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The Effectiveness of 7E Learning Cycle Model on Grade XI Students' Learning Outcomes at Senior High School 14 Bone

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Abstrak

Di era globalisasi, peningkatan kualitas pendidikan menjadi kunci dalam menghasilkan sumber daya manusia yang unggul dan adaptif terhadap perubahan. Salah satu tantangan dalam pembelajaran Biologi di tingkat SMA adalah minimnya pemahaman siswa terhadap konsep yang bersifat abstrak akibat model pembelajaran yang digunakan kurang bervariasi dan cenderung siswa tidak dilibatkan secara aktif pada proses pembelajaran. Model pembelajaran *learning cycle 7E* yang berbasis konstruktivisme diyakini mampu meningkatkan keterlibatan aktif siswa dan pemahaman konsep secara mendalam. Tujuan dari penelitian ini adalah untuk mengetahui keefektifan pembelajaran model *Learning Cycle* 7E terhadap hasil belajar siswa pada materi sel. Penelitian ini merupakan penelitian eksperimen semu (*quasi experimental research*). Desain penelitian yang digunakan adalah *nonequivalent control group design*. Populasi penelitian adalah seluruh siswa kelas XI di SMA Negeri 14 Bone tahun ajaran 2014/2015. Sampel dalam penelitian ini adalah siswa kelas XI IPA^2 sebagai kelas eksperimen yang diajarkan dengan menggunakan model *Learning Cycle* 7E dan kelas XI IPA^3 sebagai kelas kontrol yang diajarkan dengan menggunakan model STAD. Penelitian ini dilaksanakan dengan 5x pertemuan. Pengukuran hasil belajar kognitif dilakukan dengan memberikan tes hasil belajar dalam bentuk soal pilihan ganda. Data hasil belajar dianalisis dengan uji T independen. Pengukuran keefektifan ditentukan berdasarkan ketuntasan belajar siswa mencapai minimal 75% jumlah siswa memperoleh nilai kriteria ketuntasan minimal, secara statistik hasil belajar siswa menunjukkan perbedaan yang signifikan antara pemahaman awal dengan pemahaman setelah pembelajaran, dan pemberian angket respon siswa. Hasil pengujian hipotesis dengan menggunakan uji-t independen menunjukkan *Sig. (2-tailed)* < α = 0,05 atau 0,001 < α = 0,05, berarti H_0 ditolak dan H_1 diterima. Berdasarkan kriteria pengujian tersebut, dapat disimpulkan bahwa model pembelajaran *Learning Cycle 7E* efektif meningkatkan hasil belajar biologi siswa.

Kata kunci: hasil belajar, keefektifan, model learning cycle 7E

Abstract

In today's globalized world, improving the quality of education plays a vital role in shaping human resources that are both competitive and adaptable to change. One of the major challenges in teaching biology at the high school level is students' limited understanding of abstract concepts. This is often due to the use of less varied teaching methods that do not fully engage students in the learning process. The 7E learning cycle model, grounded in constructivist theory, is believed to enhance students' active participation and deepen conceptual understanding. This study aims to examine the effectiveness of the 7E learning cycle model in students' learning outcomes, specifically in the topic of cells. This research is quasi-experimental research and the research design used is nonequivalent control group design. The population consists of all students in Senior High School 14 Bone at XI grade level during the 2014/2015 academic year. The sample of this research includes students in XI IPA^2 as experiment class who were taught by 7E Learning Cycle model and all of students in XI IPA^3 as control class who were taught by STAD model. This research was held for five meetings. Measurement of learning outcomes in cognitive side was held by learning evaluation in the form of an objective test. Learning outcome data was analyzed by independent t-test. The measurement of effectiveness was determined based on mastery learning students achieve at least 75% of students received a minimum completeness criterion, statistically student learning outcomes showed significant differences between the preliminary and after learning, and the provision of student questionnaire responses. The results of hypothesis testing by an independent t-test showed Sig. (2-tailed) <α = 0.05 or 0.001 <α = 0.05, meaning that H_0 was rejected and H_1 was accepted. Based on the testing criteria, it can be concluded that 7E Learning Cycle model effectively improves students learning outcomes of biology.

Keywords: learning outcomes, effectiveness, learning cycle model 7E

INTRODUCTION

The impact on society, the nation, and the state is enormous in the age of globalization, which is characterized by the quick advancement of science and technology. To avoid falling behind developed nations, globalization pushes all nations to compete in the production of high-quality human resources. Education is an essential initial step in raising the standard of human resources. Education is crucial for educating people, which will ensure future development that is both advanced and progressive. According to (Zuhdi et al., 2021) quality education will produce individuals who are competent and adaptive to the development of the nation, so that they are able to make a real contribution in realizing the nations progress.

