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**THE EFFECT OF MIND MAPPING LEARNING TECHNIQUE ON THE STUDENTS’ INTEREST AND LEARNING OUTCOMES ON EXCRETORY SYSTEM AT GRADE XI SCIENCE OF MAN 1 MEDAN**

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**ABSTRAK**

Penelitian ini bertujuan untuk mengetahui pengaruh teknik pembelajaran mind mapping terhadap minat dan hasil belajar siswa kelas XI MIPA di MAN 1 Medan. Penelitian ini merupakan penelitian kuantitatif dengan menggunakan jenis penelitian quasi eksperimen. Penelitian ini menggunakan dua kelas yaitu, kelas eksperimen yang menggunakan teknik pembelajaran mind mapping dan kelas kontrol menggunakan teknik pembelajaran konvensional. Minat belajar siswa diperoleh melalui lembar angket minat belajar siswa dengan indikator perasaan senang, ketertarikan siswa, perhatian siswa dan keterlibatan siswa. Hasil belajar siswa diperoleh melalui tes objektif pilihan berganda. Tes hasil belajar digunakan untuk menilai kemampuan siswa pada tingkat kognitif C1-C6. Hasil pengujian hipotesis menggunakan uji independen sampel t-test. Hasil penelitian menunjukkan bahwa terdapat pengaruh teknik mind mapping terhadap minat dan hasil belajar siswa dengan nilai signifikansi 0.003 untuk minat belajar siswa dan 0.000 untuk hasil belajar siswa.

**ABSTRACT**

This research aims to determine the effect of mind mapping learning techniques on the interest and learning outcomes of students in class XI MIPA at MAN 1 Medan. This research is a quantitative research using quasi-experimental research type. This study used two classes, namely experimental classes using mind mapping learning techniques and control classes using conventional learning techniques. Student interest in learning was obtained through a questionnaire sheet of student interest in learning with indicators of feelings of pleasure, student interest, student attention, and student involvement. Student learning outcomes were obtained through multiple choice objective tests. The learning outcome test was used to assess students' abilities at the C1-C6 cognitive level. The results of hypothesis testing were obtained using independent samples t-test. The results showed that there was an effect of mind mapping technique on students' interest and learning outcomes with a significance value of 0.003 for students' interest and 0.000 for students' learning outcomes.

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**INTRODUCTION**

The problem that often arises in biology learning activities is the lack of students' ability to remember something that is delivered orally, so students need media such as notes to help with repetition and memory retention. Students' knowledge will be broader when they learn new material and then their memories are strengthened by the presence of notes (Astuti, 2019). Biology lessons, particularly those covering the excretory system, demand a strong memory and a comprehensive understanding due to the numerous processes and mechanisms involved. Biology lesson heavily relies on theories and verbal communication, which can lead to reduced student engagement and suboptimal learning outcomes (Karmita, 2022).

Preliminary observations at MAN 1 Medan showed that the Minimum Completion Criteria (KKM) for biology subjects was 82. Interviews with biology teachers at the school showed that the average score of students was still below the specified KKM. Biology teaching and learning activities in the classroom still tend to rely on lecture, discussion, and assignment methods. However, these techniques may be less interesting for some students, causing boredom and disinterest in learning. The biology teacher also said that students' interest in learning biology is still low. During question and answer activities, only some students were able to communicate effectively with the teacher. Similarly, when given assignments, many students struggled to express their understanding. Students' lack of interest in reading biology subject matter can be caused by ineffective note-taking and learning techniques because students do not know or do not have knowledge of more efficient note-taking techniques. Students' notes are usually full of one-color writings without any pictures or anything that can attract students' interest in reading the notebook and studying the material. In addition, students may not fully understand the content in their notes, leading to a lack of motivation to reread their notes.

Students who have a good interest in learning will find their own way of learning. However, students who have a lack of interest in learning will not find out about ways of learning that can help them in learning. Therefore, it is necessary for the teacher's role as a student motivator in learning and creating effective and interesting learning activities. Effective teaching involves engaging students through fun and interactive learning experiences. Teachers must act as facilitators to find ways to capture students' attention, such as using diverse teaching methods and techniques. To foster self-confidence, interest, innovative attitudes and behaviors in the teaching and learning process, it is essential to establish a connection between educational components, including teachers, students, curriculum, learning media, and resources, materials, methods, models, techniques and evaluation tools. A good learning process requires the collaboration of these components (Kalyani & Rajasekaran, 2018). Therefore, a renewal of the biology curriculum, particularly regarding the excretory system, is necessary.

