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The Relationship between Students' Learning Motivation and Learning Outcomes through Guided Discovery Model Assisted Video and Interactive Simulation

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Abstract – *This study aims to (1) implement the Guided Discovery Learning Model Assisted Video and Interactive Simulation (GDM-VIS) in physics learning on the concept of statistical fluids; (2) identify the relationship between students' motivation and learning outcomes. This research is a pre-experimental research employing One Shoot Case Study design. The learning model and instruments that have been developed were used in a class of 38 students before the distance learning was applied. The data of learning motivation were obtained through motivation questionnaire, while learning outcome data were obtained by means of a conceptual understanding test instrument. To see whether there is a correlation between students' motivation and learning outcomes, the Bivariate Pearson analysis with SPSS was used. Based on the results of the analysis, the value obtained based on the value or relationship (R) was 0.613. Furthermore, the coefficient of determination (R Square) was 0.375, meaning that the effect of learning motivation with the application of GDM-VIS toward concept understanding is 37.5%. Based on the Output Coefficients, decision making in a simple regression test, and based on the significance value of the Coefficients table, it was obtained that the significance value was 0.00 <0.05, which means that the application of the Guided Discovery Learning Model Assisted with Video and Interactive Simulation affects the students' concept understanding. This study implies that the learning using simulations with systematic stages can improve the quality of learning.*

Keywords: *GDM-VIS, Learning Motivation, Understanding Concepts*

I. INTRODUCTION

The use of appropriate media and learning methods is expected to improve the quality of physics learning. The combination of good learning media presented in appropriate learning methods makes students understand concepts related to physics easily. Students expect physics to be taught in a way that is not monotonous, not boring and more interesting and meaningful so that they can improve their mastery of concepts and the knowledge they have can be stored longer in their memory (Ahmad & Bunga, 2015). Therefore, the role of the teachers or educators is very important in analyzing learning needs and selecting learning models and methods that can increase the motivation of students in learning physics so that mastery of physics concepts and students' activity can be improved (Anggraini et al., 2019). Professional teachers are not only able to teach and transfer knowledge in the classroom, but also must know whether the learning process is going well or not in order that the learning objectives can be achieved optimally or not.

Natural science, especially physics, does not only consist of facts, concepts and theories that can be memorized, but also involves activities or processes using scientific thoughts and attitudes in studying natural phenomena that cannot be explained (Saputro et al., 2015). In other words, teachers are expected to be able to direct students to carry out scientific activities either in the laboratory or by using other devices. Physics as a science consists of products and processes. Physics products consist of facts, concepts, principles, procedures, theories, laws and postulates. All of these are products obtained through a series of scientific discovery processes through scientific methods which are based on scientific attitudes. Therefore, learning physics is not only done in class (theoretical learning) but should also be done with laboratory activities so that students can see the real concepts of physics. However, not all schools can carry out laboratory activities. This is because laboratory facilities and equipment are not available (Swandi et al., 2015).

The problem of the availability of laboratory facilities in schools can be avoided by using simulation technology. Currently, the availability of computer simulations for learning is very large and we can find it on the internet. However, not all simulations can be used directly in learning. This simulation needs to be re-developed by the teacher so that it is in accordance with the prevailing concepts and curriculum. The teacher also needs to develop a learning model that is suitable for the simulation so that it can be used independently by students. Thus, it is hoped that learning with teaching materials based on simulation technology can make students more active. One of the teaching materials that meet these criteria is called an interactive simulation based on active learning (Swandi et al., 2020). The main purpose of this type of simulation is to create a learning format that involves students in studying physics and matters related to technology more deeply so that they can gain a more thorough understanding of the content being studied, both conceptually and analytically (Amin et al., 2019; Palloan & Swandi, 2019). The use of interactive simulations integrates lectures, problem solving, and direct laboratory activities with technology. By using interactive simulation with appropriate learning model method, it is expected that it will have an impact on the quality of learning physics (Domin, 2015; Hassan et al., 2018; Hassan et al., 2015; Shieh, 2010; 2012).

