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The Effect of Learning cycle 7E Model on Student Biology Learning Outcomes in Senior High School

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ABSTRACT

This study aims to determine the effect of the Learning Cycle 7e model on biology learning outcomes on the cognitive aspects of students in high school. This type of research is a quasi-experimental research using a pre-test post-test control group design. The study population was all X MIA grade students in SMA Negeri 1 Pamboang. The research sample consisted of two classes obtained by cluster random sampling technique, namely class X MIA3 (experimental class) and class X MIA2 (control class). Data collection techniques using the test instrument in the form of essays. Based on the results of post-test data analysis of student learning outcomes on the cognitive aspects, the average value of student learning outcomes in the cognitive aspects of the experimental class was 68.56 and the control class was 60.32. Data obtained in the test for normality and homogeneity. Both classes are normally distributed and homogeneous. Hypothesis testing used test-independent sample *t test* with a significance level of 0.05. Based on the hypothesis test, showed sig. (2-tailed) is 0.005 < (α = 0.05) hence Ho is rejected and Ha is accepted. So it can be concluded that there are significant differences in student learning outcomes in the cognitive aspects, the learning cycle 7e model has a greater influence than conventional learning models on student learning outcomes in the cognitive aspects of ecosystems material.

Keywords: Learning, senior high school, cycle 7e.

INTRODUCTION

The learning system for teaching and learning activities currently it specifically demands that students do not only act as listeners. Students' active involvement in the learning process is needed for interactive learning (reciprocal interaction between teachers and students), so learning process is not just one-way (focus on students only) [1]. Students are also required in the learning process to actively search, independently or in groups, all information related to the subject matter. [2] said that curriculum development aims to improve the quality of education, in regards to current development and future trends.

In fact, most teachers today still face many obstacles in the learning process, especially transferring subject matter to students. According to [3] from the results of her research revealed that teachers are less able to carry out learning and guide students to be active in learning activities because of the lack of creativity in applying methods, models, and media that can trigger students' interest to be more active and creative in class. [4] Also added that the application of conventional learning models creates boredom and cannot provide a good understanding of biological material because the explanation is hard to comprehend. Actions and breakthroughs in teaching and learning activities are needed to be able to improve the symbiotical relationship between teachers and students so that learning objectives optimally achieved.

Some researchers' findings conducted on preliminary observations at SMA Negeri 1 Pamboang Majene Regency acknowledged that biology teachers have not been able to carry out a whole learning process that is more student-centered. Students are still very dependent on information delivery from biology teachers without any initiative to solve problems independently, students do not have the freedom to

build or develop their own knowledge because they always rely on knowledge delivered by biology teachers.
As regards to problems above, it is necessary to do an update in the implementation of the learning process by applying a learning model or approach that can actively involve students in learning and can improve student learning outcomes. Learning Cycle 7e learning model is a constructivism-based learning model which is an approach to teaching and learning based student own construction or in other words students learn new information with knowledge that students already know [5].

Learning Cycle 7e learning model is a student-centered learning process with a series of stages of activities organized in such a way that students can master the competencies that must be achieved in learning [6]. The stages of the learning cycle 7e model according to [7], namely shown in table 1:

Tabel 1. The stage of learning cycle 7e model

Stage	Teacher Activity
Elicit	Teacher shown more adept about prior understanding in ascertaining what students know prior to a lesson.
Engage	Teacher explains learning objectives and material needed and motivates students to involve in critical thinking of choosen problem solution.
Explore	Teacher guides students to define and organize the assigment related to the problem.
Explain	Teacher supports students to gather suitable information, do experiment, and to find explanation and problem solution.
Elaborate	Teacher guides students in designing and preparing the work.
Evaluate	Teacher help students to share the assigment with their friends, evaluate and compare their understanding with their know prior.
Extend	Teacher guides students to extend and to do reflection about concept.

