SCIENCE PROCESS SKILLS DEVELOPMENT : PHOTOSYNTHESIS INGENHOUSZ EXPERIMENTAL LKPD BASED ON PRACTICUM THROUGH LESSON STUDY FOR LEARNING COMMUNITY

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ABSTRACT

The research aims to produce Photosynthesis Ingenhousz experimental LKPD based on Science Process Skills through Lesson Study for Learning Community on valid and practical. The Student Worksheet (LKPD) developed is LKPD to facilitate students to have science process skills. The pattern of development of LKPD based on science process skills itself refers to the Lesson Study for Learning Community (LSLC) which consists of planning, implementing, and reflecting. This research method is a Research and Development (R & D) with 4D models (Define, Design, Develop, and Disseminate). Data is collected by using validation sheets. Data analysis was carried out using a quantitative descriptive method on the validity of the LKPD practicum based on Science Process Skills through the Lesson Study for Learning Community. The research results showed that the LKPD practicum based on Science Process Skills through Lesson Study for Learning Community was declared valid with an average score of 3.66. The practicality of LKPD is at criteria 3.60 by teachers and 3.70 by students. Based on the results of the study, it can be concluded that the LKPD practicum based on Science Process Skills through Lesson Study for Learning Community is very valid and practical.

Keywords : Science Process Skills, LKPD, LSLC, Practicum, R&D

INTRODUCTION

The experimental material of Ingenhousz photosynthesis is part of the basic framework of the process of students understanding of anabolism material. The Ingenhousz photosynthesis experiment in students presents a great challenge for teachers, this is because a large amount of the material consists of abstract concepts and this material is practicum material. Mastery of designing Ingenhousz photosynthesis experiments cannot be left for all activities in the maintenance, design and realization of anabolism material. Based on observations and discussions with several Biology teachers, problems that must be immediately sought for solutions include: (1) weak ability of students to make a series of Ingenhousz photosynthesis experiments, (2) weak ability of students to translate a series of practicum work steps into mastery of concepts, (3) weak ability of students to make connections to observations, data analysis and conclusions, (4) weak ability of students to

make relationships between conclusions and practicum objectives. In addition, so far in the learning process, it still uses the teacher-centered learning method where the role of the teacher is still very dominant so that it has an impact on the lack of independence of students.

Teacher self development in learning can be done in various ways, one of which is the Lesson Study for Learning Community activity, namely by studying learning collaboratively and continuously with their colleagues. The study of joint learning starts from learning planning, implementation of plans and observations, as well as conducting joint reflections in the form of discussions on the results of observations. Lesson Study for Learning Community is a model of teacher professional development through collaborative and continuous learning studies based on the principles of collegiality that help each other in learning to build a learning community. One of the duties of the teacher is as an educator whose job is to develop the potential of students. Therefore, a teacher needs to have strategies in learning in order to develop the potential of students (Hendayana et al, 2006). Lesson Study for Learning Community is one of the coaching efforts to improve the learning process carried out by a group of teachers collaboratively and continuously in planning, implementing, observing and reporting learning outcomes. Lesson Study for Learning Community was chosen and implemented because it is an effective way that can improve the quality of learning carried out by teachers and student learning activities. According to Lewis (2004), the benefits of Lesson Study for Learning Community include increasing teacher knowledge about teaching and learning materials, how to observe student learning activities, and strengthening collegiality relationships between teachers. Lesson Study for Learning Community also strengthens the relationship between the implementation of daily learning and long-term learning objectives, increases teacher motivation to always develop, and improves the quality of RPP including its components and learning strategies.

Lesson Study for Learning Community has stages that need to be carried out systematically, according to the version developed by FMIPA UNY in collaboration with JICA consists of three stages (one learning cycle), namely: the plan stage, the do / research lesson stage and the see stage (Kadarisman, 2009). Plan stage, this stage is carried out to identify problems in the classroom that will be used for Lesson Study for Learning Community activities and plan alternative solutions, for example the selection of subject matter, selection of methods, media, according to the characteristics of students, the type of evaluation to be applied, and so on. The results of the identification are discussed with the Lesson Study for Learning Community group, then opinions will appear and contribute suggestions from other teachers as collaborators, this activity is carried out learning can be successful. Important things to discuss are observation sheets, especially the determination of aspects that need to be considered in a learning process and its indicators. Furthermore, the results of the identification of problems and learning tools are discussed to be refined, as well as determined by the model teacher. Do stage, this stage is the implementation and observation of model teachers carrying out learning guided by RPP. Before the learning begins, a meeting is held between the model teacher and the team, in the meeting it is informed about the learning activities that will be carried out by the model teacher. Other teachers as observers

