeworkforpisa2006.htm.

OECD. (2014). PISA 2012 *Results in focus: What 15-year-olds know and what they can do with what they know*. Paris: OECD.

Rakhmawan, A., Setiabudi, A., Mudzakir, A., (2015). Design of learning sciense literacy based inquiry on laboratory activities. *Jurnal Penelitian dan Pembelajaran IPA, 1*(1), 143-152.

Rusilowati, A., Sunyoto, E. N., & Mulyani, S. (2015). *Developing of science textbook based on scientific literacy for seventh grade of secondary school*. Proceeding of International Conference on Mathematics, Science, and Education (ICMSE). Retrieved from http://icmseunnes.com/2015/wp-content/ uploads/2016/03/89_ SE.pdf.

Turiman, P., Omar, J., Daud, M. A., & Osman, K. (2012). Fostering the 21st century skills through scientific literacy and science process skills. *Procedia, Social and Behavioral Sciences, 59*, 110-116

Wenning, C.J. 2011. Experimental inquiry in introductory physics courses. *Journal Physics Teacher Education Online*, *6*(2), 2-8.

Widayati, A. (2008). Penelitian tindakan kelas. *Jurnal Pendidikan Akuntansi Indonesia*, *6*(1), 87-93.