The Effect of Using Schoology-Assisted Inquiry-Based Student Worksheet on Student Learning Outcomes

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Abstract

This study aimed to determine the effect of Schoology-assisted inquiry-based student worksheets on Newton's Law II material on students' learning outcomes. The population in the study were all students of class X IPA. There are only two classes of X IPA at SMA Yadika Bandar Lampung, so the two classes were used as controlled and experimented classes. Controlled and experimented classes were chosen randomly, so it was determined that class X IPA 1 was the controlled class and X IPA 2 was the experimented class. The research method used was a quasi-experiment with a non-equivalent control group research design. The experimented class used a Schoology-assisted inquiry-based student worksheet, while the controlled class was given conventional learning. The two classes were given a different treatment, the experimented class implemented learning using guided inquiry-based worksheets, and the controlled class used a learning model that the physics teacher had implemented in the class. Before and after learning in both classes, five questions with *HOTS* level were given so that pretest and posttest data would be obtained as learning outcomes data. The data were analyzed by three tests: N-Gain, Independent Sample T-Test, and Effect Size Test. Based on the results of data analysis, there was an increase in cognitive learning outcomes in the controlled class, which was 0.21 included in the low category, while learning outcomes of the experimented class increase were 0.47 included in the moderate category. Besides that, the independent sample T-Test earned a value of sig. 2-tailed of 0.000, so it can be seen that there was an effect of using guided inquiry-based worksheets assisted by Schoology on Newton's Second Law towards students' learning outcomes. In addition, the effect size test results showed a moderate category, so it can be concluded that Schoology-assisted inquiry-based student worksheet on Newton's second law material affects student learning outcomes. Based on the effect size test, the cohend's d value was 0.98 with a large category. This proved that the use of Schoology-assisted inquiry-based student worksheets had a moderate effect on students' cognitive learning outcomes.

Keywords: Guided Inquiry-Based Student Worksheet; Learning Outcomes; Schoology

INTRODUCTION

Education can be said to be one of the needs of everyone. Education is a learning experience in all environments and throughout life that affects the growth and development of a person's life (Jannah, 2013). The success of education can be shown from the quality of existing education, where the quality of education includes both the quality of the process and the quality of graduates. Education is said to be successful if the teaching-learning process goes well and produces quality output (Maesaroh, 2013). One of the objects observed in learning is learning outcomes. Cognitive learning outcomes are important for students because they support the development of their thinking potential (Mamu, 2014). Schools as a place to obtain formal education should facilitate students to learn by utilizing various media. Learning media should be attractive and acceptable to students, such as the Student Worksheet because it can make it easier for students to carry out investigations to understand concepts (Fitriani, Gunawan, & Sutrio, 2017).

A guided inquiry-based student worksheet is deemed sufficient to qualify as a good student worksheet because it enables students to find concepts through the investigation, which causes students to be more active in the learning process and fosters learning motivation for students to improve their learning outcomes. Research supports this (Annafi, 2016) that student worksheet based on guided inquiry was an appropriate choice of teaching materials because it could lead students to discover their own concept of knowledge. By this guided inquiry-based student worksheet, students will face relevant tasks to be completed, either through group discussions or individually, in order to be able to solve problems and draw conclusions independently (Iryani, Mawardi, &

Andromeda, 2016). Teachers no longer taught about the scientific research method (Devanti, Achmadi, & Prahani, 2020). This is because, in class X, there are already physical material traits that contain scientific research method materials. In learning activities to strengthen student understanding, examples are often given related to things around in everyday life. So it is easier for students to understand the material that the teacher has given.

The current COVID-19 (coronavirus) pandemic has encouraged schools to do online learning because it is impossible to do direct learning. This makes educators be able to carry out good learning even with quite difficult circumstances. One way that can help educators conduct online learning is by utilizing e-learning which is used as a system in carrying out learning by maximizing the use of e-learning by teachers and students; new learning methods that are more modern and easier to learn will be found. Various e-learning tools can be used, such as google classroom, learning house, Edmodo, and Schoology. Out of the various e-learning platforms, Schoology has advantages, including discussion rooms, blog posts, announcements, advanced configuration systems for assessments and quizzes such as deadlines, classification for specific workgroups or classes, synchronization with google documents, web-based attendance monitoring, time flexibility and place. There are exciting features that increase students' interest in learning which are easy assignments by teachers and collection of assignments by students, and also teachers can provide learning media such as videos or pictures so that students understand the material more. One of the e-learning tools that can be used is Schoology. Schoology is a website page that can be used in learning which has the same function as in class which is easier and

similar to Facebook (Aminoto & Pathoni, 2014). Schoology is an LMS (Learning Management System) that provides a place for teachers and students to interact online (Wibawa, 2017). Changes in learning media using Schoology could increase students' interest in learning due to their features (Supratman & Purwaningtias, 2018). In Schoology, there are several features such as attendance checks, homework, quizzes and tests, and other features (Apriyana, 2015). However, there are also shortcomings of Schoology; among others, not all students have the cost to study online, the strength of the internet network is uncertain, and some types of students understand better if it is explained directly by the teacher. From this statement, it can be said that Schoology is one of the e-learning sites that is useful for students learning process as a place to carry out online learning activities by providing new nuances and various benefits, such as unlimited space and time for the implementation of learning. Also, there are features that students can use to learn.

