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Improvement Results Engineering Student Learning With Learning Model Mind Map

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Abstract
This study aims to improve the learning outcomes of engineering students in applied physics courses using the Mind Mapping learning model at the Muhammadiyah University of Tegal. This study involved the stages of planning, action, observation, and reflection. The results showed an increase from the initial conditions, where 11 students or 39% of the student group reached the level of completion, while 17 students or 61% of students did not achieve completion. In cycle I, there was a significant increase with 15 students or 54% reaching the level of completion, while 13 students or 46% of students did not achieve completion. In cycle II, further improvements were made from cycle I and finally reached a full level of completion with 26 students or 93% of students achieving completion and the remaining 2 students or 7% did not complete. Based on the results of this study, it can be concluded that the application of the Mind Mapping learning model has a significant positive impact on improving student learning outcomes .

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1. INTRODUCTION

Physics applied is the application of the laws of physics that are useful for solving scientific or engineering problems . These applications are usually considered as a bridge between physics and engineering . Another definition of physics Applied that is war of ideas to explain phenomena observed nature and formulate the idea Then applied into the life . So physics cannot be separated from the learning process to obtain systematic knowledge about nature so that nature / environment can be studied in life everyday . About Learning something new is a process of change behavior in demand individual blessing experience and practice . The success of student learning can be seen from several indicators, namely being active in learning, mastering the material, answering questions correctly and being able to work on the right questions. This series is very important in the learning process, so if one or two of these components are missing, optimal learning goals will not be achieved. The task of an educator in the learning process is to choose the right learning model or method to be effective in delivering learning materials and learning objectives. One way to deliver learning is through the use of the mind map method (Prastyo, 2016).

Learning is an effort to change knowledge, attitudes, and skills to learn something from not knowing to knowing (Fauziah, 2017). In addition, the learning process must have positive interactions between educators and students, the position of students is not only to receive knowledge, but students must also be able to build their own knowledge while learning. Learning is a process of maturing students, this goal takes place through active interaction between students and educators as implementers of the learning process. Learning requires mental involvement and active work of students. So it is clear that learning activities are not unilateral activities of educators or students. The success of learning is highly dependent on the overall involvement of

students under the guidance of educators. Learning activities will take place optimally if students as students follow the entire series of activities in their entirety and actively formulate each finding.

Student success in learning can be influenced by factors from within the individual or outside the individual (Siagian, 2012). Many things affect the physics teaching and learning process at university, both from outside the student or the environment and from within the student themselves. Unpreparedness of external and internal factors will provide obstacles in the student learning process which then has an impact on physics learning outcomes. It is important to note that student learning outcomes are not only focused on mastery of knowledge, but also on mastery of skills that have an impact on changes in student behavior and attitudes. This mastery cannot be achieved instantly, but through a continuous learning process and learning experiences that include theoretical and practical aspects. Learning outcomes are changes in student behavior due to learning (Purwanto, 2011:46). Changes in behavior are caused because he achieves completeness of a number of materials given in the learning process. the conclusion is that learning outcomes can be in the form of changes in cognitive, affective and psychomotor aspects.

Characteristics of changes in learning explanations according to Slameto (in Fathurrohman and Sutikno, 2010) include: (1) Changes that occur directly, at least aware that knowledge increases, attitudes change, skills increase. (2) Changes in learning are continuous and functional. Learning is not a static process because it continues to increase gradually and each learning outcome has practical meaning and use. (3) Learning changes are positive and active. Learning always directs better changes. (4) Changes in learning have a goal, namely Before learning, a person should be aware of what will change in him through learning. (5) Changes group all aspects of behavior, not certain parts partially. From the opinion above, it can be concluded that learning outcomes are the ability of skills, attitudes and skills obtained by students after receiving an explanation given by the educator so that they can construct that knowledge in everyday life. Learning outcomes according to Susanto (2014) are changes that occur in students, both concerning cognitive, affective, and psychomotor aspects as a result of learning activities. Deni and Permasih (2015) factors that influence learning outcomes in the teaching and learning process can be classified into two, namely internal factors, non-intellectual factors, and external factors, as well as motivational factors. (1) Internal factors are factors that come from within students that can influence student learning outcomes, including: (a) Physiological conditions, or individual physical conditions, both innate and acquired by seeing, hearing, body structure, physical disabilities, and so on. (b) Psychological factors, both innate and hereditary, which include Intellectual factors, namely Potential factors, namely intelligence and talent, and Actual factors, namely real skills and achievements. (2) Non-intellectual factors, namely certain personality components such as interests, habits, motivation, needs, self-concept, self-adjustment, emotional, and so on. And (c) Maturity factors, both physical and psychological. (3) External factors are factors that originate from outside the student, consisting of social factors, cultural factors, physical environmental factors, and spiritual or religious environmental factors.

