BASA (BAROMETER SAINS)
Jurnal Inovasi Pembelajaran IPA
https://e-journal.unimudasorong.ac.id/index.php/basa/
e-ISSN: 2723-6242

The Effect of a Concept-Based Science Learning Module on the Learning Outcomes of Seventh-grade Students in Biotechnology

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Article information

Article history:
Received 08/06/2026
Accepted 25/06/2026
Published 30/06/2026

Keywords:
Learning Module; Conceptual; Biotechnology

ABSTRACT

This research aims to determine the effect of learning modules on Conceptual Based Biology Science learning outcomes on Class VII Student Learning Outcomes on Biotechnology Mateti at SMP Negeri 5 Sorong Regency. The method used in this research is the Classroom Action Research (PTK) method. PTK is carried out as an effort to overcome problems that arise in the classroom. This method is carried out in four stages, namely planning, action, observation and reflection. These four stages are cycles that occur repeatedly and are carried out with the same steps and are focused on contextual learning. Based on the results of research that has been conducted, it shows that student learning outcomes have increased. This increase can be seen through the cycles that have been carried out. In cycle I the average student learning outcomes were 42.56 at pre-test and 74.66 at post-test. Meanwhile in cycle II the average student learning outcomes were 48.33 at pre-test and 78.28 at post-test. Thus it can be concluded that the contextual learning model can improve students' biology learning outcomes on the concept of environmental pollution.

DOI: 10.36232/basa.v7i1.6593

How to Cite: Kabera, S. N., Sutomo, E., & Raharja, E. P. (2026). The Effect of a Concept-Based Science Learning Module on the Learning Outcomes of Seventh-grade Students in Biotechnology. *Basa (Barometer Sains): Jurnal Inovasi Pembelajaran IPA*, *7*(1), 46–51. https://doi.org/10.36232/basa.v7i1.6593

INTRODUCTION

Natural science (Science) is concerned with systematically exploring the natural world; thus, Science is not merely the mastery of a body of knowledge consisting of facts, concepts, or principles, but is also a process of discovery. (BNSP, 2016) Science education is expected to serve as a vehicle for students to learn about themselves and the natural world around them, as well as to foster further development in applying literacy concepts. The learning process emphasizes providing hands-on experiences to develop competencies for scientifically exploring and understanding the surrounding natural world. Science education is geared toward inquiry and action, thereby helping students gain a deeper understanding of the natural world around them (BNSP, 2016).

Law No. 20 of 2003 on the National Education System, Chapter II, Article 3, which reads: The National Education System serves to develop abilities and shape the character and civilization of a dignified nation in order to enlighten the life of the nation; it aims to develop the potential of students so that they may become individuals who have faith in and are devout to the One and Only God, possess noble character, are healthy, knowledgeable, skilled, creative, independent, and become democratic and responsible citizens (Law of the Republic of Indonesia No. 20 of 2003).

In the learning process, some schools still employ a teacher-centered learning model. Teachers predominantly use this teacher-centered approach to conduct lessons. Typically, during the learning process, teachers simply explain the material, and students are then asked to complete worksheets. This affects student learning outcomes, resulting in a percentage of students meeting the minimum passing score (KKM) of less than 70%, particularly in biotechnology. The minimum passing score (KKM) that students are expected to achieve in science, specifically in biotechnology, is at least 75; however, the majority of students still only score 65, 69, or 70. Furthermore, the average level of student engagement has not yet reached 60% (2024 Observation Results). Therefore, teachers need to change their teaching models so that the learning process can proceed effectively. One approach that can be used is the scientific method. Another teaching model teachers can adopt is the conceptual approach.

The conceptual learning model employed by the researcher was designed to test whether it had an effect on students' learning outcomes in science. The subjects of this study were seventh-grade students at State Junior High School No. 5 in Sorong Regency. In implementing the study, the researcher also used multimedia as a teaching aid to deliver science curriculum content, particularly the biotechnology chapter, where most students' scores remained below the minimum passing grade. Biotechnology is an important subject to study because it facilitates the identification and understanding of how living organisms can be utilized to produce goods or services for human use. Therefore, biotechnology material is considered suitable for delivery using the Conceptual Learning Model, in which students are required to explore and develop their knowledge to understand the material and solve problems related to biotechnology. This approach aims to ensure that students achieve scores above the minimum passing grade (KKM) for biotechnology material as specified.

