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The Effect of Video-Assisted Inquiry Modified Learning Model on Student's Achievement on 1st Fundamental Physics Practice

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Abstract: The purpose of research are: (1) to know the effect of video-assisted inquiry modified learning model on student's achievement; (2) to improve the student's achievement in 1st Fundamental Physics Practice through video-assisted inquiry modified learning model. The student's achievement as dependent variables includes the aspects of knowledge, skill, and attitude. The sampling technique did not choose at random. The Mathematics Education as the control group and the Science Education as the experimental group. The experimental group used video-assisted inquiry modified learning model and the control group used inquiry learning model. The collecting data technique used observation, questionnaire, and test. The researcher used the independent t-test that purposed to compare the average of achievement of control and experiment group. The results of research were: (1) there was an effect of video-assisted inquiry modified learning model on the knowledge and skill aspect but there was not on the attitude aspect; (2) The average of learning outcome of the experimental group higher than the control group's; (3) The video-assisted inquiry modified learning model helped more skilled and trained student to discovery, inquiry the scientific principle, experiment and observation, and explain the experiment and observation's result so that the students be able to understand the materials on the 1st Fundamental Physics Practice.

Keyword : Inquiry Modified Learning Model, Video, Achievement

1. Introduction

The science learning in general and the physics learning, in particular have the same essence that to do the natural process , produce natural products and scientific attitudes. The science learning not only uses mind on as a collection of knowledge but also uses the hand on as learning activities that represent process skills and scientific attitudes. Physics as part of science needs the hand on activities to support the concept [21]. Based on an interview of lecturer on 1st Fundamental Physics Practice that student in Science Education in academic years of 2015/2016 got 25% of students had "C" level, 42% of students had "B" level and 33% of students had "A" level. The result of the interview to Science Education' students produced 15% of students were not having problems when understanding the practice steps while 85% of students had problems when interpreting the practice. Lecturer of 1st Fundamental Physics Practice also stated

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that most students were less able to understand the practice steps so that difficulties when analyzing the data. From the data was obtained, Lecturer needs to provide a learning media to help practicum. This learning media can be video from various internet source which given to students. Media is a means of delivering information to students in the learning activity to achieve instruction [2]. Video as audio-visual learning media so students know the application of the material being taught. It is adds to appeal of students, motivate and explain the teaching materials so that the efficiency and effectiveness of learning can achieve optimal results [1]. Film and video can provide information to complete the reading activity, discussion, and practice, explains the complicated concept, exercises skills and natural attitude with saves time in practice [3]. According to Rante and Ihsan's research [15] that the audio-video experiment is a media that is designed to provide an understanding concept for students through practice learning when the facility does not allow to carry out the real experiment. Video of physics practice as an alternative media to help lecturer and lab assistant when they describe practice step, exercise students to find the resulting, make observation independently, facilitate student's understanding of the practice so as improve student's achievement.

Exline stated that the inquiry learning which requires identification of assumptions experimentation and observation, using critical thinking and logical as well as to explain experimental and observation results [4]. Additionally, Ashiq et al. also wrote that the inquiry learning model is dividing into three namely guided, unguided inquiry and inquiry modified. Learning model that supports this video-assisted on fundamental physics practice is inquiry learning model because lecturer plays a passive role by providing practice video so that the students can practice steps independently. Inquiry modified learning was applied in this study which based on level of inquiry by Wening [20] ie:

Table 1. Level of Inquiry Learning

Level of Inquiry	Explanation
Discovery Learning	Students develop a concept based on experience and knowledge of early
Interactive Demonstration	Students involved in the explanation and prediction that allows educators acquire, identify, confront and resolve the temporary concept.
Inquiry Lesson	Students identify the scientific principles and relationships.
Inquiry Laboratory	Students formulate empirical measurements of variables.
Hypothetical Inquiry	Students produce explanations for the observed science more realistic

Based on the above, this study aims to improve the achievement of students in the subject of 1st Fundamental Physics Practice through using video-assisted inquiry modified learning model.

