



Using Digital Mind Mapping with Microsoft 365 to Improve Student's Creative Thinking on Biology

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Received: June 8, 2023

Revised: August 22, 2023

Accepted: September 25, 2023

Published: September 30, 2023

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DOI: [10.29303/jppipa.v9i9.4170](https://doi.org/10.29303/jppipa.v9i9.4170)

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Abstract: Creative thinking skills are one of the 21st-century life skills. The development of students' creative thinking skills is important as a learning goal. However, learning in schools still tends to prioritize short-term learning outcomes on product dimensions only. The mind mapping method in blended learning activities with the help of Microsoft 365 provides space for students to develop their creativity. This study aims to develop students' creative thinking skills through the Microsoft 365-based mind mapping method. A total of 68 students from public high schools in Jakarta were sampled in this experimental study. The results showed that there was an increase in the indicators of students' creative thinking in the experimental class on indicators of originality of 70.3%, flexibility of 61.3%, fluency of 30%, and better than the control class. Microsoft 365-based mind mapping learning can be used as an alternative in creating a learning atmosphere that develops creative thinking skills because students have the authority to arrange concepts to be conveyed by choosing words that represent concepts, through colors and appropriate forms of symbols. with student creativity. Microsoft 365 has features that can facilitate interaction in class, as well as reach individual student needs through the personalized section in the one-note feature. Other features, such as Microsoft Sway, Microsoft Forms, and Microsoft PowerPoint 365 provide full support for classroom learning interactions with the mind mapping method.

Keywords: Biology; Blended learning; Creative thinking; Microsoft 365; Mind mapping.

Introduction

Creative thinking in learning can prepare students to fulfill their intellectual needs and develop as potential individuals in accordance with 21st-century life skills (Reaves, 2019; Kivunja, 2014; Choi et al., 2011). In educational practice, the development of students' creative thinking skills is not used as a learning goal. Learning in schools tends to prioritize short-term learning outcomes and is only seen in one dimension, namely the product dimension. While the formation of abilities that require a longer period of time and require cross-subject activities such as thinking skills and the ability to solve problems as a system of logical and creative thinking patterns is still far behind in its handling.

In general, the implementation of the teacher's learning process has a more dominant position, where

students listen and are given the task of reading and just filling in the questions. In addition, teachers tend not to give assignments or activities that can stimulate student creativity and do not motivate students to be enthusiastic about learning and doing assignments (Usman, 2013). As a result, students are less motivated in learning and develop creative thinking skills. The results of the study (Sugiharto et al., 2020) state that students in rural schools tend to have better creative thinking skills than students in urban schools.

Mind mapping is a method for maximizing the working power of the brain by making lines of thought (Buzan, 2007). Mind mapping is able to improve learning outcomes and increase student creativity, this is because in making mind mapping there is also the use of symbols, images, lines, and colors which can stimulate a creative mindset where students think that mind mapping is a fun note-taking method. Mind mapping

How to Cite:

Maesaroh, M., Firdausi, J., Kartikawati, E., Irdalisa, I., & Elvianasti, M. (2023). Using Digital Mind Mapping with Microsoft 365 to Improve Student's Creative Thinking on Biology. *Jurnal Penelitian Pendidikan IPA*, 9(9), 7258–7263. <https://doi.org/10.29303/jppipa.v9i9.4170>

should be used with a blend of colors in the learning process.

Microsoft 365 is one of the official internet-based learning applications that can be used for online or blended learning. Microsoft 365 has features that can accommodate classroom activities for presentations, discussions, attendance, and evaluation activities. Through Microsoft Office 365 educators and students can collaborate and share learning documents such as teaching materials, assignments, and feedback on assignment results (Amirullah, 2020).

One of the concepts contained in high school biology subjects is environmental change. In this material, students are expected to be able to have critical and creative reasoning skills to solve problems related to environmental pollution in terms of preventing and overcoming it. The concept of environmental change at the high school level is important to implement with good learning methods and media to produce students who are critical and creative in discovering and solving problems related to environmental change.

