Application of Lesson Study Using STAD-Infographic to Improve Learning Outcomes of Preservice Biology Teacher

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Abstract
Learning outcomes are seen as results manifested in the form of competencies, encompassing knowledge, skills, values, and attitudes. These competencies are derived from the instructional processes and teaching methods, stemming from the content and individuals to be taught. Cognitive learning outcomes are changes obtained in the form of knowledge at the end of the learning process. One of strategy to improve learning outcomes is using a learning model and method like STAD through lesson study. Lesson study is a coaching training or the teaching profession that consists of three stages: planning (plan), implementation of learning (Do), and reflect (see). The aim of this study was to improve learning outcomes of preservice biology teachers. The research method used is Classroom Action Research combined with lesson study consisting of three cycles. The subject were 38 bachelor Students in the Department of Biology Education, Universitas Negeri Malang who took biology learning strategy course on February 2023. The research instrument were multiple choice test (pretest and posttest) and product assessment. The results of this study showed that there was an increase in learning outcomes using STAD through lesson study.

Keywords: STAD, Lesson Study, Learning Outcomes

Introduction

The development of education in the 21st century requires students to master various competencies and skills in order to compete by enhancing their existing skills and knowledge (Zubaidah, 2016). Education is expected to be able to develop students with a number of competencies, literacy and character obtained through a series of learning processes (Ayu, 2019). Empowerment of 21st century skills aims to students grow into individuals who can adapt to increasingly advanced developments and can solve all the problems they encounter (Zubaidah et al., 2018). Cognitive ability is an important variable in solving problems. Students must have sufficient cognitive ability or knowledge to fully understand the basic concepts of the problem they are facing so that they are able to analyze the problem correctly (Tumulo, 2022).

Learning outcomes are one of the concerns of education experts to determine the quality of education and the achievement of learning objectives. Students' cognitive learning outcomes cannot be separated from a learning model applied by the teacher. A learning model that is easy for teachers to use is the cooperative model (Slavin, 2011). Cooperative learning is a learning process in which individuals learn in small groups with each other's help. Cooperative learning gives importance to cooperation as opposed to the education system previously based on competition. teaching that involves students in the learning process to understand and learn the content of a subject (Singh & Agrawal, 2011).

Student Teams-Achievement Divisions (STAD) Learning model is the simplest form of cooperative learning and is easy to use for teachers who are new to cooperative learning (Slavin, 2011). STAD is a learning method that divides students into small groups with different levels of ability (Munir et al., 2018). STAD learning consists of five main components, namely class presentation, group study, quizzes, individual improvement scores, and group rewards, which are organized into a regular teaching activity cycle (Anas, 2014). To improve their skills in conducting learning activities, teachers are required to continuously learn through various methods, including conducting research, especially Classroom Action Research (CAR).

Classroom Action Research (CAR) is research conducted by teachers in their classrooms or schools where they teach, with the aim of improving and/or enhancing the quality of the learning process and practice (Darmadi et al., 2024). To improve their expertise in teaching specific subjects, teachers are encouraged to regularly conduct CAR. The problems researched should be significant, engaging, and within the researcher's capability in terms of skill, time, cost, and effort. The scope of the research can include curriculum, students, teachers, facilities/infrastructure, and assessment. Educational problems in specific subjects are usually multifaceted and may involve one or a combination of the issues mentioned above. To solve these problems through research, they need to be broken down into sub-problems and investigated individually. Issues arising in the learning process can be addressed by teachers through CAR.

The implementation of Classroom Action Research (CAR) will be more effective if carried out continuously and collaboratively with other teachers, one of which is through lesson study activities. Lesson study is a method to enhance teachers' abilities in the learning process by mutual learning among teachers within the same subject area or with teachers of different subjects. In countries such as Japan, the United States, and Australia, lesson study has been proven to significantly improve the quality of education in schools. Lesson study involves

real (actual) classroom teaching with students, observed by other teachers. This activity is followed by reflection or discussion sessions with other teachers, lecturers, and external commentators, including parents.

Based on the observations conducted in the Biology Learning Strategy (SPB) Offering B class for the 2022/2023 academic year, it was found that one of the 21st-century skills, namely creativity, has not been developed among the students. During the learning process, it was also observed that students did not develop creative ideas during discussions using the spider web method. In addition to creativity, students' conceptual understanding also needs improvement. This was evident from the observations showing that many students had inaccurate conceptual understandings during the discussion process. Based on these findings, an innovative learning approach is needed to enhance students' creativity and conceptual understanding.