The factors mentioned above interact with each other both directly and indirectly in influencing student learning outcomes. In addition to the factors mentioned above, there are other influencing factors, namely motivation factors to achieve achievement, intelligence factors, and anxiety. One of the factors that comes from within the student (internal factors) is learning motivation. Motivation according to Asrori (2009:183) "motivation is an urge that arises from within a person, consciously or unconsciously, to carry out an action with a certain purpose". Meanwhile, Sumiati and Asra (2008) state that "learning motivation is something that encourages students to behave which directly causes the emergence of behavior in learning". The learning model is a plan or model used as a guideline for planning learning in the classroom or in the curriculum. The use of media must also be considered so that students do not get bored and to arouse student interest in the learning process. Failure to achieve learning objectives may be caused by the use of methods that are not in sync with the objectives. Therefore, educators must

create a learning situation where interesting activities use the right model and stimulate student creativity.

Improper implementation of learning methods in the classroom can result in a less than optimal learning process. Educators need to implement appropriate learning methods as a strategy to increase learning activities among students in applied physics courses so that the achievement of the results obtained is maximized. One of them is the Mind Mapping learning model . This model stimulates students' minds to create ideas and quickly record the contents of applied physics learning. Mind Mapping emphasizes the use of a combination of branching images and shapes that can be presented in an interesting and simple way in the learning process. The material presented in this way is easier for students to understand and makes it easier to understand applied physics material.

The Mind Mapping model is taught as a way to encourage students' learning creativity. Darusman (2014), Mind Mapping is a learning approach designed to help students develop their ability to summarize the main ideas of a concept through the use of easy-to-understand mind maps. The use of the Mind Mapping model in learning activities in applied physics courses aims to arouse students' interest and attention to applied physics courses and help students identify the central idea of the text so that they can better understand the content they read. In this case, the application of the Mind Mapping model can be considered as an alternative way to improve students' learning abilities, especially their understanding of applied physics material.

Product assessment is conducted in class and includes an assessment of students' skills in the process of creating concept map products and the quality of students' work. The product that will be produced by students is a concept map model of dynamic electricity material. In the process of creating this mind mapping, the ideas or concepts expressed by students are expected to be able to foster their original abilities. The development of each idea and concept they produce will foster elaboration skills that will build a new concept, which will make it easier for them to understand and master the course material. So that when students are asked to appear in front of the class, they are already able to express their ideas and concepts fluently.

Mind Mapping is one of the learning methods where students can develop their creativity in generating ideas or thoughts, as well as recording brief things and not all of them are learned. This method uses lines that are connected from one to another and form a combination of meaningful patterns, which can increase student interest and innovation in the learning process, so that the material presented can be more easily responded to. Mind Mapping is very helpful for students in understanding a concept or dynamic electricity material as a whole. This happens because when making Mind Mapping they are 'forced' to connect new concepts with the knowledge they already have. The use of Mind Mapping has several additional benefits, namely: (1) The main theme can be easily defined briefly because it is placed in the middle of the mind map. (2) The level of importance of information can be better identified. More important information will be placed close to the main idea or main idea. The relationship between each piece of information will be easier to recognize, understand, and remember. New information obtained can be easily combined into the existing mind mapping structure without damaging the overall structure. This makes it easier to remember information. Mind Mapping speeds up and simplifies the recording process because it only uses keywords. Based on the background above, it is necessary to conduct research on improving the learning outcomes of engineering students in applied physics courses using the mind mapping learning model.

2. RESEARCH METHODS

The methods used in this research are: method descriptive quantitative . According to Hermawan (2019), the method descriptive is research method that collects information by testing research questions related to conditions and events latest . In addition, this research method was carried out with the aim of main to create a systematic , accurate and concrete description of something circumstances related to the problem under study . Ideal learning is learning centered on student learning activities. The existence of high student learning activities expected to

improve student learning outcomes. The subjects of this study were engineering students in the 2023/2024 academic year in the applied physics course at the University of Muhammadiyah Tegal, all of whom totaling 28 students consisting of 16 male students and 12 female students.

