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# The Effect of Mind Mapping Method on Creative Thinking Skills of The Tenth-Grade Students on Linear Motion Material

**Ghoziyah Shaf, Khaeruddin*, and Abd.Haris**
Physics Education Study Program, Mathematics and Natural Science Faculty
Universitas Negeri Makassar, Makassar, Indonesia
*khaeruddin@unm.ac.id

**Abstract**

This quantitative research seeks to examine the effect of mind mapping on the creative thinking skills of students in class X at SMA Negeri 1 Wajo. This research's population consisted of all X MIPA class students at SMA Negeri 1 Wajo, while 60 students were randomly sampled from two classes. Probability sampling with simple random sampling was used for sampling. The research instrument was an essay-based test of creative thinking skills. The queries were developed based on the aspects of creative thinking to be measured, namely fluency, flexibility, originality, and elaboration, which Gregory's validity test validated. The prerequisite test consisted of a normality test and a homogeneity test, and the t-test was used to examine the relationship between the mind-mapping method and students' creative thinking skills. The average score of the experimental group was 23.23, which was higher than the average score of the control group, which was 17.77 points. The results of hypothesis testing with the t-test obtained a t-value of 6.057, which was greater than r-table, which was 2.002 at a significant level of 0.05, so it is concluded that there is an effect of learning with the mind mapping method on the creative thinking skills of students of class X on linear motion material at SMA Negeri 1 Wajo. This research contributed encouragement of the use of the mind mapping method on linear motion material in high school physics learning and validated creative thinking skills test instruments on linear motion material.

**Keywords:** Creative thinking; Creative thinking skills; Mind mapping method

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## INTRODUCTION

Learning in the 21st century emphasizes student-centered learning, collaborative learning, learning with a context, and learning that is integrated with student life in society in the 21st century. According to Sawitri & Azis (2020), it is possible to accomplish 21st-century learning by focusing on the student center in which this learning enhances adaptive, proactive, and problem-solving skills. Additionally, it can enhance students' creative thinking abilities.

Creative thinking skills are determined by the ability of students to

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generate new ideas from numerous points of view to solve a problem. This skill can bring out the potential in humans to create something (Fitriani et al., 2017).

Kutlu & Gokdere (2015) stated that creative thinking is the capacity to envision multiple potential solutions to a problem. Thinking skills are the ability to capture information, such as ideas or theoretical concepts, with relative specificity (Nurlaila et al., 2016).

Torrance identified four indicators of creative thinking skills: fluency, flexibility, originality, and elaboration (Ramdani & Artayasa, 2020). In addition, according to Munandar (2009), creative thinking can be measured by a student's ability to solve problems by incorporating four aspects, namely originality (providing unique answers compared to existing answers), fluency (mentioning various answers relevant to the question), flexibility (classifying categories of ideas in the answer), and elaboration (adding details to the answer object). (Yuliantaningrum & Sunarti, 2020).

Science education aims to improve conceptual comprehension and its application to daily life. Physics is one of the branches of natural sciences that consists of four elements: process, product, attitude, and application (Sulasih et al., 2018). Solving physics problems involving the study of natural phenomena can improve students' skills to think logically and creatively (Asriadi & Istiyono, 2020). Therefore, it is not sufficient to learn physics by taking notes in a conventional, lengthy, and monotonous textbook; rather, approaches, techniques, and methods must be utilized that allow students to freely express and develop their opinions (Misbahudin, 2018).

One of the physics subjects contained in class X is linear motion material that students must master. However, according to students, it is challenging to comprehend the material because not all students can independently illustrate this subject matter with words alone (Rustaman et al., 2019). Students cannot differentiate between position, velocity, and acceleration measurements. Moreover, students struggle to interpret the relationship graph between position, velocity, and acceleration versus time (Kusairi et al., 2019). Therefore, a learning method that provides visual and textual examples is required to improve students' conceptual comprehension of linear motion material. A good conceptual comprehension can also enhance students' creative thinking skills (Rahmawati et al., 2020).

It is essential to select appropriate learning methods that enable students to actively organize and locate knowledge information in the learning process, which will involve creative activity and discovery, thereby fostering divergent, original thought, prediction, and experimentation. The foundation of a student's creative attitude is learning to pose questions and solve problems, which demonstrates the student's creative skills (Nurlaila et al., 2016).