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2. Methods

This research is quantitative with the quasi experiment and nonequivalent control design because in the reality difficult to obtain a control group used for research. The sampling procedure used purposive sampling on 14 Science Education's students as an experiment group and 14 Mathematic Education's students as a control group in STKIP PGRI Nganjuk at 2016/2017 academic years. The experimental group used video-assisted inquiry modified learning model and the control used inquiry learning model. The technique of collecting data used observation, questionnaires, and test. Observation instrument was used to measure student's achievement of skills and attitude. Test to measure knowledge before learning activity (pretest) and after learning activity (posttest). Questionnaire was used to obtain for student's respond on practice learning with video. Before using in research, instruments have been validated, after that hypothesis further analyze with the independent t-test.

3. Results and Discussion

This research was held to know the effect of video-assisted inquiry learning model on student's achievement. Learning activities in experiment group and control group used inquiry learning level as follows this table:

Table 2. Leaning Activities in Control Group and Experiment Group

Level of Inquiry Learning	Leaning Activites	Control Group	Experiment Group
	Pre-test	√	√
Discovery Learning	Students develop the knowledge and the initial concept by reading the title of the lab, goals, tools and materials to be used	√	√
Interactive Demonstration	Students construct hypotheses lab practicum of titles, goals, tools, and materials	√	√ with customizing the video that is provided
Inquiry Lesson	Students identified scientific principles by doing experiments	√ corresponding the practice steps	√ considering the practice steps in the video as well as experiment independently
Inquiry Laboratory	Students perform data analysis of the variables measured	√	√
Hypothetical Inquiry	Students adjusted experiment hypothesis with the results that have been implemented, and be able to infer from the purpose of the practice	√	√
	Post-test	√	√

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3.1. Description of Result Data

The learning achievement as measured from the knowledge aspect obtained through the pretest and posttest as the table 3 while learning outcome skills aspect and scientific attitude is only obtained during the learning process is shown in Table 4

Table 3. Student's Achievement of Knowledge Aspect

	The Achievement on Knowledge Aspect			
	An average of pretest	An average of posttest	Gain	Category
Control Group	74.00	80.00	0.230	Low
Experiment Group	73.00	85.00	0.439	Medium

Table 4. Category of Student's Achievement on Skills and Attitude Aspect

Category	Number of students			
	Skills Aspect		Attitude Aspect	
	Control group average of achievement = 74.33	Experiment Group average of achievement = 80.44	Control Group average of achievement = 77.92	Experiment Group average of achievement = 83.12
High		3		
Medium	13	11	14	14
Low	1			

Table 5. The Student's Achievement

	An average of achievement	Number of Student in Category		
		High	Medium	Low
Control Group	77.5		13	1
Experiment Group	82.9	3	11	

1.1. Testing of Hypothesis

Table 6. T-Test of Achievement on Knowledge Aspect

		Independent Samples Test								
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Knowledge	Equal variances assumed	.028	.869	-2.815	26	.009	-4.85714	1.72524	-8.40342	-1.31086
	Equal variances not assumed			-2.815	25.741	.009	-4.85714	1.72524	-8.40516	-1.30913

Table 7. T-Test of Achievement on Skills Aspect

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Skills	Equal variances assumed	.014	.908	-2.460	26	.021	-6.11500	2.48597	-11.22497	-1.00503
	Equal variances not assumed			-2.460	26.000	.021	-6.11500	2.48597	-11.22498	-1.00502

Table 8. T-Test of Achievement on Attitude Aspect

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Attitude	Equal variances assumed	5.661	0.025	-1.480	26	.151	-5.194	3.551	-12.410	2.022
	Equal variances not assumed			-1.480	21.579	.153	-5.194	3.551	-12.410	2.094

Table 9. T-Test of Achievement

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Achievement	Equal variances assumed	1.141	.295	-2.615	26	.015	-5.42857	2.07607	-9.69598	-1.16116
	Equal variances not assumed			-2.615	24.331	.015	-5.42857	2.07607	-9.71027	-1.14687

3.3. Discussion

3.1.1. The Video-Assisted Inquiry Modified Learning Model on Knowledge Aspect

The experimental group and a control group got a pretest and a posttest achievement in Table 3. The experimental group had an average knowledge aspect of 85 and 80 for the control group. The difference was due to an experiment group that also contained concepts of physics such as figure 1a, while the control group got it from its references. Table 3 showed that N-gain of the control group had low category and an experimental group had a medium category. The difference of their N-gain was not too much as in Figure 3 because an experimental group received a relatively short explanation and used English language like commentary of student that they couldn't follow quickly with the concept explanation so that their concept was not too affected. Gunawan et al. [7] concluded that using of multimedia on heat energy was not significantly affected on student's concepts. Furthermore, Perry [12] obtained that there had not difference significantly of knowledge achievement though experiment group had higher N-gain.

