Problem-based Learning Through Lesson Study Activities Effectively Improves Collaboration Skills of Biology Students

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ARTICLE INFO	ABSTRACT
Article history Submission Dec 9th, 2022 Revision May 14th , 2023 Accepted May 17th, 2023 **Keyword** *Problem-based Learning* *Lesson study* Collaboration Skills	Online learning during the Covid-19 pandemic is an alternative even though it runs with limitations. Collaboration skills in online learning have not been optimally empowered, which is an urgency to be developed in order to prevent individualistic life and train social character. This research is a quantitative descriptive study aimed at analyzing differences in student collaboration skills before and after learning using the Problem-based Learning model through Lesson Study activities. The research population is Biology Department students who program the Plant Physiology course in the odd semester of the 2021/2022 academic year with a sample size of 32 students. Collaboration skills are measured through observation by paying attention to the assessment rubric adapted from Greenstein including indicators of working productively, showing respect, compromising, and being responsible for contributing. Data analysis used paired sample t-test. A significance value was obtained of 0.000 <0.05, which means that there was a significant difference between the initial collaboration and the final collaboration of students. The Problem-based Learning learning model through Lesson Study activities effectively improves student collaboration skills.

Introduction

Global competition that occurred in the industrial era 4.0 became a challenge for education in Indonesia. Empowerment of 21st century skills is an urgency in learning biology. Preventing individualistic life and training the character of socializing is the aim of the collaboration being developed [1]. Collaboration skills, namely the ability to participate in learning activities[2,3], make colleagues[4], integrate intellectual, emotional and social in groups so that the same goals can be

achieved[5]. Collaboration is also an important part of lifelong learning in the future. Students are easy to contribute to express ideas to solve problems through collaboration. Based on the results of the needs analysis that collaboration has not been optimally empowered and determines the learning model to be lacking in online learning. Collaboration not only allows teamwork but the experience gained is more important, students are able to master challenges that they may not be able to overcome on their own which can produce feelings of competence[6].

Problem-based learning is a learning model that emphasizes authentic problems. The existence of problems and questions is the basic principle of PBL so that the ability to think in solving problems is trained [7]collaboratively[8]. PBL can train analytical thinking[9]. Students also carry out investigations independently, therefore learning will be meaningful[10]. PBL was effective at enhancing collaboration[11]. Limitations in online learning, the application of PBL can be an option to be applied in learning that triggers student activity and collaboration. The learning process must also be improved, one of which is through Lesson Study activities.

Lesson study is an approach to improve the learning process, originally developed in Japan. However, along with the times, Lesson Study has begun to be developed in various countries, including Indonesia. Improving the quality of the process and improving the learning content can be pursued by implementing Lesson Study, the principles of collegiality and mutual learning become the foundation in Lesson Study so that a learning community is formed[12]. *Lesson Study aims to make the learning process better and more effective*[13]. Educators also have the opportunity to gain knowledge and experience from participating in each activity in Lesson Study[14] and increase professionalism[15]. Through Lesson Study, every process in learning always has improvements in the future. Based on the problems that have been described, it is necessary to conduct research on collaboration skills of biology students through Problem-based Learning with Lesson study activities.

Method

This research is a quantitative descriptive study that aims to determine the collaboration skills of biology students with Problem-based Learning through Lesson Study activities. PBL steps include orienting the problem, organizing students to learn, guiding investigations, presenting work, and evaluating [16]. Lesson study activities include plans, activities for planning learning scenarios, preparing learning tools. Do, this activity implements the learning scenario that has been designed. See, reflection activities and evaluate the learning that has been implemented. The research was carried out at the State University of Malang with a population of Biology Department students who program Plant Physiology courses in odd semesters of the 2021/2022 academic year. Data on student collaboration skills was obtained from observations and peer assessment during the learning process. Observations using an observation sheet that refers to the assessment rubric adapted from Greenstein include indicators of working productively, showing respect, compromising, and being responsible for contributing. Data analysis used descriptive statistics and paired sample t-test, which had previously been tested for normality prerequisites.