In Indonesia, various efforts have been made to improve the quality of education, one of which is through regular curriculum updates (Haerullah et al., 2019, 2025). However, there are other factors that contribute to the process of improving the quality of education graduates that are closely related to the learning process, namely educators, school facilities and infrastructure, school management, and, most importantly, the strategies and models used by teachers in teaching. Teachers play an important role in the success of the learning process both inside and outside the classroom. Teachers who know better the difficulties students face in understanding a given material, so teachers must have the ability to apply an approach and learning methods that are mastered and relevant to the theories and concepts taught. This aligns with (Muhayah, 2024) that the role of the teacher in planning and implementing the learning process is an important factor in achieving teaching objectives.

The methods used by teachers in teaching science, particularly biology at the secondary education level, must continue to refer to the function of high school biology education, which is to develop process skills (inquiry) and master concepts as a foundation for life in society and for pursuing higher education. According to Indrawati in (Trianto, 2007) learning will be effective if the model used is one of the information processing models that emphasize thinking processes and information management. Likewis to (Haqi et al., 2023) argues that effective information processing can enhance students' comprehension and retention.

Learning biology is often challenging for students, especially on abstract concepts that are difficult to understand. The number of theories and concepts makes students tend to memorize without deep understanding, making learning less memorable. To overcome this, students need to be directly involved in the learning process. According to (Harefa et al., 2023), the constructivism approach encourages students to be active in the learning process, build knowledge based on experience, and increase student engagement and understanding. One of the effective constructivism-based learning models is the learning cycle. According to (Septianingrum, 2022), this model provides opportunities for students to discover, apply, and use their own learning styles.

The learning cycle is a student-centered learning model that uses a constructivist approach. There are three learning cycles that have been tested, namely the learning cycle, which consists of three phases, namely exploration, concept introduction, and concept application. Then the learning cycle was developed into the 5E learning cycle, which consists of five phases, namely engage, explore, explain, elaborate, and evaluate (Wena, 2009). The 5E learning cycle evolved into the 7E learning cycle. According to Eisenkraft in (Noreen et al., 2024) there are 7 phases of this learning cycle, namely, elicit, engage, explore, explain, elaborate, evaluate, and extend.

The 7E learning cycle model is a series of systematically designed instructional steps that aim to help students achieve targeted competencies by actively participating in the learning process (Elvira & Vebrianto, 2021). This learning model gives students the best chance to develop their own understanding of subjects by drawing on previously taught material, allowing their understanding process to continuously evolve and engages students in the process of resolving issues relevant to their everyday lives.

Based on observations conducted at Senior High School 14 Bone, most teachers continue to use a repetitive teaching aprroach, which makes students disinterested and lacking in motivation to learn. Students have difficulty understanding the concepts of the material presented, which affects their learning outcomes. The scientific process skills that should be developed through learning biology have not been optimally realized. As a result, most students perceive that biology is an extremely challenging subject. Students who are overloaded with information and concepts become disinterested and confused and only retain the information when it is taught. Therefore, a learning model that directly involves students in the learning process is needed, namely the 7E learning cycle model. Theoretically, this model has been extensively researched, but the implementation in secondary schools like Senior High School 14 Bone, has not been widely studied, especially when it comes to biology student learning outcomes. Thus, this study aims to determine the effectiveness of the 7E learning cycle model on students' learning outcomes. It is also expected that this research will provide an alternative to the current biology learning issues.

METHODS

Type of research is quasi experimental research. The design used is the nonequivalent control group design. This design is nearly identical to the pretest-post test control group design, with the exception that the experimental and control groups are not selected randomly but rather that the researcher chooses the class to be sampled. This research involves an independent variable, which is the implementation of the 7E learning cycle model, and a dependent variable, which is students' cognitive learning outcomes. The population in this study consists of all XI grade students at Senior High School 14 Bone who were enrolled in the 2014/2015 academic year. Sample was selected using the purposive sampling technique, which means that the sample was selected with certain considerations. The consideration was based on the recommendation of the biology teacher of grade XI who taught in the class, because the learning achievement scores of the two classes were almost equal or homogeneous. The research was conducted in the odd semester of the 2014/2015 academic year at Senior High School 14 Bone. The instruments used in this study included pre-test and post-test questions to measure students' learning outcomes, a student response questionnaire, and instructional tools such as the syllabus and lesson plans. Data analysis involved normality testing, homogeneity testing, and hypothesis testing using an independent t-test. The data was analyzed with the help of SPSS software.

