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The Influence of the Mind Mapping Model on Students' Learning Outcomes in Biology Learning at Class XI in Tumou Tou Christian High School, Bitung City

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Abstract
Based on the results of observations and interviews with class This research aims to find out whether the mind mapping model can improve student learning outcomes in plant tissue material in class XI Tumou Tou Christian High *School. This research uses a quasi-experimental method (quasi-experiment). The subjects of this research were class XI-A as the experimental class and class XI-C as the control class. Both classes will be given learning outcomes tests in the form of pretest and posttest. Based on the results of data analysis, the results showed that there was an influence of the mind mapping model on student learning outcomes in plant tissue material in class XI Tumou Tou Christian High School. This is based on the results of the t test using IBM SPSS for Windows if the Sig. (2-tailed) < Research Alpha (0.05), namely 0.00 <0.05, then H0 is rejected and H1 is accepted. This shows that there is an influence of applying the mind mapping model on improving student learning outcomes in plant tissue material in class XI Tumou Tou Christian High School.*

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1. INTRODUCTION

Education is an important thing that every human being needs to gain knowledge, insight and skills through teaching, training or research. According to [1] , education is a conscious effort and planned process to create a learning atmosphere and learning process so that students can actively develop their potential to have religious spiritual strength, self-control, personality, intelligence, noble character, and the skills they need. , society, nation and state.

In achieving educational goals, qualified teachers or educators are needed so that the learning applied in teaching and learning activities can be realized well. For this reason, an educator not only conveys material, but an educator must also be able to create learning that involves student activity in order to improve student learning outcomes themselves. Education certainly cannot be separated from learning outcomes (Paat, et al., 2021). According to Widana & Septiari, learning outcomes are abilities obtained by individuals after the learning process takes place, which can provide changes in behavior, including knowledge, understanding, attitudes and skills of students so that they become better than before. Therefore, in realizing or achieving maximum learning outcomes, teachers must be able to choose and use appropriate learning models to help students be directly involved in the learning process [2] .

A learning model is a design prepared as a guideline for implementing learning to achieve learning goals. Achieving learning goals in education is said to be successful depending on the learning process experienced by students at school. However, it is often found that in the learning process students only focus on the teacher's explanation, resulting in students being less actively involved during the learning process so that this affects student learning outcomes [3].

Based on the results of observations and interviews with the biology teacher class those who achieve the KKM are 35% with the Minimum Completion Criteria (KKM) set at 75. The cause of the low learning outcomes is that the learning process is still centered on the teacher and students only take notes on the material given by the teacher.

Seeing this problem, it is necessary to have a solution to create effective learning in improving learning outcomes, for this reason researchers will apply one learning model, namely the mind mapping learning model. According to [4] , the mind mapping learning model is a model designed to help students in the learning process, store information in the form of subject matter received by students while studying, and help students organize the important points of the subject matter. in the form of maps, graphs, or the use of symbols so that students more easily remember the lessons given by the teacher. Through the mind mapping learning model, students are no longer required by teachers to always take notes in their entirety. Students will find out the essence of the problem, then create their own mind maps according to their creativity. The mind mapping learning model is also able to increase students' creativity, activeness, knowledge and independence in the learning process, thus the mind mapping learning model is suitable for use in the process of learning activities, especially in biology learning.

According to [5] , Biology learning is basically learning that requires students to do a lot of activities or be actively involved in the learning process. Therefore, the mind mapping learning model is a solution offered by researchers because mind mapping is a learning model that enables students to be able to explore creative ideas and be active in participating in learning activities so that students are able to make notes that are more interesting, easy to remember and easy to take. understood so that the mind mapping model can help students in the learning process and can automatically improve student learning outcomes.

The learning model using mind mapping invites students to learn actively using the brain. Mind mapping can help students understand, organize and visualize material and activities creatively and attractively. The mind mapping learning model gives students the freedom to develop their knowledge and creativity according to each student's imagination and combined with colors, curved lines, images and shapes which makes it easier for the brain to absorb the information received compared to using ordinary notes. The mind mapping learning model is a learning model that aims to improve student learning outcomes so that they are more active in learning activities [6] .