Efforts to empower students' creative thinking skills can be carried out by providing exercises in the form of description questions and tasks in the learning process that facilitate the development of their creativity (Fatmawati et al., 2021). The mind mapping method provides a lot of practice to students in designing mastery of concepts in the form of mind maps. Mind mapping can also be an effective tool for mapping learning innovations in field observation activities by students and students (Kerans, 2022). The mind mapping method has collaborated with the use of Microsoft 365 in blended learning on environmental change material in schools with the aim of developing students' creative thinking skills. The implementation of the Microsoft 365-based mind-mapping learning method in blended learning, it will provide space for students to develop their creativity. Implementation of learning using the mind-mapping method properly will create optimal learning and make all students more active in interacting in class with both educators and friends in carrying out assignments that will affect creativity in learning. Therefore, it is critical to conduct this research in order to enhance students' creative thinking skills through digital mind-mapping learning with the use of Microsoft 365.

Method

This research was carried out in a high school in DKI Jakarta throughout 2021. A total of 68 students were sampled in the study which consisted of two classes. The research method used in this study was an experiment

with a posttest control group design. The research stage consists of 3 stages, namely:

1. Preparation Stage

At this stage, we prepared research instruments in the form of learning tools such as blended lesson plans, student worksheets, Microsoft 365 learning media, assessment rubrics, and items for the assessment of creative thinking skills. We carried out validations with two researchers and biology learning experts. Next, we conducted a trial of the validated research instrument to test the validity and reliability of the instrument.

2. Implementation Stage

The learning process was carried out in two classes, namely the control and the experimental class. The experimental class of 37 students received learning treatment with Microsoft 365 media based on the mind mapping method. While the control class, the learning process uses Microsoft 365 media through the expository method.

3. Data Analysis Phase

The data analysis phase was carried out after the treatment was given to the two classes. We conducted a prerequisite test on the results of the two classes' creative thinking skills test results. Hypothesis testing was carried out using the T-test (different test) to see the difference between the two research classes that were normally distributed and homogeneous.

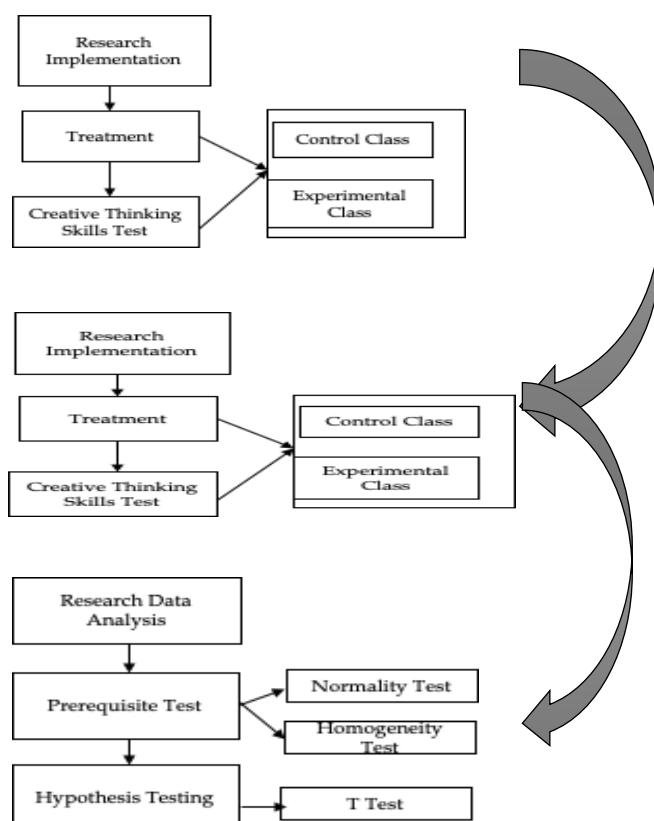


Figure 1. Research Flowchart

Result and Discussion

The research implementation at one of the high schools in Jakarta had a research sample in X MIPA 4 as the control class, and X MIPA 3 as the experimental class using the Microsoft 365-based mind mapping method on environmental change material. Students in the control class totaled 31 students while the experimental class numbered 37 students. The following is an explanation of the data obtained.