Based on data from a preliminary study conducted on physics teachers at SMA Yadika Bandar Lampung, it was known that during this pandemic, the implementation of learning was carried out online by utilizing media in the form of google classroom and the use of student worksheets. Based on teacher interviews, it was found that the learning process was more focused and that the outcomes were better if the students' worksheet was used instead of not using the students' worksheet. In addition, there are still no worksheet-based learning media for students on several physics topics.

One of the physics materials that have not used student worksheets is Newton's second law material. In Newton's second law material, students often experience misconceptions, causing student learning outcomes to be less good. This is supported by research (Putri, 2013) which stated that in Newton's second law material, the average student who experienced misconceptions was 91.34%. In addition, students were also less active in the learning process, as evidenced by the fact that they rarely asked questions or made suggestions, which then affected students' learning outcomes that were not optimal. This is supported by research (Rosdianto, 2017) which stated that the average value for Newton's law material was 47.50, which occurred because of the tendency of students to follow teacher orders so that students were less active.

Previous studies have discussed student worksheets, including research on the design of student worksheets based on problem-solving to improve science process skills and higher-order thinking skills (Ubaidillah, 2016). A student worksheet is designed based on the discovery learning models to achieve students' physics competence (Erdi, Yulkifli, & Murtiani, 2017). Student worksheet integrates guided inquiry design assisted by virtual laboratory to facilitate the learning process (Aslinda, Hufri, & Amir, 2017), the application of student worksheet-assisted virtual lab uses a group investigation type cooperative learning model to improve the knowledge competence of students (Kurnia, Hidayati, & Ramli, 2017), as well as the development of guided inquiry-based student worksheet to increase the ability of multi-representation in Newton's second law material (Sitopu, 2019). Based on these studies, the researcher decided to use the guided inquiry model to be implemented in the experimented class and used Schoology as the medium for online learning during this research. Therefore, this study aimed to determine the effect of student worksheets based on Schoology-assisted inquiry on Newton's

second law material on student learning outcomes.

METHOD

The type of this research is an experimented quantitative study using the Quasi Experiment Design method. The design of this research is the Non-equivalent Control Group Design, in which one experimented group was given a special treatment in the form of a student worksheet based on Schoology-assisted inquiry. The class learned by implementing the guided inquiry stages, including orientation, understanding concepts, investigations, drawing conclusions, and discussions. These stages were implemented with the help of an LMS (Learning Management System), namely Schoology. In addition, it was supported by teaching materials in the form of Newton's law student worksheets adopted from the

development by Sitopu (2019). The student worksheet contained phenomena, concept understanding questions; the investigation includes making predictions, making problem representation diagrams, formulating problems, formulating hypotheses, determining variables, determining experimented steps, analyzing data, and drawing conclusions. Sample questions and practise questions also supported student worksheets.

Another group was the controlled group, which was given learning treatment conventionally applied by the school teacher. In this class, there was no investigation, so the learning was teacher-centred. In addition, the learning did not use student worksheets and only used Google Classroom as a learning medium. The summary of the research procedure can be seen in the flowchart in Figure 1.
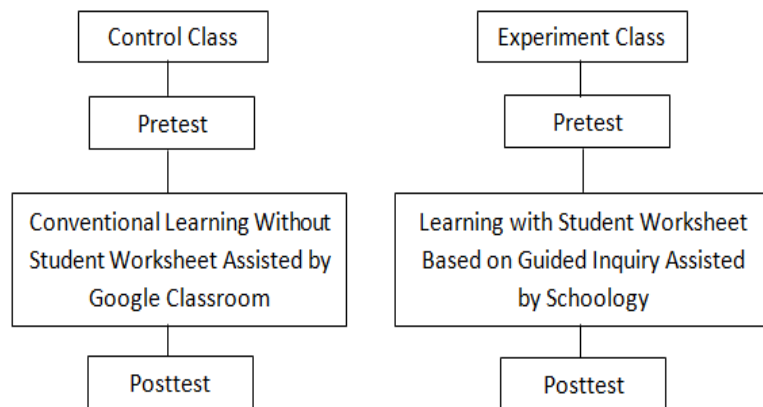

Figure 1 Research Procedure

The population in this study was all students of class X IPA SMA Yadika Bandar Lampung, amounting to 2 classes which consist of 25 students in each class. The two classes were chosen randomly to determine the experimented and controlled classes because the average value of the report cards of the two classes was close to similar. Therefore, class X IPA 1 was chosen as a controlled class and X IPA 2 as an experimented class.

