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Improving student biology learning outcomes through guided inquiry assisted mind mapping

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Abstract

Guided inquiry can make students active in solving problems with the skills and knowledge that students have. This supports the improvement of student learning outcomes and fosters student creativity in understanding learning materials through mind mapping. The purpose of this study was to examine the guided inquiry model with the aid of mind mapping on the biology learning outcomes of class X high school students. This type of research uses a quasi-experimental with Pre-test and Post-test Non Equivalent Control Group Design. The population of the study was class X students as many as 3 classes with a total of 108 people. The sample consisted of 2 classes, namely X IPA1 as the control class and X IPA2 as the experimental class. Samples were taken using purposive sampling technique. The data was taken using a test instrument in the form of multiple choice questions 20 questions. Data analysis was carried out using the t test, the results obtained were $t_{count} > t_{table}$ so H_0 was rejected and H_a was accepted. The conclusion of this study is that there is an effect of guided inquiry model with mind mapping on biology learning outcomes. This guided inquiry learning model with mind mapping can help students participate in the learning process and observation and can make students understand the subject matter better.

Abstrak

Inkuiri terbimbing dapat membuat siswa aktif dalam memecahkan masalah dengan keterampilan dan pengetahuan yang dimiliki siswa. Hal ini mendukung peningkatan hasil belajar siswa dan menumbuhkan kreatifitas siswa dalam memahami materi pembelajaran melalui *mind mapping.* Tujuan penelitian ini untuk melihat model inkuiri terbimbing berbantuan *mind mapping* terhadap hasil belajar biologi siswa kelas X SMA. Jenis penelitian menggunakan *quasy experimental* dengan *Pre-test and Post-test Non Equivalent Control Group Design*. Populasi dari penelitian adalah siswa kelas X sebanyak 3 kelas dengan jumlah 108 orang. Sampel terdiri atas 2 kelas yakni X IPA1 sebagai kelas kontrol dan X IPA2 sebagai kelas eksperimen. Sampel diambil menggunakan teknik *purposive sampling*. Data diambil menggunakan instrumen tes berupa soal pilihan berganda berjumlah 20 soal. Analisis data dilakukan dengan menggunakan uji *t*, diperoleh hasil $t_{hitung} > t_{tabel}$ jadi H_0 ditolak dan H_a diterima. Kesimpulan dari penelitian ini adalah ada pengaruh model inkuiri terbimbing dengan *mind mapping* terhadap hasil belajar biologi. Model pembelajaran *guided inquiry* dengan *mind mapping* ini bisa membantu siswa berpartisipasi dalam proses pembelajaran maupun pengamatan serta dapat membuat siswa lebih memahami materi pelajaran.

A. Introduction

Education is a conscious effort made to a person (student) with an active process of guidance, teaching, and training to develop his potential for his role in the future. Education can change a person's personality for the better (Lubis, 2018). The education system is a process that helps a person learn more about certain topics and concepts. Official information causes individuals to have examples of thoughts and behaviour according to the education they get (Amanudin, 2019). The factor that increases the development of a country is education. A quality learning process is needed to improve education. According to the Education Development Index (EDI) data, currently, Indonesia has a fairly low quality of education, so improvements in learning activities are needed (Hamsir, 2017).

Teaching and learning activities at this time are still experiencing many problems. One of the problems students face is the lack of participation in-class learning. Problems that usually occur in the learning process in class include students who still do not understand the material and because the material is difficult to understand only with the teacher's explanation. In observations made at school, some students tend to be bored in class because the teacher only gives students notes without explanation. With these obstacles, the learning process does not run perfectly (Nazliah et al., 2019). In the scope of education, educators explain the material so that students understand the content of the material to achieve learning outcomes (cognitive aspects), attitudes (affective aspects), and skills (psychomotor aspects). However, the field results are still many learning processes focusing only on teachers (Lubis, 2018).

Learning outcomes are an assessment that students get after carrying out the learning process in class (Purwanto, 2013). The assessment is seen from the pattern of actions, such as attitudes, appreciation, and skills. The education system in national education refers to learning outcomes from Bloom's taxonomy which consists of learning outcomes, behavior change, and skills (Widodo & Widayanti, 2013).