One method oriented student-centered and found to be effective in improving students' understanding of physics concepts is the guided discovery method. The guided discovery method is a learning method that requires active student interaction in the teaching and learning process (Arafah, 2020; Sudirman et al., 2020). One of the learning models in the 2013 curriculum that can be used is the Guided Discovery model. In the Guided Discovery Model, the teacher provides opportunities for students to become problem solvers for the problems faced independently, so that the knowledge obtained by students becomes more personal, easy to remember and lasts for a long time (Juhri, 2020; Putrayasa et al., 2014; Widiana et al., 2014). Learning with the Guided Discovery Model can be effective if the teacher prepares the appropriate media and learning instruments.

In applying the Guided Discovery Model, teachers can use various methods of learning such as experimental methods and demonstration methods to show real physics concepts in accordance with everyday life (Nurlina, 2020). However, there are still many teachers and schools who still experience problems in carrying out the experimental process such as shortages of materials, equipment, laboratory space and various other obstacles (Amin et al., 2016; Swandi et al., 2020). Various solutions have been introduced by several previous studies to overcome this problem, namely the use of various technologies to demonstrate or demonstrate the concept of physics. As has been done (Ahmad & Bunga, 2015), which uses interactive teaching materials based on computer simulations that can improve high school student learning outcomes. There is also research conducted by several researchers which uses computer simulations through the Excell application on magnetic electrical materials which can improve students' conceptual understanding (Gunawan et al., 2015; Palloan & Swandi, 2019). As well as research conducted by Irfan who uses a virtual laboratory to see how the activities and perceptions of students.

With the use of interactive simulations with the experimental method is expected to have an impact on the motivation of students. With high motivation, it will have a positive impact on mastering the concept of physics. Based on this, the researchers implemented the Guided Discovery Model Assisted Video and Interactive Simulation (GDM-VIS) learning which is expected to increase students' motivation and learning outcomes. The formulation of the problem in this study was to determine how the categories of students 'motivation to learn due to the application of GDM-VIS in physics learning on Static Fluid concept and the categories of students' conceptual understanding. Furthermore, the researcher also wanted to find out whether there was a relationship between motivation caused by the use of GDM-VIS and students' understanding of concepts.

II. METHODS

This type of research is a pre-experimental research with a trial design using One Shoot Case Design. The research was conducted at SMAN 10 Makassar in the academic year of 2019/2020 before distance learning due to the spread of the corona virus was implemented. The following is the research design used.

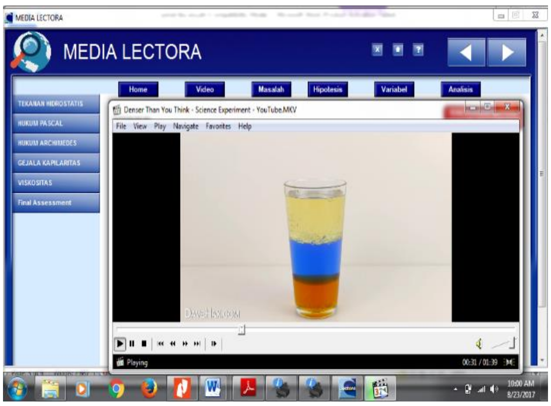
Table 1. Research Design

X O	X :	Application of GDM-VIS in physics learning
	O :	Results (Motivation and Concept Understanding)

