



The Effect of Scaffolding Using the Peer Tutoring Method on Biology Learning Outcomes in the Material of the Human Excretory System

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ABSTRACT

Purpose of the study: To find out the effect of scaffolding using the peer tutoring learning method on the cognitive, affective and psychomotor aspects of class IX students of SMP Negeri 1 Muaro Jambi on the subject of the excretory system in humans.

Methodology: This type of research is a real experiment or true experiment. While the research design used in this study is the Posttest-Only Control Design. The sample in this study was class IX A as the experimental class and class IX D as the control class. The types of data and data sources in this study are quantitative data obtained from the results of tests carried out or data that describe cognitive aspects and qualitative data, namely data obtained from affective and psychomotor aspects. The instrument used for assessing learning outcomes in the cognitive aspect is a written test. Multiple choice questions are used for the posttest in the experimental class and the control class. For the assessment of learning outcomes on the affective aspect a questionnaire was used, and for the assessment of learning outcomes on the psychomotor aspect a worksheet was used for students.

Main Findings: Scaffolding (providing assistance) using the Peer Tutoring learning method does not affect the learning outcomes of biology in class IX students of SMP Negeri 1 Muara Jambi in the cognitive aspect, but affects the affective and psychomotor aspects.

Novelty/Originality of this study: It can be used as material for consideration and information for teachers in selecting appropriate, effective, and efficient learning models in the biology learning process. So that it can improve student learning outcomes in Biology subjects.

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1. INTRODUCTION

One of the ways to increase student learning outcomes is the role of the teacher in managing learning [1]. Teachers are required to be able to master various learning strategies. The teacher must be able to choose a learning method that is suitable for the material to be taught because a good learning method in conveying learning material will increase students' interest in paying attention to the material presented [2]. From the observations of researchers at SMP Negeri 1 Muaro Jambi, it turns out that in class IX the teacher has never delivered material by providing assistance or scaffolding using the peer tutoring method, but in class IX the teacher uses the discussion model in class in the learning process. However, from the results of the researchers'

observations, even though in class IX they held discussions during learning, it turned out that students were less active in asking questions and less interacting with their discussion partners. Even though in terms of discussions, especially discussions in class, students should be more active, be it asking questions, or giving opinions.

From the results of initial observations, the subject of the excretory system in humans in class IX is still a subject that is quite complicated because it is one of the materials that has many parts that must be understood. Even though it has been made with a discussion model, students are still less active so that student learning outcomes are unsatisfactory. The teacher should make learning methods more varied in order to improve student learning outcomes in participating in the learning process.

Based on the results of observations made at SMP Negeri 1 Muaro Jambi, it is known that the average value of Biology daily tests on the Competency Standards for Understanding various systems in human life of students is still relatively low. This can be seen from the average value of each class which is still below the KKM, the KKM set is 75. In class IX A the average value is 58.64, class IX B the average value is 59.25, class IX C the average value is 57.67, class IX D the average value is 57.18.

This is because learning in the classroom is usually only teacher-centered. Most students in the teaching and learning process only rely on explanations from the teacher, and record what the teacher has given or recorded on the blackboard or what the teacher ordered [3]. When the teacher asked, no one wanted to answer and only wanted to answer when asked to. Students tend to often wait for answers from teachers and record them [4].

To be able to increase the activity and learning outcomes of students, a learning method that is somewhat different from before is needed, namely providing learning assistance or scaffolding using peer tutoring techniques. Scaffolding is an aid (parameters, rules or suggestions) that learners provide to students in learning situations [5]. Scaffolding allows students to get help through new skills or beyond their ability [6]. Scaffolding is one result of social constructivist principles [7]. Scaffolding is applied because it can make students more socially interacting and more active in the learning process [8].

Peer Tutoring or in Indonesian is better known as peer tutoring [9]. Learning with peer tutors is done on the basis that there are a group of students who are easier to ask questions, more open with their own friends compared to their teachers [10]. With peer tutors students who are less active become active because they are no longer ashamed to ask questions and express opinions freely [11].