Observations and interviews with teachers indicate that the most prevalent learning method at SMA Negeri 1 Wajo is the conventional method, specifically the lecture method. The lecture method is teacher-centered, so the success of learning depends on the teacher's ability. The information conveyed by the lecture method quickly becomes obsolete and cannot be perpetually memorized, and this method is ineffective in enhancing students' creative thinking skills. This is evident in students' physics problem-solving skills. Students tend to solve problems in the same manner as other students and only copy their answers. They rely solely on the taught problem-solving steps and cannot solve problems that differ from the examples provided.

Mind mapping is a learning method that can be used to enhance students'

thinking skills. The mind mapping learning method is a creative note-taking technique that combines the functions of the right and left brains to encourage students to think more creatively while realizing the imagination contained in the mind maps created by students throughout the learning process. According to Tony Buzan, mind mapping is one of the creative thinking tools that reflects the natural workings of the brain and allows the brain to use all of its images and associations in a radial pattern similar to the brain's design as a network in all directions (Husni & Zainuddin, 2018).

Tony Buzan initially introduced the concept of Mind Mapping, also known as Radiant Thinking, in the 1970s. According to Tony Buzan, a mind map has a central idea or word and five to ten other ideas that emanate from the central idea, which is highly effective for uncovering concealed ideas or organizing owned information. The structure of a mind map resembles a tree diagram with branches, making it simple to connect one piece of information to another (Budiyanto, 2016).

According to Buzan (2013), mind mapping is a creative thinking tool that mirrors the brain's natural processes and allows it to use all of its images and associations in a radial pattern similar to the brain's design as a network in all directions. In addition, mind mapping seeks to increase one's thinking speed, provide unrestricted mental flexibility, and lead to the discovery of original ideas (Afrizon, 2016).

There are four different forms of mind mapping: network tree, cycle concept, events chain, and spider concept map. Mind mapping with a network tree structure was utilized in this research. This is because Tony Buzan's mind mapping falls under the network tree mind mapping category (Nursoviani et al., 2020).

Mind mapping helps students capture thoughts and ideas on paper by using clear, complete, and simple images, colors, and symbols to make information easier to understand and recall, maximizing learning moments. In addition to liberating a person who wishes to record information, mind mapping enables individuals to associate information with themselves while fostering creativity (Mutiara, 2018).

Mind mapping can improve the ability to elaborate and flexibility in locating keywords, thereby enhancing concept comprehension (Putri, 2017).

According to the findings of Rofiqoh et al. (2020) research on the identification of student's creative thinking skills with the mind mapping method in physics learning of optical subject matter in high school, the results of students' creative thinking skills for each indicator range from 50 to 79, which places them in the moderate category. Zubaidah et al. (2017) also conducted a study titled “Improving Students' Creative Thinking Skills through Science Differentiation Inquiry Integrated with Mind Map," the findings indicate disparities in students' creative thinking skills for various learning models. Students taught with the science differentiation inquiry model integrated with mind mapping demonstrate higher levels of creative thinking than those taught with conventional models. The study results are limited to science classes in junior high school, in which the disparities in students' levels of critical thinking cannot be compared to those of students in high school.

This study aims to determine the creative thinking skills of students taught using the lecture method, the creative thinking skills of students taught using the mind mapping method, and whether the mind mapping method has an effect on the creative thinking skills of students at SMA Negeri 1 Wajo regarding linear motion material.

## METHOD

The type of research employed by the researchers is the True Experimental Design with Posttest-only Control research design. The population of this research consisted of X MIPA class students at SMA Negeri 1 Wajo during the academic year 2021/2022. The population comprised four classes, namely X MIPA 1, X MIPA 2, X MIPA 3, and X MIPA 4, with a total of 126 students.

Table 1 Research population

| No | Class | Number of students |
|---|---|---|
| 1 | X MIPA 1 | 30 |
| 2 | X MIPA 2 | 30 |
| 3 | X MIPA 3 | 33 |
| 4 | X MIPA 4 | 33 |
| **Total** | | **126** |

Source: Data of SMAN 1 Wajo

The research sample comprised 60 students from two classes: X MIPA 1 class, with 30 students serving as the experimental group, and X MIPA 2 class, with 30 students serving as the control group. This sample was selected using probability sampling, a technique in which all population members have an equal chance of being sampled (Sugiyono, 2013). Two classes were selected randomly using simple random sampling because the distribution of students in each class was not based on rank.

