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How much does using the Mind Mapping learning approach "improve" the grasp of mathematical ideas in junior high school students?

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Abstract

The learning model is a teacher's tool in the form of structured images that are presented to students. The learning model applied aims to improve students' understanding of mathematical concepts. The author determines the purpose of this study. Namely to assess the impact of experiments on the subject's knowledge of mathematical concepts in geometry material. This type of research uses experimental research using a mind mapping learning model with a pre-experimental design, one-group pretest-posttest. Tests were carried out randomly or through cluster sampling on building materials class VII Realschule. The data collection tool that the researchers used for this research was a test designed to test students' understanding of concepts. The researcher interviewed teachers, students, and documents in this data collection method. A hypothesis test was carried out on the data obtained after conducting a sig5% level t-test, normality test, and homogeneity test on statistical data. It was found that students could not understand mathematical concepts (mind mapping). This dramatically influences the results of understanding mathematical concepts. After using this method, students receive higher performance scores than before. Based on the t-test results, we can conclude the difference in the value of learning outcomes before and after applying the author's teaching method.

Keywords: Building Space; Mind Mapping Learning Models; Understanding Concepts.

Introduction

Learning is an activity that is widely used by humans every day, such as designing clothes, carpentry, and buying and selling transactions will use learning to do their daily lives well. Since humans were born, the learning process has been ongoing (Bossé et al., 2021; Inganah et al., 2023; Li, 2021). From learning, humans can develop their abilities and achieve what they want. One of the skills that must be possessed in learning mathematics is understanding concepts (Darmayanti et al., 2023; Ismail et al., 2021). Understanding concepts is an essential goal in learning (Cundiff et al., 2020; Syaifuddin et al., 2022). This gives an understanding that the materials taught to students are not just rote but more than that (Hasanah, Syaifuddin, et al., 2022; Shen et al., 2018). With an understanding, students can better understand the concept of the subject matter itself (Humaidi et al., 2022; Knuth, 2020). Understanding the concept is also one of the objectives of each material the teacher delivers (Khalil, 2019; Nurina Vidyastuti et al., 2018) because the teacher guides students to achieve the expected concept (Silalahi, 2019).

The importance of understanding a concept can be seen in the objectives of learning mathematics at the SMP/MTs level, namely that students can understand mathematical concepts (Gee et al., 2021; Khoiriyah et al., 2022), explain the interrelationships between concepts and apply them flexibly (Belser et al., 2018; Sugianto et al., 2017), accurately (Czerniewicz, 2017), efficiently (Siriopoulos, 2021), and precisely in problem-solving (Hu et al., 2018). From these objectives, it can be concluded that understanding concepts is one of the most essential parts of learning mathematics (MM Effendi et al., 2022), so it is hoped that after the learning process, students can understand mathematical concepts and apply them to solving problems.

Students are said to understand concepts if students can define concepts, identify and give examples or non-examples of images (Liang, 2016; Qomariyah et al., 2023), develop mathematical connection skills between various ideas (Wahyuni et al., 2019), understand how mathematical concepts are related to one another so that a thorough understanding is built (Widodo et al., 2020), and use mathematics in the context in which they are based. Students are said to understand the procedure if they recognise it (several steps of the activities carried out), including the correct algorithm rules or calculating processes.

The reality on the ground shows that most students are less interested in mathematics, and some even give the nickname "mathematics is scary" (Anjarwati et al., 2023). Moreover, many students need help understanding the simplest parts after learning mathematics (Qomariyah et al., 2023) (Vidyastuti et al., 2022). Many concepts must be understood (Rizki et al., 2022; Wulandari et al., 2022). so that mathematics is considered a complex, complicated and difficult science. This situation was obtained by researchers when making observations for the subject of developing a mathematics evaluation system at one of the State SMP TMI Roudlotul Qur'an.

Based on the results of interviews with researchers during initial observations of mathematics teachers at TMI Roudlotul Qur'an Middle School, the real problem students face is that basic mathematical concepts, such as addition operations, turn out to be how to understand subtraction, multiplication, and division. This makes it difficult for students to understand the advanced material the teacher teaches. He added that IX. A class studying volumetric material should understand it well but still need to understand it. Students only know the formula for the area of a square or square and the procedure for the size of a rectangle, but they use different forms. I need to find out the type of apartment. This is due to a need for more understanding of the materials concept.

