

IMPLEMENTATION OF GUIDED INQUIRY LEARNING MODEL USING PhET SIMULATION ON
MOMENTUM AND IMPULS TO IMPROVE STUDENT LEARNING OUTCOMES OF SMK
INFORMATIKA AL QOLAM LABANG

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Abstract

This research aims to analyze student's leaning outcomes after applied guided inquiry learning model using *PhET Simulation*. Type of this research is pre-experimental with one group pretest-posttest design, and it uses one class as experiment and one class as replication. Samples are students of class XI-1 and XI-2 Woman in SMK Informatika Al Qolam Labang, which had been tested normality and homogeneity tests, all two classes are distributed normally and homogeneous. Variables of this research include independent variable is giving a treatment guided inquiry learning model, dependent variable is student learning outcomes, implementation of learning, and students' response, while control variable is teacher, allocation time, momentum and impuls. It is known that proposed hypothesis, H_0 is non significant gain, and H_1 is significant gain. Based on t-test analysis, it is found that $t_{\text{calculation}} \geq t_{\text{tabel}}$, therefore H_0 is rejected and H_1 is accepted with a 5 % error level. This result shows student learning outcomes in all two classes are XI-1 and XI-2 Woman have increased significantly with *n-gain* score 0,68 and 0,67. Skill's average and attitudes' average score in all two classes belong good category.

Keywords: Guided Inquiry Learning Model, Student Learning Outcomes, Momentum and Impuls, PhET Simulation.

INTRODUCTION

In globalizationera of knowledge and technology develop rapidly, especially in the field of information and communication. New technology in a short time sprang up with more sophisticated innovations. It is triggered by new discoveries and competition in a very tight globalization era. This fierce competition also affects all aspects of life, not necessarily the field of education.

The learning process in the educational unit is organized interactively, inspiration, fun, challenging, motivate the participants to actively participate, and provide sufficient space for initiative, creativity, and independence according to the talent, interest, and physical and psychological development of learners. Each educational unit undertakes lesson planning, implementation of learning process and assessment of learning process to improve efficiency and effectiveness of graduate competency achievement based on Government Regulation Number 19 Year 2005.

The education system in Indonesia is expected to equip learners with learning skills and life skills.

One of the subjects that play an important role in developing the knowledge, skills and potential to print a quality and competent generation in the face of technological developments in the modern era is the science of nature. These subjects play an important role in the development of information and communication technology.

Physics is one of the branches of natural science that is the basis of technology. Physics learning at this time emphasizes learning more oriented to learners to be more active in the learning process so that physics material can be understood with the ability to think analytically learners. This means that learners must be active and responsible for themselves in exploring information, finding, and solving problems to understand concepts in physics. Teachers only become facilitators in the learning process.

In fact, according to the results of pre-research conducted by researchers at SMK Informatics Al Qolam obtained the result that 77.5% of students stated that the material momentum and impulse is still quite difficult and almost all learners stated that when physics study rarely do experimental activities/experiments . In addition, based on the

results of information obtained from physics teacher of SMK Informatika Al Qolam that physics learning in the classroom is not fully supported by the presence of adequate laboratory equipment so that the delivery of learning is not intact accepted by learners. As a result learners have difficulty in exposing and applying the concept of physics to solve problems in everyday life. Teachers are expected to be able to design new innovations and trained the thinking skills in physics learning so that learners more active role in it.

Learning using guided inquiry learning model is a learning process through inquiry that gradually directs learners to self-learning which requires careful planning, strict supervision, and guided by the teacher. The investigation in learning generally emphasizes questions and ideas that motivate learners to want to learn a lot and create ways to share knowledge learned. The main purpose of the Guided Inquiry Learning Model is to develop self-directed learning by extending the knowledge and skills of learners through various sources of information used both inside and outside school (Khulthau et al., 2007).

According to (Bilgin, Ibrahim, 2009) in his research get results that learners in the experimental group have a better understanding and basic concepts and attitudes show a positive attitude to improve learning outcomes of learners by applying the guided inquiry learning model.

PhET is a learning media that can help teachers become facilitators in delivering materials so that learners can understand learning. Almost every school in the current era has a computer that can be used as a learning medium for learners.

Based on the above description, efforts made to melatihkan patterns of thinking more innovative learners is to conduct research entitled "Implementation Of Guided Inquiry Learning Model Using PhET Simulation on Momentum and Impuls to Improve Student Learning Outcomes Of SMK Informatika Al Qolam Labang". In addition, PhET Simulation media can also motivate students of SMK Informatics Al Qolam so that later spurred to be able to create applications on the computer that can be used as materials for learning physics more fun.

METHOD

This research is included in the type of quantitative descriptive research with pre-experimental design approach, with the research form used is one-group pretest-posttest design. This study will describe the learning outcomes of learners with the application of guided inquiry model based on PhET Simulation on the material momentum and impulse. This study used experimental class and replication class used for research without using control class.

The researchers used two classes with the same type of treatment. The design of this study can be described as follows.

