THE IMPLEMENTATION OF VIRTUAL HOME LABORATORIES TO IMPROVE STUDENTS PSYCHOMOTOR ABILITIES

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Abstract: Psychomotor relates to learning outcomes that are achieved through skills as a result of knowledge competence. Learning that still uses the demonstration method and has not optimized learning activities in the laboratory. This study aims to determine how implementing a virtual home learning laboratory improves students' psychomotor abilities. This study uses a quasi-experimental method with a nonequivalent control group design. The sample used in this study was 46 respondents from the Mathematics and Natural Sciences Department at Senior High School 8 Purworejo, Indonesia. The research sample consisted of two classes: the control and experimental classes. The instruments used in this study were learning implementation sheets, psychomotor observation sheets, student response questionnaires, and students' psychomotor ability test instruments. The data analysis technique in this research is quantitative, and the *t-test*. The analysis of test data using the N-gain test obtained 0.75 for the experimental class with high category and 0.29 for the control class with low category results. The statistical analysis results of the *independent* sample t-test show that laboratory implementation affects the psychomotor abilities of students.

INTRODUCTION

Students essentially use learning to develop their potential. Learning activities involve two parties: students as recipients of education and educators as facilities providers. The virtue of learning activities is the occurrence of the learning process [1].

Learning media is an important element in the learning process. Learning media is a learning resource that can assist teachers in enriching their knowledge, with various types of learning media by teachers can be used as material in providing knowledge to students. The use of learning media can foster student interest in learning new things in the learning material delivered by the teacher so that it can be easily understood [2]. A teacher must be able to use his knowledge and skills in choosing approaches, models, and learning strategies and use teaching methods or tools that can provide understanding for students on the concepts of the lessons being taught. Learning that occurs in individuals is a complex behavior, namely, the interaction between students and students with the same goal.

The psychomotor domain is a domain that is closely related to skills after a person receives a certain learning experience. The skill itself shows the level of expertise of a person in a particular task or set of tasks [3]. Trowbridge and Bybee Elly Herliani (2013) clarified the psychomotor domain into four categories, namely: a) *moving*, b) *manipulating*, c) *communicating* dan d) *creating*. So, the assessment of psychomotor learning outcomes includes preparation, process, and product. Assessment can be carried out during learning activities, namely when students practice or after the process takes place by testing students, one of which is through a report on the practicum results [4].

Knowledge competency laboratories can be fulfilled in the laboratory and are also useful for students in everyday life to improve students' understanding and psychomotor concepts. Learning physics by doing practical activities can make students understand more deeply the physics theory that has been given and is expected to be able to improve student learning outcomes. Practical activities can provide learning opportunities for students to prove an existing theory or even find new material from the practicum process [5]. It is in line with the opinion of Woolnough & Allsop (Handayani et al., 2018), who stated that practicum activities could generate motivation to learn and develop basic skills. Experimenting can be a means of learning with a scientific approach and, of course, supporting the subject matter. So that physics learning can still be carried out by using virtual laboratories.

The laboratory does not only include buildings or rooms and equipment. However, the notion of a laboratory develops along with the need for the meaning of a place of learning for certain scientific concentrations [6]. In addition to the laboratory, it is often interpreted as a place in which learning tools. Laboratories can also take the form of a campus or classroom, nature or the environment, social institutions, and even the community itself. Laboratory activities are needed as one of the successes of learning activities [7].

Based on the results of interviews with physics teachers at SMA Negeri 8 Purworejo, it was found that the psychomotor abilities of students were low. It was based on an average percentage of 65% of students who had not completed because students' interest in physics subjects was lacking, and they tended to think physics lessons were difficult. Learning that still uses the demonstration method and has not optimized learning activities in the laboratory requires supporting facilities that are attractive, efficient, and easily understood by students. One of the learning facilities that can support the learning process is the Ministry of Education and Culture's learning house portal.

Rumah Belajar is a web portal that can be accessed via the internet, and Android users can download the application through the Play Store; according to Warsihna (2013), the "Rumah Belajar (RB)" portal in cyberspace (internet) plays an important role in the education sector, especially in Indonesia. This portal will make it easier for teachers to make innovative and interesting learning, it provides various components needed for learning, especially for student homework, and it allows students to understand technology as early as possible[8].

RB is a support for learning activities. Students can study anywhere, anytime, with anyone with a learning house portal. RB is expected to help the process of Learning and Teaching Activities in understanding the material being taught and can be practiced in the Virtual Laboratory [9]. *A virtual laboratory* is a virtual laboratory that can be used for distance learning aids (online) in the form of a web that can be accessed via a computer or smartphone.[10].

This study aimed to determine the effect of the virtual laboratory RB on the psychomotor abilities of students.