RESULTS AND DISCUSSION

Based on the results there was a difference in the improvement of student learning outcomes between the experimental class using the model of Learning Cycle 7E and the control class using the conventional learning model, namely STAD, which is commonly used by the biology teacher at the school.

According to Wicaksono in (Sapitri, 2013), the effectiveness of a learning model can be determined by the following criteria:

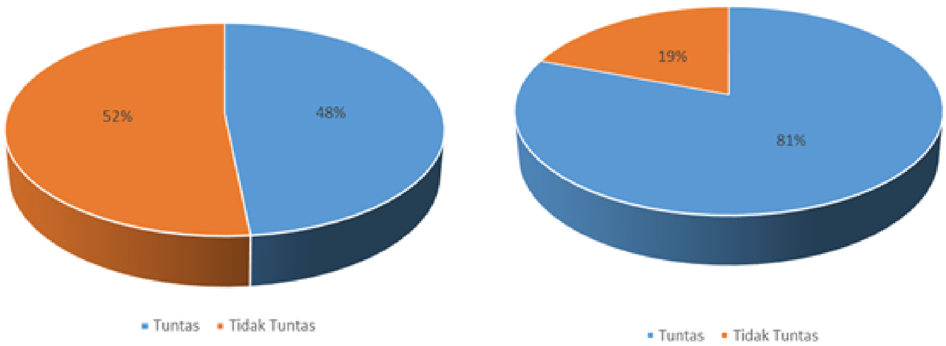
1. Learning is considered complete when at least 75% of the students achieve the minimum completeness criteria in improving their learning outcomes.

   The data on student learning outcomes after the post-test for the control and experimental classes are categorized based on the minimum completeness criteria set by the school and can be seen in Table 1.

Table 1. Category of control and experimental class student learning outcomes based on minimum completion criteria after post-test

Sample	Frequency		Percentage	
	Complete (≥ 75)	Incomplete (<75)	Complete (≥ 75)	Incomplete (<75)
Control Class	15	16	48%	52%
Experiment Class	25	6	81%	19%

The student is considered to have completed the learning outcome if they achieve a minimum score of 75 on the minimum completeness criteria. Based on Table 1, the experimental and control classes consisted of 31 students for each class. The minimum completion criteria used was 75. After giving the posttest and being examined in the control class, only 15 students with a percentage of 48% achieved a minimum score of 75 and above (complete). While in the experimental class that used the Learning Cycle 7E model, there were 25 students who reached the minimum completeness criteria score with a percentage of 81%. The completeness of student learning outcomes according to the minimal completeness criteria is shown in the pie chart in Figure 1.



a. Control Class **b. Experiment Class**

Figure 1. Circle diagram of student learning outcomes based on minimum completion criteria after post-test

2. A learning model is considered effective in improving student learning outcomes if, statistically, the results show a significant difference between initial understanding and understanding after the learning process.

   The improvement in students' conceptual understanding of cell material after the learning process can be identified through the results of the N-Gain test. Student learning outcomes can be categorized based on the average gain score: high ($g \geq 0.7$), medium ($0.7 > g \geq 0.3$), and low ($g < 0.3$). Based on the research findings, the N-Gain values are presented in Table 2.

Table 2. Calculation of N-Gain value

Normal Gain	Control Class	Experiment Class
Lowest	0.4	0.6
Highest	0.7	0.8
Average	0.6	0.7
Category	**Medium**	**High**

Based on the data analysis, the control class falls into the medium category with an average gain of 0.6. The experimental class has an average gain of 0.7, categorizing it as high. Both the experimental and control classes showed improvement in learning outcomes. So, it can be concluded that the learning models used in both the control and experimental classes were effective in improving students' learning outcomes on the cell topic.

3. A learning model is considered effective if it can enhance students' interest and motivation, as evidenced by students becoming more motivated to study harder and achieve better learning outcomes, while learning in a pleasant environment.

Data on student responses to the implementation of the 7E Learning Cycle model were obtained using a questionnaire measuring students' interest and motivation. The questionnaire was administered to the experimental class after the implementation of the 7E Learning Cycle model. The questionnaire consisted of 15 positive statements with five response categories: Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD). Based on the analysis of the questionnaire data, the students' responses to the implementation of the 7E Learning Cycle model are presented in the bar chart in Figure 2.