The mind mapping learning technique can be applied to these conditions. Mind mapping is a note-taking technique that involves using keywords connected by curved lines. These keywords can include words, images, and colors. It is a creative way to take notes (Polat & Aydın, 2020). Mind mapping is the easiest way to input information into the brain and retrieve information from the brain with animations that are liked and easily understood by its creator. The visual and graphic presentation of mind mapping, comprising a variety of information, shapes, and colors, can captivate the attention of learners as they study it. In the end, this approach can enhance learning interest and assist learners in recording, reinforcing, and recalling the information they have learned (Buzan, 2018).

Teachers use mind mapping to present subject matter in the form of concepts, which can enhance student interest and improve learning outcomes. The effective use of mind mapping techniques is particularly beneficial for learning materials that involve numerous concepts or the workings of a system, such as in the material about the excretory system. Because mind mapping consists of keywords, symbols, images, and interconnected curved lines, it can describe and present the material in an organized manner, making it easier to understand (Thahir & Hambali, 2020). This technique was chosen because it is an effective way to record learning material and facilitate student understanding of biology lessons, particularly the excretory system at MAN 1 Medan. Therefore, researchers aim to apply it in delivering material in the classroom to enhance students' interest and improve learning outcomes.

**RESEARCH METHODS**

This research used a type of quasi experimental research with a quantitative approach. Specifically, to determine the impact of a specific intervention on the subject, namely students. The intervention in question was the use of mind mapping learning techniques to enhance students’ interest and learning outcomes in studying the humans excretory system topic. The data was obtained through questionnaire and cognitive test of students’ interest learning outcomes in grades XI MIPA 1 and MIPA 3. This research design involved using the Nonequivalent Pre-test Post-test Control Group Design approach.

**Research Procedure**

The data were collected through questionnaires and learning outcomes test. The research was conducted in the classroom, starting with a pre-test to assess the initial knowledge of students in the experimental and control classes. The mind mapping learning technique was then implemented to facilitate the learning process. After learning activities were carried out, questionnaire and post-test was conducted to evaluate students' interest and learning outcomes in the experimental and control group.

**Data Analysis**

Data analysis for the student learning interest using a Likert scale ranging from 1 to 4, with the criteria being poor, fair, good, and excellent. The percentage is calculated using the following formula.

$$Percentage=\frac{frequency}{Number of sample}×100\%$$

Table 1. the criteria for the interest questionare

|  |  |
| --- | --- |
| **Interval** | **Classification** |
| 81% < Score ≤ 100% | Excellent |
| 63% < Score ≤ 81% | Good |
| 45% < Score ≤ 63% | Fair |
| 27% < Score ≤ 45% | Poor |

The completion of student learning outcomes in the excretory system material can be obtained by comparing the Minimum Completion Criteria (KKM - Kriteria Ketuntasan Minimum) of MAN 1 Medan, which is 82. Students who score below 82 are considered incomplete, while students who score equal to or above 82 are considered complete.

$$Student score=\frac{Score obtained}{maximum score}×100\%$$

Table 2. Student learning outcomes criteria

|  |  |
| --- | --- |
| **Interval** | **Classification** |
| 0% ≤ K ≥ 82% | Incomplete |
| 82% ≤ K ≥ 100% | Complete |

The prerequisite test that used were normality test and homogeneity test. Normality testing in this study is used to determine whether the data is normally distributed or not. The data normality test used is Kolmogorov-Smirnov using SPSS version 29 for windows. With the following decision-making criteria; if the test results obtained a significance value > 0.05, then the data is declared normal. However, if the test results obtained a significance value ≤ 0.05, then the data is declared not normally distributed.

The purpose of data homogeneity testing is to determine the similarity of variations in two or more data distributions. In this study, we used a homogeneity test with SPSS version 29 for windows. The decision-making criteria are as follows: if the significance value obtained from the data homogeneity test is > 0.05, the data is considered homogeneous. If the significance value is < 0.05, the data is considered non-homogeneous.

After the prerequisite test, hypothesis testing was conducted. This test was conducted using the independent sample t-test using the SPSS version 29 for windows. The independent sample t-test test was used to determine the difference in interest and learning outcomes of experimental class students using mind mapping learning techniques and control classes using conventional learning techniques.

The decision-making criteria for hypothesis testing in this independent samples t-test are as follows: if the significance value is > 0.05, then H0 is accepted and Ha is rejected, or conversely, if the significance value is <0.05, then H0 is rejected and Ha is accepted.