The mind mapping process begins with students discussing in groups to work on applied physics problems in the chapter on dynamic electricity, then they describe their thoughts related to dynamic electricity in a concept map. After that, students collectively present the results of their group work in front of the class and are assessed by educators. Giving assignments to create products can improve students' sense of responsibility when working in groups. In this study, product assessment will produce concept map props made with Canva that help students visualize concepts of dynamic electricity that are difficult for them, such as abstract objects.

Data collection techniques through observation and evaluation of student performance. Observation techniques were chosen because the problems faced were still within the scope of the university, therefore a quick follow-up was carried out. Observation sheets were used to assess student learning activities. According to Wina Sanjaya (2011) observation instruments in classroom action research are guidelines for observers to observe things that will be observed. This study uses an observation sheet in the form of a rating scale, which is an observation sheet containing guidelines used in observations including a list of all aspects to be observed so that observers only need to provide a sign of the presence or absence of the observed aspects. Problems in the classroom that are known when the learning process begins, which are formed into several groups and then action is taken to achieve the best results.

Indicators to measure creativity include students' critical thinking skills and student learning outcomes to propose different solutions from other groups in developing ideas based on their own thoughts or each group. When the first cycle was carried out, namely by implementing the Mind Mapping model, educators got quite satisfactory results from 28 students who understood the dynamic electricity material, namely 13 people and the rest were still incomplete. When the second cycle was carried out, the results obtained were very satisfactory, namely initially 13 students increased to 26 students who understood the material explained and the remaining 2 students did not understand. In this case, Mind Mapping has made students have the potential for rapid changes in mindset.

Table 1.1 Student Learning Outcome Criteria Table

Frequency (F)	Information
90 – 100	Completed
70 – 80	Completed
60 – 70	Not Completed
50 – 60	Not Completed
Amount	

3. RESEARCH RESULTS AND DISCUSSION

Increasing activity and learning outcomes in the Human Sense Organs material using the *Mind Mapping* method for engineering students in the second semester of the Muhammadiyah University of Tegal in the 2023/2024 academic year was carried out in 2 cycles preceded by pre-cycle or preliminary activities in order to examine the problems that occur in the Applied Physics course. In the preliminary activities, learning was carried out using only one method, namely conventional lectures, this resulted in student involvement in the class only as listeners. This incident had an impact on the low activity and learning outcomes of students, the average pre-cycle student activity was 3.9 % with the average student learning outcomes of students in the Applied Physics course being 63.2 while in classical student completion it can be said that the

class category with a low learning percentage is 75 %. students who have completed learning in this learning activity are 1 1 students while 17 other students have not completed learning. From the low activity and learning outcomes in the Pre-cycle activities, this is the reason educators as researchers use the *Mind Mapping method* and image media in their classroom action research. The results of the implementation of Cycle I have proven to increase student activity for the Applied Physics course. Learning activities that can be observed in cycle I with an average percentage of 79% are indicators of understanding questions given by 19 people amounting to 76%, completing assignments from educators done by 20 people amounting to 82%, collaborating in discussions and group work done by 18 people amounting to 74%, completing evaluation questions on time and correctly done by 24 people amounting to 84%.

Table 1 Pre-Cycle Student Learning Outcomes

Mark	Number of students	Percentage (%)	Information
90 – 100	-	-	Completed
70 – 80	11	61	Completed
60 – 70	17	39	Not Completed
50 – 60	-	-	Not Completed
Amount	28	100	

The learning outcomes carried out in cycle I also increased with an average value of 69 where in pre-cycle 6 3.2 there was an increase of 5.8 . The percentage of learning completion also increased from the pre-cycle from 39% to 55 % there was an increase of 16 %. The increase that occurred was quite good , efforts to improve learning outcomes were continued in cycle II, this cycle was carried out based on the results of reflection in cycle I, where in cycle I the student activities that emerged were felt to need to be improved again.

Table 2. Learning outcomes of students in Cycle I

Mark	Number of students	Percentage (%)	Information
90 – 100	-	-	Completed
70 – 80	13	45	Completed
60 – 70	15	55	Not Completed
50 – 60	-	-	Not Completed
Amount	28	100	

Cycle II is carried out by providing guidance, approaches for students who have not yet achieved the expected activities and learning outcomes. From the process of cycle II, the results of student learning activities are obtained with an average percentage. The implementation of cycle II is based on the consideration that there are still 13 students who have not completed their studies, so educators make improvements again.