make observations using prepared observation sheets and other necessary devices. The observer records the positives and negatives in the learning process, both in terms of the behavior of the model teacher and students with the aim of helping in the reflection stage. See stage, at this stage the model teacher who implements the lesson plan is given the opportunity to express his impressions during the implementation of the lesson, both towards himself and towards the learners faced. Furthermore, the observer conveys the results of the analysis of his observation data, especially those related to student activities during learning. Then the model teacher who did the implementation will respond back to the observers comments. The important thing to reconsider is the RPP that has been drawn up as the basis for the next cycle of RPP improvement.

Based on the above, an appropriate strategy is needed to be able to improve the ability of students science process skills. Basic science process skills consisted of observing, applying the correlation of space or time, concluding, performing measurements, communicating, organizing and predicting. Integrated science process skills consisted of identifying variables, defining operations, formulating hypotheses, interpreting the data, conducting experiments, formulating models, and presenting the information (Özgelen, 2012). The science process learning should emphasize on providing direct experiences to develop scientific exploration and the understanding of competencies (Subamia, 2012). One of the methods for developing science process skills is practical methods. Practicum is a fundamental part of every knowledge branch and especially for science. Practicum is currently an important role in confirming the taught theory in the classroom (Reid, 2006). According to Arifin (2003) suggest that practical method supports the learning process activities in finding certain principles or explaining developed principles. Practicum will be effective if it is well planned, giving the opportunity to choose an alternative procedure, designing experiments, collecting data, and interpreting the obtained data.

Teaching materials as one of the learning tools and learning resources for students should have an important role in learning to help teachers direct learning to run more optimally. Some textbooks that refer to the old curriculum stuff learners with concepts that must be memorized, and do not invite learners to think about constructing learners knowledge and experiences to discover for themselves the concepts they must understand and find their meaning and connection to the lives of learners. For this reason, it is necessary to develop appropriate teaching materials so that the development of students science process skills can also be improved (Suharyadi, P. A., and Hernani, 2013). One of the teaching materials that can facilitate students in learning activities is the Student worksheet (LKPD). LKDP development needs to pay attention to two aspects, namely design and development steps. Two things that need to be considered in designing the development of LKPD include the level of reading ability and knowledge of students. LKPD development steps include determining learning objectives, collecting materials, compiling elements, as well as examination and refinement (Afifah, R. N, 2015). LKPD that can activate students, make it easier for students to understand the teaching material provided and concise and rich in tasks to practice is the LKPD that students need during classroom learning (Prastowo, A, 2011).

Development of LKPD practicum based on science process skills through Lesson Study for Learning Community (LSLC) to be able to improve the science process skills of students (Dragoş, V., & Mih, V, 2015). Collaboration with the LSLC pattern of science process competencies can be instilled in learners (Saito, E., et.al, 2015). By going through the plan, do, and see stages, the LSLC team was able to prepare and implement instructional designs based on good science process skills (Hadiprayitno, et al, 2020). Based on this, the purpose of this study is to produce a valid and practical LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community.

METHOD

This research method is a Research and Development (R & D) research. Research and Development is a research method used to produce and test the effectiveness of LKPD. The research and development design used in this study is a 4D model consisting of define, design, develop, and disseminate stages (Sugiyono, M, 2015). Stages and instruments used in each stage: 1) Define. This initial stage aims to find out and define the needs in learning and collect information related to LKPD to be developed. To obtain this information, instruments are used in the form of observation sheets, interview sheets, and curriculum studies. 2) Design. The information obtained at the define stage related to the development of the LKPD Practicum based on Science Process Skills is used as a reference for designing the LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community. 3) Develop. The main objective in the development stage is to produce a valid and practical LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community to be widely implemented. The instruments used to test the effectiveness in LKPD that have been developed are questionnaires, LKPD effectiveness tests in terms of Student Science Process Skills. 4) Disseminate. After the development stage is complete, it is continued to the final stage, namely dissemination or dissemination of LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community.

LKPD validity analysis consists of the validity of the contents and the validity of the construction. The validity of the contents for analyzing the LKPD development procedure and the conformity of the LKPD to the theory, is carried out theoretically by experts. Validity to see the relationship of each component in LKPD with learning theory, by calculating the average score of the validator. LKPD validation calculation with the conversion of the average total score into qualitative values using the criteria used (Senjaharmini, D. A., et al, 2019). LKPD validity data obtained using LKPD validation sheets.