Every academic unit wants to achieve the best learning process outcomes for its students. However, learning biology at SMAN 1 Merbau is still quite low. Therefore, based on interviews & observations of biology teachers at the school. It is known that the average value of the class X biology exam has not reached the KKM value, which is only 62.6, while the KKM value set for the high school level is 75.

Regarding the curriculum recommended by the government, namely K13 (2013 curriculum), the learning process is student-centered. But the facts obtained after direct observation of teaching and learning activities were teacher-centered, who explained the learning material, and practicum was rarely carried out. As for the biological material itself, as is known, many make observations outside the classroom.

According to Hamsir (2017), most students do not participate in class often in learning activities. So that causes not achieve active learning in class. These problems need to be changed to learning activities so that the learning outcomes of class X science students at SMAN 1 Merbau will increase. The use of models in the learning process that is not appropriate can make students unmotivated, bored, and inactive, this causes students not to know the material presented by the teacher, and it will have an impact on learning outcomes (Nazilah et al., 2019). Under the existing facts, it can be seen that the student's biology learning outcomes are still low, and the inactivity in the classroom requires problem-solving.

Guided inquiry is a learning model in which learning activities are carried out by observing and explaining the relationship with events. Guided inquiry learning can make students active in observing problems that will be solved using the skills and knowledge possessed by students (Rumahorbo & Setia, 2016). This guided inquiry learning model encourages students to actively learn, provides students with observational learning as students understand it, provides a series of thoughts about learning activities through guidance, student growth is gradual, and there are other opportunities for learning activities; students learn through social relationships with others (Azizmalayeri et al., 2012).

This guided inquiry model focuses on student collaboration in analyzing and resolving contradictions, generalizing, and concluding (Sukma et al., 2016). Learning activities can be combined with making mind mapping to support the improvement of student learning outcomes. Mind mapping is a method used to create groups of material that already understand the formation of simple and unique images and writing. Mind mapping is a technique used to make it easier for students to assemble some important things in material and help students improve their understanding of the subject matter (Aprinawati, 2018). Mind mapping is said to be able to make a good route map for memory and can compose material understanding so that the brain naturally

thinks in such a way (Nazilah et al., 2019). Ecosystem material is material that covers a wide range of biology subjects. This ecosystem material often makes it difficult for students to understand the concept of the material, so students experience misconceptions about it. Jahidin & La Rabani (2018) stated that the misconception about ecosystem material is still quite high because understanding ecosystem material requires the involvement of the students' reasoning and creativity. Misconceptions are due to the weakness of reference sources in learning. The lecture learning method makes students feel bored and passive during learning activities so that students do not understand the material explained, and there is no curiosity (Nurfadilah et al., 2021).

Many studies discuss the influence of guided inquiry models on learning outcomes, such as Hilman (2014) research on the effect of guided inquiry learning assisted by mind mapping on science process skills and science learning outcomes, where guided inquiry learning using mind mapping has a positive impact on processability. Scientific and student learning outcomes. Patterns of thinking and directed questions contribute to students' scientific process skills. Mind mapping helps students organize, understand, relate, and provide visual explanations of material that may be easier to understand than verbal explanations. Susanti et al. (2017) regarding the use of guided inquiry to increase activities and learning outcomes of chemistry, proving that this learning model can make students' chemistry learning activities and results increase. Reinforced by learning outcomes from the initial conditions to the final conditions have increased. Lumentut et al. (2017), with research on the effect of guided inquiry models assisted by mind mapping on learning outcomes inspired by redox materials, higher scores were achieved in learning outcomes, so this became a special feature of guided inquiry. So that students can form and develop self-concepts, which allows students to understand basic concepts and ideas better. However, there are still few guided inquiry research assisted by mind mapping on biology subjects, especially ecosystem materials: therefore, research is necessary.

Based on the information above, the guided inquiry learning model assisted by mind mapping can help students participate in the learning and observation process and make it easier for them to understand the subject matter. Furthermore, guided inquiry assisted by mind mapping can make it easier for teachers to convey the material and make students more active when learning in class using mind mapping. Therefore, this study aimed to analyze the guided inquiry learning model's effect with mind mapping on the biology learning outcomes of students at SMA Negeri 1 Merbau.

