The Effect of Using Phyphox Applications to Improve Learning Outcomes Reviewed from Early Knowledge and Response

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Abstract *- This study aims to determine whether or not using the phyphox application affects student learning outcomes in terms of prior knowledge and student responses. This research was conducted in high school, using a quasi-experimental research method (quasi-experimental). The design model of this research was pre-test and post-test using a randomized design by giving an initial test before learning and a final test after learning. In this study, two classes were involved as representatives of the experimental class, given the behavior of learning hypothetical deductive thinking strategies using Phyphox media. In contrast, the control class was used as a comparison of Phyphox tools. The results showed that the experimental class students' learning outcomes were superior to those of the control class. It is shown in the comparison data of the N-Gain value and the results of hypothesis testing. Several covariate parameters also support this research. The percentage change in the practical contribution's value and each parameter's relative contributions shows that the test has improved.*

Keywords*: Learning Outcomes; Phyphox; Prior Knowledge; Response*

INTRODUCTION

One of the goals of national education is to strive to educate the nation's life (Sujana, 2019). A good education makes it easier for the Indonesian people to achieve a bright, peaceful, and prosperous future (Setyono & Widodo, 2019). The development of science and technology at this time is so rapid that it affects developments in various fields (Freeman, 1991). One field that takes advantage of the development of science and technology is the field of education (Jufriansah et al., 2022).

Physics is a subject related to the scientific approach (Bentri, 2019; Ellis & Silk, 2014). By studying physics, students can change their thinking patterns to think critically and compare some information to gain knowledge through comparisons of these natural phenomena (Simbolon, 2015; Fransiska et al., 2021). Along with advances in technology and information, researchers also have the idea to create a simulation media in the Phyphox application. The development of this simulation media is an alternative to overcoming the problem of learning physics that seems complicated (Lee et al., 2021). This Phyphox application contains several experiments or formulas related to physics (Heienke & Stampfer, 2018). Some of these experiments are about acceleration without gravity, acceleration due to gravity, and much more. From the observations and research results, several problems exist in schools, and student learning outcomes still need to be improved (Kersting et al., 2018). Learning models using the Phyphox application have yet to be implemented in schools, and learning in schools is still fixated on books.

This research is considered necessary because technology adaptation in learning physics is still minimally applied to areas with minimal school laboratory facilities and infrastructure. It is reinforced by preliminary data from observations made in schools that there was a lack of student participation in

physics experiments. Another problem found is students' perception that learning physics seems complicated. It is justifiable because the big problem we found was the lack of prior knowledge about physics content from both teachers and students. It is contradictory because almost all students in the average sample class have an android. So this needs to be a challenge in the world of education that technological adaptation has an essential role in increasing student responses during the teaching and learning process in class. So the purpose of this study was to determine the effect of using the Phyphox application in improving learning outcomes in terms of prior knowledge and student responses.

RESEARCH METHODS

This research is in high school, starting from February to March 2022. The sample of this study consisted of an experimental class of 20 students, while the control class consisted of 20 students. This study uses several instruments, including learning outcomes instruments consisting of pre-test and post-test, and student response instruments which are used as parameters to assess how many students respond before and after using the Phyphox application.

Data analysis begins with a statistical test to determine the learning outcomes of the two sample classes. It is followed by a prerequisite test for all data, using normality and homogeneous test for each parameter. The parameters used are the dependent variable which refers to the use of Phyphox. In contrast, the independent variables use two covariates: initial knowledge data obtained from test scores and student responses based on response questionnaires. The three variables are then followed by a multivariate test to determine the contribution of each covariate. It is also then strengthened by the gain test to evaluate the effect of using Phyphox in learning. At the same time, initial knowledge is taken from test scores at school and ultimately presented in Figure 1. Student response criteria according to Table 1.

