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Analysis of biology students' problem-solving skills using the PBL model through Lesson Study (LS) online

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Abstract
Problem-based learning models train students to develop thinking and problem-solving skills in contextual circumstances. This research aims to analyze the problem-solving ability of 32 biology students in 2020 at Malang State University in the course of Plant Physiology. This study is a second-cycle action study using the PBL model through lesson study activities. Data analysis uses a problem-solving skills essay test consisting of identifying problems, identifying strategies, formulating hypotheses, evaluating potential, implementing solutions and evaluating results. The results showed that there was an increase in students' problem-solving ability from cycle I by 60.0% to 72.0% in cycle II and there were several indicators that experienced an increase in scores, namely indicators identifying strategies, formulating hypotheses, implementing solutions, and evaluating results. But the indicator score identifies the problem, and implements the solution decreases.

Keywords: Problem based learning, problem solving, lesson study

Introduction

In the 21st century the challenge in the world of education is that learners are required to have skills in order to compete in real life. Learners apply knowledge and engage the ability to engage in high-level reasoning, understand content, apply, and transfer knowledge to solve problems (OECD, 2018). Based (Germaine et al., 2016) Education must be able to center on learners, one way is to train their thinking skills. Learners need to have a high level of thinking skills to be involved in solving problems around them (Mellisa, 2018).

According to PISA Year (2018) the average science score of Indonesian students is 396, the indonesian ranking is still below thailand with a score of 426. This indicates a lack of students' thinking skills. Therefore, it is necessary to apply learning that can improve students' thinking skills, one of which is problem-solving ability. Problem-solving skills are important for learners to be able to survive in the face of future challenges (Darwis & Hardiansyah, 2020). Problem solving skills are done to recognize problems, find alternative solutions, choose one alternative as a solution, and evaluate the answers that have been obtained (Paidi, 2014).

However, based on data in the field students have difficulty identifying learning problems in plant physiology. This is due to the lack of problem-solving skills of students in the online learning process, students have difficulty and are not used to answering questions (Kurniawan et al., 2020). In addition, plant physiology learning is one of the complex learnings where students are faced with real-world problems, making students feel difficult. According to Susilo (2014), plant physiology materials also require knowledge of physics and chemistry that make students find it difficult to learn plant physiology. In addition, based on the analysis of the needs of students who have taken plant physiology courses from 15 respondents, 40% of them stated that plant physiology materials are abstract and 47.6% give reasons for plant physiology materials so complex that they are difficult to understand. Therefore, in studying Plant Physiology it requires understanding the basic concepts first. Therefore students need to be encouraged to get used to practicing

solving problems and realizing their ideas, Therefore, students need to be encouraged to be able to solve problems and realize their ideas, one of which is by using the PBL model through lesson study activities.

Problem Based Learning model is seen as having an advantage in the learning process. Problem Based Learning model is seen as having an advantage in the learning process (Yen et al., 2012). Problem Based Learning (PBL) is a model based on authentic and contextual problems (Aliasbin, 2019.). This model aims to study the content, process capabilities, problem solving, and study real-world issues through discussion and with investigation (Lederman et al., 2013). The application of this model is designed to encourage students to become analytical, and innovative researchers (Sumarta, 2017). The PBL model can help motivate travelers to think and act rather than just memorization. The availability of certain problem solving presented to learners can facilitate the development of an understanding of the prevailing concepts and be able to apply these various concepts to other scenarios, this may have a high learning efficacy.These advantages are described in the Ministry of Education and Culture (2013b) as follows: (1) a meaningful learning process for students, where students learn to solve problems through the application of their knowledge; (2) students can integrate knowledge and skills simultaneously and apply them in an appropriate context; (3) improve critical thinking skills, improve student performance initiatives, internal learning motivation, and be able to develop collaboration within groups. Alias (2011), states that Problem Based Learning (PBL) will train and develop high-level thinking skills oriented to the real world, students will also learn to think by solving a problem. Based on the above problems, this study aims to analyze students' problem-solving abilities in growth and development materials, and movement in plants by using the PBL model through online LS activities.