Lesson Study for Learning Community (LSLC) activities are carried out for three cycles with each cycle carried out in the LSLC stages, namely Plan (planning learning), Do, (implementing of learning), and See (observing the learning process) using the observation method carried out by the observer team (biology teachers and chemistry teachers at SMA Negeri 6 Semarang). The process of implementing the Lesson Study for Learning Community

(LSLC) uses a learning model of concept achievement in enzyme and metabolism material, a laboratory exercise learning model on photosynthesis Ingenhousz experimental material, a laboratory exercise learning model on the Ingenhousz photosynthesis experimental design material.

RESULTS AND DISCUSSION

This stage of research develops the Ingenhousz photosynthesis LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community.

1. Define Stage

The analysis carried out consists of five steps, namely: problem analysis, student analysis, concept analysis, task analysis and formulation of learning objectives. First, the problem analysis carried out in this stage is to conduct an interview with a biology teacher at SMA Negeri 6 Semarang to get information about the conditions and facts of learning biology at SMA Negeri 6 Semarang. The information obtained is used to analyze problems that arise in biology learning at SMA Negeri 6 Semarang. After going through the process of observation and interviews, it was found that in Biology learning at SMA Negeri 6 Semarang there were several problems, including: (1) the involvement of students in learning biology was still low, (2) the undevelopment of students science process skills related to the Ingenhousz photosynthesis experimental material (3) the teaching materials used are package books and LKPD from certain publishers which are more emphasized on the material and questions so that they do not show the activities of students in the development of science process skills, (4) the learning method used is still dominated by the teacher centered method. This problem is used as a basis in determining the LKPD Practicum based on Science Process Skills through the Lesson Study for Learning Community needed so that its application is appropriate and efficient.

Second, the analysis of students conducted with interviews, found the fact that students at SMA Negeri 6 Semarang have a fairly high motivation in participating in biology learning in class, the ability to work together in groups is quite high. Third, concept analysis contains the identification of the main concepts taught that are systematically arranged. The concept related to the selected basic competence is the Ingenhousz photosynthesis experiment. Fourth, task analysis examines tasks in the form of competencies developed in learning. Fifth, the formulation of learning objectives is used as a basis for designing LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community. The learning objectives that are compiled include so that students are able to analyze the concept of the Ingenhousz photosynthesis experiment correctly, students are able to design the Ingenhousz photosynthesis experiment with the right parameters, students are able to write down the observation results in the Ingenhousz photosynthesis experiment design appropriately and students are able to interpret the data in a scientific investigation appropriately.

2. Design Phase

At this stage, the design of the LKPD Practicum based on Science Process Skills based through Lesson Study for Learning Community was carried out. Broadly speaking, the components in the initial design stage of the LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community include the title of LKPD, basic competencies, learning indicators, learning objectives, instructions for using modules, case studies, simple experiments, questions and conclusions. In the design section of the Ingenhousz photosynthesis experiment, it can help develop science process skills in designing and conducting scientific investigations and interpreting scientific data and evidence.

3. Develop Phase

This stage of LKPD development aims to produce better learning tools after going through a validation process and field trials. The learning tools that have been designed are validated and revised based on expert input. Furthermore, it was tested on a limited basis at SMA Negeri 6 Semarang to see the practicality of the LKPD developed. The following data is obtained consisting of data from expert validation and practicality.

LKPD Validation

The validation process involves one expert validator. This expert then validates the correctness of the content, format, language and graphics of the LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community developed. Validators provide an assessment of the LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community which was developed by filling out a questionnaire and asking for suggestions for improvement. The highest score is 4 and the lowest score is 1 for each statement. The total score given by the validator is then averaged to get the average score. This average score is then converted to a scale value of 4. The criteria for the validity of LKPD can be seen in table 1.

Table 1. Criteria for Validity of Teaching Materials (LKPD)

Score	Criteria
3,5 < SR ≤ 4,0	Highly Valid
2,5 < SR ≤ 3,5	Valid
1,5 < SR ≤ 2,5	Invalid
1,0 < SR ≤ 1,5	Highly invalid

The provisions and procedures of this assessment apply to all validation data. Recapitulation of the validation results of the LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community developed is presented in Figure 1. The results of the expert validity test showed a very valid result with a final score of 3.66. In addition to scoring and categories, in this stage, the team together with validators

reflect to become the basis for improving LKPD. Here are some notes provided by validators for LKPD improvement, including: 1) adding images to the Ingenhousz photosynthesis experiment work step on LKPD to make it easier for learners to recognize material tools and experimental stages, 2) integrating science process skills indicators in LKPD, 3) fixing questions on previous cycle LKPD.