Descriptive Statistics of Control and Experiment Classes

From the results of the creative thinking test, data were obtained from the control and experimental class research results. The following is descriptive data on the post-test results of students' creative thinking in the control class and the experimental class.

Table 1. Posttest Descriptive Data for Creative Thinking Skills

Class	N	SD	Skor min	Skor max	X
Control	31	6.6	50	65	58
Experimental	37	9.37	58	85	74.67

At the end of the learning meeting, students were given a creative thinking posttest with a description of 10 questions. The highest score obtained by students in the control class was 65 and the lowest score obtained by students was 50 with a range of 15. The average value obtained in the control class ($n = 31$) was 58.00 with a standard deviation of 6.6. Descriptive data for the experimental class had the highest score of 85 and the lowest score obtained, namely 58 with a range of 27. The average value obtained in the experimental class ($n = 37$) was 74.67 with a standard deviation of 9.37.

Creative thinking skills measured in control class students include fluency, flexibility, and originality. Mastery of students' creative thinking skills in the control class and experimental class for each indicator can be seen in Figure 2.

Table 2. Normality Test Results

Class	N	X	SD	χ^2 count	χ^2 table	Conclusion
Control	31	58.00	6.6	2.51	13.27	Normally Distributed
Experimental	37	74.67	9.37	9.37	11.34	Normally Distributed

The acquisition of the χ^2 count value in the control class is 2.51. The value of χ^2 (0.99) with a significance level of 1% is 2.51 because χ^2 count < χ^2 (0.99) it can be stated that the data in the control class are normally distributed. The χ^2 count acquisition in the experimental class was 9.37. The value of χ^2 (0.99) with a significance level of 1% and $db = 4$ is 9.37 because χ^2 hits < χ^2 (0.99),

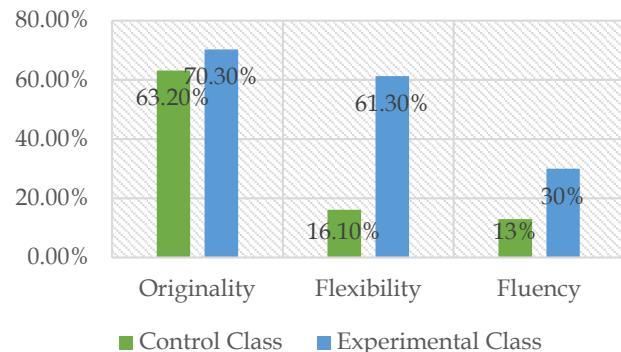


Figure 2. Descriptive Data Diagram of Students' Creative Thinking Skills Items

Regarding the creative thinking ability of students from the Experiment class, it can be seen that the indicator of students' creative thinking originality indicator has the highest percentage 70.3% for the experimental class and 63.20% for the control class with good criteria. The indicator of creative thinking flexibility is 61.3% with criteria for the experimental class, and 16.10% for the control class with fewer criteria. Fluency creative thinking indicators in the experimental and control classes respectively 30% and 13% with fewer criteria.

Test the Research Data Hypothesis

1. Prerequisite Test

The research data prerequisite test used the normality and homogeneity test for the two research classes. The posttest data normality test uses the Chi-Square Formula (χ^2) at a significant level of 1%. Based on the test results in the experimental class, it was obtained χ^2 count = 9.37 and χ^2 table = 13.27. Meanwhile, in the control class, χ^2 count = 2.51 and χ^2 table = 11.34. The test criteria for the normality test are accepting H_0 if the significance value is greater than $\alpha = 1\%$, and rejecting H_0 if the significance value is less than $\alpha = 1\%$.

it can be stated that the data in the experimental class are normally distributed.