**RESULT AND DISCUSSION**

**Description of Student Learning Interest Data**

Data on students’ learning interest after the learning process in the experimental class using the mind mapping technique and in the control class using conventional note-taking techniques are presented in table 3 below.

Table 3. Student interest data after learning

|  |
| --- |
| **Descriptive Statistics** |
|  | N | Minimum | Maximum | Mean | Std. Deviation |
| Eksperimental Class | 36 | 58.33 | 97.22 | 75.9994 | 9.38938 |
| Control Class | 38 | 45.37 | 89.81 | 69.0271 | 11.32696 |
| Valid N (listwise) | 36 |  |  |  |  |

Based on the table 3 above, the mean score of students' learning interest in the experimental class is 75.99 (good category) with a standard deviation of 9.39. The highest score is 97.22 (excellent category) and the lowest score is 58.33 (fair category). The mean score of students' interest in learning in the control class is 69.03 (good category) with a standard deviation of 11.33. The highest score was 89.81 (excellent category) and the lowest score was 45.37 (fair category).

Table 4. Frequency Distribution Data and Percentage of Student Learning Interest

|  |  |  |  |
| --- | --- | --- | --- |
| **Interval Value** | **Category** | **Eksperimental Class** | **Control Class** |
| F | % | F | % |
| 81% < Score ≤ 100% | Excellent | 9 | 25 | 5 | 13.15 |
| 63% < Score ≤ 81% | Good | 24 | 66.67 | 23 | 60.52 |
| 45% < Score ≤ 63% | Fair | 3 | 8.33 | 10 | 26.33 |
| 27% < Score ≤ 45% | Poor | 0 | 0 | 0 | 0 |
| Total | 36 | 100 | 38 | 100 |

Based on the table 4 above, the results of frequency distribution and percentage of students' learning interest in the experimental class there were 9 students (25%) scored in the excellent category, 24 students (66.67%) scored in the good category, 3 students (8.33%) scored in the fair category, and no students scored in the poor category. In the control class, 5 students (13.15%) scored in the excellent category, 23 students (60.52%) scored in the good category, 10 students (26.33%) scored in the fair category, and no students scored in the poor category.

**Description of Students' Learning Interest Data Based on Learning Interest Indicators**

Table 5. Student Learning Interest Data Based on Learning Interest Indicators

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Sub Indicator** | **Eksperimental Class** | **Control Class** |
| **Percentage**  | **Category**  | **Percentage** | **Category** |
| 1 | Feelings of Pleasure | 83,50% | Excellent  | 76,31% | Good |
| 2 | Student Interest | 72,21% | Good  | 66,91% | Good |
| 3 | Student Attention | 79,85% | Good | 71,70% | Good |
| 4 | Student Involvement | 71,86% | Good | 64,55% | Good |
| **Total**  | 307,42 | 279,47 |
| **Mean**  | 76,85 | 69,86 |
| **Category** | Good | Good |

Based on the data table 5, it can be seen that students’ learning interest based on indicators of learning interest in the experimental class after learning activities on indicators of feelings of pleasure obtained a percentage score of 83.50% (excellent category), on student interest obtained 72.21% (good category), on student attention obtained 79.85% (good category), and on student involvement obtained 71.86% (good category). While the percentage score in the control class based on indicators of feelings of pleasure was obtained 76.31% (good category), on student interest obtained 66.91% (good category), on student attention obtained 71.70% (good category) and on student involvement obtained 64.55% (good category). The mean score of learning interest obtained by the experimental class was 76.85% (good category), while the mean score of learning interest of the control class was 69.86% (good category). The average of students' learning interest score based on learning interest indicators was higher in the experimental class than in the control class.

The acquisition of the highest value in the indicator of feelings of pleasure from the experimental and control classes indicate that biology is the most preferred subject. The feeling of pleasure is the feeling of liking a lesson without compulsion. There is a difference in the percentage value of students' interest in learning in each indicator of interest in learning after learning activities using mind mapping techniques in experimental classes and conventional techniques in control classes. The difference in the percentage value of students' learning interest may be due to the level of students' own interest in learning about biology and also due to the encouragement given through the use of models, methods or techniques during learning activities. This indicates that the use of learning techniques can influence students' learning interest (Lubis, 2018).