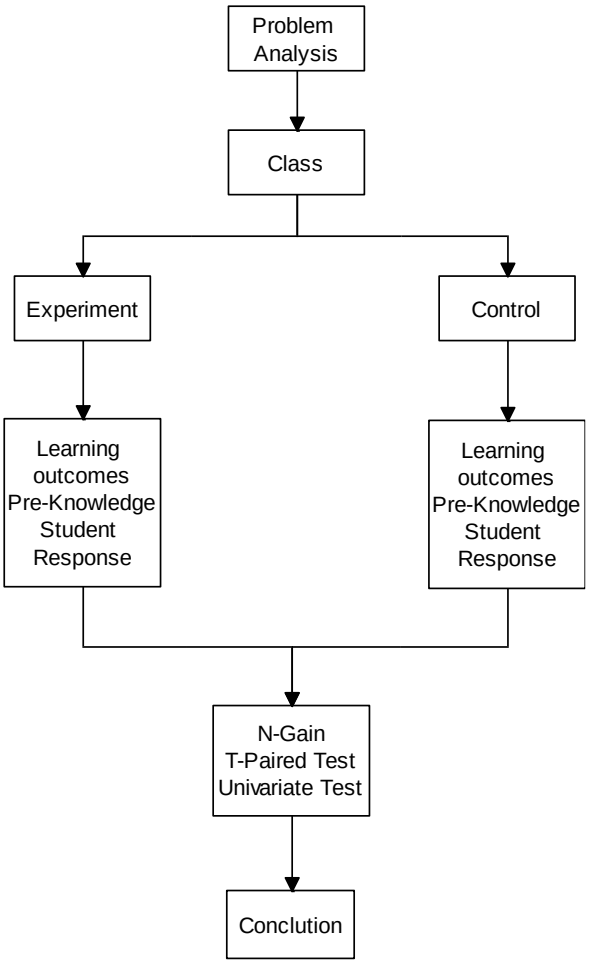

Figure 1. Research flow

Table 1. Student response criteria

Percentage (%)	Category
$82.5 < x < 100$	Very good
$62.5 < x < 82.5$	Good
$43.75 < x < 62.5$	Not good

(Lie et al., 1996)

RESULTS AND DISCUSSION

Results

Based on the results of the descriptive analysis, it was found that the difference in the average pretest and posttest scores between students who studied using the Phyphox application and students who did not use the Phyphox application. This

data is taken from various analytical test results by researchers. More details are presented in Table 2.

Table 2. Description of learning outcomes statistics

	Maximum value	Minimum value	Standard Deviation
Posttest	45	20	7,236
Pretest	75	60	4,552

Based on the student response test, learning using the Phyphox application shows that the overall average percentage is included in the excellent category with 71%. It shows that learning Physics using the Phyphox application gets a positive response from students.

Based on the results of the N-Gain test, it was explained that there were differences in the significant value of student learning outcomes in the experimental class and the control class. From the N-gain value for the experimental class of 0.7, it can be concluded that in the experimental class, the increase in significance value is in the medium category. More details are presented in Table 3.

Table 3. Comparison of the N-Gain value of the experimental class and the control class

Class	N-Gain	Category
Experiment	0,7	Medium
Control	0,3	Medium

The results of the simple linear regression test of the SPSS 25-assisted summary model obtained a significant value of 0.000 <0.05 (F value;102.4> 4.35). In addition, a simple linear regression test was obtained explaining the magnitude of the correlation value or the relationship of the R-value of 0.854 and obtained an R Square of 0.729. More details are presented in table 4.

Table 4. The value of the coefficient of determination

R_y(X1,X2)	0.900536
R^2	0.810965

The results of the T-Paired test showed that the significance values for the experimental and control classes were 0.001 and 0.018, which were smaller than 0.05, so the hypothesis was accepted. That is, there is an increase in the average learning outcomes of students both in the control and experimental classes. The results that the researchers obtained at the time of the study explained that all students actively participated in learning activities using the Phyphox application. In detail, the T-Paired test data is presented according to table 5.

Table 5. The results of hypothesis testing using the T-Paired test

Class	Mean pretest	Mean posttest	Signification
Eksperiment	33.3333	45.1282	0.001
Control	26.6660	32.2664	0.018

From these results, the researchers concluded that using the Phyphox application is very supportive of improving student learning outcomes, as seen from students' learning outcomes before using the Phyphox application and after using the Phyphox application. It was the following research (Wayan et al., 2014).

The value of the covariate test parameter strengthened this study. Namely, there was an increase in the test indicated by the percentage change in the value of the practical contribution and the relative contribution of each parameter, and ultimately presented in Table 6.

Table 6. Covariate analysis results

Practical contribution		Relative contribution	Sum
X_1	40%	16%	56%
X_2	60%	35%	95%

Discussion

The high achievement of student learning outcomes in the experimental class is due to the learning experiment class using the Phyphox application, which makes

students more active in class. While the control class in the learning process involves more of the role of the teacher than the students, students are less active and obtain lower learning outcomes than in the experimental class. The effectiveness of using the Phyphox application learning media is also in line with research conducted by (Fatmala et al., 2020; Kaps et al., 2021; Nanto et al., 2022)

It is supported by research conducted by Wahyuningsih (2014) which states that learning physics using the experiential learning model has an impact on learning motivation in the "motivated" criteria in vocational students (Wahyuningsih & Indrawati, 2014; Nuniati et al., 2021). Furthermore, Staacks et al. (2019) in his research that the application of the phyhpox application in learning was able to increase student motivation

Based on the support from several theories above and the research results obtained, using the Phyphox application in physics learning in schools can improve student learning outcomes in terms of initial knowledge and student responses.

The importance of this research is the role of technology adaptation which can assist the teaching and learning process, becoming the carrying capacity of 21st-century education. The experimental procedure is not limited by time and place because it can be carried out by students or teachers anywhere. Several supporting sensors in the Phyphox application can assist students and teachers in transferring knowledge. Of course, learning physics is more fun and meaningful. However, several obstacles are encountered in this study, namely the existence of an unstable internet, which reduces the connection process when dual monitors are carried out between Android and laptop.

CONCLUSION

Based on the results of research and discussion and various analytical tests, the researchers concluded that many students who used the Phyphox application improved their learning outcomes compared to students who did not use the Phyphox application. It can be seen from several analytical test results and other tests compared to before using the Phyphox application.

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