Joyce & Calhoun, (2024) state that a learning model is a plan/pattern that can be used to shape the curriculum (learning plan), design learning materials, and guide classroom learning. This means that a learning model provides a framework and direction for teachers to teach. One interesting learning model that can help achieve classroom learning objectives is the STAD learning model. The STAD learning model is the simplest learning model. Using the STAD learning model involves student group learning, presenting new information to students each week either through verbal presentations or texts. According to (Slavin, 2011), STAD consists of five main components: class presentation, group work (teams), quizzes, individual progress scores, and group recognition (awards). The purpose of applying the STAD model in learning is to motivate students, encourage and help each other, and to master the skills presented by the teacher.

Olson (1974) states that media encompasses all forms and channels for the process of conveying information. Smaldino, (2008) define media as anything that can deliver information from the source to the receiver. Based on these opinions, media plays a crucial role in presenting material and messages to stimulate students in the learning process, making them more interested and able to understand the material more easily. The use of educational media can facilitate the teaching and learning process, making language skills easier and more engaging for students. One type of educational media that can be used is infographics.
Infographic media is a medium that visualizes data and conveys complex information to readers so that it is easily understood (Pang et al., 2018). Thus, infographic media falls into the category of enjoyable media because it consists of images and brief explanations of the material arranged chronologically, making it easier for students to learn. Various previous studies have proven that infographic media is suitable for use as an educational medium. One such study is by (Khomaria et al., 2017), which used infographic media to increase interest in learning social studies among students at SDN Semading Kebumen. The conclusion from Khomaria's study is that the use of infographic media can increase students' interest in learning.

Based on the background provided above, the researcher examines the issues occurring in Class B Biology Learning Strategy through classroom action research using lesson study to enhance creativity and conceptual understanding of students using the STAD model assisted by infographics, titled "Implementation of STAD Learning Model Assisted by Infographics to Enhance Creativity and Conceptual Understanding of Students in Biology Learning Strategy Course 2022/2023."

Method

The research method used is Classroom Action Research (CAR) combined with Lesson Study, consisting of three cycles. This approach is taken because the implementation of CAR becomes more effective when carried out continuously and collaboratively with other teachers, one of which is through lesson study activities. Lesson study is a method to enhance teachers' abilities in the learning process by mutual learning among teachers within the same subject area or with teachers from different subjects. The STAD learning model assisted by infographics was chosen to enhance one of the 21st-century skills of students in the Biology Learning Strategy course, Offering B, for the 2022/2023 academic year, namely creativity. Besides improving creativity, it is expected that the STAD learning model assisted by infographics will also enhance students' conceptual understanding.

I. Cycle 1: Cycle 1 consists of three main stages, namely plan, do, and see. The plan activity was carried out on February 8, 2023, the do activity was carried out on February 9, 2023, and the see activity was also carried out on February 9, 2023.
II. Cycle 2: Cycle 2 consists of three main stages, namely plan, do, and see. The plan activity was carried out on February 15, 2023, the do activity was carried out on February 16, 2023, and the see activity was also carried out on February 16, 2023.
III. Cycle 3: Cycle 3 consists of three main stages, namely plan, do, and see. The plan activity was carried out on February 22, 2023, the do activity was carried out on February 23, 2023, and the see activity was also carried out on February 23, 2023.

Results

The research results outlined in this section relate to the conceptual understanding of each cycle of the classroom action research. The implementation of Classroom Action Research (CAR) begins with a pre-test, followed by post-tests for Cycles I-III. The research results outlined in this section relate to the conceptual understanding of each cycle of the classroom action research. The implementation of Classroom Action Research (CAR) begins with a pre-test, followed by post-tests for 1st until 3rd Cycles.