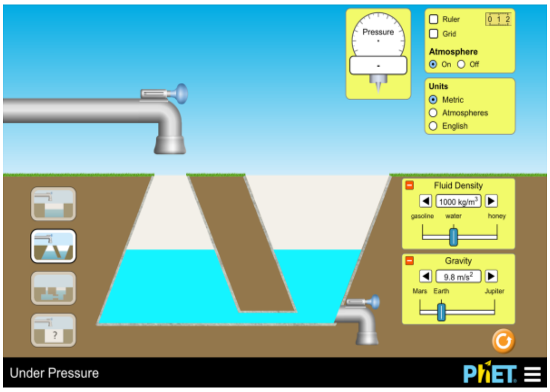
In this design, there was 1 class as a sample taken from the population of class X. Physics learning with GDM-VIS was implemented on the concept of static fluids for 2 meetings. The GDM-VIS application is adapted from the guided discovery learning syntax. After the learning was complete, the learning motivation data were collected through a learning motivation questionnaire and understanding the concept of physics through a multiple-choice concept comprehension test. The percentage of motivation and conceptual understanding were then analyzed using Bivariate Pearson correlation analysis with SPSS (Charli et al., 2019; Lestari, 2011; Syah et al., 2019) to determine the relationship between learning motivation and students' conceptual understanding after being taught using the Guided Discovery Model Integrated Video and Interactive Simulation.

III. RESULTS AND DISCUSSION

The media used has gone through a development process containing experimental videos adapted from YouTube and interactive simulations from PheT and other sources. Furthermore, the simulation developed using Lectora contains: (1) Learning Objectives, (2) Material Summary, (3) simulations taken from www.youtube.com and Phet Interactive Simulations, (3) Instructions for formulating problems, hypotheses, analysis and conclusions. The lesson plans, books and students' worksheets can also be downloaded directly by clicking the download menu on the initial display of computer learning media, for example, book display and worksheets. The following is a video and interactive simulation on the concept of static fluids:



(a)



(b)

Figure 1. (a) video display; (b) interactive simulation

The learning motivation data and students' understanding of the concept were obtained through a learning motivation questionnaire that was filled out via google form and then to gain the data on the students' concept understanding, a concept understanding test consisting of 15 multiple choice questions was used. The percentage of learning motivation and the value of understanding the concepts of each student are as follows.

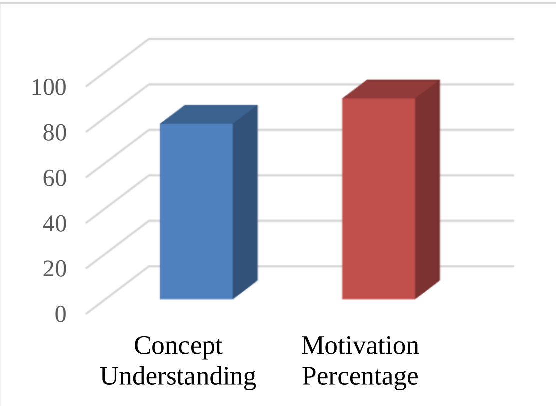


Figure 2. Average of learning motivation and concepts understanding percentage

From the table above, the average percentage of students' learning motivation using the Guided Discovery Model Integrated Video and Interactive Simulation is at a value of 88.33 which is categorized as *very high*. Meanwhile, the average percentage of students' conceptual understanding was 77.02 which was in the *high* category. This shows that there is a positive impact on the implementation of learning using GDM-VIS on students' motivation and understanding of concepts. To find out whether there is a relationship between learning motivation and student learning outcomes, then tested with Pearson Bivariate correlation analysis with SPSS, the results are as in the Table 2.

Table 2. Output Model Summary From SPSS

		Motivation	Concept Understanding
Motivation	Pearson Correlation	1	.613**
	Sig. (2-tailed)		.000
	N	38	38
Concept Understanding	Pearson Correlation	.613**	1
	Sig. (2-tailed)	.000	
	N	38	38

**. Correlation is significant at the 0.01 level (2-tailed).

Based on the Table 2, it can be explained that the value of the correlation or relationship (R) is 0.613. From this output, the coefficient of determination (R Square) is 0.375, which explains that the effect of the independent variable, namely learning motivation, on the dependent variable, namely understanding the concept, is 37.5%. Based on the Output Coefficients, decision making in a simple regression test, based on the significance value of the Coefficients table, the significance value was 0.00 <0.05, which means that Ho is rejected, and Ha is accepted. Therefore, it can be concluded that the learning motivation variable with the application of the Guided Discovery Model Integrated Video and Interactive Simulation influences the variable understanding of the concept.

