The effectiveness of experiential learning model by using mind map to the understanding of concepts on fungi materials at the tenth-grade students of senior high school

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Abstract. This study aimed to find out what experiential learning model by using mind map could increase the understanding of concepts of fungi materials at the tenth-grade students of senior high school. This study was quasi-experiment research that used pre-test and post-test control group design. The population of the research was all of the tenth-grade students at SMAN 1 Kalasan. The technique of getting sample used cluster random sampling technique where X MIPA 4 class became an experiment class, and X MIPA 5 class became a control class. The used instruments in this research contained the observation sheet about the implementation of learning by using experiment learning model and evaluation sheet about the students’ understanding of concepts. The data of the research were analyzed by using t-test (independent sample t-test). The results showed that the significant value (2-tailed) was 0.000 (< 0.05). It concluded that there was a difference of understanding concept between class experiment and control class. It was proved that the learning process through experiential learning model by using mind map could increase the students’ understanding of concepts.

1. Introduction

Learning model has an important role in teaching and learning process. It will make the learning process more interesting and enjoyable. The interesting and enjoyable learning will make the students become more comfortable to learn, so the learning achievement that is gotten will be more maximal. There are many types of learning models that can be implemented by the teacher during the learning process, one of them is experiential learning model. Experiential learning model is a learning process that involves the experience of students directly so that learning becomes more active by building their learning knowledge and skills. According to Hariri & Erna [1], learning from experience there is a connection between doing and thinking. If someone is active then that person will learn much better. This is due in the learning process learners actively think about what is learned and then how to apply what has been learned in real situations.

The syntax in experiential learning model consists of four stages that are Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE) [2]. One of the stages in experiential learning is Reflective Observation. In this stage, the material learned by students will be easier to understood by using mind map techniques. Learning by using mind map can improve memory by associating and imagining concepts, and by having interconnected keywords make it easier for students to understood the material [3, 13].
In regard to it, learning biology needs understanding of concepts well in which one of them is fungi materials. Based on the interview result with the teachers at SMAN 1 Kalasan, the students’ understanding of concepts about fungi is low. According to the teacher the difficulties experienced by students in fungi material is because the material uses a lot of Latin terms and difficulty in distinguishing types of fungi based on division. In addition, based on observations made at school, students tend to be passive during the learning process, especially in terms of asking questions and expressing opinions on biology lessons.

The learning model that is suitable to solve the problem faced by the students in understanding the concepts becomes the important thing to achieve the learning objectives. The implementation of experiential learning model by using mind map for fungi materials is expected to be able to solve the problem stated before. Based on the explanation, it is needed to do the research “The Effectiveness of Experiential Learning Model by using Mind Map to the Understanding of Concepts on Fungi Materials.”

2. Methods
2.1. Research Design
This research is done on November 2018 at SMA N 1 Kalasan at Bogem Street, Taman Martani, Kalasan, Sleman regency of Yogyakarta in academic year 2018/2019. This is quasi-experiment research by using pre-test and post-test control group design.

2.2. Population and Sample
The population of the research is all of the tenth-grade students at SMA N 1 Kalasan that are divided in five classes. The research sample in this research is only two classes that consist of 52 students. The sampling technique uses cluster random sampling techniques where the chosen classes that become the research sample are X MIPA 4 (experiment class) that gets the treatment of experiential learning model by using mind map and X MIPA 5 (control class) by using 5M learning model. Both classes are the classes that have similar knowledge. It is proved by interviewing the teachers whom stated that both classes have similar knowledge since the division of class is random, and it is not based on their achievement. The teachers’ statement is proved by the pre-test value result from both classes. It shows that the value is almost similar. The significant value after tested by SPSS is p > 0.05, so the pre-test value of both classes is not really different.

2.3. Research Instruments
The instruments used in this research are observation sheet that contains of learning implementation of experiential learning model by using mind map and 30 multiple choices questions about understanding of concepts that contain cognitive field from C1, C2, C3, and C4. The instrument used in the form of written questions given at the time of the pretest (to know the understanding of the concept before getting treatment) and posttest (to find out the understanding of the concept after getting treatment). The trial of this research instrument uses a validity test and a reliability test.

2.4. Data Analysis
The data analysis that is used in this study includes pre-requisite test (tests of normality and homogeneity) and hypothesis test (independent sample t-test). Data processing was performed with SPSS software version 20.

