



Application of Guided Inquiry using LKPD on Animal Tissue Topic and its Impact to Science Process Skills and Students' Outcome Learning

Amalia Nurina Putri[✉], R. Susanti¹

Biology Department, Faculty of Mathematics and Science, Universitas Negeri Semarang, Indonesia

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Abstract

According to interview with biology teacher of 11th grade of SMA Negeri 9 Semarang, known that teaching-learning process on animal tissue topic implemented was teacher-centered learning, so that low students' participation in the classroom happened and also there is no laboratory activity which resulted in the low ability of science process. One way to solve that problem is to implement learning model that carry out scientific methods and student-centered learning called guided inquiry. This study aims to analyze the effectiveness of implementation of guided inquiry model using LKPD on students' science process skills as well as the learning outcomes. The participants is 72 students of 11th grade in science class 5 and 6 of SMA Negeri 9 Semarang in the first semester in year 2019/2020. This study used *pre-experimental design* with *One Shoot Case* design. Implementation of guided inquiry model using LKPD is effective if $\geq 90\%$ score of science process skills reach a minimum of good criteria and excellent, $\geq 75\%$ of students are able to reach the minimum criteria for completeness of studying ($KKM \geq 70$) and enhancement *pretest-posttest (N-gain)* score are in the medium-high category of $\geq 90\%$ students. The results show science process skills in 97,15% of students reach good and excellent criteria, completeness of studying score in 93,06% of students reach the minimum criteria for completeness of studying ($KKM \geq 70$) as well as the enhancement *pretest-posttest (N-gain)* score in 100% of students are in the middle to high category. This study has identified guided inquiry model using LKPD of animal tissue topic as effective implementation strategy for developing science process skills of students as well as boosting the learning outcomes of students in SMA Negeri 9 Semarang.

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[✉] Correspondence Address:

D6 Building, 1st Floor, Jl Sekaran Gunungpati Semarang
Email: hirimahinatakireina@gmail.com

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INTRODUCTION

Biology is the natural science that studies living organisms, environment, as well as the relation (Sudarisman, 2015). Biology does not only study the facts of natural phenomena but also body metabolism, hormonal system, coordination system, and any other things. Biology is one of the science-based subjects with scientific methods as a referral for delivering the content (Hapsari *et al.*, 2012). For that reason, a learning model that uses the scientific method is needed. According to Alimah and Marianti (2016) scientific method is steps of scientific problem solving to obtain knowledge that is rational and verifiable. Scientific problem solving steps start from observing, forming hypothesis, testing hypothesis by experimentation, and draw conclusions. One learning model that focuses on the scientific method is the inquiry learning model. There are several types of inquiry learning models, one of which is guided inquiry (Utami *et al.*, 2013). According to Leonard and Penick (2009) students on guided inquiry learning models conduct investigations through discussion or else independent or group experiments to gain knowledge and communicate findings as well as ideas to others. Students use scientific method in conducting investigations and experiments (Putri *et al.*, 2015).

Based on observation and interview with biology teacher of 11th grade of SMA Negeri 9 Semarang, known that teaching-learning process implemented teacher-centered learning especially on animal tissue topic, so that low students' participation in the classroom happened and students feel bored. Students only listening, remembering, and doing nothing so that students have poor understanding of biology concepts. Students have difficulty in understanding and differentiating animal tissues. Also, the lack of laboratory activities hinders students from observing real animal tissues and students lack of science process skills.

Guided inquiry model give opportunity for students to learn finding facts, concepts, and fundamental using science process skills (Budiada, 2011). Students not only learn by reading and memorizing the subject matter, but also practice developing thinking skills and being scientific so that the process of knowledge construction occurs well. Science process skills involve learning competence, procedural competence, social competence as well as communicative competence (Rustaman, 2005). Students get instruction and guidance through the inquiry process by the teacher so students can find and conclude what they get. Through guided inquiry, students gain skills to use tools and resources for study while learning the contents of learning and fulfill basic competencies (Kuhlthau *et al.*, 2007). As stated by Kurniawan (2013) implementing a guided inquiry model could improve students' understanding so it boosts the learning outcomes. Guided inquiry learning also develops students' self-confidence and the ability to find a variety of solutions to problems. This statement supported by Annafi (2017) that inquiry learning is a learning model that has a strong impact and effective because students get an opportunity to study thoroughly. Minawati *et al.* (2014) stated that the implementation of guided inquiry learning models requires an appropriate learning media, one of which uses the Student Activity Sheet (LKPD). LKPD based on guided inquiry is a right choice because it can direct students to find their own concepts of knowledge. The presence of LKPD based on guided inquiry can help students discover and develop concepts with a systematic process (Annafi, 2017).