Method

This type of research is an action study that aims to analyze students' problem-solving abilities in growth and development materials, and motion in plants by using the PBL model through online lesson study activities with two cycles with each cycle lasting two meetings. PTK research flow can be seen in Figure 1. The study was conducted in November 2021. The subjects in this study were the 2020 class offering I with a total of 32 students consisting of 27 female students and 5 male students. The instrument used in this research is a test of students' problem-solving abilities. The criteria for classification of troubleshooting capabilities can be seen in Table 1.

Table 1. Criteria for classification of problem-solving abilities

Percentage (%) Assessment criteria	Percentage (%) Assessment criteria
0 -39,9	Very lacking
40,0-54,9	Less
55,0-69,9	Enough
70,0-84,0	Good
85,0-100	Excellent

Sumber: Suparya (2016: 75)

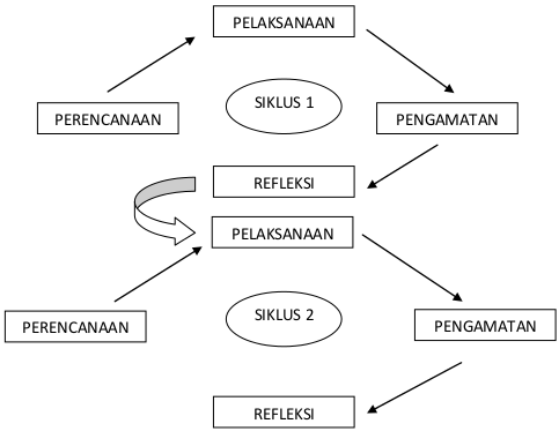

Figure 1. Class action research flow

Results and Discussion

This research was conducted in the course of Plant Physiology on the matter of Growth and Development, and Motion in Plants. The results of this study in cycle 1 obtained an average problem-solving ability of 60.0 and in cycle 2 obtained an average of 72.0 this indicates an increase in problem-solving skills by using problem-based learning models through lesson study activities with good categories. This is because Lesson Study is used to improve the quality of learning and improve teacher competence through collaborative and sustainable assessment (Ibrohim, 2010). Lesson study has three stages, namely plan, do, and see. In the plan stage is carried out collaboratively with the lesson study team that aims to design learning so that students are active and build student participation in learning, stage do is the stage of carrying out learning, the see stage used to find the shortcomings and advantages when carrying out learning ((Susilo, 2013), so that through lesson study will be able to improve the quality of the student learning process (Aziz et al., 2016). One way that can improve the quality of the learning process is a problem-based learning model. Problem-based learning models use learning based on real problems so as to effectively improve students' problem-solving skills and not used to solving contextually complex problems (Redhana, 2013).

Based on data analysis, problem-solving capabilities are obtained in Figure 2.