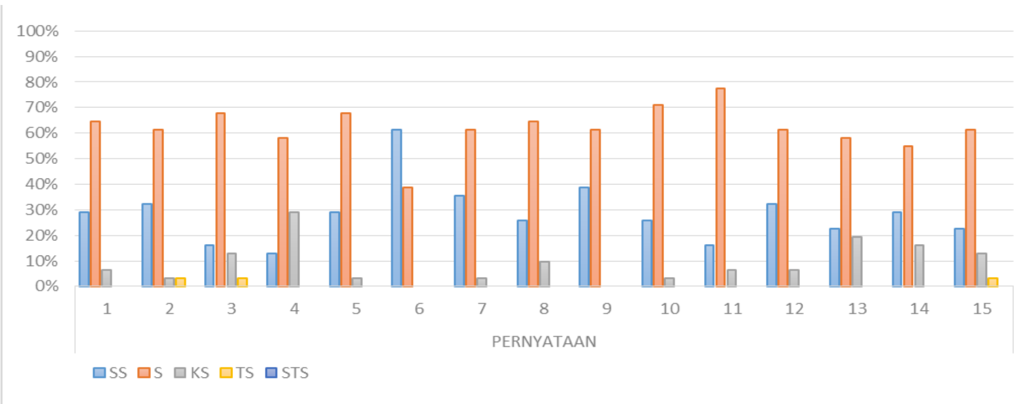


Figure 2. Diagram of student response questionnaire

Based on Figure 2, the results can be interpreted that students responded very positively to the implementation of the 7E Learning Cycle model in improving their learning outcomes, with 90.5% agreeing, 8.8% neutral, and 0.6% disagreeing. The high percentage of positive responses compared to negative responses indicates that the 7E Learning Cycle model has increased students' motivation and interest in learning.

To statistically validate the effectiveness of the 7E Learning Cycle model, prerequisite tests were conducted, including tests for normality and homogeneity. The normality test is used to determine whether the data obtained comes from a normally distributed population or not. The results of the normality test can be seen in Table 3.

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Table 3. Results of pretest and posttest normality test of experimental group and control group

Data	Sample (N)	Significance	Conclusion
Pretest	62	0,366	Normally distributed data
Posttest	62	0,073	Normally distributed data

In data testing using the Kolmogorov-Smirnov test, the data is considered normally distributed if the significance value is greater than α, and not normally distributed if the significance value is less than or equal to α. Table 3 shows that the pretest data in both the control and experimental classes are normally distributed because the significance value> α, which is 0.366> 0.05. In the posttest data, the control and experimental classes are also normally distributed, with 0.073> 0.05.

The next analysis is the homogeneity test to determine whether the two data groups have the same or different variances. The homogeneity test used is the Levene's Test. The criterion for homogeneity is that the learning outcome data is considered homogeneous if the significance > 0.05, and not homogeneous if the significance ≤ 0.05. The results of the homogeneity test can be seen in Table 4.

Table 4. Results of homogeneity test of pre-test and post-test of experimental group and control group

Data	Sample (N)	Significance	Conclusion
Pretest	62	0,865	Homogen
Posttest	62	0,547	Homogen

Based on Table 4, the results of the homogeneity test using Levene's test show that the significant values of the pre-test and post-test data are greater than 0.05. These results indicate that the data used are homogeneous or have the same variance in both control and experimental classes. Based on the analysis, the data was found to be both normally distributed and homogeneous, allowing the use of parametric statistical testing, specifically the independent t-test, for hypothesis testing. The hypothesis testing used was the independent t-test. The test criteria are if Sig. (2-tailed) < α = 0.05, then H0 is rejected and H1 is accepted. Based on the statistical results obtained, the significance value was 0.001 < α = 0.05, which means H0 is rejected and H1 is accepted. Thus, it can be concluded that the Learning Cycle 7E model effectively improves students' biology learning outcomes.

Based on the previous explanation, students taught using the Learning Cycle 7E model showed more effective improvement in learning outcomes. One of the contributing factors to the higher average learning outcomes in the experimental class is the deeper understanding of the material gained by students during the learning process. The Learning Cycle 7E model engages students more actively in the learning process and provides opportunities for them to construct their own understanding. According to Eprilia & Puspitawati (2021), actively involving students in the learning process allows them to build understanding independently through various activities presented during the learning process so that it will affect their learning outcomes

The Learning Cycle 7E model encourages students to take an active role in the learning activities, enabling them to explore and enrich their understanding of the concepts being studied. The phases in this model also foster collaboration among students, promoting effective interaction within their own groups as well as with members of other groups. This, in turn, motivates students to actively engage in discussions to solve problems. This aligns with (Wena, 2009), in cycle learning, students do more than just listen to the teacher's explanation, they can also actively explore, analyze, and evaluate their understanding of the concepts learned.