3. Results and Discussion
3.1. Result
The data results are gotten from test value of pre-test and post-test. The description of the students’ understanding of concepts through pre-test and post-test can be seen in Table 1 and 2, as follows.
Table 1. Value the first understanding of concepts in control class and experiment class (pretest).

| Statistics      | The First Understanding of Concepts |          |          |
|-----------------|-------------------------------------|----------|----------|
|                 | Control Class                       | Experiment Class |
| Mean            | 36.28                               | 34.10    |
| Maximum Score   | 56.67                               | 60.00    |
| Minimum Score   | 10.00                               | 13.33    |
| STDEV           | 13.74                               | 14.25    |

The descriptive analysis results toward the first understanding of concepts are gotten that the average of pretest in control class is 36.28 whereas the experiment class is 34.10 (Table 1). It means the both classes have beginning ability that is similar with the range of 2.18.

Table 2. Value the last understanding of concepts in control class and experiment class (posttest).

| Statistics      | The Last Understanding of Concepts |          |          |
|-----------------|------------------------------------|----------|----------|
|                 | Control Class                      | Experiment Class |
| Mean            | 73.85                              | 87.95    |
| Maximum Score   | 93.33                              | 96.67    |
| Minimum Score   | 60.00                              | 76.67    |
| STDEV           | 7.76                               | 6.26     |

The descriptive analysis results toward the last understanding of concepts are gotten that the average of experiment class is 87.95. The value is higher than the value of control class that is 73.85 (Table 2). It shows that the values between the experiment class and control class have understanding of concepts that differ greatly. The difference value between experiment class and control class is 14.10, so it can be concluded that experiment class gets high the average value after getting of experiential learning model through mind map.

Hypothesis test is done after doing the normality test and homogeneity test. Normality test aims to determine whether the data obtained are normally distributed or not normally distributed. This test uses the Kolmogorov-Smirnov test at a significance level of 0.05 with the help of SPSS software version 20.

Table 3. The results of normality test.

| Classes | Data  | Sig. | Significance Level | Description |
|---------|-------|------|--------------------|-------------|
| Control | Pretest | .200 | P > 0,05 | Normal      |
|         | Posttest | .191 |          | Normal      |
| Experiment | Pretest | .200 |          | Normal      |
|         | Posttest | .060 |          | Normal      |

The normality test results are gotten 0.200 significant value of pre-test data and 0.191 significant value of post-test data from the control class (Table 3). The probability value is up to 0.05 (p > 0.05) that shows normal distribution, so H₀ statement is rejected. The value of the experiment class is gotten 0.200 significant value of pretest data and 0.060 significant value of post-test data. The probability value is up to 0.05 (p > 0.05) that shows normal distribution, so H₀ statement is also rejected.

Homogeneity test aims to determine whether the variance between groups tested homogeneous or not. The test used is the Levene test. Homogeneity test results, presented in the table below.
Table 4. The results of homogeneity test.

| Data   | Sig. | Description |
|--------|------|-------------|
| Pretest| .699 | Homogeneous |
| Posttest| .518| Homogeneous |

Moreover, probability value of pretest data toward understanding of concepts in the experiment class and control class is 0.699 whereas probability value of post-test data toward understanding of concepts in the experiment class and control class is 0.518. Based on the calculation, it shows that the pretest value and post-test value have significant value higher than 0.05 so that it can be concluded that the data are homogeneous.

After the pre-requisite test is done and get the data that are distributed normally and homogeneous, the hypothesis test is done by using t-test (independent sample t-test). T-test is done to find out the existence of differences toward understanding of concepts in experiment class and control class. The t test aims to find out the difference in understanding of the concepts of the two classes.

Table 5. Value of independent samples t-test.

| Data   | Sig. (2-tailed) | Description |
|--------|-----------------|-------------|
| Pretest| .577            | Insignificant|
| Posttest| .000        | Significant |

The t-test result gets 0.577 of significant value (2-tailed) from pre-test data. The probability value is bigger than 0.05 so that it can be concluded that there is no difference of pre-test value between experiment class and control class. On other hand, the post-test data gets 0.000 of significant value (2-tailed). Probability value is smaller than 0.05, so it can be concluded that there are differences in the posttest values of the two classes. From the results of the t test on the posttest data show that the treatment given has a positive effect and can improve students’ understanding of concepts.

To find out the increasing of the ability in understanding of concepts the researcher does a calculation of normalized gain score. The result of the calculation score can be seen in the table below.