B. Material and Method

The research took place at SMAN 1 Merbau and was carried out in March 2022. This study used a quasi-experimental Pre-test Post-test Non-Equivalent Control Group Design from Sugiyono. The population of all class X IPA SMAN 1 Merbau is three classes with a total of 108 people. The sample of this study consisted of 2 classes, namely X IPA 1, totaling 36 students for the control class using the conventional learning model, and X IPA 2, totaling 36 students for the experimental class using the guided inquiry model with the help of mind mapping. The research was carried out in waves because schools still implement a limited face-to-face learning process due to Covid-19. The learning process in waves divides students into two parts, namely, wave A (18 people) and wave B (18 people) on different days.

The purposive sampling technique took samples. This is considered the same number of students and the equivalent student learning outcomes in the last semester. Data retrieval by utilizing multiple-choice tests with up to 20 questions consisting of 5 options. The test consists of a pre-test and a post-test, for the test instrument used is a validation test. The validity test is carried out with one material expert validator and one construct expert and validation test on students who have studied ecosystem material in class XI science. Then the pre-test and post-test data are met. Finally, a statistical analysis of the normality, homogeneity test, and paired sample t-test with the SPSS version 23.0 plan for windows is carried out.

C. Results and Discussion

The results show the research on students' biology learning on ecosystem materials through a guided inquiry model assisted by mind mapping in the experimental class and through conventional models in the control class. The data can be seen in Figure 1.

Figure 1 shows that the experimental class has an average pre-test of 57.78 and a post-test value of 80.83. For the control class, the average pre-test score is 56.94, and the post-test average is 57.36. While the experimental & control class is, not only the average value is different, but the median and mode values also have differences. The median value for the experimental pre-test class is 57.5, and the mode is 55. In the post-test experimental class, the median value is 80, and the mode is 85. Besides, in the control class, the median

pre-test is 55, and the mode is 55. In the post-test, the median value is 57.5, and the mode is 60. Based on the experimental & control class learning results, the experimental class has an increase in the learning process, and the value of the learning outcomes is quite good compared to the control class.

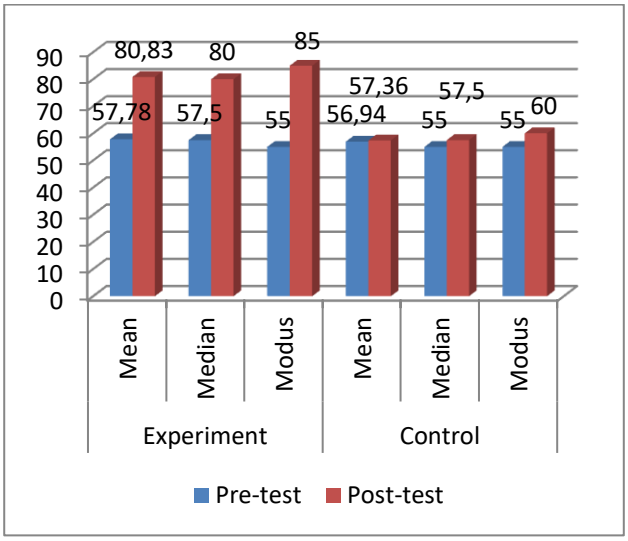

Figure 1 Graph of learning outcomes in experimental and control classes

For further testing with the normality test, homogeneity before the hypothesis stage. First, the normality test is used to see if the data contained in the two classes is normal or not. For the results of the normality test in the experimental and control classes, the number is greater than 0.05. This means that the pre-test and post-test scores for the experimental and control classes are normal. Then the homogeneity test was carried out with the overall pre-test and post-test scores in both classes having a significance result greater than 0.05. Therefore, the pre-test and post-test scores in the experimental and control classes were homogeneous.

Because the normality & homogeneity values have been met, the paired sample t-test is tested for hypotheses. The results were obtained (t_{count} 40.227) and (t_{table} 2.030). So the result ($t_{count} > t_{table}$) so that H0 is rejected. Ha is recognized. This means that the guided inquiry model is influenced by mind mapping on student biology learning outcomes on ecosystem material at SMA Negeri 1 Merbau.