METHOD

Classroom action research is an approach or action taken by teachers to improve the quality of education through changes that teachers can implement. The approach used in this classroom action research is Kurt Lewin's model of classroom action research. The method used in this study is Classroom Action Research (PTK), which focuses on teachers' actions as efforts to improve the learning process and outcomes. This classroom action research is based on the core concepts of Kurt Lewin's action research model, consisting of four components: Planning, Acting, Observing, and Reflection (reflecting)

This study is a Classroom Action Research (PTK) study. According to Siswojo Hardjodipuro (2017), Classroom Action Research is an approach to improving education through change by encouraging teachers to critically reflect on their own teaching practices and be willing to modify them

RESULTS AND DISCUSSION

The results of the researcher's observations of the school showed that teaching and learning activities took place in the morning; there were enough classrooms so that no students attended in the afternoon; the school was located in a rural area near residential neighborhoods; school facilities and infrastructure were still incomplete; most of the students attending this school were from the surrounding community; and the minimum passing grade (KKM) set for science was 70.

Based on observations made during the learning process, it was found that groups were formed randomly and evenly; each group consisted of both male and female students regardless of their abilities. Each group placed its name on the group table. Some students did not want to join the groups assigned by the teacher. These students only wanted to be in a group with the friends of their choice; in addition, many students were still joking around while the lesson was in progress. The students were unfamiliar with the contextual learning model and had never experienced learning using this model before. Since they were not yet accustomed to using this contextual learning model, the learning atmosphere still appeared unfocused during the first session.

Based on the analysis of the students' pretest data, the lowest score was 15 on a scale of 1 to 100, and the highest score was 70, with a class mean of 42.56 and a standard deviation of 13.08. In the posttest for Cycle I, an improvement was observed, with the lowest student score being 60 and the highest score being 85. The class average reached 74.92 with a standard deviation of 6.32. Data on the improvement in student learning outcomes in Cycle I can be seen from the students' learning outcomes after undergoing contextual learning in the cognitive aspect, which took the form of multiple-choice tests.

Table 1. Pretest and Posttest Score Data for the First Cycle

Statistic Data	Pre-test	Post-test
Minimum	15	
Maximum	70	85
Mean	40,14	
Median	42,5	
Mode	45	75
Standard Deviation	13,08	
Sample Size	36	

In Cycle I, before the contextual learning was implemented, the lowest score was 15 and the highest was only 70; the median was 42.5; the mode was 45; and the mean pretest score was 40.14 with a standard deviation of 13.08. After undergoing contextual learning, learning outcomes improved, with the lowest score at 60 and the highest at 85; the median was 75; the mode was 75; and the mean pretest score was 71.39 with a standard deviation of 7.58. However, on the final test (posttest) for Cycle I, only 21 students achieved the minimum passing score (KKM), with a success rate of 58.33%.

In Cycle I, the overall average N-gain calculation, with a total of 36 students, was 0.52. The percentage of the N-gain results can be seen in Table 2.

Table 2. Percentage Increase in Learning Outcomes (N-gain) for Cycle I

No.	Category Frequency	Percentage
1	Low	0%
2	Moderate	100%
3	High	0%

Class N-Gain	0.52

Based on the data in the table above, after undergoing contextual learning in the first cycle, 35 students achieved a "moderate" N-gain (increase in understanding), and 1 student achieved a "high" N-gain.

Table 3. Data on Achievement of the Minimum Competency Standard (KKM) from Cycle I Research

No	Test	Average Final Test Score	Persentage of Students Who Met the KKM	Percentage of Students Who Did Not Meet the KKM
1	Pretest	40,14	2,78 %	97,22%
2	Posttest	71,39	63,89 %	36,11 %

From the data in Table 4.5, it is evident that the average pretest score obtained by the students was 40.14, with only 2.78% of students meeting the minimum competency standard (KKM) meaning only 1 out of 36 students was deemed to have met the standard. In addition, the average posttest score was 71.39, with 63.89% of students meeting the minimum passing score, indicating an increase in the number of students considered to have met the minimum passing score specifically, 23 students.

The implementation of the contextual learning process in Cycle I for each session was supplemented by the use of student worksheets. The student worksheets were distributed to each of the groups that had been formed. The assessment results for the student worksheets from the first session are shown in Table 4.