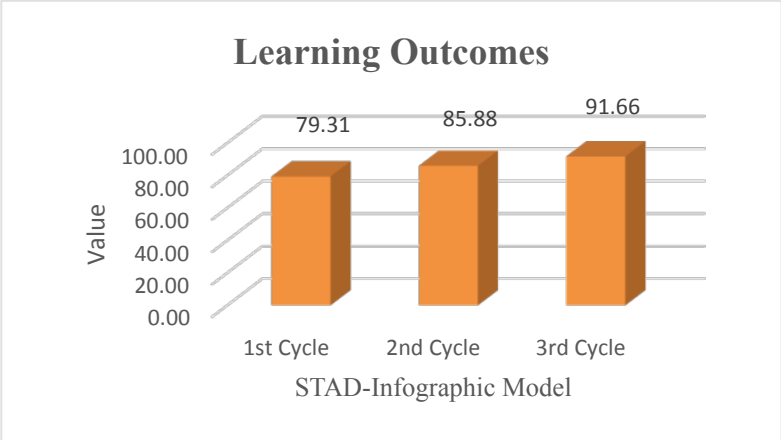

Figure 1: Average learning scores from Cycle 1 to Cycle 3

The pre-test results represent the initial conceptual understanding of students before the Classroom Action Research with Lesson Study was conducted. Cycle I learning was carried out with 37 students present, covering the topic of concepts and principles of the discovery and inquiry learning models. The model lecturer administered a post-test and assigned an infographic task. Based on the evaluation results in Cycle I using the post-test, there was an

increase in students' conceptual understanding scores compared to the pre-test. The average score for students' conceptual understanding in Cycle I was 79.31.

Cycle II learning was conducted with 37 students present, covering the topic of concepts and principles of Problem-Based Learning (PBL) and Project-Based Learning (PjBL) models. The model lecturer administered a post-test and assigned an infographic task. Based on the evaluation results in Cycle II using the post-test, there was an increase in students' conceptual understanding scores compared to the post-test scores from Cycle I. The average score for students' conceptual understanding in Cycle II was 85.88. This result can be displayed in the following graph.

Cycle III learning was conducted with 37 students present, covering the topic of concepts and principles of the Cooperative Learning model. The model lecturer administered a post-test and assigned an infographic task. Based on the evaluation results in Cycle III using the post-test, there was an increase in students' conceptual understanding scores compared to the post-test scores from Cycle II. The average learning score for students in Cycle III was 91.66. This result can be displayed in the following graph.

Discussion

1st Cycle

The implementation of Cycle I learning was conducted on February 9, 2023, in the Biology Learning Strategy Offering B class, with 37 students and 2 observers present. The learning topic was the concepts and principles of the discovery and inquiry learning models. The class used the STAD learning model. At the end of the lesson, the model lecturer provided a Learning Activity Sheet (LAS) consisting of 6 questions and an infographic assignment. However, due to limited time, the completion of the LAS was continued asynchronously, with a submission deadline on Tuesday, February 14, 2023, at 11:59 PM WIB. The model lecturer also provided a link to the post-test asynchronously via the WhatsApp group on Tuesday, February 14, 2023, at 5:00 PM WIB, with the submission deadline set for 11:59 PM WIB.

Based on the observations of the two observers, the lesson did not finish on time due to issues with the classroom. The model lecturer spoke loudly and did not stay in one place, instead monitoring each student during both the pre-test and the LAS completion. However, during the pre-test, the model lecturer did not inform the students beforehand that the questions would include multiple-choice and open-ended formats, causing students to need more time to complete the pre-test. An admirable quality of the model lecturer was the ability to handle difficulties calmly and without panic. The model lecturer also explained the syntax of the STAD model being implemented to the students, which is rarely done in class and usually only written in the learning materials.

2nd Cycle

The implementation of 2nd Cycle learning was conducted on February 16, 2023, in the Biology Learning Strategy Offering B class, with 38 students and 2 observers present. The learning topic was the concepts and principles of Problem-Based Learning (PBL) and Project-Based Learning (PjBL) models. At the end of the lesson, similar to Cycle I, the model lecturer provided a Learning Activity Sheet (LAS) consisting of 6 questions and an

infographic assignment. However, due to limited time, the completion of the LAS was continued asynchronously, with a submission deadline on February 21, 2023, at 11:59 PM WIB. The model lecturer also provided a link to the post-test asynchronously via the WhatsApp group on February 21, 2023, at 4:40 PM WIB, with the submission deadline set for 11:59 PM WIB.

According to the observations of the two observers, a commendable aspect of the model lecturer is their clear and confident voice, mastery of the subject matter, and effective classroom management skills. Additionally, the model lecturer is able to maintain focus and promptly seek solutions to issues that arise during the lesson. As previously mentioned by the model lecturer, there was an unplanned incident, yet they remained calm and effectively managed the class. During group presentations, due to the large number of students (38), observers noted that some students appeared less focused and were busy with other tasks on their laptops. Another observer also noted a similar situation during the classical question-and-answer session after the presentations, where some students were focused on their laptops. This issue can be anticipated in the next cycle by advising students to only use laptops during group discussion activities (LAS completion). Prior to that, it would be best not to use laptops.