This research used a test of creative thinking skills as a research instrument. Students were administered the creative thinking skills test as a post-test to collect cognitive data regarding their creative thinking skills in learning. The questions were developed based on the aspects of creative thinking skills to be measured, and they comprised eight questions: two questions measuring fluency, two measuring flexibility, two measuring originality, and two measuring elaboration. The test instrument was developed for the learning objectives to be attained and was intended to assess students' creative thinking skills.

The eight test items consist of queries that two experts have validated. The first validator is an expert in physics learning, while the second is an expert in multimedia learning. Expert instrument testing, also known as the Gregory test or Gregory test requirements deems an instrument reliable based on the expert agreements if $Vc \geq 0{,}75$.

Based on the results of item analysis conducted on the students' physics learning outcomes test instrument, the tabulation results obtained are 1.00, where these results exceed 0.75 ($1.00 \geq 0.75$), meaning that each item of the instrument can be used in the subsequent stage of research.

This is a quantitative study that processes data in the form of numbers to provide answers to the formulation of research problems. Descriptive statistics and inferential statistics are utilized in this study. Students in X MIPA class at SMA Negeri 1 Wajo were administered a descriptive analysis to determine the characteristics of the score distribution for their creative thinking skills. This research employed the normality test, homogeneity test, and hypothesis testing as inferential statistics. The entire statistical analysis for this research was conducted by researchers utilizing Ms. Excel's data processing applications.

The normality test used was the Lilifors test. The test was carried out at the level of truth $\alpha = 0.05$, with the test criteria being H0 is rejected if L0>Lt and H0 is accepted if L0<Lt. In this research, the normality test was carried out for both classes, namely the control class and the experimental class.

After the data had been deemed normally distributed, the subsequent step was conducting a homogeneity test. The homogeneity test used was a two-variant homogeneity test or Fisher test with the criteria if $F_{value} < F_{table}$, then the data is homogeneous. Meanwhile, if

$F_{value}>F_{table}$, the data are not homogeneous, with a significant degree of freedom of the denominator and numerator dk=(n-1) at a significant level$\alpha = 0,05$.

Hypothesis testing was conducted to determine the effect of the mind mapping method on students' creative thinking skills using the t-test in this research. The test criteria are $H_0$ is rejected if $t_{value} \geq t_{table,}$ in this case Ha is accepted. However, $H_0$ is accepted if $t_{value} < t_{table}$. In addition, if the significance value of the t-test < α = 0.05 (5%), then $H_0$ is rejected, and Ha is accepted, which means that there is an influence between the independent variable and the dependent variable.

## RESULTS AND DISCUSSION

The post-test results showed that the experimental group's minimum score is 18, and the maximum score is 28, with an average score of 23.23 and a standard deviation of 2.98. The minimum score for the control group was 11, and the highest score was 24. The average score for the control group was 17.17, with a standard deviation of 3.95, as shown in Table 2.

Table 2 Statistical results of creative thinking skills test

| Parameter | Results of the Creative Thinking Skills Test | |
|---|---|---|
| | Control class | Experiment class |
| Sample size (n) | 30 | 30 |
| Ideal maximum score | 32 | 32 |
| Ideal minimum score | 0 | 0 |
| Obtained maximum score | 24 | 28 |
| Obtained minimum score | 11 | 18 |
| Average score | 17.77 | 23.23 |
| Standard deviation | 3.95 | 2.98 |
| Variant | 15.56 | 8.87 |

The results indicated differences between experimental and control class students' creative thinking skills. The average score of student's creative thinking skills can be compared in the form of a frequency distribution table, which is presented in Table 3.

Table 3 Frequency distribution categorization of the creative thinking skills test results

| Interval | Category | Control class | | Experiment class | |
|---|---|---|---|---|---|
| | | F | Percentage (%) | F | Percentage (%) |
| 0-5 | Very Low | 0 | 0,00 | 0 | 0,00 |
| 6-11 | Low | 4 | 13,33 | 0 | 0,00 |
| 12-17 | Moderate | 13 | 43,33 | 0 | 0,00 |
| 18-23 | High | 12 | 40,00 | 16 | 53,33 |
| 24-29 | Very High | 1 | 3,33 | 14 | 46,67 |
| **Total** | | **30** | | **30** | |

The data in Table 3 reveals that, out of 30 students in the control class, 13 students, with a percentage of 43.33 percent and an age range of 12 to 17, fall into the "Moderate" category. Meanwhile, most of the 30 students in the experimental class scored in the "High" category, in which 16 students with a percentage of 53.33 percent and an interval of 18 to 23 were classified as "High".