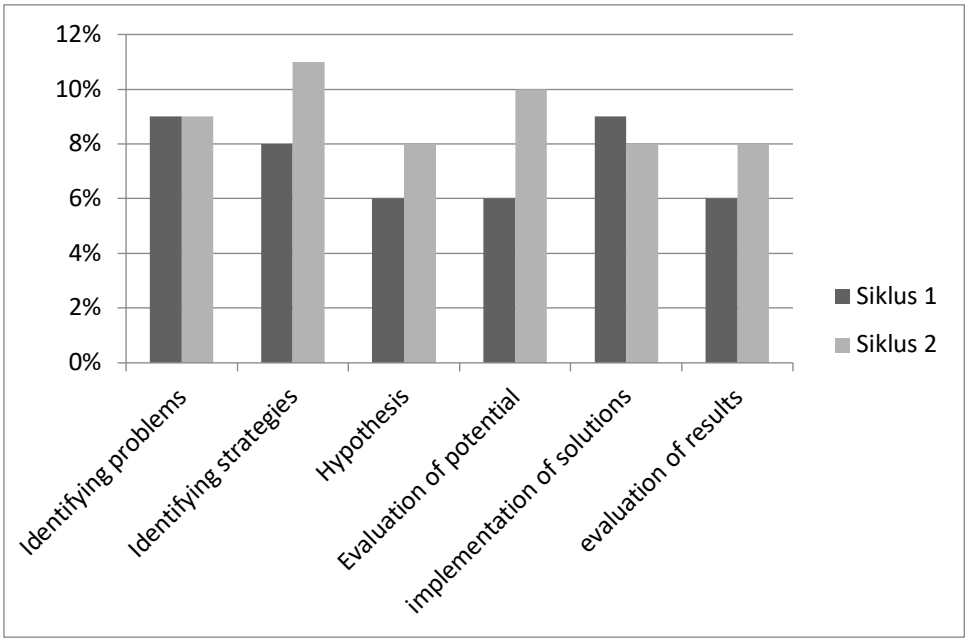

Figure 2. Problem-solving skills

In cycle I it was obtained that the percentage of indicators identifying problems in problem number one by 9.1%, identifying strategies on problem number two by 8.4%, formulating hypotheses on problem number three by 6.4%, evaluating potential by 5.8%, implementing solutions by 8.9%, and evaluating results by 6.1%. In cycle II it was obtained that the percentage of indicators identifying problems in problem number one by 9.0%, identifying strategies in problem number two by 11.1%, hypothesizing problem number three by 7.8%, evaluating the potential of problem number four by 9.8%, implementing solutions to problem number five by 8.2%, and evaluating the results on problem number six by 8.1%.

In the indicator of identifying problem number one decreased by 0.1%, this is because students are mistaken in identifying problems based on the discourse given. For example, in cycle I to identify problems with the problem of rice and corn crops are both included in the Family: Poaceae. But on the ground shows that rice lives in a wetter environment than the corn environment. Conditions of excessive light intensity can unsettle rice farmers because it is certain that rice growth will be greatly decreased. This is different from corn, as corn is more tolerant to drought and high light intensity. A good answer is that students are able to explain the factors of environmental differences that affect the growth of both plants, namely the need for light and water supply. In corn plants have proline content and sugar content so that it is resistant to drought. Low light intensity causes photosynthesis to decrease and reduce photosynthetic enzymes so that corn plants are more tolerant to high light intensity. Conversely, rice plants have low proline and sugar content so that the growth of rice plants is less resistant to drought. But it was still found that some students answered by not identifying problems such as light affecting plant growth. This is because students do not know the

direction in solving the problems given (Redhana, 2013). Based on the results of Research Indriwati & Gofur (2019), it is known that in identifying the problem students focus on one problem and other problems go unnoticed. In the indicator implementing the solution of the problem provided decreased by 0.7%. This decrease is because students have not been able to provide solutions that are in accordance with some of the discourses given. In the process of learning cycle I when doing LKM in groups found groups that have not been able to distinguish the formulation of problems with literature studies. But in the learning process cycle II in doing LKM in each group of students have been able to formulate problems by asking questions in the form of problems. The highest increase was also seen in the indicator evaluating the potential in the fourth question, which is 4%. When solving problems in the process of collecting data and information (Lee & Lee, 2020), then students are able to evaluate the problems provided. In addition, the improvement of problem-solving skills in each cycle also occurs because in the learning process using a problem-based learning model carried out through Lesson Study activities, namely plan, do and see every week so that there are improvements in each learning cycle. In addition, lesson study as a context in this research so as to improve the content, process, and quality of learning. Based on the results of research, it can be concluded that the problem-solving ability of students is relatively good.

Conclusion

Based on the results of the study, it can be concluded that students' problem-solving abilities have increased and are included in good categories. However, some indicators of problem-solving capabilities decreased, namely in indicators identifying problems and implementing solutions.

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