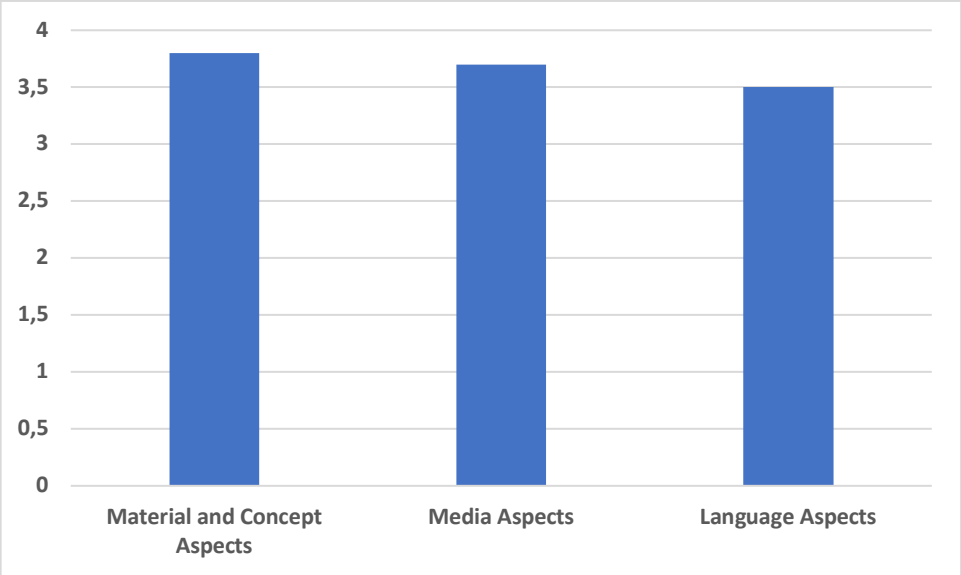

Figure 1. The results of the validation of the LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community

Practicality of LKPD

The practicality data of the LKPD trial consists of data on the teacher's response to the suitability of the content of the material and concepts, media and language. LKPD practicum based on Science Process Skills through Lesson Study for Learning Community on the Ingenhousz Photosynthesis experimental material developed and student responses to the readability test of the LKPD practicum based on Science Process Skills through Lesson Study for Learning Community after implementation.

Table 2. Practical Criteria for Teaching Materials (LKPD)

Score	Criteria
3,5 < SR ≤ 4,0	Very Practical
2,5 < SR ≤ 3,5	Practical
1,5 < SR ≤ 2,5	Impractical
1,0 < SR ≤ 1,5	Very Impractical

Data on the response of teachers and students to the use of LKPD practicum based on Science Process Skills through Lesson Study for Learning Community experimental material Ingenhousz photosynthesis is collected after learning is completed. The respondents who were involved in knowing the teacher's response to the use of LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community

were four biology teachers of SMA Negeri 6 Semarang while the number of respondents to the readability of LKPD Practicum based on Science Process Skills through Lesson Study for Learning Community which was developed consisted of ten students as respondents. The results showed that the response of teachers and students' responses to the use of LKPD were included in the very practical category. A results of the practicality results of the LKPD trial is presented in Table 3.

Table 3. Results of Practicality LKPD Practicum Science Process Skills based on Lesson Study for Learning Community developed

No	Instrument	Score	Criteria
1	Questionnaire on teachers' responses to LKPD	3,6	Very practical
2	Questionnaire of student responses to LKPD	3,7	Very practical

4. Disseminate Stage

This stage is to widely implement the LKPD practicum based on Science Process Skills through Lesson Study for Learning Community that has been developed. To be able to carry out this activity, LKPD has been validated by experts and then tested. Dissemination is carried out based on the results of validity tests which then the LKPD practicum based on Science Process Skills through Lesson Study for Learning Community itself will be submitted to partner schools, SMA Negeri 6 Semarang. Based on the results of the research and discussion above, the LKPD practicum based on Science Process Skills through Lesson Study for Learning Community is very valid and practical.

CONCLUSION

Based on the results of research and discussion, it can be concluded that the LKPD Practicum of Science Process Skills based on Lesson Study for Learning Community is valid with an average score of 3.66, practicality to LKPD Practicum Science Process Skills based on Lesson Study for Learning Community developed. is on the criteria of 3.60 by teachers and 3.70 by learners. Based on the results of the study, it can be concluded that the LKPD Practicum of Science Process Skills based on the Lesson Study for Learning Community is very valid and practical.

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