Students' cognitive learning outcomes were measured by the students' pre-test and post-test answers. The research instruments were five essay questions with HOTS level in which the questions were given before and after the treatment. The questions were obtained from the higher-order thinking skills (HOTS) book questions and national exam questions, so that the validity and reliability were not tested.

The results of the research data obtained were then tested by using

SPSS. The normality test was conducted to determine whether the learning outcomes were from a normally distributed population or not. Hypothesis testing was carried out to determine the homogeneity of the behaviour given to the sample. N-gain was used to see the difference of pre-test and posttest scores between the experimented and the controlled class. An Independent sample t-test was used to determine whether there was a difference in the mean scores between two unrelated sample groups. The test was used if the data of the two classes were normal. If the distribution of the data was not normal, the Mann Whitney test was applied instead. In addition, the effect size test was used to identify the influence of the learning effect in this study.

RESULT AND DISCUSSION
From the research done, the results were in the form of average results before and after the cognitive learning test. Students' increased cognitive learning outcomes can be seen from the comparison between the pre-test and post-test scores of the controlled and the experimented class. The instrument used to obtain the pre-test, and post-test results were in the form of 5 essay questions based on the indicators to be achieved, namely determining, analyzing, and concluding. The average pre-test and post-test results can be seen in Table 1.

Table 1 Average Pre-test and Post-test Results of Cognitive Learning Outcomes

Class	Pre-test	Post-test	N-Gain
Control	26.00	41.60	0.21
Experiment	28.40	60.60	0.47

Based on Table 1, it can be seen that the experimented class has a higher n-gain value in the moderate category than that of the controlled class with the low

category. After that, the normality test was carried out to determine whether the learning outcome score data came from a normally distributed population or not. The results of the normality test can be seen in Table 2.

Table 2 Data Normality Test Results

Class	Kolmogorov Smirnov Sig.	
	Pre-test	Pre-test
Control	0.83	0.20
Experiment	0.20	0.20

Based on Table 2, all data have a sig value>0.05. Based on the decision-making guidelines, it can be said that all data were normally distributed. After the normality test, the homogeneity test was then carried out. The homogeneity test of students' cognitive learning outcomes data was carried out to see whether the variance of two or more data population groups was the same (homogeneous). The results of the homogeneity test can be seen in table 3.

Table 3 Homogeneity Test Results

Score	Levene Statistic	Sig
Cognitive Learning Outcomes	1.06	0.30

Based on Table 3, it can be seen that the significance of learning outcomes in the cognitive domain was 0.30>0.05; so it can be said that the data was homogeneous. In this research, the n-gain normality test was also carried out. The n-gain data normality test was used to determine whether the n-gain learning outcomes came from a normally distributed population or not. The results of the normality test can be seen in table 4.

Table 4 N-Gain Data Normality Test Results

Class	Sig	Description
N-Gain Control	0.30	Normal
N-Gain Experiment	0.20	Normal

Based on Table 4, it can be seen that the sig. of both data > 0.05. Based on the decision making, it can be said that all data were normally distributed. The next test was the independent sample t-test to determine whether there was a difference in the mean scores between two unrelated sample groups. The results of the independent sample t-test can be seen in table 5.

Table 5 Independent Sample T-Test Test Results

Levene's Test for Equality of Variances	T-Test for Equality Means
	Sig. 2-tailed
Equal variances	0.00

Based on Table 5, the sig. 0.00 is less than 0.05, so it can be concluded that there was an effect of using Schoology-assisted inquiry-based student worksheets on Newton's Second Law material on student learning outcomes. Then, the effect size was analyzed. The effect size test was used to determine how much the influence of student worksheets based on Schoology-assisted inquiry on the students' learning outcomes. The effect size test results can be seen in Table 6.

Table 6 Effect Size Test Results

Class	Cohen's	*Effect t-size*
Control	10.39	0.98
Experiment		

Based on Table 6, it can be seen that the effect size is 0.98 with a large category, so it can be concluded that student worksheets based on Schoology-assisted inquiry had a considerable influence on students' learning outcomes.