After descriptive analysis, the data were subjected to hypothesis testing to ascertain the effect of the mind-mapping method on creative thinking skills. Hypothesis testing was conducted after the data were declared normally distributed and homogeneous. The t-test results are $_{value}$ = 6.057 > $_{table}$ = 2.002, indicating that Ho is rejected and Ha is accepted.

The post-test scores for each aspect of students' creative thinking skills are depicted in Table 4.

Table 4 Average scores for each aspect of students' creative thinking skills

| Aspect measured | Average score | |
|---|---|---|
| | Control class | Experiment class |
| Fluency | 2.50 | 3.27 |
| Flexibility | 2.32 | 2.78 |
| Originality | 1.70 | 2.52 |
| Elaboration | 2.37 | 3.05 |

The quantity of responses provided by students reveals that both class X MIPA 2, as the control class, and class X MIPA 1, as the experimental class, scored highest on the Fluency Aspect of creative thinking skills. The mean score indicates that, on average, students can generate numerous original thoughts or concepts appropriately. This is consistent with the findings of the Busyairi et al. (2022) study, which also acquired the highest score for fluency by examining the number of solutions provided by students when solving problems.

The elaboration aspect of creative thinking skills is the second-highest aspect after fluency. Class X MIPA 1, the experimental class, received a higher average score than class X MIPA 2, the control class, based on the students' responses describing their results in great detail. This is because the ability to provide a detailed and detailed description of their opinions reflects the extent to which students understand a problem and the extent to which students can explain a given solution to a problem (Firdaus et al., 2018).

Class X MIPA 1, as the experimental class, received a higher average score on the flexibility aspect of creative thinking than class X MIPA 2, as the control class, due to differences in students' capacity to provide diverse responses. Whereas flexibility is the capacity to generate a variety of ideas or answers, it is the capacity to view a problem from different perspectives and employ various approaches or modes of thought when solving a problem (Nisa Auliyah et al., 2021).

The originality aspect received the lowest average score in class X MIPA 2 as the control class and class X MIPA 1 as the experimental class. The low level of this aspect can be seen in most students who still use the old or less innovative method of answering questions, and 50% of students answer in the same way. Originality ability is a significant factor in determining students' creative thinking, as demonstrated by their ability to discover novel and innovative solutions to problems (Firdaus et al., 2018).

The analysis data of the post-test results for the control class, X MIPA 2, which is taught using the lecture method, fell into the "Moderate" category based on the variation in the number of scores and percentage of student scores. Meanwhile, the experimental class, X MIPA 1, taught using the mind mapping method, had the highest percentage of students with high creative thinking skills.

This is because the learning method utilized in X MIPA 2 class is the lecture method, which is monotonous and solely concentrates on the teacher by merely explaining the learning material, thereby causing students to be passive in learning activities. According to the findings of Y. S. Putri & Alberida's (2022) study, the learning process that still employs teacher-centered learning

methods renders students passive, with low levels of creative thinking. In addition, Mandasari (2016) found that the lecture method does not foster the development of student's creative thinking skills because the learning process focuses solely on the student's capacity to remember information.

According to the findings of Kalsum et al. (2019) in their study titled "Application of Mind Mapping Learning Model to Creative Thinking Ability of Class XI Students," the low creative thinking of students is a result of the less creative and one-solution-only learning methods employed by teachers. In addition, monotonous and uninspiring student notes contribute to students' reluctance to relearn school-learned material. Consequently, there is an effect on the value of creative thinking skills.

Class X MIPA 1 was taught by applying the mind mapping method, which is in line with the results of research conducted by Tony Buzan (in Nurjan, 2018), which states that the human brain often remembers information in the form of images, symbols, sounds, shapes, and feelings. The mind mapping method can help train creativity, help remember words and readings, improve understanding of material, help organize material, and develop new insights.

In line with this, research conducted by Ayu et al. (2013) on the effect of the mind-mapping method on creative thinking skills indicates that using the mind-mapping method in learning will provide students with opportunities to be more imaginative and creative. Theoretically, therefore, mind mapping is a more effective method for enhancing students' creative thinking skills.

Misbahudin's (2018) research "The Effect of Creative Thinking on Energy Material and Its Application" demonstrated a significant increase in creative thinking scores, indicating that mind mapping can enhance student creativity. This is because mind mapping enables students to connect the material and provide a variety of highly creative problem-solving strategies.