Peer tutor learning is a method that gives students the opportunity to be more active in asking questions about anything they don't understand [12]. Through peer tutors who are none other than their own friends, students will not feel embarrassed to ask the tutor, namely their own friends, there will be no feeling of reluctance, awkwardness, embarrassment, low self-esteem, so that students do not hesitate to express difficulties. he faced.

The role or position of the teacher in learning using peer tutoring techniques, namely as a facilitator in implementing this learning method so that it will lead to student activity in participating in the learning process. Based on the description above and the results of observations, the authors conducted research for a thesis with the title, namely: The Effect of Scaffolding using the Peer Tutoring Method on Biology Learning Outcomes of Class IX Students of SMP Negeri 1 Muaro Jambi on the Material of the Excretory System in Humans.

2. RESEARCH METHOD

This type of research is a real experiment or true experiment. It is said to be true experimental (true experiment) because in this design, the researcher can control all external variables that affect the course of the experiment. While the research design used in this study is the Posttest-Only Control Design. In this design there are two groups, each of which is chosen randomly (R). The first group was given treatment in the form of learning using the Scaffolding learning model using the Peer Tutoring Method while the others were not given any treatment. The research design can be seen in the following table:

Table 1. Posttest-Only Control Design

Group	Treatment	Final Test (posttest)
Experiment Class	X	TA
Control Class	-	TA

Information:

X = Treatment in the learning experimental class in the form of Scaffolding with the Peer Tutoring Method.

TA = Final Test (posttest).

This type of research is true experimental, so in this study the sampling method is probability sampling with simple random sampling technique. The sample in this study was class IX A as the experimental class and class IX D as the control class

The type of data source data used is quantitative data, namely data obtained from the results of tests carried out or data that describes cognitive aspects. Qualitative data, namely data obtained from affective and psychomotor aspects. The source of the data in this study were class IX students of SMP N 1 Muaro Jambi. The data collection method in this study was to provide posttest questions after completing the learning process in the experimental class and control class on the subject of environmental change and waste recycling. The questions used are questions that have been tested and have met the requirements of the criteria of validity, difficulty level, distinguishing power and reliability. In addition, questionnaire sheets were also used for affective assessments and performance sheets for psychomotor assessments.

The instrument used for assessing learning outcomes in the cognitive aspect is a written test, where the test is in the form of multiple choice questions. Multiple choice questions are used for the posttest in the experimental class and control class. For the assessment of learning outcomes on the affective aspect a questionnaire was used, and for the assessment of learning outcomes on the psychomotor aspect a worksheet was used for students. Tests to measure students' mastery of concepts after the learning process uses the Gtoup Investigation learning model in the form of objective tests.

3. RESULTS AND DISCUSSION

Based on the Liliefors test, the results are as shown in the following table:

Table 2. Sample Class Normality Test

Class	Number of Students	L_o	L_t	Information
IX A	29	0.15	0.19	Normal
IX B	28	0.14	0.19	Normal
IX C	29	0.15	0.19	Normal
IX D	27	0.12	0.19	Normal

Based on the table above it can be seen that $L_o < L_{table}$. Thus it can be seen that the four classes in the population have normally distributed data.

The statistical test used is Fisher's test. After doing the calculations obtained $F_{count} = 1.44$ and $F_{table} = 2.52$. It can be seen that $F_{count} < F_{table}$. So it can be concluded that the four population classes have homogeneous variants, thus the sample can be taken using random sampling where each sample class is drawn to determine the experimental class and the control class. Class IX A as Experiment class and class IX B as Control class. The results of research on the cognitive aspect were obtained by calculating the value of student learning outcomes from the experimental class and control class, so that student learning outcomes from the experimental class and control class were obtained with the following averages:

Table 3. Average and Standard Deviation of Cognitive Outcomes

Class	Number of Participants	Average Standard	Deviation
Experiment	29	61.58	4.79
Control	29	60.55	3.86

From the table above, it can be seen that the experimental class taught using the peer tutoring learning method has a higher average value than the control class which is taught using the direct learning model. Based on the results of student learning, then a hypothesis test was carried out. The hypothesis in this study was tested using a statistical test, namely the t-test. before the t-test is carried out, the normality test is first carried out using the Liliefors test and the homogeneity test with the F-test.