**Normality Test Result of Student Learning Interest**

Table 6. Normality Test of Student Learning Interest

|  |
| --- |
| **Tests of Normality** |
|  | Class | Kolmogorov-Smirnova |
| Statistic | df | Sig. |
| Students' Learning Interest | Eksperimental Class | .081 | 36 | .200\* |
| Control Class | .111 | 38 | .200\* |
| a. Lilliefors Significance Correction |

Based on the table above, indicate that the data on students' learning interest in the experimental class and the control class obtained a significance value > 0.05. Therefore, it can be concluded that the data are normally distributed.

**Homogeneity Test Result of Student Learning Interest**

Table 7. Homogeneity Test of Student Learning Interest

|  |
| --- |
| Test of Homogeneity of Variance |
|  | Levene Statistic | df1 | df2 | Sig. |
| Students' Learning Interest | Based on Mean | 1.651 | 1 | 72 | .203 |
| Based on Median | 1.342 | 1 | 72 | .251 |
| Based on Median and with adjusted df | 1.342 | 1 | 70.355 | .251 |
| Based on trimmed mean | 1.654 | 1 | 72 | .203 |

The results of the homogeneity test of student learning outcomes, as presented in the table above, indicate that the data on students’ learning interest in the experimental and control classes obtained a significance value > 0.05. Therefore, it can be concluded that the data have a homogeneous variance.

**Hypothesis Test of Students’ Learning Interest Result**

Table 8. Hypothesis Test Results of Student Learning Interest

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Class** | **N** | **Mean** | **Sig** | **A** |
| Eksperimental | 36 | 75,9994 | 0.003 | 0.05 |
| Control | 38 | 69,0271 |

The results of hypothesis testing in table 8, show that students' learning interest after learning activities in experimental and control classes has a significance value of 0.003 < 0.05. Therefore, it can be concluded that H0 is rejected and Ha is accepted. The average value of students' learning interest in the experimental class is significantly different from the control class, indicating that there is an effect of mind mapping learning techniques on students' learning interest.

The results of the analysis show that learning by using mind mapping techniques can increase students' learning interest. This is also supported by the results of Harfika's research (2020) that there is a significant effect of mind mapping techniques on students' interest in learning. In the learning process, students are enthusiastic about learning because students are free to be creative and imaginative in expressing their own ideas based on concepts, theories and their relationship to everyday life related to the excretory system material that is made mind mapping. This difference in students’ learning interest can be attributed to a number of factors that can affect student interest in learning itself. Some factors that affect students' learning interest are internal factors that originate within the students themselves. These include: a) attention in learning, which refers to the concentration of students on a learning object; b) curiosity, which is a strong feeling or attitude to know more about something; and c) needs, which is a situation that encourages students to carry out certain activities in order to achieve a goal. And external factors may originate from the family, educational institution, or broader social context (Rizki, 2021).

**Description of Student Learning Outcomes Data**

The data on student learning outcomes were obtained through pre-tests and post-tests conducted in experimental classes using mind mapping techniques and control classes using conventional note-taking techniques on human excretory system material.

Table 9. Student learning outcomes data

|  |
| --- |
| **Descriptive Statistics** |
|  | N | Min | Max | Mean | Std. Dev |
| Pretest Eksperimental | 36 | 36 | 80 | 65.89 | 11.006 |
| Posttest Eksperimental | 36 | 68 | 92 | 81.33 | 6.625 |
| Pretest Control | 38 | 44 | 80 | 66.21 | 9.740 |
| Posttest Control | 38 | 60 | 88 | 74.95 | 7.063 |
| Valid N (listwise) | 36 |  |  |  |  |

Table 9 shows that the mean score of the students' pre-test in the experimental class is 65,89 with a standard deviation of 11,00. The highest score is 80 and the lowest score 36. The mean score of the pretest in the control class is 66.21 with a standard deviation of 9.74. The highest score is 80 and the lowest score is 44. The average value in the two sample classes is not different after the t test, which indicates that the value of student learning outcomes in the two classes is the same. After learning activities, the mean score of student posttests in the experimental class is 81.33 with a standard deviation of 6.62. The highest score is 92 and the lowest score is 68. While the mean of student posttest score in the control class was 74.95 with a standard deviation of 7.06. The highest score was 88 and the lowest score was 60.