Table 4. Student Worksheet Assessment Results for the First Session of Cycle I

No.	Group	Score
1	1	75
2	2	50
3	3	40
4	4	65
5	5	65
6	6	70
7	7	50
Total		415
Average		59,29

The results of the student worksheet assessment completed by each group, as presented in the table above, indicate that the worksheet scores from the first session did not meet expectations; only 2 groups achieved a score of ≥ 70, with the highest score reaching only 75, while the lowest score was 40, and the average score was 59.29. The second session of Cycle I of the learning activities continued in accordance with the lesson plan that had been prepared. In this session, the learning activities were the same as in the previous session that is, they included the distribution of worksheets but the learning material differed. The worksheet scores for each group are shown in Table 5.

Table 5. Worksheet Assessment Results for the Second Session of Cycle I

No	Kelompok	Perolehan Nilai
1	1	75
2	2	65
3	3	60
4	4	70
5	5	65
6	6	70
7	7	65
Jumlah		470
Rata-Rata		67,14

The results of the assessment of the student worksheets completed by each group during the second session, as presented in the table above, show that the scores on the worksheets in the second session improved slightly, although they did not yet meet expectations: three groups scored ≥ 70, with the highest score reaching only 75, while the lowest was 60, and the average score was 67.14.

In addition to the data above, the results of observations during the first session of Cycle I were as follows: At the beginning of the lesson, the classroom atmosphere was not yet conducive; the classroom still appeared disorderly because the students were not yet accustomed to contextual learning, so when the lesson began, some students were still joking around during class. During the discussion phase for completing the worksheets, the discussion did not proceed smoothly; some students were still joking around with their friends, and students were not yet accustomed to discussing topics during lessons, so many students from each group continued to ask questions. During the investigation or observation phase, group cooperation was not yet well established; some students still relied on their smarter classmates. When presenting their group work, students did not appear confident in presenting the results of their discussions and observations because they were not yet accustomed to presenting such findings.

Meanwhile, the results of the observations during the second session were as follows: By the second session, the students had begun to participate in the lesson in an orderly manner. While working on the worksheets, the students appeared enthusiastic, and the discussions proceeded smoothly. The students began to enjoy the activity, and the teacher provided guidance to the students during group work to encourage effective collaboration, as good cooperation leads to high-quality work; consequently, all students were actively engaged during this phase.

During the planning stage of the first cycle, the teacher planned to implement contextual learning, determined the main topics, developed a lesson plan, prepared assessment tools (concept mastery tests), formed student learning groups, and prepared learning resources. This was followed by the action stage. In the action stage, the teacher implemented contextual learning as outlined in the lesson plan, which had been adapted to the teaching module.

Once the activity was implemented, the observation phase began. The results of the observation during the first session of the first cycle were as follows: At the start of the lesson, the classroom atmosphere was not yet conducive; the classroom still appeared disorderly because the students were not yet accustomed to participating in CTL-based learning, so when the lesson began, some students were still joking around. During the discussion phase for completing the worksheets, the discussion did not proceed smoothly; some students were still joking around with their friends, and students were not yet accustomed to discussing topics during class, so many students in each group continued to ask questions.

Based on the results of the study, it was found that CTL-based instruction can improve student learning outcomes in terms of conceptual mastery. This is demonstrated by the increase in the average posttest scores. The average pretest score in the first cycle was 40.14, and the average posttest score increased to 71.39. Meanwhile, in the second cycle, the average pretest score was 48.61, and the average posttest score increased to 78.75.

CONCLUSION

Based on the research findings, it was concluded that the Concept-Based Science Learning Module had an effect on the learning outcomes of seventh-grade students in the biotechnology subject at State Junior High School 5 in Sorong Regency. This is evident from the increase in science learning achievement scores obtained on the posttest compared to the pretest results: the average posttest score in Cycle I was 71.39, with 63.89% of students meeting the proficiency standard, and an increase of 23 students who met the proficiency standard. Meanwhile, the average posttest score in Cycle II was 78.28, with 97.22% of students meeting the proficiency standard, and an increase of 35 students meeting the proficiency standard. Thus,

the average N-Gain score in Cycles I and II increased from 0.55 to 0.59; therefore, it can be concluded that there was an increase in the average N-Gain between Cycle I and Cycle II.

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