Table 6. The results of main gain scores.

| Classes   | Average Value | Enhancement | Mean Gain Scores | Category |
|-----------|---------------|-------------|------------------|----------|
|           | Pretest       | Posttest    |                  |          |
| Control   | 36.28         | 73.85       | 37.57            | 0.64     | Medium |
| Experiment| 34.10         | 87.95       | 53.85            | 0.85     | High   |

Pre-test value of control class is 36.28, and post-test value is 73.85. There is an upgrading value about 37.57 with 0.64 of Gain Score (medium category) whereas pre-test value of experiment class is 34.10, and post-test value is 87.95. There is an upgrading value about 53.85 with 0.85 of Gain Score (high category). These results show that the learning process with the experiential learning model by using mind map can increase the students' understanding of concepts with high category.

3.2. Discussion

The data results of the students’ understanding of concepts test that are gotten from the experiment and control class show that the implementation of this learning model affects the students’ understanding of concepts in the fungi materials. In the control class, it is gotten the average value from pretest about 36.28 thus, after implementing 5M learning, it is gotten the average value from post-test about 73.85. It means that there is an increasing value about 37.57. Moreover, In the experiment class, it is gotten the average value from pretest about 34.10 then after implementing the experiential learning model by
using mind map, it is gotten the average value from post-test about 87.95. It means that there is an increasing value about 53.85.

Differences in understanding students’ concepts in the two classes can also be proven based on the t test (independent sample t-test). The results of the posttest with the t test showed sig. (2-tailed) of 0.000 (<0.05), so that the value is significantly different and it can be concluded that there are differences in posttest scores in the control class and the experimental class, meaning that the use of experiential learning models with mind maps has a better influence on the understanding of participants' concepts students on fungi material.

The learning problems of the students to understand the fungi materials concern on the feature, reproduction, and the classification of fungi based on the division. These problems can be solved well through the experiential learning model by using mind map. The using of the experiential learning model by using mind map is enable the students independently to explain the understanding of concepts about fungi’s materials by using mind map in groups as an interesting and creative review. Mind mapping is a technique to visualize the relation between various concepts and the colors and pictures [4, 12].

In regard with the experiential learning in the classroom, the teacher will give the explanation of the stages of the experiential learning model then the students learn these stages and implement them. The experiential learning model consists of four stages that are Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualization (AC), and Active Experimentation (AE) [5].

In the concrete experience stage, the students are given the real experiences. These given experiences are connected with the concepts and real problem that are related to the fungi materials and other natural science activities in which they can push the students doing natural science activities or involving themselves to the phenomena learned. Thus, the students observe the phenomena done and reflect the data gotten in the form mind map at the Reflective observation stage. In abstract conceptualization stage, the students start to learn how to make abstract or concept of the event happened. The active experimentation stage serves the opportunity to the students to use the concepts that are already constructed to be observed and analyzed further regarding with other characteristics from the observed phenomena.

After the four stages are already done by the students in learning process, they will be involved directly in the learning process and they construct by themselves their own experiences that are gotten to be new knowledge. By doing this way, there is a process of learning inside the students since they are faced to the real activity in solving problem so that it can shape a certain knowledge. The students will get different experiences from what they learnt. The experiential learning model is developed based on Kolb's theory which emphasized the central role of experience in the learning process [6]. According to Kolb & Kolb [7] experiential learning models in line with constructivism learning theory, can make it easier for students to build meaning from their learning experiences. Kolb & Kolb [8] also states that the experiential learning model is a process of building knowledge that involves creativity among four learning models that are responsive to contextual demands.

The using of experiential learning model by using mind map produces the better understanding of concepts. Mind map can produce a note that gives much information in one page and shows the relation from various concepts that are easily memorized. Making mind map helps the students in understanding the fungi materials that are made by various colors, pictures, and curved lines that relate the branches. In this regard learning using mind map helps students to learn a subject matter in a focused manner. Students are given the opportunity to explore and express their imagination and abilities as stated in the form of mind map [9]. The research results from [10]also stated that the learning strategy of mind map can increase the understanding of concept. Besides, the study by [11,14] stated that the experiential learning model can increase the students’ understanding of concept.

In control class, the learning activities are done by implementing 5M learning model such as Mengamati (observing), Menanya (asking), Mencoba (Trying), Mengasosiasikan (Associating), and Mengomunikasikan (communicating). This learning model is dominated by explaining by using power-point as a media and students’ worksheet that are already made by the teacher in the school.
This case make the students as the receiver of information called passive receiver and they only get the information from the teacher. The learning process prefers to be less in giving the opportunity for the students to find out their own concepts learnt. Moreover, the practical work is done only limited in observing fungi in macroscopic size.

4. Conclusion
The learning process by implementing the experiential learning model using mind map can increase the understanding of concepts of fungi’s materials for the tenth-grade students at Senior High School.

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