Effectiveness of Guided Inquiry Learning Tools to Improve Understanding Concepts of Students on Momentum and Impulse Materials

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Abstract: This study aims to the effectiveness of guided inquiry learning tools to improve understanding concepts of students on momentum and impulse materials. The learning device was developed using a 4D model consisting of four steps, namely define, design, develop and disseminate. This research was conducted at SMAN 4 Mataram in the tenth grade of MIPA 1 with a total of 20 people. The data was obtained in the form of pre-test and post-test scores. The data were analyzed using the Shapiro Wilk test and paired sample t-test at a significance level of 5%. The results of the Shapiro Wilk test show that the data are normally distributed and meet the requirements to perform a parametric test. The results of the paired sample t-test show that the t-count (24.347) is greater than the t-table (2.093). This means that there is influence of guided inquiry learning tools improves understanding concepts of students. These results indicate that the guided inquiry learning model is effective to improve understanding concepts of students on momentum and impulse materials.

Keywords: Learning tools; Guided inquiry model; Understanding concepts.

Introduction

Science is the study of natural phenomena and is a very important study. One of the branches of science is Physics, which studies various natural phenomena and has a very important role in the development of science and technology. Therefore, Physics is very important to study. However, in fact, there are still many students who are less interested in studying Physics. Physics learning emphasizes providing direct experience or examples in the form of events in everyday life so that students can easily understand physics learning (Doyan et al., 2020; Yudiafarani et al., 2022). One of the physics materials that is still considered difficult by some students is Momentum and Impulse, in which several concepts must be understood and related to scientific phenomena in everyday life (Shellawati et al., 2018).

Based on the results of observations at SMAN 4 Mataram several problems can be seen, the first is that there are still a lot of students who still don't like physics so during the learning process they are not active in learning. In addition, the method used is also still using lectures, where the teacher emphasizes formulas and memorization, thus making it difficult for students to understand concepts from physics (Doyan et al., 2020). In addition, limited learning time also has a very big influence on the learning process today (Handriani et al., 2015; Susilawati et al., 2015). Lack of learning time makes teachers less optimal in providing classroom learning (Kartini et al, 2019; Khasanah et al., 2019).

Some of the problems that occur require teachers to be more creative in using the chosen model and media in delivering the material (Susilawati et al, 2015; Doyan et al., 2022). An alternative that can be done in solving problems is to use models and media that can help

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students be more active and dominate during the learning process (Nurmaya et al., 2021). One of the models that can be used is the guided inquiry learning model (Susilawati et al., 2019). The guided inquiry learning model emphasizes students think critically and analytically to seek and find their answers to a question in question (Susilawati et al., 2020).

Based on the description above, a solution is needed to improve the understanding of students' concepts by using a guided inquiry model. The guided inquiry model will help students in understanding concepts through investigations of problems given by the teacher. Students can find their own investigation procedures with teacher guidance and conclude by themselves. Students are expected to be able to find their own knowledge through simple experiments and find their own concepts so that they can practice their ability to understand concepts.

Method

This study was developed with a 4-D model. The 4-D model consists of four stages, namely: Define, Design, Develop and Disseminate (Sugiyono, 2017). The population of this research is all class X MIPA 1 at SMAN 4 Mataram, totaling twenty students. The data obtained from this study were in the form of pre-test and post-test data. The pre-test and post-test data were analyzed using the Shapiro Wilk test and the t-test (paired sample t-Test) at a significance level of 5%. The Shapiro Wilk test is used to test for normality with samples below 50 data, while the paired sample t-test is a parametric test tool used to determine the difference between two samples of the same object. The Shapiro Wilk normality test and the paired sample t-test in this study used the help of SPSS 25.

Result and Discussion

Guided inquiry learning tools to improve understanding concepts of students on momentum and impulse materials have been successfully developed. This research aims to find out the effectiveness of the developed physics learning tools. The data obtained in this research are in the form of pretest and posttest values. The pretest is given before the students are given treatment and the posttest is done after the treatment is given. The treatment given was in the form of guided

inquiry learning. The following are the results of the pre-test and post-test of students shown in Figures 1 and 2.
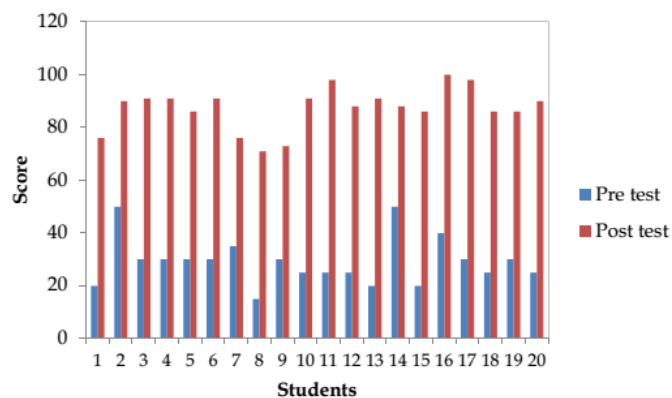