Furthermore, a valuable lesson from 2nd Cycle learning activities is that the model lecturer used interesting and contextual precepts to enable students to distinguish the principles of PBL and PjBL learning models. With effective precepts, it enhanced students' understanding of the concepts behind the PBL and PjBL learning models, thus achieving today's learning objectives successfully. Consequently, there was an improvement in students' conceptual understanding from 1st Cycle to 2nd Cycle.

3rd Cycle

The implementation of 3rd Cycle learning was conducted on February 23, 2023, in the Biology Learning Strategy Offering B class, with 38 students and 2 observers present. The learning topic was the concepts and principles of Cooperative Learning models (STAD, Think Pair Share, Jigsaw, Group Investigation, Number Head Together, Teams Games Tournament, Cooperative Integrated Reading and Composition). At the end of the lesson, similar to previous cycles, the model lecturer provided a Learning Activity Sheet (LAS) consisting of 6 questions and an infographic assignment. However, due to limited time, the completion of the LAS was continued asynchronously. The model lecturer also provided a link to the post-test asynchronously via the WhatsApp group on February 28, 2023, at 4:14 PM WIB, with the submission deadline set for 11:59 PM WIB.

In addition, during 3rd Cycle of the learning process, there was a finding during the discussion session where the model lecturer modified the questions in the LAS. The model lecturer realized that the questions in the LAS were too general, considering that Cooperative Learning encompasses various types. This could potentially impact the learning objectives intended to be achieved. Subsequently, the model lecturer revised the questions in the LAS for each group with different types of Cooperative Learning, allowing each group to delve deeper into specific Cooperative Learning types. Thus, this issue was addressed and followed by group discussions.

STAD-Infographics on Student Learning Outcomes

Learning outcomes are the achievements of student learning after instruction. Student learning outcomes encompass three aspects: affective, psychomotor, and cognitive (Robiyanto, 2021). Learning outcomes serve as an indicator to assess students' learning effects and can be used to evaluate learning activities (Lin et al., 2017). Learning outcomes are influenced by both external and internal factors. External factors include environmental factors and instrumental factors such as teachers, curriculum, and teaching models, while internal factors originate from physiological and psychological factors such as intelligence, achievement motivation, and cognitive abilities (Yandi et al., 2023).

According to Purwaningtyas et al., (2021), one form of learning that provides students with their own work and experiences, commonly known as constructivist learning, is cooperative learning. Cooperative models can enhance students' learning outcomes because students are directly involved in creating, allowing them to remember the material longer and be motivated in classroom learning activities. Through the STAD model, students are taught to collaborate, assist, and support each other. This can enhance students' social skills in interacting with others and help foster positive attitudes and respect for individual differences. The STAD model provides opportunities for each group member to contribute to achieving learning goals. This can boost students' motivation and self-confidence, as well as help them feel more motivated and engaged in the learning process. This is in line with the research findings of Utami (2016), that cooperative learning like STAD can improve students' learning outcomes.

The STAD learning method is used by teachers to form teams consisting of individuals with various skills and knowledge who work together (Setiawan & Basyari, 2017). The benefits of STAD learning include: improving critical thinking skills, creative thinking, cognitive learning outcomes, process skills, understanding and acquisition of knowledge, group member concern, mathematical problem-solving abilities, communication and collaboration among students, fostering social solidarity, students' teamwork skills, positive influence in subjects, and enhancing students' interest in learning (Ramadhan et al., 2016).

The STAD model allows students to assist each other in understanding and mastering the learning materials. Thus, each group member can help and support one another in achieving a better understanding of the learning materials. In the STAD model, learning groups are expected to collectively achieve learning objectives. Therefore, the STAD model can enhance students' overall learning outcomes.

Conclusion

Based on the results and discussion of this study, the conclusions are as follows:

1. The biology teaching using the STAD learning model assisted by infographics through lesson study shows that all students in Offering B 2023 were able to participate well in the learning process based on the assessment results of infographic assignments and post-tests.
2. The STAD learning model assisted by infographics can enhance students' creativity, as evidenced by the average creativity scores of students in Offering A 2023 being in the high category.
3. The STAD learning model assisted by infographics can improve the learning outcomes of students in Offering B 2023.

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