Based on the statements above, a guided inquiry learning model using LKPD needs to be applied so that learning activities are effective and improve the science process skills as well as student learning outcomes.

RESEARCH METHOD

This study has been conducted in SMA Negeri 9 Semarang in Juli to Oktober 2019. The populations are all students of 11th grade in SMA Negeri 9 Semarang. The samples are students of 11th grade in science class 5 and 6 as an experiment class taken using purposive sampling. The independent variable is the implementation of the guided inquiry model assisted by LKPD while the dependent variable is the science process skills and student learning outcomes after the treatment. Researchers used the Pre Experimental Design approach with the One Shoot Case research design that the two classes were given the same treatment and each one was carried out posttest after treatment (Sugiyono, 2015). There are two types of

data in this study, primary data and secondary data. Primary data is the score of science process skills and cognitive learning outcomes of students. Secondary data is the implementation of learning, student responses and teacher responses. There are 7 steps of guided inquiry learning using LKPD (Learning, 2004), are:

- a. Planning an investigation: The researcher groups students into a heterogeneous small group, guides students to plan an investigation, helps to prepare equipment needed and arrange proper work procedures
- b. Retrieving: The researcher presents cases or phenomena and students conduct investigation which allow them to find problem using Lembar Kerja Peserta Didik (LKPD) and the researcher guides students asking questions based on the presented cases or phenomena.
- c. Processing: The researcher guides students conducting investigation and encouraging data collection
- d. Creating: Researcher helps students analyzing data by discuss it with the team member in a group.
- e. Sharing: The researcher guides students presenting what they have got in the investigation that they have been conducted.
- f. Evaluating: The researcher helps students drawing conclusion and emphasizing important things based on investigation result.

RESULTS AND DISCUSSION

Students' Science Process Skills

Data on science process skills is obtained from observations using observation sheets when students conduct laboratory activity on animal tissues. The results of observing students' science process skills in the two classes studied are presented in Table 1.

Table 1. Number of students according to five category of science process skills

Science Process Skills Category	Number of Students	Percentage (%)
Excellent	37	51,43
Good	33	45,72
OK	2	2,85
Poor	0	0
Worst imaginable	0	0

In Table 1 shows that 97.15% of students achieved excellent and good science process skills. This shows that the implementation of guided inquiry learning model using LKPD is effective on students' science process skills, because $\geq 90\%$ of students achieve excellent and good criteria of science process skills. Research result of Kurniawan *et al.* (2017) showed that guided inquiry learning using LKPD improved science process skills and learning achievement.

Learners must use tools and materials to observe animal tissue directly, group tissues based on observations and conduct group discussions. If students undergo difficulties, students ask questions to the teacher or teammates. Siswono (2017) stated that science process skills aims to build students' prior knowledge through activities that involve cognitive, psychomotor and affective (social) knowledge. This opinion is supported by Nasution (2018) research that the implementation of guided inquiry learning models has a good impact on the science process skills of students of SMA Negeri 3 Padangsidempuan with the highest average in laboratory activity score. Nurhidayati *et al.* (2015) stated that if students are trained continuously and guided through experiments, data analysis and draw conclusions can improve the skills of biological science processes. This is consistent with the research of Maikristina *et al.* (2013) that the science process skills of students who are taught with guided inquiry models are higher than problem solving learning models.

Animal tissues teaching-learning process in SMA Negeri 9 Semarang usually did not include laboratory activities. When the researcher asked students to do laboratory activity, students feel enthusiastic in the learning process. Baeti (2015) stated that experiment-based learning boost the interest and enthusiasm of students in teaching-learning process. The enthusiasm of students in conducting laboratory activity focus during their activities make it easier for students to understand the lesson (Nasution, 2014).

There are two students who get OK score in science process skills. Based on further review, a student did not know how to use tools and materials as well as the function, he made a mistake in determining the

parts of animal tissue and did not actively ask questions on laboratory activity. While one other student did not know how to use tools and materials as well as the function and could not determine the parts of animal tissue based on the structure, function and characteristic. According to Bili *et al.* (2018), One of the limitations of conducting a short laboratory activity causes the science process skills of students to be poorly trained. Based on Sumaryati and Hasanah (2015) one of the weaknesses of the guided inquiry learning model is that it takes a long time, so the teacher has difficulty adjusting the time determined and it is difficult to control the success of all students.