RESEARCH METHODS

This research was conducted at Senior High School 8 Purworejo in the odd semester of the academic year 202/2023. This type of research is a Quasi Experiment. The population in this study is class XI MIPA 3 and class XI MIPA 5, while the sample is part of the number and characteristics possessed by the population. The samples in this study were two classes, namely class XI MIPA 3 with 26 students as the experimental class and class XI MIPA 5 with 20 students as the control class [11].

Research design Nonequivalent Control Group Design in this design, two groups are not selected randomly, then given a pre-test to determine whether the experimental and control groups' initial states have differences. The experimental and control groups carried out the initial test. The two groups received different treatments; where the experimental group used a virtual laboratory, and the control group did not use any treatment and ended with a final test for each group [12].

Table 1. Nonequivalent Control Group Design

Experiment	O_1	X_1	O_2
Control	O_1	X_2	O_2

There are two classes that will be compared in this research, namely the experimental class (E) and the control class (K). Both classes were tested with a pre-test to determine the student's initial understanding of Newton's law material that they had not studied. After that, the two classes were given different treatment during the learning activities. Class E was given treatment in the form of learning using virtual laboratory media, and class K was given learning treatment using the demonstration method. After giving treatment to both classes, to find out the student's learning outcomes, a post-test was conducted.

The research instruments used were tests and observations. The test was conducted to determine the increase in student learning outcomes. The test was carried out at the beginning (pre-test) and at the end (post-test) of learning activities using essay questions with ten questions. Observation is a process of systematically observing and recording the behavior of research subjects. The tool used to observe can be in the form of an observation sheet. Observations in this study aim to determine the psychomotor skills of students towards learning activities using treatment and demonstration. Observers observe students' psychomotor activities during the learning process [13].

RESULTS AND DISCUSSION

The learning house virtual laboratory in improving students' psychomotor abilities was carried out pre-test, post-test, and observation in each experimental and control class with the results in table 2. They showed the learning outcomes of students.

Table 2. Results of N-Gain Table

No	Class	N-Gain	Category
1	Experimental class	0.75	High
2	Control class	0.29	Low

Table 2. Based on the pre-test and post-test data results, the data obtained for the increase in the N-gain test of 0.75 with high criteria for the experimental class and 0.29 with low criteria for the control class. This value indicates that students'

learning outcomes in the experimental class are higher than in the control class [14].

Figure 1. shows the psychomotor abilities of students obtained based on the results of observations during learning activities in the experimental and control classes. Based on the bar chart, it can be concluded that the experimental class is superior to the control class [15].
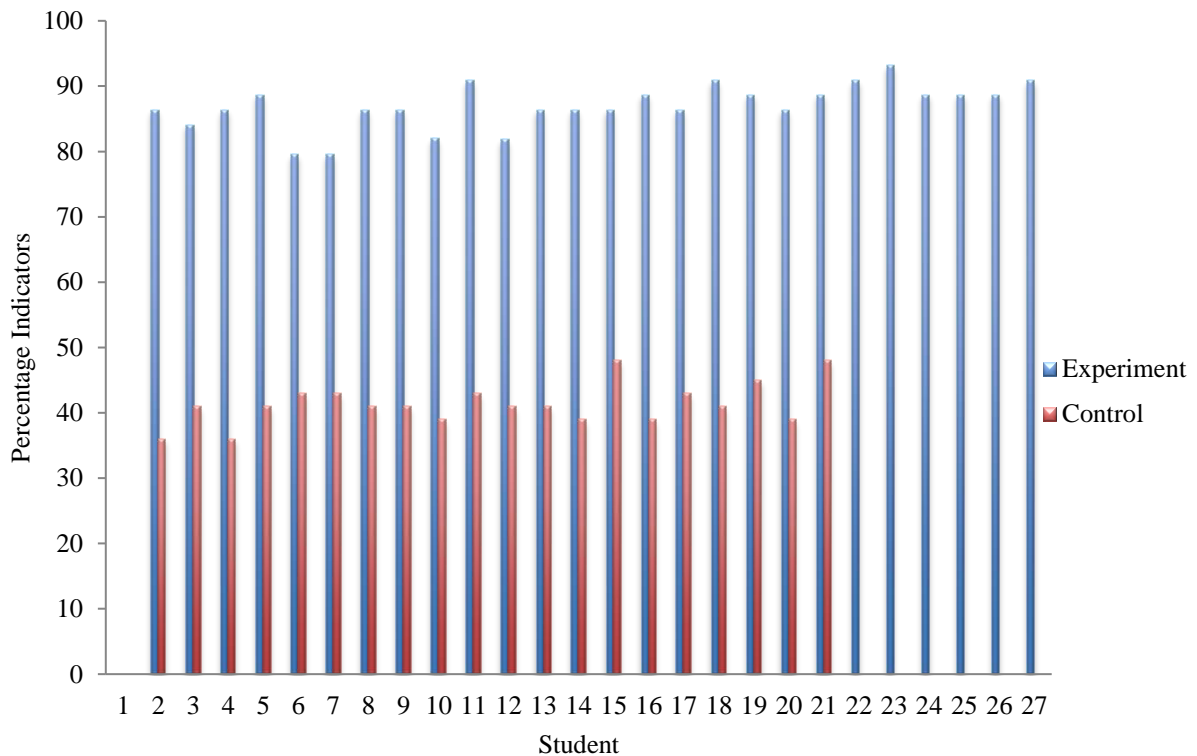