The stages of Learning Cycle 7e model will certainly have a positive impact in every learning activity. This assumption is reinforced by the results of research conducted by [8] saying that the critical thinking skills of students who learn to use Learning Cycle 7e models based on local culture are better than students who learn to use the Discovery Learning model. [9] also said that the Learning Cycle 7e model was effective in improving students' scientific literacy abilities. Another opinion according to [10] revealed that students who were taught using the Learning cycle 7e model had higher generic science skills than students who were taught using the discussion method. Furthermore [11] also said that the use of the Learning Cycle 7e model will make students have a more sophisticated reasoning ability, and better process skills.

Based on findings above, the researcher needs to conduct research on the Learning Cycle 7e model with the aim of knowing the effect of the Learning Cycle 7e model on student biology learning outcomes on the cognitive aspects of ecosystem subject in high school so as to provide new information in the world of education about the Learning Cycle 7e model.
The rest of this paper is organized as follow: Section 2 describes the proposed research method. Section 3 presents the obtained results and following by discussion. Finally Section 4 concludes this work.

RESEARCH METHOD

This research is a quantitative research using quasi-experimental methods. The research design used was a pre-test post-test control group design. The population in this study were all students of class X MIA of SMA Negeri 1 Pamboang consisting of 3 classes with a total of 90 students. The sample was gained by cluster random sampling technique. So the sample obtained by class X MIA 3 amounted to 25 students as the experimental class and class X MIA 2 totaled 25 students as the control class. The study was conducted at SMA Negeri 1 Pamboang, Majene Regency, West Sulawesi Province.

The instrument used in this study to measure students' cognitive abilities was a test instrument in the form of 5 essay questions that had been previously tested to determine its quality. Thus, instrument validation by expert judgments was carried out.

The data source in this study is the overall value of student learning outcomes in the cognitive aspects of the experimental class and the control class. The data taken is the initial test data (pre-test) and the final test (post-test), which will then be hypothetically tested using t-test independent sample t test with

the help of SPSS for Windows version 25. Requirement that must be met before conducting the hypothesis test is that the data are tested for normality and variance homogeneity. Statistical tests were performed at a significance level of 5%.

RESULTS AND DISCUSSION

The result of the study is quantitative data derived from cognitive aspects of learning outcomes using the essay test instrument. The value of pre-test and post-test student learning outcomes are only measured on the cognitive aspects.

Student learning outcomes of experimental class and control class before treatment
Statistical tests were carried out by analyzing the pre-test scores of the students' learning outcomes of the experimental class and the control class in order to find out the differences in the learning outcomes of the experimental class and the control class before treatment.

Based on the pre-test scores of students' learning outcomes in the experimental class and the control class, the recapitulation of descriptive statistical values obtained can be seen in table 2 below:

Table 2. Descriptive statistics value of students' learning outcome of experiment and control class

Students Learning Outcome	Pre-test Result	
	Experiment Class	Control Class
Mean	17.80	17.12
Lowest Score	10	8
Highest Score	38	35

Furthermore, to find out the difference in student learning outcomes in the experimental class and the control class before being given treatment, first a pre-requisite test is carried out, namely the normality test (absolute requirement) and the homogeneity test (non-absolute requirement).
Normality test
Normality test is carried out to find out whether the data is normally distributed or not with a significance level (α = 0.05) using SPSS for Windows version 25. The results of the analysis are presented in Table 3 below:

Table 3. Pre-test data normality test result for experiment and control class

Class	Shapiro-Wilk		
	Statistic	Df	Sig.
Experiment	.820	25	.001
Control	.864	25	.003

Based on the results of the normality test of the pre-test data for experimental class and the control class in table 3 above, the experimental class' value of Sig. (significance) on the Shapiro-Wilk technique is 0.001 and Sig. (significance) for the control class in the Shapiro-Wilk technique is 0.003. Sig value in the experimental class (0.001) and the control class (0.003) are < α (0.05), meaning that the students' pre-test data in the experimental class and the control class were not normally distributed. Then a non-parametric test was performed using the U Mann Whitney test.
U mann whitney test
To find out whether there are differences in student learning outcomes before both classes were given treatment, a non-parametric statistical test was carried out using the U Mann Whitney test. The results of the calculation of the U Mann Whitney test can be seen in table 4 below:

Table 4. U mann whitney test results for experimental class and control class data

Class	Number of Sample	Mean rank	Sum of ranks	Asymp. Sig (2-tailed)
Experiment	25	25.80	645.00	0.881
Control	25	25.20	630.00	

Based on the results of the U Mann Whitney test pre-test data of the experimental class and the control class, the value of Asymp. Sig (2-tailed) > 0.05. So it can be concluded that there is no significant

difference in student learning outcomes between the experimental class and the control class before being given treatment or it can be said that the initial abilities of students are the same.

Student learning outcomes of experimental class and control class after treatment

The learning outcomes tests conducted after treatment in the experimental class and control class intended to determine the development of student abilities in each experimental class (learning cycle 7e) and control classes (conventional models).

Data on student learning outcomes after treatment were analyzed using SPSS for Windows version 25. The results of the analysis showed a summary of the descriptive statistical values that can be seen in table 5 below:

Table 5. Descriptive statistics on student learning outcomes of experimental class and control class

Students Learning Outcome	Post-test Result	
	Experiment Class	Control Class
Mean	68.56	60.32
Lowest Score	46	40
Highest Score	85	83

Then, the normality test (absolute requirement) and homogeneity test (non-absolute requirement) were used as a pre-requisite to find out the difference between the learning outcomes of the experimental class and the control class after treatment.

Normality test

The normality test is then performed as an absolute requirement to find out whether the data is normally distributed with a significance level (α = 0.05) using SPSS for Windows version 25. The results of the analysis are presented in table 6 below:

Table 6. The post-test data normality test result of experimental class and control class

Class	Shapiro-Wilk		
	Statistic	Df	Sig.
Experiment	.935	25	.112
Control	.981	25	.897

Data from the normality test of the experimental class and the control class in table 6 above, shows that in the experimental class the Sig. (significance) value on the Shapiro-Wilk technique obtained is 0.112 and the Sig. (significance) for the control class of 0.897. Sig. value (significance) obtained in each class > α (0.05). So it can be concluded that students' post-test data in the experimental class and the control class are normally distributed.

Homogeneity test

The homogeneity test results using SPSS for Windows version 25 with a significance level (α = 0.05) can be seen in table 7 below:

Table 7. Post-test data homogeneity test results of experimental and control class

Post-test Data	Levene Statistic	df1	df2	Sig.
Based on mean	.008	1	48	.930

Data in table 7 above shows the significance value (Sig) based on mean of 0.930 > α (0.05). So, it can be concluded that the data has the same variance (homogeneous).

After the data is known to be normally distributed and homogeneous, parametric statistical tests were performed using the independent sample t-test to determine the differences in learning outcomes of the experimental class and the control class.

Independent sample t test

The t-test used a significance level (α = 0.05). The results of the t-test independent sample t-test calculations using SPSS for Windows version 25 can be seen in table 8 below:

Table 8. Independent sample t-test t test results of experimental class and control class

		Levene's Test for Equality of Variances				
		F	Sig.	t	df	Sig. (2-tailed)
Students Learning Outcomes	Equal variances assumed	.008	.930	2.963	48	.005

The data in table 8 above shows that the results of the independent sample t-test t test data of the experimental class and the control class after the treatment. It is known that sig. (2-tailed) is 0.005 < (α = 0.05) or H_o was rejected and H_a was accepted. So it can be concluded that there are significant differences in student learning outcomes after treatment wherein the learning outcomes of experimental class students (using the Learning cycle 7e model) have an average value of 68.56 higher than the control class (using conventional models) with an average value of 60.32.

The results of the analysis on the hypothesis test using the independent sample t test showed that the learning model of learning cycle 7e had a more positive effect on the learning process. Student learning outcomes on the cognitive aspects that are taught using the learning cycle 7e learning model has an average value higher than the learning outcomes of students who are taught using the conventional model.