Based on the Normality test using the Liliefors Test, the results are shown in the following table:

Table 4. Cognitive Aspect Value Normality

Class	Number of Test Participants	L_o	L_t	Information
Experiment	29	0.44	0.19	Normal
Control	29	0.38	0.19	Normal

From the table above, the values for the normality test are obtained for:

- Experimental Class $L_o = 0.44$ and $L_{table} = 0.19$ and a significance level of 0.01 then $L_o > L_{table}$ ($0.44 > 0.19$).
- Control class $L_o = 0.38$ and $L_{table} = 0.19$ and a significant level of 0.01 then $L_o > L_{table}$ ($0.38 > 0.19$).

So it can be concluded that the experimental class and the control class are not normally distributed

Based on the homogeneity test using the F test, the following results are obtained:

Table 5. Homogeneity Test

Class	N	Average	S ²	F _{count}	F _{table}
Experiment	29	80.24	8.42		
Control	29	73.03	5.12	2.26	2.52
Amount	58				

From the table above for $\alpha = 0.01$, it is obtained that dk quantifier = 28, dk denominator = 28 so that the value F_{Table} = 2.52 is obtained, thus F_{Count} < F_{Table} (2.26 < 2.52), so that the sample has a homogeneous variant.

In this study, to test the hypothesis used a two-sided similarity test on one side, namely the right side. Based on the hypothesis test using the t-test, the following results are obtained:

Table 6. Test the Cognitive Learning Outcomes Hypothesis

Class	N	S _i ²	S _{gab}	t _{count}	t _{table}	Information
Experiment	29	22.94				
Control	29	14.89	4.39	0.90	2.10	H ₀ is accepted

From the table above, t_{count} = 0.90, and t_{table} = 2.42, H₀ is accepted: t_{count} < t_{table} (0.90 < 2.423) or $\mu_1 < \mu_2$, H₁ is accepted. So it can be concluded that the peer tutoring learning method does not affect the learning outcomes of Biology class IX students of SMP Negeri 1 Muaro Jambi on the cognitive aspect.

The results of the research on the affective aspect were obtained by calculating the value of student learning outcomes from the experimental class and control class, so that student learning outcomes were obtained with the following averages:

Table 7. Average Standard Deviation of Affective Learning Outcomes

Class	Number of participants	Average	Standard Deviation
Experiment	29	87.46	12.5
Control	29	81.32	9.3

From the table above it can be seen that the experimental class taught using the peer tutoring learning method has a higher average value compared to the control class which is taught using the direct learning model. Based on the results of student learning, then a hypothesis test was carried out. The hypothesis in this study was tested using a statistical test, namely the t-test. before the t-test is carried out, the normality test is first carried out using the Liliefors test and the homogeneity test with the F-test.

Based on the normality test using the Liliefors test, the following results are obtained:

Table 8. Normality Test of Affective Aspect Learning Outcomes

Class	Number of Test Participants	L _o	L _t	Information
Experiment	29	0.44	0.19	Normal
Control	29	0.38	0.19	Normal

From the table above, the values for the normality test are obtained for:

Experimental Class L₀ = 0.17 and L_{table} = 0.19 and a significance level of 0.01

then L₀ > L_{table} (0.17 > 0.19).

Control class L₀ = 0.12 and L_{table} = 0.19 and a significant level of 0.01

then L₀ > L_{table} (0.12 > 0.19).

So it can be concluded that the experimental class and the control class are normally distributed at the 95% level of confidence. Based on the homogeneity test using the F test, the following results are obtained:

Table 9. Test of Homogeneity of Affective Aspect Learning Outcomes

Class	N	Average	S ²	F _{hitung}	F _{Tabel}
Experiment	29	87.46	156.25		
Control	29	81.32	86.49	1.80	2.52
Amount	58				

By using the F test, homogeneity results were obtained with F_{count} = 1.80 and from the distribution list F, F_{table} = 2.52, thus F_{count} < F_{table} (1.80 < 2.52), so it can be concluded that the Experimental class and the Control class have homogeneous variant.