Figure 1. Psychomotor Ability in Experiment Class and Control Class

Several tests were carried out to determine the effect of implementing the learning home virtual laboratory.

a) Normality Test

This normality test is used to determine whether students' pre-test and post-test data are normally distributed [16]. To perform this normality test using the Shapiro-Wild test with the help of SPSS. A distribution is said to be normal if the significance level is > 0.05, whereas if the significance level is 0.05, the distribution is not normal. The results of the normality test can be seen in Table 2.

Table 2 shows the psychomotor ability of the experimental class was 0.053, and the control class was 0.100 with each sig. > 0.05, it can be concluded that the data is normally distributed.

b) Homogeneity Test

A homogeneity test is a test of whether or not the variances of two or more distributions are equal. This homogeneity test was conducted to determine whether the variables' data were homogeneous. This homogeneity test uses the Test of Homogeneity of Variance. Data is said to be homogeneous if the significance level is > 0.05, whereas if the significance level is < 0.05, then the data is not homogeneous [17]. The results of the data homogeneity test can be seen in Table 3.

Table 2. Normality Test Tabel

	Class	Shapiro-Wilk		
		Statistic	Df	Sig.
Result	Experiment class	.923	26	.053
	Control Class	.920	20	.100
a. Lilliefors Significance Correction				

Table 3 shows that test of Homogeneity of Variance obtained a significance value > 0.05. It can be concluded that the two classes are homogeny.

c) Hypothesis Test

Based on the results of the normality test and homogeneity test, the hypothesis is tested. An Independent Sample T-test is used in making decisions about whether the hypothesis in this study can be accepted or rejected [18]. The hypotheses to be tested using the T-test are:

H_a: There is an effect of the implementation of the virtual laboratory on the psychomotor abilities of students at Senior High School 8 Purworejo

H_0: There is no effect of virtual laboratory implementation on the psychomotor abilities of students at SMA NEGERI 8 Purworejo

The basis for making the decision to accept or reject the hypothesis is based on the significance of sig. (2-tailed) > 0.05, then the hypothesis is rejected, and if sig. (2-tailed) < 0.05, then the hypothesis is accepted. The results of the Independent Sample T-test can be seen in Table 4.

Table 3. Homogeneity Test.

		Levene Statistic	df1	df2	Sig.
Data result	Based on Mean	.558	1	44	.459
	Based on Median	.522	1	44	.474
	Based on the Median and with adjusted df	.522	1	43.999	.474
	Based on trimmed mean	.621	1	44	.435

Table 4. Independent Sample T-test

	Paired Differences				
	Mean	Std. Deviation	95% Confidence Interval of the Difference		Sig. (2-tailed)
			Lower	Upper	
Result	65.739	23.587	58.735	72.744	.000

Based on Table 4. Independent Sample T-test obtained the value of sig. (2-tailed) 0.000 students. Because of the value of Sig. <0.05, it can be concluded that H_0 is rejected and H_a is accepted, meaning that there is an effect of the virtual laboratory's implementation on students' psychomotor abilities. So the implementation of the virtual laboratory has a significant effect on the psychomotor abilities of students. It is indicated by the difference between the results of the control class and the experimental classes' results. Based on this description, it can be seen that implementing the virtual laboratory at home learning affects students' ability at Senior High School 8 Purworejo.

CONCLUSION

There is a significant influence on the implementation of the virtual laboratory on the psychomotor abilities of students at Senior High School 8 Purworejo Indonesia. It was obtained based on the results of the pre-test, post-test, and observation of students' psychomotor abilities. Based on the results of the N-gain obtained, a value of 0.07 indicates an increase in student learning outcomes in the high category. The calculation results from the t-test analysis for the value of students' psychomotor abilities obtained the value of sig. (2-tailed) the psychomotor ability of students is 0.000. Because of the value of Sig. <0.05, it can be concluded that the implementation of the virtual home learning laboratory affects psychomotor abilities.

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