The results of the research show that from the hypothesis testing, the coefficient value of learning motivation on the results of understanding the concept is positive. The influence of correlation is 37.5%. Although only 37.5% of the results of this study are appropriate, because students' conceptual understanding is not only influenced by learning motivation factors due to the media and learning methods used by the teacher. Learning motivation is divided into two, namely internal motivation and external motivation. Internal motivation is a factor that exists within an individual that encourages students to learn. Meanwhile, external motivation is a factor that is outside the individual, such as the ability of the teacher, teacher learning methods and the learning media used. Motivation to learn from external factors is one of the success factors of students. Based on the results of the analysis, the value of the calculated rs = 0.613> rs table = 0.375 with a significance level of 0.000 <0.05, which explains that learning motivation with the application of guided discovery learning models assisted by video and interactive simulation media has a positive and significant relationship to conceptual understanding. learners on static fluid material.

The concept of learning on static fluid material with a guided discovery model supported by video and interactive simulations has advantages and disadvantages. The advantage of this model is that it helps students remember and use physics formulas because students find the formula themselves according to the teacher's direction and worksheets. Meanwhile, interactive simulations and videos can be used as interactive, effective and efficient learning media both outside school hours and when teaching and learning activities take place. Students can review the material that has been delivered by the teacher through the media, while the teacher is required to always develop the material and questions so that students do not get bored to always use this media. With these conditions, students will further strengthen their mastery of learning material and students become more active.

The results of this study are in line with Bruner's opinion that the Discovery Learning Model is a model suitable for the active search for knowledge by humans, and by itself provides the best results (Hanafi, 2016). In static fluid, students still often experience misconceptions so they need to be actively involved in learning to reduce these misconception (Suryadi et al., 2015). Teachers should encourage students to solve the problems they face or solve them in their groups, not teach them the answers to the problems they face. Teachers should encourage students to solve the problems they face or solve them themselves in their groups, not teach them the answers to the problems they face. Teachers in carrying out learning should not be as good as providing tactical solutions, this helps direct students' thinking by making questions, giving students options to be able to construct their thoughts and finally can find solutions for themselves the problem.

The Discovery Learning model emphasizes the discovery of previously unknown concepts or principles. Students are given a stimulus in the form of a phenomenon or problem that is deliberately engineered by the teacher to improve their creative thinking skills in finding solutions to the problems posed (Ridlo, 2018; Taber, 2013). The presentation of teaching materials in the Discovery Learning model directs students to carry out various activities such as formulating problems, identifying problems, collecting data, analyzing data and making conclusions. The way of presenting these teaching materials makes learning more meaningful, because students can find concepts by constructing the knowledge they want to know themselves. Knowledge gained through learning discovery can improve reasoning and independent thinking skills and improve cognitive skills to find and solve problems (Hakim et al., 2018; Yanto et al., 2019).

Students' learning motivation does not only come from external factors such as the use of learning models and learning media but many other influencing factors such as parental support, school or campus environmental factors, organizational factors and the character of students (Kim & Frick, 2011; Lee et al., 2019). Therefore, to achieve maximum learning outcomes, teachers need to pay attention to these factors, including how to integrate motivation from internal and external factors so that they have a positive and large impact on the quality of learning physics.

IV. CONCLUSION AND SUGGESTION

Based on the results of data analysis and discussion, it can be concluded that the learning motivation of students with the application of the Guided Discovery Model Assisted by Video and Interactive Simulation (GDM-VIS) has a positive relationship with students' conceptual understanding. Although the percentage of influence of motivation with GDM-VIS on concept understanding is only around 37.5%, this can be a reference for further research to increase the percentage by considering other factors both from an internal and external perspective.

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