**Normality Test Result of Student Learning Outcomes**

Table 10. Normality Test Result of Student learning outcomes

|  |
| --- |
| **Tests of Normality** |
|  | Class | Kolmogorov-Smirnova |
| Statistic | df | Sig. |
| Student Learning Outcomes | Pretest Eksperimental | .132 | 36 | .118 |
| Posttest Eksperimental | .156 | 36 | .026 |
| Pretest Control | .158 | 38 | .017 |
| Posttest Control | .164 | 38 | .011 |
| a. Lilliefors Significance Correction |

The results of the normality test on student learning outcomes, as presented in the table above, indicate that the data on student learning outcomes in the experimental and control classes obtained a significance value > 0.05. Therefore, it can be concluded that the data is normally distributed.

**Homogeneity Test Result of Student Learning Outcomes**

Table 11. Homogeneity Test Result of Student learning outcomes (Pre-Test)

|  |
| --- |
| **Test of Homogeneity of Variance** |
|  | Levene Statistic | df1 | df2 | Sig. |
| Student Learning Outcomes | Based on Mean | .311 | 1 | 72 | .579 |
| Based on Median | .218 | 1 | 72 | .642 |
| Based on Median and with adjusted df | .218 | 1 | 69.082 | .642 |
| Based on trimmed mean | .268 | 1 | 72 | .606 |

Based on the above, indicate that the data on student learning outcomes in the form of pre-tests in experimental and control classes obtained a significance value > 0.05. Therefore, it can be concluded that the data have a homogeneous variance.information about learning concepts was also considered less useful.

Table 12. Homogeneity Test Result of Student learning outcomes (Post-Test)

|  |
| --- |
| **Test of Homogeneity of Variance** |
|  | Levene Statistic | df1 | df2 | Sig. |
| Student Learning Outcomes | Based on Mean | .173 | 1 | 72 | .679 |
| Based on Median | .020 | 1 | 72 | .888 |
| Based on Median and with adjusted df | .020 | 1 | 69.943 | .888 |
| Based on trimmed mean | .129 | 1 | 72 | .721 |

Based on table above, indicate that the data on student learning outcomes in the form of post-tests in experimental and control classes obtained a significance value > 0.05. Therefore, it can be concluded that the data have a homogeneous variance.

**Hypothesis Test Result of Student Learning Outcomes**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Class | N | Mean | Sig | A |
| Eksperimental | 36 | 81.33 | 0.000 | 0.05 |
| Control | 38 | 74.95 |

The results of the hypothesis test indicate that the post-test scores in the experimental and control classes have a significance value of 0.000 < 0.05. Therefore, it can be concluded that the H0 is rejected and the Ha is accepted. This implies that the average post-test score of students in the experimental class is significantly different from that of the control class after learning activities. This demonstrates that the mind mapping learning technique has an effect on student learning outcomes.

The average value of the post-test, as previously described, is utilized as the basis for the independent sample t-test hypothesis test, which aims to identify the effect of the mind mapping technique on student learning outcomes. The resulting significance value is found to be 0.000 < 0.05. It can be concluded that the H0 is rejected and the Ha is accepted. This indicates that the average value of the post-test of experimental class students is significantly different from the average value of the post-test of control class students after learning activities. Based on the results of the t-test, it can be concluded that there is an effect of the mind mapping technique on student learning outcomes. This is in line with the findings of Nazliah & Harahap (2019), which indicate that mind mapping has a positive effect on student learning outcomes. Mind mapping is a creative and engaging note-taking technique that involves the use of colors, images, and words. It is an effective, efficient, and useful learning method that encourages students to map their knowledge and understanding, which can enhance their learning outcomes. Similarly, Bawaneh (2019) stated that the application of mind mapping techniques significantly improved students' immediate achievement in science. This technique can enhance concept mastery, student learning activities, and teacher activities during the learning process.

Students in a class or school have different characteristics, which can influence the acquisition of learning outcomes. Student learning outcomes can be influenced by several factors, including internal factors, external factors, or learning approach factors. Internal factors can be physiological factors or the physical condition of students, which can affect the course of the learning process. Student intelligence factors, such as the high level of intelligence of a student, can make it easier to understand lessons and solve problems encountered in the learning process, thereby encouraging interest in learning. Another internal factor is student attitude, which can be influenced by student activeness and enthusiasm in participating in the learning process. External factors can originate from family or society, as these are the closest people to students. The level of attention and support provided by family members can positively influence students' motivation to engage in learning activities. Similarly, a supportive and positive community environment can also encourage students' learning efforts. While the learning approach factor can be influenced by the application of various learning strategies, methods, or techniques employed by educators to engage students and foster active learning (Farita, 2019).