From the description of the interview results above, we can see that the primary way to learn mathematics quickly is first to understand the basic concepts. According to Sugianto et al. (2022). To learn concept B based on concept A, one must first understand concept A. If someone understands concept A, he can appreciate concept B. That is, learning mathematics must be gradual (Rahmah et al., 2022), continuous (Sekaryanti et al., 2023), and based on previous learning experiences (Hasanah, In'am, et al., 2022). students are bored and not interested in participating in learning. As the learning process progresses, the teacher's role increases. Students only listen to the teacher's explanation from the beginning, and when the teacher gives examples of problems to be processed, only a few students are actively involved in solving the problem. Do. The other students watched passively. Therefore, the learning model must be applied appropriately to minimise student boredom in participating in learning and ensure that all students participate actively and understand the concept of learning material (Lindenbauer & Lavicza, 2021). The 2013 curriculum, which is currently the reference for learning, also defines learning as a scientific approach that ensures that students depend not only on teachers and knowledge but are also actively involved in learning.

The learning process is the core of educational activities in schools. The achievement of learning success in terms of achieving proficiency standards is highly dependent on the teacher's ability to control the learning process in the classroom. I explained that there should be. For this reason, teachers must be proactive and creative in achieving the educational goals in each subject (Cholily & Suwandayani, 2021). The teacher is also one of the parties responsible for the problem of student learning outcomes. With various learning methods, it is expected to facilitate students' understanding of the material and reduce their saturation in the learning process. Must be able to create (Low et al., 2020) said teachers need to understand that every student has abilities, intelligence, potential and expertise. This cannot be achieved by teacher competence in delivering material. There are many ways to solve every student's learning problem (Huda et al., 2019). However, the many learning models mean that teachers must carefully choose the suitable model for learning.

The learning model is a tool that can be used as reference material for teachers to sort out which model for student learning is most appropriate, with the aim and hope that students can easily understand the delivery of the material (Domke, 2020). So before the teacher chooses a learning model, he must consider the selection of a learning model, namely considering the expectations that will be achieved and something related to materials and learning materials.

The use of learning models in the learning process is aimed at helping students understand the subject matter accurately and accurately. One learning model that is expected to help students understand concepts and create effective learning is the mind-mapping learning model. The mind-mapping learning model can be interpreted as a concept media as a means of delivering learning material, which, in essence, aims to make students interested in learning to process a problem critically by solving coherent problems. The mind-mapping learning model is a critical thinking tool for identifying problems, finding solutions to problems, and solving these problems (Supriadi et al., 2021). This has been proven by various studies, one of which shows that the mind-mapping learning model can be used to hone and develop the ability to understand concepts (Reinke & Casto, 2022). From (Reinke & Casto's 2022) research, it can be concluded that the mind-mapping learning model can improve students' conceptual understanding. The research results obtained: Students who were able to repeat the concept did it before the action of 7 students (20.6%), after the action of 21 students (61%), and before the action of 10 students (29.5%). Students who can give examples, and the behaviour of 24 students (70%) after the behaviour. Before the action, eight students (26.5%) could apply concepts to the problem; after the action, there were 31 students (91%).

Mind mapping is a collaborative learning model that improves student understanding and increases student retention of learning materials. This learning model makes it easier for students to record material more effectively and efficiently. Students often take notes by copying directly from books, but many still take long, linear notes without variation. This linear, ineffective and efficient recording hinders the achievement of optimal learning outcomes.

The mind-mapping learning model can be used as a tool to remember. (Shie et al., 2022) also stated that mind mapping can assist in writing and assigning essays related to concept mastery. Based on the description above, it can be assumed that the Mind-His Mapping learning model also influences students' ability to understand mathematical concepts (Hayati et al., 2022; Marxy, 2017). In mathematics, students pay less attention to the teacher's learning (Fatimah et al., 2020). Some students think mathematics is very dull (Sukaesih et al., 2022), so it is difficult for students to understand mathematics, which causes student scores to be shallow (Gavens et al., 2020). Understanding concepts is an essential fundamental part of studying mathematics for anyone who can master and quickly solve problems better because solving problems requires mastery of several concepts (Rangkuti et al., 2022). As a result, students can only understand geometric concepts verbally but have not been able to describe the concept of geometric understanding, and student scores accurately are low (Astriani et al., 2020). Because understanding students' concepts is still lacking and students are required to have academic value, this research is expected to help students learn to understand the concepts provided.