Students' learning outcomes were measured based on predetermined learning achievement indicators. Achievement indicators were calculated by comparing the average score of students with the maximum score expressed in percentage. The indicators on each question were cognitive learning outcomes indicators consisting of analysis (questions number 1 and 4), evaluation (questions number 2 and 3), and creation (question number 5). The average achievement of indicators for cognitive learning outcomes based on the pre-test and post-test item numbers is presented in Figure 2.
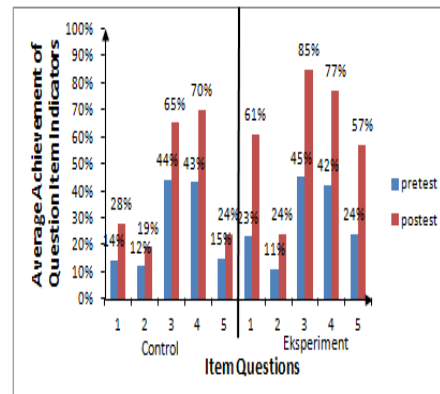

Figure 2 The Average Achievement of Students' Learning Outcomes Indicators based on the Pre-test and Post-test Results of the Controlled class.

Based on Figure 2, it can be seen that the average achievement of the experimented class indicators is higher than the controlled class. The cause of the higher increase of experimented class students' cognitive learning outcomes was due to the application and use of guided inquiry-based student worksheets in finding their concepts through guided inquiry learning stages, starting from orientation, understanding concepts, investigations, drawing conclusions, and discussions. The teacher also played a major role in guiding students so that they could achieve good learning.

Based on the results of data analysis in Table 1, it is known that the controlled class obtained an N-Gain value of 0.21 in the low category, and the experimented class obtained an N-Gain value of 0.47 in the moderate

category. From these results, it is known that learning outcomes in the experimented class who used the guided inquiry learning model assisted by student worksheets obtained an increased learning outcome compared to the controlled class which did not do investigations and tended to be teacher-centred. It can be seen from the preliminary research that conventional learning tended to cause students to be less active in asking questions because students preferred to follow the teacher's orders in the learning process. Yet, the increase in learning outcomes of the experimented class was still smaller than Hamida's (2018) study with an N-Gain obtained of 0.70. This is because the learning time was limited, in which one online learning meeting took around 1x45 lesson hours, while offline learning took 3x45 lesson hours. This causes a less optimal learning activity.

In addition, it can be seen from the results of the independent sample T-Test in Table 5 that the sig. 2 tailed<0.000 indicates that there was an effect of using student worksheets based on guided inquiry assisted by Schoology on Newton's Second Law material on student learning outcomes. The influence in terms of the effect size shown in Table 6 was that the use of student worksheets in guided inquiry learning had a moderate effect on learning outcomes.

These results are supported by the average achievement percentage of each question, and it is known that the experimented class obtained the average achievement per item higher than the controlled class. In addition, reviewed from the answers to questions, it is known that students who used student worksheets implemented with a guided inquiry model had high enthusiasm to find their concepts of knowledge because students were directed to carry out investigations following the instructions on the student worksheets.

The impact of using guided questions in their research was that students became more enthusiastic in participating in learning, especially when being given practice (Amir & Marisda, 2021). In addition, based on research by Yulianti, Zhafirah, & Hidayat (2021), it was known that the integrated guided inquiry model by using the application of PhET to vibration and wave materials could facilitate students to train critical thinking skills.

This result is supported by research by Annafi (2016) that the achievement of student learning outcomes using guided inquiry-based student worksheets was higher than students who did not use the guided inquiry-based student worksheet—learning by using guided inquiry-based student worksheet which required students to conduct experiments encouraged students to be more active which lead to an increased achievement of student learning outcomes (Maida, Bayharti, & Andromeda, 2019). Guided implications of inquiry-based worksheets could be used to implement learning to help students improve their critical thinking skills (Lestari & Makiyah, 2021).

During the implementation of this research, there were several obstacles found in the form of difficulty in controlling the learning process online; internet networks constrained some students, and the learning was ineffective due to online circumstances. The solution given was to remind students to check the network and get ready before starting the class to be more effective in the learning process.

CONCLUSION

Based on the results of data analysis and hypothesis testing, it can be concluded that there is an effect of Schoology-assisted inquiry-based student worksheet on Newton's II law material on the learning outcomes of students' cognitive domains, evidenced

by an increase in student learning outcomes in the cognitive domain with a significance value of 0.00. In the controlled class, there was an increase of 15.60 with an average N-Gain of 0.21. In the experimented class, there was an increase of 32.20 with an average N-Gain of 0.47 and a large effect size of 0.98, which means that the Schoology-assisted inquiry-based student worksheet has a considerable influence on the learning outcomes of students' cognitive domains.

Further research is expected that the teacher can take advantage of the Schoology by providing investigation tasks outside of learning. By doing so, they can maximize learning time, add videos, and analyze assignments, so that students can learn independently. Independent learning outside of learning hours can help overcome problems with student signal connections and others. For further researchers, an additional measurement of learning outcomes on affective and psychomotor aspects is encouraged. This is so that the research will obtain results that are wider in observations.

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