



## Improved Understanding of Student's Learning Concept and Motivation in Inclined Plane Material by PhET Simulation

Ahmad Minanur Rohim<sup>1,2✉</sup>, Ellianawati<sup>1</sup>

<sup>1</sup>Postgraduate Universitas Negeri Semarang, Semarang, Indonesia

<sup>2</sup>MTs NU I'anatuth-Thullab Mutih Wedung, Demak, Indonesia

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### Abstract

This research is aimed to improve the understanding of the concept and the motivation of learning physics students on inclined plane material class of Eighth grade of MTs NU I'anatuth-Thullab Mutih Kulon Demak School Year of 2020/2021. This study conducted at the eighth grade of students as the subject consisting of 29 students. This class action research was conducted as much as one cycle consisting of three meetings. The results of pretest data were given moments before the implementation of virtual laboratory media. Based on PhET (Physics Education Technology) simulation, the researcher got different results with the posttest given after the implementation of learning using virtual laboratory media by using PhET. The results of the pretest reached 25% on understanding of student concepts, and there was increased after using the media through posttest which is 75%. There was increased on percentage through understanding of student concepts in inclined plane materials using virtual laboratory media by 50%, the percentage of student learning motivation increased on inclined plane material by 28%, and in the data after using virtual laboratory media got a good category at 76%.

✉Correspondence:

MTs NU I'anatuth-Thullab Mutih Wedung Demak Peguron No.

1-2 Mutih Kulon, Wedung, Demak 59554, Indonesia

e-mail: [nurminan3@gmail.com](mailto:nurminan3@gmail.com)

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## INTRODUCTION

Educational facilities are an integral component of the implementation of education at all types and levels of education. Without being supported by adequate facilities, it is difficult to expect the implementation of education that produces quality and competitive human resources. Lestari & Suryani (2019) revealed that the use of media would increase the student's learning motivation, so the student's attention to learning materials can be improved by the understanding of student concepts. Through the media learners can be interested in physics learning. Therefore, it can happen the understanding of concepts for learners during the teaching and learning process.

Learning with virtual laboratories and experimental methods are some of the learning methods that can increase the motivation and activity of learners. Experimental method is one of the suitable methods used to increase the motivation and activity of learners in learning (Sari, 2019). Practicum can be done using computer media to overcome obstacles in practicum activities in the laboratory. Learning using a computer can give an edge where learners can directly interact (virtually) with the material being studied. One example is PhET simulation (Physics Education Technology). PhET simulation is a simulation created by the University of Colorado (Yusuf & Widyaningsih, 2019).

There are several methods of improvement that have been done elsewhere, namely based on previous research that has been done by Marlinda et al. (2016), concluding that learning with real experiments and PhET simulations has both stimulated the knowledge of quality and understanding of learners rather than traditional learning. Furthermore, the research conducted by Darmawan & Dwijayati (2019). The results showed that learning using PhET simulation was able to make students motivated to increase their activities, students were interested and passionate on practicing so that they could complete the learning results and could improve the ability to think critically children. Furthermore, the research conducted by Husnaini & Chen (2019) showed that learning with virtual laboratories improve the learning activities of learners, while research conducted by Hariyani (2019) showed that the application of experimental methods in science subjects could improve learning

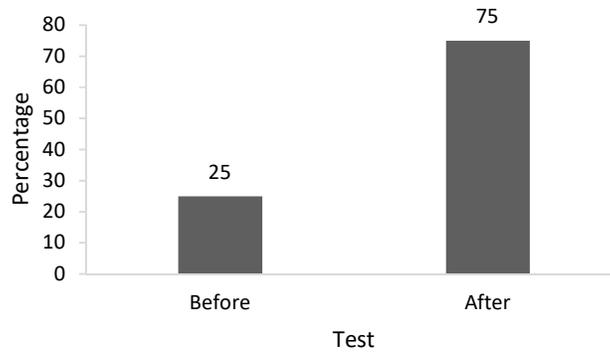
outcomes and students were more interested and motivated in the learning process. The learners could easily understand the concepts of science. Furthermore, the research conducted by Anggreani (2015) concluded that environmentally based experiment methods could improve the critical thinking ability of children.