The normality test of the two classes is normally distributed, so it is continued by conducting a homogeneity test to determine the variance of the two study classes. The researcher conducted an F test at a significance level of 1% ($\alpha = 0.01$) to test whether the research data was homogeneous or not. The test criteria

for the homogeneity test are as follows: Accept H_0 if the significance value is greater than $F \alpha = 1\%$ and reject H_0 if the significance value is less than $F \alpha = 1\%$.

Table 3. Homogeneous Test Results

Class	N	SD	Fcount	Ftable	Conclusion
Control	31	3	3.24	3.63	Homogeneous
Experimental	37	4	3.24	3.63	Homogeneous

Acquired a calculated F value of 3.24 and a table F value of 3.63. $F_{\text{count}} < F_{\text{table}}$, then it can be stated that the two classes have homogeneous variance.

2. Statistical Hypothesis Test

The data analysis prerequisite test has been carried out where both groups are normally distributed and the variance is homogeneous, the statistical hypothesis testing uses the T-test which will show the effect of the treatment given to the experimental class with the criteria $t_{\text{count}} > t_{\text{table}}$. Below is a table of the results of testing the hypothesis using the T-test with a significant level of 1%.

Table 4. Hypothesis Test Results

Class	N	X	Tcount	Ttable	Conclusion
Control	31	58.29			Significantly
Experimental	37	74.67	9.50	2.38	different

The results of the hypothesis calculation can be seen that the value of $t_{\text{count}} > t_{\text{table}}$ ($9.50 > 2.38$). So it can be stated that the research hypothesis (H_0) is rejected which means that there is a significant influence of the Microsoft 365-based mind mapping method on students' creative thinking skills.

The results of data analysis and hypothesis testing described above shows that the ability to think creatively in the experimental class using the mind-mapping method has a better level of mastery of creative thinking compared to the control class. Classes that use the mind mapping method have a posttest average of 58.00 and an overall creative thinking average of 74.67 while classes that use conventional learning have a posttest average of 50.00 and an overall creative thinking average of 58.29. the experimental class that uses the mind mapping learning method can make students actively involved during the learning process by using the mind mapping method in addition to providing benefits in terms of being active it also trains students to think.

The mind mapping method is a form of learning activity to train students' ways of thinking, this method presents material content in the form of mind mapping based on the abilities of each student (Panggabean & Danis, 2020). Mind mapping allows all students to

develop more creative, more complex thinking because they go through the stages of reflecting, and discussing, so that students are more creative in conveying ideas or ideas. Students have their discussion activities difficult in groups that allow interaction between students. Other researchers provided information that the use of mind mapping in a project-based learning model was able to increase student motivation (Nuramalina et al., 2022).

The control class has relatively lower creative thinking skills because it uses a learning model that does not accommodate creative thinking skills during learning activities, so during the learning process, students are not active. This is in accordance with the opinion put forward by (Daga, 2020; Fitria & Indra, 2020; Supeno, et al., 2023) that conventional learning is centered on the teacher, and students are placed on objects instead of learning subjects.

Based on its activities, mind mapping can be interpreted as a learning strategy to map thoughts in a flexible, interesting, and creative way that can be implemented both offline and online (Ayu Maharrany et al., 2022). Digital mind-mapping activities help students organize ideas, and develop critical creative and creative thinking skills, and writing skills (Sairo et al., 2021). The mind mapping method can influence students' creative thinking because it has two stages that play a role in developing creative thinking, namely mind mapping. Students consistently carry out these stages in each meeting which contributes to obtaining better creative thinking compared to the control class which uses conventional learning models.