In addition, Salfina et al. (2015) found that the significance value of learning using the mind-mapping method is significant, indicating differences in creative thinking and communication skills between students taught using the mind-mapping method and those taught using conventional methods.

Mind mapping will enhance students' comprehension, memory, and active and creative thinking skills in teaching and learning physics courses (Rustaman et al., 2019). This is supported by Winsura's (2016) study, which revealed that mind mapping can enhance students' creative thinking skills.

The students attend to a teacher's explanations through the learning with mind mapping and actively participate in the learning process to better comprehend and retain the material (Bunga et al., 2022).

Mind mapping that begins with the central idea or image and then branches into sub-ideas that explore themes in greater depth trains students' Elaboration Aspect of creative thinking. In addition, it trains students' inventive thinking skills in the Fluency Aspect by requiring them to generate as many related sub-ideas as possible. The Flexibility Aspect can be trained by having students translate keywords into symbols or images, where key words are words that convey the memory-triggering essence of an idea. In general, mind mapping should be created to make it stand out from the crowd so that it is easier to remember, thereby training students' creative thinking skills in the Originality Aspect. Figure 1 depicts mind mapping on linear motion material, which is the result of this study.

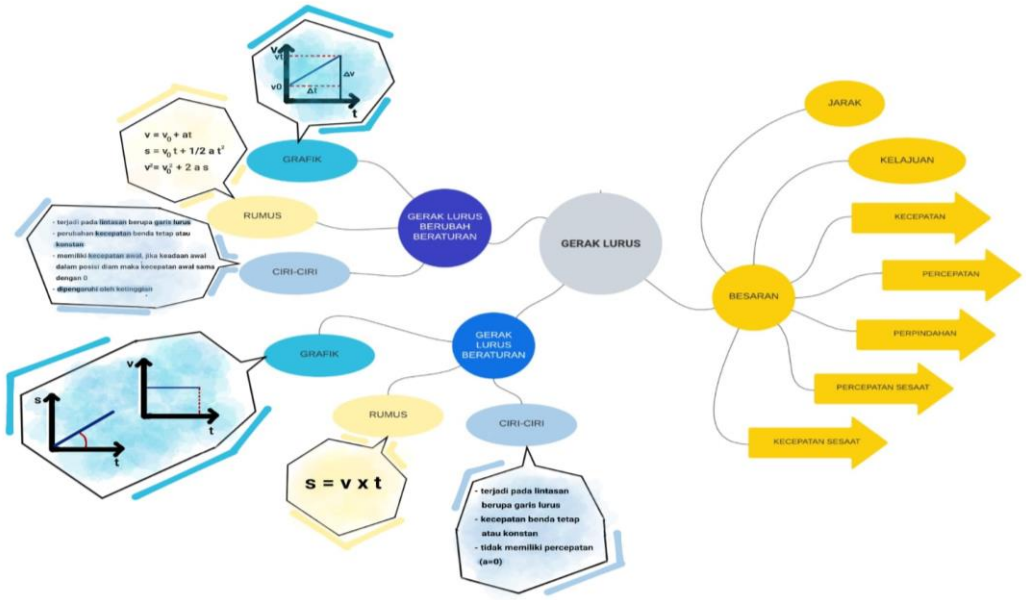


Figure 1 Mind mapping of linear motion

The results of the t-test indicate differences between the creative thinking skills of students taught using the mind-mapping method and those taught without the mind-mapping method, indicating that the learning methods utilized in education affect students' creative thinking skills. Class X students at SMA Negeri 1 Wajo can think creatively using the mind mapping.

## CONCLUSION

The results of research conducted at SMA Negeri 1 Wajo regarding the effect of the mind mapping method on students' creative thinking skills demonstrated that students taught using the lecture method have creative thinking skills in the high category, while those taught using the mind mapping method have creative thinking skills in the very high category. In addition, based on the analysis, it can also be concluded that the mind-mapping method affects students' creative thinking skills.

The researchers hope that teachers will employ appropriate learning methods, such as mind mapping, to enhance students' creative thinking skills based on the research and results of the data analysis of creative thinking skills. The results of this research are in the form of mind mapping methods on linear motion materials, and creative thinking skills instruments can serve as a research resource for other scholars. It is anticipated that future researchers will be able to build upon the findings of this research by combining mind-mapping techniques with interactive learning models.

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