The use of mind mapping learning techniques can enhance student engagement in the identification and comprehension of the subject matter, thereby facilitating the absorption of the student's understanding. Furthermore, it can positively impact the student's learning outcomes. Mind mapping can assist students in organizing and sorting their ideas in a visual and structured manner, which makes it easier for them to remember the relationships between one concept and another (Suhada et al., 2020). Student learning outcomes can be influenced by students' learning habits and styles. Mind mapping is a note-taking technique that develops a visual learning style. This is due to the use of various colors, symbols, shapes, and interesting images, which facilitate the absorption of information by the brain. When viewed from its usefulness, the mind mapping technique is highly suitable for students with a visual learning style, as it enables them to achieve optimal learning outcomes. The mind mapping technique has been demonstrated to enhance the creativity of students in designing and collaborating on mind maps, thereby facilitating deeper understanding of the material and improved retention. Mind mapping is based on the concept of images, shape, and symbols arranged using the students' own words, which has been shown to enhance students’ learning outcomes (Lu & Bano, 2023).

**CONCLUSION**

Based on the results and discussion of the research conducted, the following conclusions can be made:

1. There is a significant effect of mind mapping learning technique on the learning interest of students in class XI MIPA MAN 1 Medan on the material of human excretory system with a significance value of 0.003.
2. There is a significant effect of mind mapping learning technique on the learning outcomes of students in class XI MIPA MAN 1 Medan on the material of human excretory system with a significance value of 0.000.

**REFERENCES**

Astuti, T. P. (2019). Model problem based learning dengan mind mapping dalam pembelajaran IPA abad 21. *Proceeding of Biology Education*, *3*(1), 64-73.

Bawaneh, A. K. (2019). The effectiveness of using mind mapping on tenth grade students' immediate achievement and retention of electric energy concepts. *Journal of Turkish Science Education*, *16*(1), 123-138.

Buzan, T. (2018). *Mind map mastery: The complete guide to learning and using the most powerful thinking tool in the universe*.

Farita, Z. (2019). Analisis Faktor-faktor Yang Mempengaruhi Minat Belajar Siswa Pada Mata Pelajaran Biologi Kelas Xi Ipa Sma Negeri Se-kecamatan Tenayan Raya Pekanbaru Tahun Ajaran 2018/2019 (Doctoral dissertation, Universitas Islam Riau).

Harfika, H., Thahir, R., & Hambali, H. (2020). Pengaruh Metode Mind Mapping terhadap Minat Belajar Biologi Konsep Monera Siswa Kelas X SMA. Binomial, 3 (1), 61–72.

Kalyani, D., & Rajasekaran, K. (2018). Innovative teaching and learning. *Journal of applied and advanced research*, *3*(1), 23-25.

Karmita, N. (2022). *Analisis Kesulitan Belajar Materi Sistem Ekskresi Pada Kelas Xi MIPA Di MAN 1 Konawe Selatan* (Doctoral dissertation, IAIN Kendari).

Lubis, F. A. (2018). Pengaruh penerapan strategi pembelajaran inkuiri divariasikan dengan media mind mapping terhadap minat belajar siswa. *Jurnal Biolokus: Jurnal Penelitian Pendidikan Biologi dan Biologi*, *1*(2), 93-100.

Nazliah, R., Harahap, R. D., & Hasibuan, E. R. (2019). Pengaruh model pembelajaran mind mapping terhadap hasil belajar siswa pada materi respirasi di kelas XI SMA Negeri 2 Bilah Hulu. *Jurnal Biolokus: Jurnal Penelitian Pendidikan Biologi dan Biologi*, *2*(2), 180-185.

Polat, Ö., & Aydın, E. (2020). The effect of mind mapping on young children’s critical thinking skills. *Thinking Skills and Creativity*, *38*, 100743.

Rizki, M. (2021). Faktor yang mempengaruhi minat belajar siswa.

Suhada, S., Bahu, K., & Amali, L. N. (2020). Pengaruh metode pembelajaran mind map terhadap hasil belajar siswa. *Jambura Journal of Informatics*, *2*(2), 86-94.

Thahir, R., & Hambali, H. (2020). Pengaruh metode mind mapping terhadap minat belajar biologi konsep monera siswa kelas X SMA. *Binomial*, *3*(1), 61-72.

Lu, J. N., & Bano, V. O. (2023). Pengaruh Metode Pembelajaran Mind Mapping Terhadap Hasil Belajar Siswa Pada Materi Sistem Pernapasan Manusia. *Jurnal Biologi dan Pembelajarannya (JB&P)*, *10*(1), 58-65.