In this study, to test the hypothesis used a two-sided similarity test on one side, namely the right side. Based on the hypothesis test using the t-test, the following results are obtained:

Table 10. Hypothesis Test of Affective Aspects of Learning Outcomes

Class	N	S_i^2	S_{gab}	t_{Hitung}	t_{Tabel}	Information
Experiment	29	156.25	11.01	2.14	2.10	H_0 ACC
Control	29	86.49				

From the table above, $t_{count} = 2.14$, and $t_{table} = 2.10$, H_1 is accepted: $t_{count} < t_{table}$ ($2.14 < 2.10$) is accepted at a 95% significance level. So it can be concluded that the peer tutoring learning method influences the learning outcomes of Biology class IX students of SMP Negeri 1 Muaro Jambi on the affective aspect.

The peer tutoring learning method at SMP N 1 Muaro Jambi has an effect on the psychomotor aspects of students. The psychomotor aspect appears in the form of students' skills and acting abilities. The results of research on psychomotor aspects were obtained by using instruments in the form of student worksheets when working on discussions.

The results of research on the psychomotor aspect were obtained by calculating the value of student learning outcomes and the participation of each student in their own group from the experimental class and control class, so that student learning outcomes were obtained with the following averages:

The average and standard deviation of each sample class of psychomotor learning outcomes can be seen in the following table:

Table 11. Average Standard Deviation of Psychomotor Learning Outcomes

Class	Number of participants	Average	Standard deviation
Experiment	29	68,79	8,27
Control	29	64,90	5,68

From the table above it can be seen that the experimental class taught using the peer tutoring learning method has a higher average value compared to the control class which is taught using the direct learning model. Before the t-test was carried out, the normality test was first carried out using the Liliefors test and the homogeneity test with the F-test. Based on the normality test using the Liliefors test, the following results are obtained:

Table 12. Normality Test of Psychomotor Learning Outcomes

Class	Number of Test Participants	L_o	L_t	Information
Experiment	29	0.15	0.19	Normal
Control	29	0.11	0.19	Normal

From the table above, the values for the normality test are obtained for:

- Experimental Class $L_0 = 0.15$ and $L_{table} = 0.19$ and a significance level of 0.01 then $L_0 > L_{table}$ ($0.15 > 0.19$).
- Control class $L_0 = 0.11$ and $L_{table} = 0.19$ and a significant level of 0.01 then $L_0 > L_{table}$ ($0.11 > 0.19$).

So it can be concluded that the experimental class and the control class are normally distributed at the 95% level of confidence.

Based on the homogeneity test using the F test, the following results are obtained:

Table 13. Psychomotor Aspect Homogeneity Results

Class	N	Average	S^2	F_{Hitung}	F_{Tabel}
Experiment	29	6879	68.39		
Control	29	64.90	32.26	2.11	2.52
Amount	58				

Using the F test, homogeneity results were obtained with $F_{count} = 2.11$ and from the distribution list F, $F_{table} = 2.52$, thus $F_{count} < F_{table}$ ($2.11 < 2.52$), so it can be concluded that the two classes have homogeneous variants. .

From the results of the normality test and homogeneity test, it can be concluded that the student learning outcomes of the experimental class and control class are normally distributed and have a homogeneous variance, so that they meet the requirements for hypothesis testing using the t-test.

Table 14. Psychomotor learning outcomes hypothesis

Class	N	S_i^2	S_{gab}	t_{Hitung}	t_{Tabel}	Information
Experiment	29	68.39	7.09	9.26	2.10	H_0 ACC
Control	29	32.26				

From the table above, $t_{count} = 2.96$ and $t_{table} = 2.10$, H_1 is accepted: $t_{count} < t_{table}$ ($2.96 < 2.10$) is accepted at a 95% significance level. So it can be concluded that the peer tutoring learning method influences the learning outcomes of Biology class IX students of SMP Negeri 1 Muara Jambi on the psychomotor aspect.

4. CONCLUSION

Scaffolding (Providing Assistance) using the Peer Tutoring learning method does not affect the learning outcomes of biology in class IX students of SMP Negeri 1 Muara Jambi on the cognitive aspect. Scaffolding (Providing Assistance) using the Peer Tutoring learning method has an effect on biology learning outcomes in class IX students of SMP Negeri 1 Muara Jambi on affective and psychomotor aspects.

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