The research on applying the mind mapping learning model was carried out by (2022) from the researcher. The current research is also experimenting with this model. It is intended that with this learning method, students can easily understand the concept of learning in the material of cubes and blocks. Seeing mind mapping learning can make solutions easily in understanding concepts evenly and getting more memory. It is a bridge to make it easier for teachers to teach the material in schools, which can be expected to increase understanding of concepts in learning. In this study, the researcher

wanted to experiment with students to improve their understanding of mathematical concepts focused on the spatial theme using mind-mapping model learning aids.

Research Methode

Pre-experimental design, one group pretest-posttest, is the method researchers use in this study. Because in this study, the researcher required students to take the initial test with blank understanding and had not been given action, this test was said to be a pretest. After the action, students were required to retake the test with test questions that were still the same as the initial test questions to get differences in the results of understanding the concept, this test is said to be a posttest, which means a test after the action is given. The quantitative research method is used as a measuring tool to measure the results of students' understanding of mathematical concepts (Sugiyono, 2018).

Data collection techniques to obtain complete data, (Simamora et al., 2020) The author conducted interviews with teachers related to mathematics and then continued to interview students while giving them test questions. It is necessary to know that the test questions given to students have previously been validated or consulted with supporting lecturers and mathematics subject teachers. After conducting several tests, the author can obtain the assessment or data needed to compile this scientific work.

As a tool for collecting, summarizing and presenting the information obtained by the author, it can be called a data collection technique. In the data collection technique here, the researcher creates questions for the pretest or posttest in the form of essays with indicators of understanding the concept. The concept comprehension test questions contain material for building cubes and blocks.

Data analysis techniques in this study were carried out using quantitative analysis. In using this design, there is only one group that has been determined, the design in this design will carry out 2x tests, namely before being given an action about understanding the concept and after being given an action to see the difference. The following is the research pattern of the one-group pretest-posttest design method (Sugiyono, 2018).

After the pre-test was carried out, the researcher took action in the form of learning students to find effective sentence elements in the descriptive text, which then used the mind mapping model (X), then, in the final stage, the researcher gave a post-test (O2). The data obtained will be tested using a t-test formula at the 5% sig level. In the next process, the researcher conducted a prerequisite test as the first test in the form of a normality test and homogeneity test, then, the next step was to test the hypothesis on the data obtained in the ability to understand students' mathematical concepts. This is done to determine the statistical test with the aim of being used to test the hypothesis.

Results and Discussion

Concept Understanding Pretest Results.

At this stage, the writer tested the students to find out how much they understood about geometric shapes, and this was carried out pre-research was carried out, at the beginning, the writer did a pretest on students, namely with the aim of seeing and knowing more about students' abilities about understanding concepts, namely to see where understanding ability in related material (building space). Based on the initial test (pretest) scores, the percentage of students' understanding of the concept was obtained with <65% (incomplete) with a large number of students, namely 27 people and a total percentage of 93.10%. ≥65% (complete) with many students, namely 2 people; the total percentage is 06.90%. So, the presentation on this initial test is said to be incomplete.

Concept Understanding Posttest Results.

After doing the pretest, the writer did action on students to determine the value of the posttest in understanding the concept in this study. Based on the results of the final test (posttest), the percentage of students' understanding of the concept was obtained with <65% (incomplete) with a large number of students, namely 5 people and a total percentage of 17.35%. ≥65% (complete) with many students, namely 24 people and the total percentage is 82.65%. So, the percentage in this final test (posttest) is said to be complete. The application of the mind mapping learning model is said to be successful, namely if it improves the understanding of mathematical concepts after being tested and obtains the following results: (a) students get a good completeness score, even quite good in understanding mathematical concepts, especially in geometric material; and (b) there are different results in the pre and post-tests of each student.

Data analysis techniques from this study were prerequisite tests and hypothesis testing. The prerequisite test consists of loading the normality and homogeneity tests. After the prerequisite tests have been completed and the results found in the test, a hypothesis test is carried out in the form of a t-test or discriminating power test (average) as a benchmark in testing the hypothesis of this study.

Prerequisite Test.

Normality test.

This normality test is used to see whether the data obtained is normally distributed or not. (Abror 2022). The normality test used pretest and posttest data to understand students' mathematical concepts. In this study, the normality test was carried out with SPSS using a paired sample T-test with a significant level of 5%.