Student Learning Outcomes

Student learning outcomes obtained from *posttest* score, LKPD score and lab report score. The successful implementation of guided inquiry learning models using LKPD can be seen from the classical completeness of the student's final score. A summary of the students' final scores is presented in Table 2.

Table 2. Analysis of the Students' Final Scores

Subject	Number of Students	Percentage (%)
Students who pass (≥ 70)	67	93,06
Students who did not pass (< 70)	5	6,94

Table 2. shows classical completeness reaching 93.06%. There are still 5 students who did not pass from the two classes. Data on student learning outcomes enhancement is presented in Table 3.

Table 3. Student *N-gain* Score Data for 11th Grade Science Class 5 and 6

<i>N-gain</i> Scores	Number of Students	Percentage (%)
Low	0	0
Middle	29	40,28
High	43	59,72

The implementation of the guided inquiry model using LKPD was effectively applied to animal tissue topic in SMA Negeri 9 Semarang because 93.06% of students reached the minimum criteria for completeness of studying ($KKM \geq 70$) and 100% of students got middle to high category on *N-gain* score. Iswatun *et al.* (2017) proved that guided inquiry learning more effectively improve the learning outcomes of light reflectance topic than direct instruction. Dewi *et al.* (2013) and Rahmawati *et al.* (2012) proved that guided inquiry learning model could improve the learning outcomes of students.

The implementation of the guided inquiry model using LKPD of animal tissue topic conducted four times, delivery the concepts twice, once laboratory activity and once final evaluation. The researcher used guided inquiry learning in the following syntax, planning, retrieving, processing, creating, sharing and evaluating. At the first meeting the researchers examined general animal tissue, epithelial tissue and muscle tissue together with the students. The second meeting examined the connective tissue and nerve tissue. The third meeting held a laboratory activity observing animal tissues using microscope and writing a lab report.

In the first stage, planning, researcher presented events or phenomena related to the topic and guided students to find learning resources and relevant information related to the theory being studied. In retrieving stage, researcher grouping students into a heterogeneous small group consist of 4-5 students. Then researcher guide students planning and conducting an investigation. Students fill the LKPD out in a group and find learning resources independently with researcher's assistance. One of the advantages of LKPD based on guided inquiry is that it allows students to find and conceptualize systematically (Annafi, 2017). Based on Astuti and Setiawan (2013) LKPD supports an innovative, constructive, and student-centered learning-based learning model. Putri *et al.* (2015) also stated that inquiry learning ease students to understand the questions in LKPD.

Processing stage, researcher guided and facilitated data collection and process information obtained to link with the concept. Creating stage, researcher helped students analyze the data by discussing it with teammates. Involvement in discussions and group work makes students actively broaden their horizons to solve problems (Nur *et al.*, 2018). In sharing stage, researcher guided students present what they have got in group discussion and give an opportunity to other groups to give a feedback. The activity of presenting results

is one-way students get concepts and become more inquisitive, actively asking questions, expressing opinions, working together, and communicating each other (Kristanto & Susilo, 2015).

The skills acquired after the implementation of the guided inquiry model in this study are conducting experiments, observing animal tissues, analyzing data, drawing observations, conducting discussions, concluding and communicating observations. Hasanah *et al.* (2016) stated that the skills acquired after carrying out guided inquiry learning are conducting experiments, observations, recording the data, making graphs, analyzing data, concluding, and communicating. According to interview with biology teacher shows that guided inquiry learning using LKPD makes students actively involved in the teaching-learning process. The advantages of LKPD are made and developed by teachers into media and learning guidelines so that students can play an active role in teaching and learning activities (Afifah, 2018).

Learning outcomes in the two classes studied showed good results, but there are still five students who have not passed yet. Known that two students had low scores on the score of the lab report (value <70) due to being late in submitting reports, while the other three students were late in submitting reports, the report was not systematic and incomplete. The diversity habits of students make learning plans does not always go well and affect learning outcomes (Sumaryati & Hasanah, 2015).

CONCLUSION

Based on the results of research and discussion, it is concluded that the application of guided inquiry model using LKPD of animal tissue topic effectively applied to science process skills and learning outcomes of students in SMA Negeri 9 Semarang, with the score of science process skills in 97,15% of students reached good and excellent category, completeness of studying score in 93,06% of students reach the minimum criteria for completeness of studying ($KKM \geq 70$) as well as the enhancement pretest-posttest (N-gain) score in 100% of students are in the middle-high category.

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