Table 3. Student Learning Outcomes Cycle II

Mark	Number of students	Percentage (%)	Information
90 – 100	6	21	Completed
70 – 80	20	72	Completed
60 – 70	2	7	Not Completed
50 – 60	-	-	Not Completed
Amount	28	100	

In cycle II, student activity increased again with an average percentage of 96%, namely from the indicators of understanding the questions given by 25 students amounting to 95%, completing assignments from educators carried out by 26 people amounting to 97%, collaborating in discussions and group work carried out by 25 people amounting to 95%, completing evaluation questions . on time and correctly done by 26 people amounting to 97%. The learning outcomes obtained by students in cycle II increased reaching an average of 79 occurred improvement of 5.8 with 26 students completing it , it can be said that 97% have completed it happen improvement by 42% of Cycle I. From the various improvements in both activities and learning outcomes, this is classified as very good because students quickly grasp the material using the *Mind Mapping Method* .

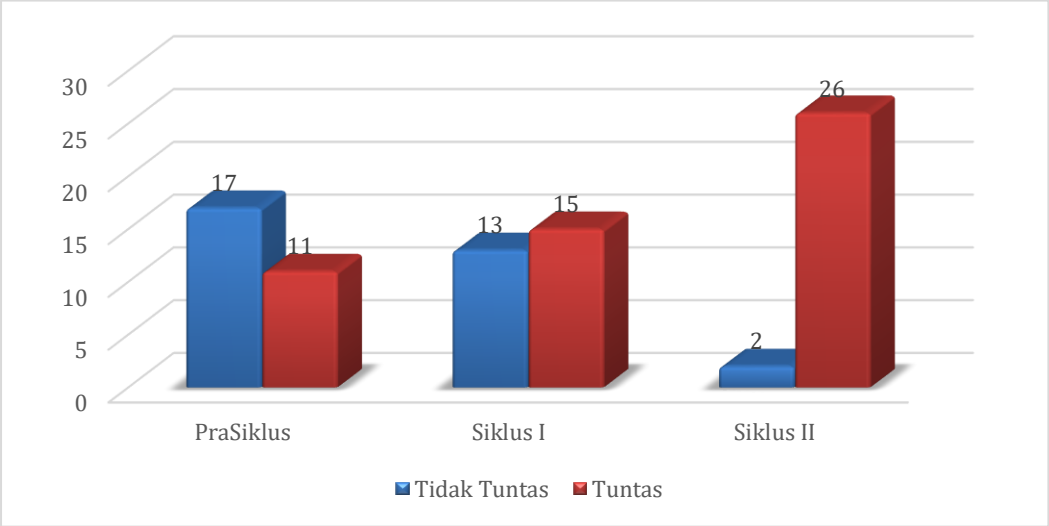

Figure 1 Comparison of Learning Outcomes of Pre - Cycle , Cycle I and Cycle II

4. CONCLUSION

Learning using the *Mind Mapping method* in Applied Physics courses shows an increase in student learning outcomes, and is able to increase student interest in learning. Student learning outcomes from the Pre-cycle in cycle I have increased, namely from 28 grade IV students there are 11 students who have achieved learning completeness ≥ 70, while the rest are below 70, and classical absorption is still incomplete, which is still 55%. Student learning outcomes in cycle II based on the evaluation results show a very satisfactory increase, namely from 28 even semester engineering students, 26 students have achieved learning completeness ≥ 70, while the rest are 2 students who are still below 70 and classical absorption has reached completeness, which is 93%.

Based on the conclusions obtained, it can be stated that the use of teaching aids in identifying the concepts of dynamic electricity in the Applied Physics course can improve the learning outcomes of even semester engineering students at Muha University, so educators

provide several follow-up suggestions, namely: (1) To strengthen the material being studied, educators should use image media or teaching aids in the learning process so that students do not seem abstract and can more easily understand the material being presented. (2) educators must be able to determine and apply the right and appropriate learning model to discuss a material in learning, so that students can easily receive and absorb the material being presented. (3) To clarify the material being studied, educators should use powerpoint media or teaching aids in the learning process so that students do not seem monotonous and can more easily understand the material being presented. (4) educators must be selective in selecting and using teaching aids that are appropriate to the learning material. (5) educators must be able to choose and apply the right, accurate, simple and appropriate media to discuss the subject matter so that students can easily receive and absorb the subject matter being presented. And for schools, namely: (1) Schools should encourage and facilitate the implementation of various new learning strategies and provide the visual media (teaching aids) needed to support the learning process.

Then for the author, namely: (1) Should make thorough preparations before conducting research so that the research process runs smoothly and the results achieved are more optimal. (2) Make a selection of image media (teaching aids) that are appropriate to the learning material. This research can also be input for other researchers to conduct further research with different topics, both in thematic learning or other subjects.

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