In accordance with this description, the researcher is interested in examining more deeply the problems faced by teachers and students with the title "The Influence of the Mind Mapping Model on Student Learning Outcomes in Class XI Biology Learning at Tumou Tou Christian High School, Bitung City".

The aim of this research is to find out whether the application of the mind mapping model has an effect on the learning outcomes of class XI students at Tumou Tou High School, Bitung City.

2. RESEARCH METHOD

This research was carried out at Tumou Tou Christian High School, Bitung City in the odd semester 2023/2024 for 2 months starting from September to October 2023. This research used a quasi-experimental method. The experimental method can be a research method designed with the aim of measuring the effect of one treatment on another treatment under controlled conditions (Sugiyono, 2013). This research is classified as experimental research because it is designed to find out whether there is an effect of applying mind mapping on student learning outcomes by using 2 classes as an experimental class and as a control class.

Data that has been collected through student learning outcomes is analyzed to test hypotheses starting with prerequisite tests in the form of normality tests, homogeneity tests [7] . The data is processed using the following test:

1. Normality test

   Data normality can be expressed with a normal distribution or Normal curve [8] . Carried out using the Liliefors test. With the aim of finding out whether the sample is normally distributed. The data normality test is carried out in stages, namely:

   a. Step 1: Determine the Testing Hypothesis

      Ho: the sample is normally distributed, HA: the sample is not normally distributed

b. Step 2: Determine Testing Criteria
   Accept H0 if Lo ≤ Lt, Reject H0 if Lo Lt , Alpha = 0.05>
c. Step 3: Calculate Zi, F(Zi), S(Zi), and calculate the difference F(Zi)-S(Zi)
d. Step 4: Summarize the results.
   The data was processed using the SPSS application, so the normality test used was the Kolmogorof-Smirnof test. The test criteria that are usually carried out are if the significance value is α then the data is normally distributed and if the significance value α = 0.05 then the data is not normally distributed.><

2. Homogeneity Test

The homogeneity test is used to determine whether several population variants are the same or not. This test aims to find out whether the variance of the study population is homogeneous. To find out whether the variance is a homogeneous population, a homogeneity test is carried out using the maximum variance formula compared to the minimum variance. The formula used to determine the F test is as follows:

$$F = \frac{varians\ terbesar}{varians\ terkecil}$$

With testing criteria, namely:

If Fcount ≥ Ftable then it is not homogeneous and if Fcount ≤ Ftable it means homogeneous where Ftable is obtained from the value distribution table with dk = n-1 and α=0.05.

If you use the SPSS application to test research data, the homogeneity test criteria are, if the significance value is > α = 0.05 then the population data has a homogeneous variant, whereas if the significance value is < α = 0.05 then the population data has a non-homogeneous variant.

3. Hypothesis testing

The truth of this hypothesis is proven through the data collected [9] . In order to test a statistical hypothesis, the researcher first determines which test statistics are appropriate to use, whether using parametric or non-parametric statistical tests. The hypothesis that has been formulated must be tested for truth through a two-party test with a level of α = 0.05.

The formula for determining statistical tests is:

$$t = \frac{\bar{x}_1 - \bar{x}_2}{s\sqrt{\frac{1}{n1} + \frac{1}{n2}}}$$

Where $s = \frac{(n1-1)s_1^2+(n2-1)s_2^2}{(n1+n2-2)}$

Information:

$\bar{x}_1$ = valueaverage X1
$\bar{x}_2$ = valueaverage X2
S = standard deviation
S_1^2 =experimental standard deviation
S_1^2 = control standard deviation
n1 =number of experimental class samples
n2 = amountcontrol class samples

If the research data is tested using the IBM SPSS for Windows application, a hypothesis test will be carried out, namely the t test by comparing the calculated significance of each independent variable to the dependent variable with a significance level of 5%.

3. RESEARCH RESULTS AND DISCUSSION

3.1. Research result

The aim of this research is to find out whether there is an influence of applying the mind mapping model on student learning outcomes in class XI Tumou Tou Christian High School, Bitung City. The method used is the experimental method with the research design used is "Pre-test, Post-Test control group design". The learning outcomes test instrument consists of 20 multiple choice questions which are used to collect as learning outcomes data in research. The exam was given as a pre-test and post-test in each experimental class and control class to ensure students' initial skills in both classes. The pre-test was given before starting the treatment. To determine changes in students' biology learning outcomes, a post-test was carried out after the treatment was carried out. After carrying out post-test activities, researchers will use the post-test results data as a basis for ensuring increased student learning outcomes after being given treatment in the experimental class.