The 7E Learning Cycle consists of seven phases in the learning process, each phase is interconnected and built upon the others. According to (Perdana et al., 2024), each phase is designed to build upon and reinforce information from the previous stage. The first phase (Elicit) involves identifying students' prior knowledge as a baseline before the learning begins. It aims to assess students' initial understanding by asking basic questions about the definition of cells, the differences between animal and plant cells, and asking students to name the organelles of a cell. Through this phase, the teacher can determine where the instruction should start, making the learning process more efficient. This in line with (Santi & Atun, 2021), which state that identifying students' initial knowledge through questions or discussions between teachers and students can build engagement and allow teachers to better understand students' willingness to learn.

The second stage (Engage) focuses on getting students interested in the material to be learned, to spark their curiosity and motivation to learn. According to (Shesilya & Aloysius, 2023), this phase is used to stimulate students' interest by triggering questions and relevant initial activities using interactive media so that students are more involved in the learning process. This is aligns with (Adam et al., 2022), this phase aims to focus students' attention on the task at hand. The focus is achieved through short but engaging activities that stimulate thinking and enhance their interest and curiosity about new concepts and ideas

The third phase (Explore) is an enjoyable phase for students, as it involves group collaboration to solve a given problem. According to (Adnyani et al., 2018), states that with the presence of small groups, information exchange and idea sharing can occur, leading to positive collaboration among each group member. Also (Lubiano & Magpantay, 2021), states that this phase helps build conceptual understanding through direct experiences such as conducting observations. In this phase, the researcher distributes worksheets on cell material to each group, and students search for and discover concepts to solve the given problems. During this phase, students are also directly involved in learning through observation, with the teacher as a facilitator.

In the fourth phase (Explain), students are freely given the opportunity to express their opinions regarding the concepts they have discovered, making the learning process more active. The teacher will clarify any misconceptions or incorrect concepts. This aligns with (Marfilinda et al., 2020) who indicate that during this phase, students are encouraged to re-express concepts they learn about in their own language, while the teacher serves as a guide through the process of clarifying and strengthening concepts. According to (Sari et al., 2021), this phase trains students to express their opinions by providing logical reasons to support their arguments.

The fifth phase (Elaborate) is when students apply the concepts they have learned to new situations, making the learning more meaningful. According to (Noreen et al., 2024), this phase serves as an opportunity for students to develop a deeper understanding through various activities. In this phase, the researcher provided students with the opportunity to create concept maps and analogies based on their understanding of the cell material that had been taught. This aligns with (Silitonga et al., 2021) at this phase students develop their concept understanding and apply it to other contexts.

The next phase is the sixth stage (Evaluate). In the Evaluate phase, students are given an evaluation to assess their understanding of the material that has been taught. The evaluation tools used by the researcher were a quiz consisting of six multiple-choice questions and two essay questions. At the end of each lesson in this stage, the researcher administered a quiz to measure the students' ability to achieve the learning objectives and the level of their competency mastery. According to (Mekonnen et al., 2024), at this phase students can realize the development of their understanding and reflect on the concepts that have been learned in

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order to make improvements if needed. Activities carried out at this phase can provide space for students to assess their learning outcomes.

The seventh phase (Extend) is when students can further develop and apply the concepts to more complex situations in everyday life. In this phase, the researcher explained to the students that the topic of cells does not stop at animal and plant cells but will also be explored further in the next material, such as in the topic of tissues. According to (Rahman & Chavhan, 2022), at this phase students can apply or transfer what they have learned into the actual world, which is vital for developing critical thinking and social skills.

In implementation of the Learning Cycle 7E in the classroom, both teachers and students have distinct roles in each learning activity. The teacher's role is to elicit prior knowledge, stimulate students' interest and motivation in learning, while students are responsible for applying and expanding the concepts they have learned. Furthermore, (Dewi & Arifin, 2023) revealed that this model can provide a meaningful learning process for students.

CONCLUSION

Based on the data analysis and discussion of the research conducted at Senior High School 14 Bone, it can be concluded that the Learning Cycle 7E model effectively improves student learning outcomes.

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