## METHOD

The research method used in this study was experimental method with 29 students as the subject of VIII-class of MTs NU I'natuth-Thullab Mutih Kulon Demak School Year of 2020/2021. Instruments in this study was used the form of observation sheets of students' concept understanding skills and creativity. The method of collecting data used essay tests in the form of pretest and posttest questions, as well as the provision of student response questionnaires. While data analysis used a percentage formula of each aspect, to find out how much understanding of the concepts and motivations of students in learning.

## RESULTS AND DISCUSSION

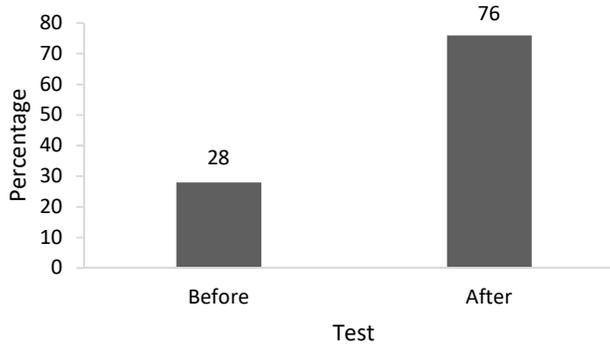
The learning was conducted in grade VIII inclined plane material conducted as much as one cycle consisting of three meetings. The result of pretest data was given moments before the implementation of virtual laboratory media. Based on PhET simulation, the researcher got different results with the posttest given after the implementation of learning using virtual laboratory media by using PhET. PhET-based virtual laboratory media was able to properly visualize the concept of inclined plane material but, its difficult to understand when the learning process was presented by the lecture method or directly to students. Indirectly, it can be affect the factors in students, one of that is the understanding of students' concepts. The student's improved on understanding of the student concepts in the learning process can be seen in Figure 1. The average percentage of students' concept understanding before using media through pretest reached 25%, and increased after using the media through posttest which is 75%. Increased percentage of students' concept understanding on inclined plane material using virtual laboratory media by 50%.



**Figure 1.** Improved Understanding of Student Concepts

The percentage of learning motivation that initially students were still lazy to learn physics obtained results on the inclined plane material by 28%, after using the PhET-based virtual laboratory media got an increase in motivation to learn physics at a percentage of 76% with a good category. The

increase in the percentage can be seen from the increase in enthusiasm and student learning outcomes in learning physics on inclined planes. The increase in students' learning motivation can be seen in Figure 2.



**Figure 2.** Improved Student Learning Motivation

Learning using virtual media is proven to be able to improve students thinking skills because it can describe and explain abstract concepts and present more complete physical processes. The use of virtual media in conducting experiments or practicums makes it easier for students to understand the concept of vibration and waves through the description of abstract concepts. Figure 2 showed the motivation of students in following the learning process. As well as virtual laboratory media could increase the students' learning motivation. Student motivation gave affect what and how students learn, when students learn and consider to have been more skilled, then students will be motivated to continue their learning (Herawati, 2017).

Learning will be more meaningful if the learning carried out by students is actively learning to find self-concept with the guidance of the teacher. Research conducted by Cuadros et al. (2015) there was a significant increase in science process skills in the experimental class compared to the control class

because the use of PhET software in implementing this learning made students more effective and efficient in learning activities. The use of PhET software in learning will result in students' independence in learning to understand concepts and students can repeat the learning that is done virtually with PhET software, because the software can be accessed via the internet without being bound by time and place.

PhET Simulation is a learning medium through a computer or smartphone device that is connected to the internet, students can search according to their needs. Through PhET media, students' scientific process skills can be improved by following all practical experimental procedures virtually. By using PhET simulation students can carry out activities to obtain data and facts like in a real laboratory, so that with these data and facts students can draw conclusions about physics concepts. PhET media is a virtual laboratory device that can display abstract concepts that cannot be displayed on real laboratory equipment. In

mastering concepts, students can make predictions, explain and understand concepts better than students who practice using real tools, so that through PhET simulations, science process skills can be improved through virtual practicum activities (Haryadi & Pujiastuti, 2020).

## CONCLUSION

Understanding the concept and motivation of learning physics grade VIII B MTs NU I'anatuth-Thullab Mutih Kulon Demak School Year 2020/2021 can be improved by using virtual laboratory learning media through PhET. The achievement of the specified success indicators was proof that the understanding of students' concepts and learning motivations to physics can be improved by usings of virtual laboratory learning media based on PhET. It appears that the percentage of students' concept understanding increased by 50% and the percentage of student motivation polls increased by 28% and 76% of students were in the good category.

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