So the research data analysis at SMA Negeri 1 Merbau shows that using the guided inquiry model assisted by mind mapping can further develop learning outcomes. The increase in learning outcomes is known from the mean pre-test and post-test results in the experimental & control class. This guided inquiry learning model makes it easy for students to understand the material, making students active in the class compared to the control class using the past learning model. So that with the application of guided inquiry, it can reduce some of the obstacles in learning activities in the classroom that make the value of student learning outcomes not good. The purpose of this guided inquiry learning model is to invite students to participate more physically and mentally and be responsible in the learning process (Dewi, 2018). In guided inquiry learning, the teacher systematically analyzes and solves problems through the achievement of students' critical thinking, so this learning model is student-centered rather than teacher-centered (Lati et al., 2012). Therefore, student learning outcomes improve in terms of their activities and understanding of the material they already understand.

Applying the guided inquiry learning model has six steps (Riyadi, 2015). Based on the steps, it can be seen that the guided inquiry learning model has advantages for improving learning outcomes and science process skills. Susanti et al. (2017) stated that the guided inquiry learning model keeps students engaged in the scientific learning process. The guided inquiry learning model prepares students to carry out learning activities with independent experiments to understand a problem and find the answer.

The implementation of guided inquiry in learning is accompanied by mind mapping. With the help of mind mapping, it will affect the cognitive aspects of students' biology (Nursyamsi et al., 2021). The learning process that applies mind mapping assistance can help students experience an increase in their willingness to learn, enthusiasm for learning, and imaginative and cognitive outcomes of students. This statement is proven by the mean value of students in the experimental class at the pre-test is 57.78, and for the post-test is 80.83 with the mean result. It can be seen that the use of the guided inquiry model assisted by mind mapping can improve student learning outcomes. Mind mapping is applied at the end of the learning process to improve memory and understanding of the material that students have studied. The existence of mind mapping assistance makes students more creative and innovative in solving problems, improves students' understanding of the material, and makes it easier for students to master concepts (Yusuf & Amin, 2016; Pratidina et al., 2012). Applying mind mapping to activities helps increase students' creativity using the brain's basic functions consisting of several branches, such as trees. Increased student creativity can be seen in the

activeness and creativity of students in asking questions and expressing opinions so that the atmosphere during the learning process becomes more lively. This mind mapping helps students digest what they have learned more easily and get ideas for understanding concepts and expressing students imaginations (Latifah et al., 2020; Afdholiyah et al., 2021; Yasin, 2017).

The characteristics of the guided inquiry model can form and improve students' self-concept so that it has a higher impact on learning outcomes and allows students to understand the conceptual basis and better ideas about the subject matter. In addition, with the help of mind mapping, students can more easily and quickly remember facts, numbers, and formulas (Lumentut et al., 2017).

This research is in line with previous research (Hilman, 2014; Nursyamsi et al., 2021), which states that guided inquiry learning assisted by mind mapping provides positive scientific knowledge and improving learning outcomes will positively influence their science education. Guided inquiry thinking patterns and work patterns help students improve students' scientific process skills, while mind mapping makes it easier for students to understand the material. Sunni & Anggun (2020) revealed that students who use the guided inquiry model with the help of mind mapping make students more aware of the material presented. Students can participate actively in the learning process in the classroom compared to students using the past learning model. The benefits of mind mapping facilitate the delivery of material. By starting with problem-solving exercises, students can learn to remember more by thinking more critically and efficiently.

D. Conclusion

Based on the research that has been done, it can be concluded that there is a difference between the learning outcomes of the experimental & control classes so that there is an effect of guided inquiry assisted by mind mapping on the students' learning outcomes of ecosystem material at SMAN 1 Merbau. This is reinforced by the fact that student learning outcomes using guided inquiry learning models assisted by mind mapping are higher than student learning outcomes using conventional learning models.

After the research has been completed, the researcher can submit suggestions to the teacher to be more precise in choosing the learning model applied in the classroom so that students can participate in the learning process and easily understand the material presented by the teacher. In addition, students are expected to be more appreciative of the people in front of the class when delivering material. Students can take advantage of various learning resources properly and appreciate the teacher when carrying out learning activities both in class or when doing practicum outside the classroom.

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