The results of data processing shown in Figure 2 show that the highest percentage in this study was an indicator of originality in the experimental class which was 70.3% higher than the control class which obtained an average of 63.2%, this was because the learning process, namely at the mind stage (thinking) in training students to think creatively. The teacher delivers material about environmental change and preservation. Then students are asked to observe the material and practice making mind maps to develop creative thinking skills. Activities to stimulate students to think creatively are carried out by the teacher so that in the learning process students play an active role and are able to make concept maps of the material that has been conveyed by the teacher. Develop originality creative thinking processes (authenticity) by solving problems that are given in the middle of learning based on the problem-solving result sheet, it can be seen that students are able to parse information by writing down the information they know and are asked according to what is meant in the problem and are able to use concepts to determine steps better.

Creative thinking is an individual's ability to think about and be able to do something that most people have

never done or relatively rarely do (Ritter et al., 2020; Gube & Lajoie, 2020). The control class has a lower percentage of originality indicators (authenticity) 16% compared to the experimental class. The percentage of fluency indicators in the control class is 13% with very little interpretation. The flexibility indicator for students in the experimental class was 61.30%, much higher than the control class, which was 16.10%. This is because students in the control class are only fixated on the learning given by the teacher without practicing flexibility and fluency abilities. The highest indicators of creative thinking ability in the originality and flexibility indicators of the experimental class had percentages of 70.30% and 61.30%. The lowest indicators of creative thinking skills were the indicators of flexibility and fluency in the control class with percentages of 16.10% and 13% respectively which were in the less category.

The difference in the posttest results for the ability to think creatively above in the both of classes cannot be separated from the treatment of the learning model in the learning process, in the experimental class using the mind mapping learning method which is oriented towards creative thinking which includes the 3 stages described above, while the control class uses the conventional model (teacher center).

Based on the research that has been done, shows that the mind mapping method tends to have more influence on increasing the originality indicator. Active learning in the classroom can be created with an appropriate learning model. One of the activities that can create active learning is using the mind mapping method (Astriani, et al., 2020). Mind mapping can be described as a combination of curved lines, symbols, words, short sentences, and simple pictures according to the concept, mind mapping is made based on the ideas of each individual student (Sunardiyyah et al., 2022; Chasanah, 2020; Aisah, 2021; Sanjaya et al., 2020). Overall the experimental and control class creative thinking indicators have originality (authenticity) the highest average value among other indicators. On the originality indicator, the experimental class has higher creative thinking than the control class. While the indicator for the control class and also the lowest creative thinking experimental class is fluency. Thus it can be said that the mind-mapping learning method has a good influence on students' creative thinking, especially in matters of environmental change and preservation.

Conclusion

Based on the results of the study, showed that the Microsoft 365-based mind mapping method improved the creative thinking skills of class X MIPA high school

students in Jakarta at a significance level of $\alpha= 1\%$. The highest indicators of students' creative thinking in the experimental class were originality 70.3%, flexibility 61.3%, and fluency 30 %. The Microsoft 365-based mind mapping method can be used as an alternative in creating a learning atmosphere that develops creative thinking skills because students have the authority to arrange concepts that will be conveyed through concept maps with colors and shapes that suit student characteristics. On the other hand, the mind mapping method provides opportunities for social interaction, because this model is packaged in the form of group learning which can provide information to each other to train self-confidence and think creatively. Microsoft 365 has features that can facilitate interaction between friends and teachers in class, one of which is through the one-note feature which reaches individual student needs through the personalized section. Microsoft Sway, Microsoft Form, and Microsoft PowerPoint 365 provide full support for classroom learning interactions with the mind mapping method.

Acknowledgments

The author would like to thank the Majelis Dikti-Litbang Muhammadiyah and UM Prof. Dr. Hamka who has provided support for this research.

Author Contribution

Maesaroh; conceptualization and drafting manuscript, Jannah Firdausi; design the instrument, and analysis, Eka Kartikawati; methodology, Irdalisa; validation and critical revision, Mega Elvianasti; validation.

Conflicts of Interest

The author's state that the data published in the manuscript does not have a conflict of interest for any institutions.

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