From the results of the pretest significance value of 0.017, from the Kolmogorov-Smirnov normality test in understanding the concept, it can be concluded that it is not normally distributed because the sig value is less than 0.05. Meanwhile, the posttest significance value is 0.080. This means the posttest significance value is normally distributed because 0.10 is greater than 0.05 (0.017 > 0.080).

Homogeneity Test.

A homogeneity test is a procedure stage to gain confidence that some of the data being analyzed has the same type of variant or does not have the same variant (Polat et al., 2022).

Ho: There is no significant change after or before using the mind-mapping learning strategy model.
Ha: There is a significant difference before and after using the mind mapping learning strategy.

To test the hypothesis above, the results of the homogeneity test are presented in the table below:

Table 1. Homogeneity test

		Sig
Mark	Based on Means	,398

Based on the results of the homogeneity test using the Levene formula, the value based on the mean obtained a significance value of 0.398, so H0 is accepted because the sig value is > 0.005, which means that the population variance is homogeneous.

Table 2. results paired samples test learning outcomes understanding the concept.

Paired Samples Test	
	Sig. (2-tailed)
Posttest Pretest	,000

From the table above, the t-test in the form of a Paired sample test obtains a significance value of 0.000, then Ho is rejected, Ho is rejected, which means there is an increase in learning outcomes because the significance value is <0.005. From the sig value, it can be concluded that students' understanding of concepts has increased quite well by learning the mind mapping model. In research testing the hypothesis on understanding this concept, it was concluded there is a difference between before and after getting the mind mapping learning model strategy. As well as obtaining increased

learning outcomes in understanding concepts compared to before using the mind-mapping learning model strategy.

This study's results support the research results (Harahap & Ghofur, 2020) influencing the mind mapping method in terms of their ability to understand mathematical concepts and their learning motivation to learn and can improve learning outcomes. Nurazizah et al., (2021) also explained that mind mapping can generate creative ideas about a concept as a whole for each individual. This research showed that learning mind mapping can broaden discussions and opinions that are easy to understand conceptually in paper presentations through the representation of symbols, words, lines and arrows. Devita N et al., (2018) conducts mind mapping research to help write essays or assignments related to concept mastery. The study results show that learning from the mind mapping model can influence students to write essay assignments coherently and correctly with an understanding of the concept.

After the researchers carried out learning according to the mind map model for experimental class students and learning without using mind maps for control class students, the results of the analysis proved the hypothesis. Research theory Putri et al., (2019) state that students' ability to understand mathematical concepts taught by mind mapping is greater than that taught by learning without mind mapping. This shows that learning the mind map model influences the ability to understand students' mathematical concepts. This is also in accordance with the results of research by Seda et al., (2019). stated, "Theoretically, the mind map learning model can influence students' ability to understand mathematical concepts, because in this learning, the concepts learned are not directly communicated to students by the teacher, but students acquire concepts from the material studied by creating a structured model for the purpose of creating conditions for memorize and understand the subject more fully it will be easier to understand the subject if the subject has learned a structured model, according to Jerome Bruner's learning theory which holds that learning mathematics is studying facts. Concepts and structures (Fadillah, 2019). Learning mathematics with the mind The mapping model begins with the process of observing and studying the physics concepts of algebraic forms displayed by the teacher. After students understand the material, students are invited to make a mind map of the material they are studying and discuss the problems presented in the question sheet in groups. Then, proceed with presenting the results of the concept maps made in groups. Other students listen and react to what is presented in front of the class. After finishing the presentation, the teacher guides students to conclude the material that has been studied. Based on the steps described above, it can be seen that the mind map learning model focuses more on involving students to actively participate in learning so that students can fully understand the concepts being taught. Study. Learning mind maps affects students' ability to understand mathematical concepts.

The learning process without a mind map is more controlled by the teacher. The teacher explains the material in one direction, and the students listen more. Students work on the exercises given by the teacher by the standard procedures required. Students learn individually, and student engagement is only positive for some students. Unlike the mind map learning model, this model requires students to participate in every learning activity actively. Based on this discussion, it can be concluded that mind map learning with the mind map model is more focused, and students participate more in learning than non-spiritual learning.

Conclusion

So, the research results from the discussion show that the learning model that the author applies (mind_maping) significantly influences the results of understanding mathematical concepts. Because after applying this method, students get more excellent achievement scores than before. Then, it can be concluded that there are differences in the value of learning outcomes before applying the teaching method from the author and after applying the teaching method from the author.

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