Results and Discussion

The description of the research results presented is a description of the average initial collaboration observation, final collaboration observation and paired sample t-test collaboration skills. The results of observations of initial collaboration and final collaboration obtained an average of 81.24 and 88.71. The mean for each indicator of initial and final collaboration skills can be seen in Figure 1.
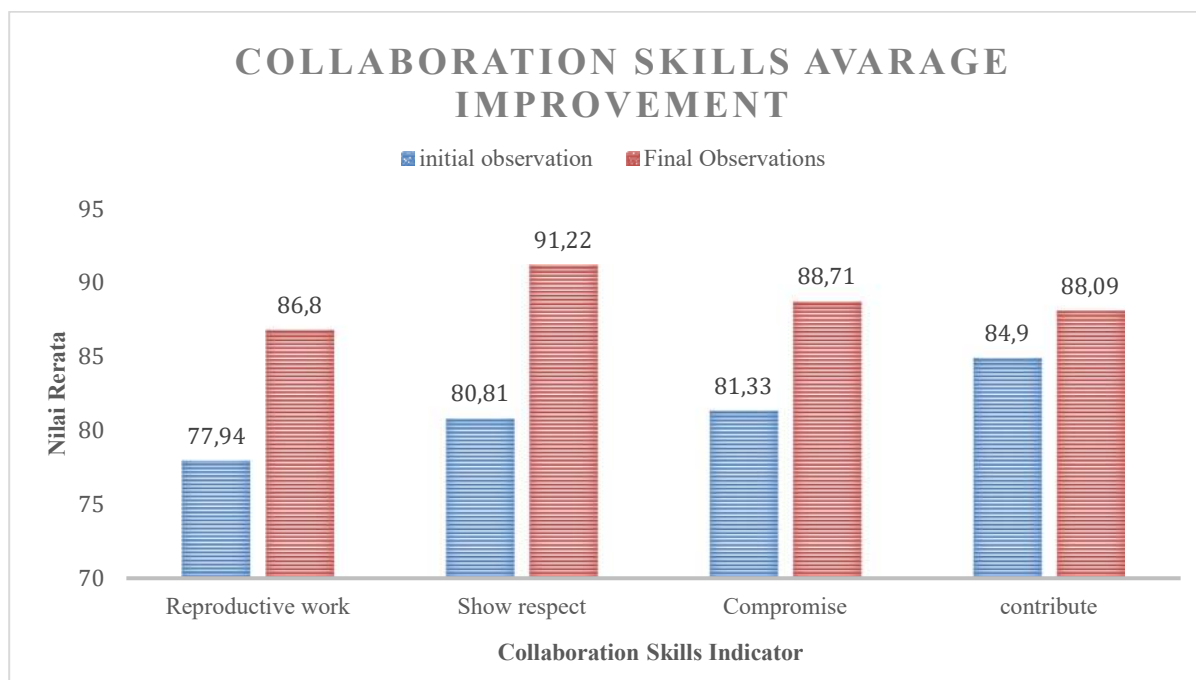
Figure 1. Average of Each Collaboration Skills Indicator

Based on Figure 1. it is known that the initial and final collaborations have increased. This is because the learning process uses the PBL steps. The PBL phase stimulates active and collaborative learning which encourages the development of collaborative skills and equips students with high-level thinking skills in solving problems [17].

Then we tested the difference in the mean of the initial collaboration observation and the final collaboration observation using the paired sample t-test. Before the paired sample t-test was carried out, a normality test was carried out using the SPSS Version application. 20. The normality test results can be seen in Table 1.

Table 1. Normality Test Results

	Kolmogorov-Smirnov[a]		
	Statistic	df	Sig.
Initial observation	.139	32	.121
Final observation	.129	32	.191

Based on Table 1. it was found that the significance value of the initial collaboration observation and the final collaboration was $0.121 > 0.05$ and $0.191 > 0.05$, this means that the data is normally distributed. Next, a paired sample t-test was performed, which can be seen in Table 2.

Table 2. Results of paired sample t-test

Paired Differences						t	df	Sig. (2-tailed)
Pair	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
Initial observation-Final observation	-6.313	4.028	.712	Lower	Upper	-8.866	31	.000
				-7.765	-4.860			

Based on the results of the paired sample t-test hypothesis test, a significance value of 0.000 <0.05 was obtained, indicating that there was a significant difference between the mean value of initial collaboration observations and the mean value of final student collaboration (Table 2). This shows that students who are taught using the Problem-based Learning model through Lesson Study activities provide an increase in student collaboration skills. During the learning process which is carried out online, students are seen actively discussing solving problems on student worksheets. This is also due to the learning model that is applied.

The PBL model emphasizes students on real problems and is followed by solving problems that are carried out in collaboration. This model is a learning model that focuses on students, where students' thinking skills can be optimized through systematic collaboration [18]. PBL model involves students actively in learning[19]. Students actively work together during the learning process indicating the existence of student attitudes that lead to positive change[20]. This is also supported by the research results that PBL can increase student collaboration, as evidenced by the existence of student cooperation, contributions, and having responsibility in solving problems presented in learning[21]. Lecturers also always try to provide stimulus, students are able to provide feedback, express opinions, exchange ideas between students so that interaction is established between students and students and lecturers. The application of PBL in learning Plant Physiology by raising problems found around the environment or found in everyday life makes it easier for students to synchronize theory with practice so that students can find solutions and hope to solve problems found in real conditions.

There are differences in collaboration skills in the initial and final observations due to the PBL model applied through Lesson Study activities. Where lesson study is an activity that can develop the teaching profession in a sustainable and collaborative manner designed to improve the student learning process[22]. This means that through Lesson study activities learning is well planned, where activities are carried out in stages. Plan activities, carry out planning, prepare learning scenarios that will be carried out. Do activities, carry out learning according to what has been designed and see, reflect and evaluate and follow up on learning. Deficiencies found in learning are always made improvements for further learning. This is supported that Lesson study can improve the content, process, and quality of learning[23]. Therefore, through the Lesson study learning approach with the hope of improving the quality and learning process. Effective educator professional development is carried out through Lesson Study, educators are involved and focus on student development[24]. Lesson study activities that apply learning strategies to overcome the problems being faced can be carried out [25].

Conclusion

The Problem-based Learning learning model with Lesson Study is effective in improving biology students' collaboration skills. It is hoped that the Problem-based Learning model with Lesson Study can be applied to other subjects.

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