This research was carried out at Tumou Tou Christian High School, Bitung City. Students from classes XI-A to XI-E are the population. Meanwhile, the sample used involved two classes, namely the experimental group, namely class XI-A, with a total of 31 students who were taught through the application of the mind mapping model, while the control group, namely class Samples are used in research to make it easier to collect data from the population [10]. A sample is a group of elements selected from a larger group with the hope of studying this smaller group [11] .

Through calculation results calculated using the SPSS application, the pretest and posttest scores for the experimental class and control class can be shown in Table 1 below:

Table 1. Description of Pretest-Posttest Scores for Experimental Class and Control Class

Description	Experimental Class		Control Class	
	Pre-Test	*Post-Test*	*Pre-Test*	*Post-Test*
Minimum Value	10	65	10	10
Maximum Value	45	90	45	95
Range	31	31	31	31
Average	30.48	79.35	26.45	63.06
Variance	82,258	29,570	78,656	28,796
Standard Deviation	9,070	5,438	8,869	16,817

Table 1 shows that the pretest results for the control class have a minimum score of 10 and a maximum score of 45 with an average score of 26.45. Experiencing improvement is shown in the control class posttest scores with a minimum score of 10 and a maximum score of 95 with an average score of 63.06. Besides that, the lowest score in the experimental class on the pretest was 10 and the highest score was 45 with an average score of 30.48. There was an increase in the posttest score with the lowest score being 65 and the highest score being 90 with an average score of 79.35 so that through this table a temporary conclusion can be drawn that the mind mapping model has an influence on the learning outcomes of class XI Tumou Tou Christian High School students.

Data analysis

To test whether the mind mapping model has an effect on student learning outcomes, analysis using different test statistical techniques was used. Before carrying out a different test, a prerequisite test must be carried out.

1) Normality test

This test aims to test whether the sample comes from a normally distributed population or not. The Kolmogorof-Smirnof method was used to test the pretest and posttest scores for the experimental class and control class using the SPSS application for data analysis and a significance level of 0.05. if the significance is > 0.05 then the data is declared to be normally distributed. The results of the normality test can be shown in Table 2 below:

Table 2. Normality Test Results

Class	Lcount	Table
Sample	31	31
Significant Level	0.05	0.05
*Pretest*Experiment	0.177	0.159
*Posttest*Experiment	0.98	0.159
*Pretest*Control	0.33	0.159
*Posttest*Control	0.137	0.159

Based on the results of the normality test, both experimental classes and the control class are normally distributed because Lcount < Ltable. In the experimental class the pretest and posttest Lcount values were (0.177 and 0.98) < Ltable (0.159) and in the control class the pretest and posttest Lcount values were (0.33 and 0.137) < Ltable (0.159).

By using the SPSS application to test the normality of the data, it can be seen that the experimental class pretest and control class pretest sample data have a significance value greater than alpha (α=0.05). The normality test results for the experimental class were 0.177 > 0.05, while the normality test results for the control class were 0.33 > 0.05. So it is known that the pretest and posttest sample data for the experimental class and the pretest and posttest sample data for the control class are normally distributed.

2) Homogeneity Test

After the sample is declared to have a normal distribution, homogeneity testing will then be carried out. Where the homogeneity test is used to find out whether the data from the research results have homogeneous or inhomogeneous variants. Population variance was tested using the statistical Lavene Test assisted by the SPSS application with a significance value of α= 0.05. The results of the homogeneity test can be shown in Table 3 below:

Table 3. Homogeneity Test Results

Pretest Data	Experimental Class	Control Class
Number of Respondents	31	31
Variance	29,570	28,796
Fcount	1.04	
Ftable	2.25	
Conclusion	Homogeneous	

The results of the analysis of testing the similarity of two variances with statistics using the Fisher Test (F Test) at a significance level (α) = 0.05 in the pretest data with variant S12 = 29.570 and variant S22 = 28.796 gives a value of Fcount = 1.04 and Ftable = 2 .25. This can show that Fcount < Ftable

Based on the output of the homogeneity test results from IBM SPSS for Windows, it can be seen that the pretest significance value is 0.452 > alpha 0.05. After carrying out the test it can be seen that the significance value is > 0.05 so that according to the existing criteria the two classes come from the same or homogeneous population.