The difference in learning outcomes is due to the learning model of learning cycle 7e having stages that require students to be actively involved in building knowledge and understanding independently of the subject matter they were learning. The learning cycle 7e model departs from students' initial understanding of the material to be learned by giving a number of questions relating to concepts in everyday life in the electronic phase. Early understanding is an important component in learning activities. [12] said that initial knowledge was one of the factors that support students in learning both listening and reading.

In the *engage* phase which was the second stage of the 7e learning cycle model students' interest was raised by involving in each student learning activity as to increase knowledge and develop a sense of curiosity. [13] students who have an interest in a particular subject need to give greater attention to the said subject. With students' interest in the learning process, it will be easier for students to accept given material. Direct learning in the *explore* phase was done by observing learning objects that were prepared by the teacher, students wrote down their observations without being directly taught by the teacher. The phase pushed students to be more active in gaining knowledge related to the concepts being learned, working together in their groups. [14] said that students who are active in the learning process can stimulate and develop their skills, think critically, and overcome the difficulties that exist in the learning process.

Direct observation by students then concluded by their own understanding to be presented and explained to each other in *explain* phase. Students were given an understanding of several scientific words to be used in explaining the results of exploration. The observations showed that most students had been able to explain the concept independently and construct the knowledge gained to answer the questions given by the teacher.

In *elaborate* phase, student activity was again enhanced by being confronted with new situations by giving students the opportunity to discuss with classmates to solve problems and be required to apply the knowledge gained to real situations through experiments. This stage went well enough, judged by students who were getting used to looking for information independently through existing information sources. Discussion that occurred from the preparation stage to the *elaborate* stage proved students were able to understand the basic concepts better and students were involved fully in the learning process by requiring students to read, understand the material, express opinions, respond to the opinions of friends and give and accept advice from friends.

The learning process that has been carried out is then evaluated involving students' understanding and skills at the *evaluate* stage. The teachers continuously observed and paid attention to the ability and skills of students to assess the level of knowledge obtained by students. In the *extend* phase, students were guided to apply the knowledge they had acquired by linking the next material or previous material with new concepts. Student activities could be seen when performing the ability to think, search, find

and explain concepts that had been learned.[7] stated that the *extend* stage is the actualization stage of students' abilities in meeting the demands to think, search, discover, and explain the examples of the application of new concepts and skills that have been learned.

The explanation above provides information that the learning cycle 7e model makes students more active in seeking information, expressing opinions, asking questions, answering questions, and enable them to be good listeners at discussion. These conditions enable students to build their own understanding and gain direct learning experiences with the real world hence positively affect student learning outcomes. Improved learning outcomes in the class using the learning cycle 7e model is different from the class using conventional learning models. The conventional learning model made students more inclined to accept material from what the teachers said without any initiative to search independently so that learning became teacher-centered. This was shown as students were less active asking and working together in groups. The conventional model students were required to memorize the material delivered by the teacher and did not relate the material to the current situation (contextualization). These conditions caused students inclined to be busy chatting with other or falling asleep when the teachers explained so the results of their learning were less than optimal.

The results of data analysis using the independent sample t-test indicated that there were significant differences in student learning outcomes in cognitive aspects. Students who were taught using the learning cycle 7e model had higher average scores than classes taught using conventional models. The learning cycle 7e model had a higher positive effect than the conventional learning model. The results of this study were in line with the results of research conducted [6]. It was known that a significant difference shown in the learning outcomes of the experimental class (learning cycle 7e) was higher than the control class (conventional models) of biodiversity subject. [15] also revealed that the learning cycle 7e model was more effective in improving student learning outcomes and scientific attitudes than conventional learning models.

CONCLUSIONS

Based on the results of research conducted by researchers, it is proved that there are significant differences between student learning outcomes in the cognitive aspects on ecosystem material using the learning cycle 7e model with student learning outcomes using conventional learning model. The learning cycle 7e model has a positive effect on student learning outcomes on the cognitive aspects of ecosystem material. This can be observed by the average value of student learning outcomes after treatment in the experimental class (learning cycle 7e) was 68.56, higher than the control class (conventional learning model) of 60.32.

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