Tabel 1. Research Design

Group	Pre-test	Treatment	Post-test
Experiment (XI-1 Woman)	→ O ₁	X	→ O ₂
Replication (XI-2 Woman)	→ O ₁	X	→ O ₂

Pretest test is given to the experimental and replication classes to find out the initial knowledge of the learners. After obtaining the data, the teacher delivered the momentum and impulse material by applying guided inquiry model based on PhET Simulation. After being treated, the learner is given a final test (posttest). The data obtained in the form of pretest and posttest value will be analyzed using t test which can be determined gain that is difference between posttest and pretest value. The purpose of this test is to determine differences in learning outcomes of learners before and after treatment (treatment). In addition, the pretest and posttest values will be analyzed using n-gain to determine the magnitude of the increase in learners' learning outcomes that are measured through the pretest and posttest values.

RESULT AND DISCUSSION

Prior to doing research, learning tools and research instruments are validated first. Furthermore, the test is done to other students who have gained momentum and impulse material to find out the feasibility of the problem that will be used for pretest and posttest through the item analysis. Based on the criteria of item analysis there

are 19 feasible questions to be used from the 20 existing questions.

The pretest results can be used to determine the initial ability of learners tested by using normality and homogeneity test. The result of normality test and homogeneity test resulted by $\chi^2_{\text{count}} < \chi^2_{\text{table}}$, so that the data stated normal and homogeneous distributed.

The t-test is the result of pre-test and post-test analysis to show whether there is a significant difference between pre-test and post-test. The results of both values can show the calculated gain value by reducing the pre-test and post-test values. The value of gain analyzed using t-test, can be calculated mean significance (t_{count}). The result of mean significance calculation (t_{count}) compared with (t_{table}) in both classes, as presented in the table below:

Tabel 2. t-test Results

Class	Score		Explanation
	t_{table}	t_{count}	
Experiment (XI-1 Woman)	1,71	18,99	Significant
Replication (XI-2 Woman)	1,71	15,08	Significant

Based on the above table, it shows that in both classes $t_{\text{count}} \geq t_{\text{table}}$. So it can be concluded that there are differences after given the guided inquiry learning model and experienced a significant improvement. The existence of the replication class aims to strengthen the results of the experimental class.

The n-gain test was conducted to find out how much improvement occurred in the experimental class and the replication class after the guided inquiry learning model was applied. The *n-gain* value can be from the difference between the pre-test and post-test values. The result of calculation of n-gain value can be seen in the following table:

Tabel 3. N-gain Test Results

Class	<i>n-gain</i>	Explanation
Experiment (XI-1 Woman)	0,68	Middle
Replication (XI-2 Woman)	0,67	Middle

The result of the calculation of n-gain in the experimental class is 0.68 and the replication class is 0.67 and both are in the medium category. Pursuant to result of pretest and posttest can show that learners mastery in aspect of knowledge after getting pre-test in class XI-1 Women counted 24 students not complete, while class XI-2 Women for 24 students also not complete. The completeness of the post-test results is more than the pre-test value. In class XI-1 Women 19 students complete and 5 students not complete, while in class XI-2 Women as many as 22 students declared complete and 2 students unfinished. This is because the material tested is new for the learners because before the learners have not get the material momentum and impulse and time gained learners to learn momentum and impulse is short enough so that learners not fully understand. Students whose value is still incomplete should be given an opportunity to improve the value with remidi until finally all learners complete. Limitations of time researchers in doing research result remidi not implemented.

Assessment of skills from the assessment results while performing experiments in both classes of XI-1 and XI-2 Women showed the same result of 3.2. The abstract skill value of Class XI-1 Women was 3.2 times greater than the XI-2 Women class of 3.1. The results of the assessment have differences in the value of abstract skills because students are still confused in connecting the existing phenomena in the Student Worksheet to be able to analyze the results of the experiment in order to get the right conclusions. It can also be caused at the time of the experiment, some computers can not be installed so some groups have to join other groups. The classroom atmosphere during lab work becomes less conducive.

Assessment of the attitude of learners are diligent and disciplined, critical, curiosity, meticulous and thorough, can convey information, honest and responsible. Based on the results of the students' attitude assessment shown by the two classes is almost the same, but the XI-1 Women experimental class attitude is greater than the XI-2 Women replication class. Both classes are experimental class and replication class can be concluded that after applied inquiry model of guided inquiry of both classes entered in good category.

CONCLUSION

Implementation of guided inquiry model based on PhET Simulation on momentum and impulse materials at SMK Informatics Al Qolam can improve learners' learning outcomes significantly with the increase of n-gain value of 0.68 and 0.67 for class XI-1 Women and XI-2 Women. Skill's average and attitudes' average score in all two classes belong good category.

SUGGESTION

Before the implementation of the research should the researchers prepare well the application to be used for research, such as installing all computers that will be used with PhET Simulation. For other researchers who want to research using guided inquiry model based on PhET simulation should consider the shortcomings that exist to anticipate the occurrence of things outside the plan, so that researchers are able to take advantage of the situation well.

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