3) Statistical Hypothesis Testing

The hypothesis that will be tested in the research is that the mind mapping model has an effect on improving student learning outcomes in class XI Tumou Tou Christian High School. To test this hypothesis means comparing the average increase in learning outcomes of students in the group taught using the mind mapping model with the average increase in learning outcomes of students in the group who were not given treatment or the control group.

To determine the effect of the independent variable on the dependent variable, a hypothesis test is carried out. In this research, the hypothesis test uses the t test with the help of the SPSS application. When testing a hypothesis using the t test, the calculated significance value of the independent variable is compared with the calculated significance value of the dependent variable at a significance level of 5%. In making decisions on hypothesis testing with the t test, by comparing the results of Sig. (2-tailed) with α research. The results of the hypothesis test can be shown in Table 4 below:

Table 4. Hypothesis Test Results

Information	Experimental Class	Control Class
Average	79.35	63.06
Variance	29,570	28,796
Number of Respondents	31	31
Tcount	11,872	
Table	2,000298	
Conclusion	Reject H0 and Accept H1	

Based on table 4, it shows that the data obtained is tcount (11.872)≥ ttable(2.0002). In accordance with the test criteria if tcount≥ ttable then H0 is rejected and H1 is accepted, and if tcount < ttable then H0 is accepted and H1rejected

Based on the results, the posttest value Sig. (2-tailed) = 0.000. Meanwhile, research α = 0.05. This means that the Sig value. (2-tailed) is smaller than alpha (0.000 < 0.05) so H0 is rejected and H1 is accepted. Therefore, it appears that the mind mapping model has an effect on improving student learning outcomes in plant tissue material in class XI Tumou Tou Christian High School.

3.2. Discussion

This research was carried out at Tumou Tou Christian High School, Bitung City, the research samples used were two classes, namely class XI-A (experimental class) and class XI-C (control class) with a total of 31 students in each class. This research uses a mind mapping model on plant tissue material.

Based on the results of the data analysis that has been carried out, it shows that there is a significant difference in the average value of posttest learning outcomes between the experimental class and the control class carried out in class XI of Tumou Tou Christian High School, Bitung City. In class In class The difference in the average value of learning outcomes for students in class XI-A and class XI-C at Tumou Tou Christian High School is because the experimental class, namely class group discussion learning.

The learning outcomes of class learning. The mind mapping learning model can also help students overcome difficulties, know what to write and how to organize ideas, because this technique can help students find ideas and how to start them. This is supported by the opinion of [12] , mind mapping is another method used to strengthen students' knowledge and understanding of the material they have read. The results of the research showed that there were differences in the learning outcomes of students in the experimental class XI-A which

used the mind mapping model and the control class XI-C which used the group discussion learning model.

The above statement is also strengthened by hypothesis testing (T Test) where tcount is greater than ttable, namely 11.872 > 2.000298 so that the results of the analysis show that there are differences in the learning outcomes of experimental class students using the mind mapping model with the learning outcomes of class students. control using a group discussion learning model. It can be interpreted that the learning outcomes of class XI-A students at Tumou Tou Christian High School are the result of mind mapping model treatment. So it can be concluded that the mind mapping model has a very significant influence on the biology learning outcomes of class XI students at Tumou Tou Christian High School.

Results and discussion contain research findings and scientific discussion. Write down scientific findings obtained from the results of research that has been carried out but must be supported by supporting data. It is not permitted to write raw data in this article. The research data is presented in the form of tables or figures then followed by an explanation of the parts that are considered important.

4. CONCLUSION

The mind mapping model has an effect on improving the biology learning outcomes of class XI studentsin plant tissue materialat Tumou Tou Christian High SchoolBased on the results, the posttest value Sig. (2-tailed) = 0.000. Meanwhile, research α = 0.05. This means that the Sig value. (2-tailed) is smaller than alpha (0.000 < 0.05) so H0 is rejected and H1 is accepted.

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