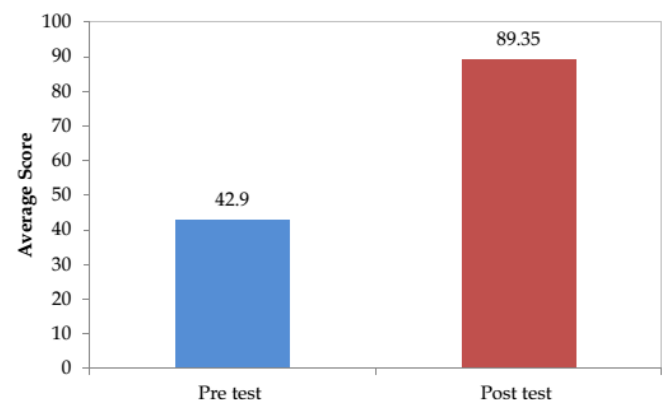**Figure 1**. Pre-test and Post-test Scores of Students.

Figure 2. The Average Value of Pre-Test and Post-Test of Students.

Based on Figure 2, it can be seen that the average value of the pretest is smaller than the post-test. This shows that guided inquiry learning tools on momentum and impulse materials can improve understanding concepts of students.

The next analysis is the normality test of the data. The analysis used the Shapiro-Wilk normality test with the help of SPSS 25. The purpose of the normality test was to determine the distribution of pre-test and post-test data with a total of twenty students. The results of the Shapiro-Wilk normality test are shown in table 1.

Based on table 1, it can be seen that the results of the data normality test are 0.054. This shows that the significance of the pre-test and post-test data is greater than 0.05. It can be said that the data are normally contributed and meet the requirements to perform parametric tests.

Table 1. Normality Test Results in Understanding Concept Ability of Students.

| | Kolmogorov-Smirnov[a] | | | | | Shapiro-Wilk |
	Statistic	Df	Sig.	Statistic	df	Sig.
Pre test	.267	20	.001	.878	20	.016
Post test	.210	20	.022	.906	20	.054

Table 2. Results of Paired Sample t-test

	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		T	df	Sig. (2-tailed)
				Lower	Upper			
Pair 1 Pre testpost test	-57.60000	10.58002	2.36576	-62.55160	-52.64840	-24.347	19	.000

After knowing that the data is normally contributed, then proceed with the t-test which in this study uses the Paired Sample t-test. The results of the data analysis using SPSS 25 are shown in table 2.

Based on table 2, it can be seen that the correlation value between samples is 0.266, which means that there is a significant correlation or relationship between the two samples. The correlation of data is seen from the data significance value, if the data significance value is < (α) then the data is called correlated. From the results of the analysis obtained a significant value (2-tailed) 0.00 < 0.05 (α) then the data is said to be correlated. In addition, the t-count value (24.347) is greater than the t-table (2.093). This shows that there is is an influence of guided inquiry learning tools in improving the understanding of concepts from students.

Based on the results of the t-test, it can be said that the learning device with the guided inquiry model is effective to improve understanding concepts of students on momentum and impulse materials. This is in line with research conducted by Doyan et al (2020), Nurmaya et al (2021), and Yudiafarani et al (2022) who said that the guided inquiry model could improve understanding concepts of students.

The use of guided inquiry learning models in the learning process makes students seek information not only from the teacher but also from the media (Doyan et al, 2021). Through this media, students in finding information related to learning materials become more independent (Gunawan et al, 2021). The curiosity of students obtained when given a stimulus at the beginning of learning increases (Susilawati et al, 2021).

In addition, in the inquiry learning model, students find and use various sources of information and ideas to increase understanding of a particular problem, topic, or issue (Satria et al, 2020). This model requires students to carry out a series of investigations, explorations, searches, experiments, searches, and research (Wahyuni et al, 2016).

The existence of opportunities for students to express ideas and mindsets in solving problems listed in learning activities that use the guided inquiry learning model has an impact on students' pride and confidence in themselves because students feel valued for their existence in the learning process, thereby minimizing the condition of many students cheating or not believing on their abilities (Susilawati et al, 2022).

Conclusion

Based on the results of the research and discussion, it can be concluded that the guided inquiry learning device developed with the 4D model can improve understanding concepts of students on momentum and impulse materials. The results of the paired sample t-test show that the t-count (24.347) is greater than the t-table (2.093). This means that there is influence of guided inquiry learning tools improve understanding concepts of students. These results indicate that the guided inquiry learning model is effective to improve understanding concepts of students on momentum and impulse materials.

Acknowledgements

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