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Figure 1. The concept about how calculate to read of measurement in video practicum

Figure 2. Concept about how to of result measurement

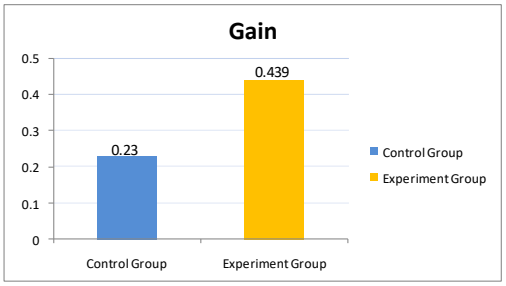

Figure 3. N-gain on The Control Group and Experimental Group

Nevertheless, the result of hypothesis testing showed the significant value 0.009<0.05 that means there was a video on the 1st fundamental physics practice could affect learning achievement. Its effect was that an improving of achievement on the experimental group with N-gain 0.439 was higher than the control group. On the concept about the measurement of micrometer showed that students of the experimental group should read of the measurements like as figure 1, equation 1.1 and 1.2, they should calculate like as figure 2 and equation 1.3.

$$Main\ scale = (the\ number\ that\ you\ found\ with\ mm\ unit) \quad 1.1$$

$$nonius\ scale = (the\ number\ that\ you\ found)x\ 0.01\ mm \quad 1.2$$

$$result\ of\ measurement = main\ scale\ (mm) + nonius\ scale(mm) \quad 1.3$$

While the control group didn't know about its unit for main scale and nonius scale and accuracy of micrometer, so they only calculated from the number of their find.

In concept of Hooke Law, showed that student of control group could not distinguish between mass and weight which is needed in its equation likes as equation 1.4.

$$F = -k.\Delta x \quad 1.4$$

Because this experiment used vertical series and mass of an object was effected by gravitation so

$$F = W = m.g \quad 1.5$$

Equation 1.5 was substituted into equation 1.4 so

$$m.g = -k.\Delta x \quad 1.6$$

The student of experimental also knew that Δx equals to $x_2 - x_1$ but student of the control group used x_2 into equation of Hooke Law so knowledge aspect of the control group was lower than the experimetal group.

Pranowo et al. [13] stated there was difference significantly on improving of student's concept that uses guided inquiry learning with multimedia and without multimedia. According to Isa [19], there were multimedia assisted through guided inquiry learning obtained improving mastery learning significantly that were the first cycle had 13 students passed study and 60% of students had not understood then the second cycle had 38 students passed study, and 5% of students had not understood.

3.1.2. The Video-Assisted Inquiry Modified Learning Model on Skills Aspect

Learning achievement on skills showed that the experimental group had high category as three students and 11 students were the medium category. Students had the high category because they could interpret and exercise practice step by the video practicum quickly and precisely. Before they watched video, students were asked to read the title, purpose, material, and equipment of practice so that they get information before.

The control group had low category as one student and 13 students had medium category because they could interpret practice step with themselves without the help of lecturer and it took longer time. Testing of the hypothesis that a significant aspect of the skills had $0.021 < 0.05$ means the video-assisted inquiry modified learning model could affect student's skill aspect. However, improving the achievement could not be determined specific because this value was singular. This result obtained during the learning process without pretest/posttest.

In the measurement of the micrometer, students of the experimental group got the explaining about the name of its componens like figure 4 which an outer barrel to measure a nonius scale and practice step like as figure 5 that the student should make sure the zero line on the barrel lines up with the line on the slave. In another experiment, the student should know about Hooke Law. From video, student of the experimental group knew that they should measure initial length before an object was hanged in spring and the end length after it. Beside it, student could know that the spring scale showed weight measurement. In this step, the control group read the number of spring scale as mass and only measured the end length of the spring and then its number into Hooke equation. This results were consistent with research from Shi-Jer et al. [8] that "video had more significant effects on students' achievements in a chemistry laboratory context than terms of operating equipment." Research from Limatahu ae al [11] showed 85% of students had a high interpretation on improving process skills so that using of video of practice and electronic module improved on process skills. Gormally et al [6] stated that students had inquiry lab students scored significantly higher on the post test than traditional lab moreover this research used video in inquiry model.

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Figure 4. The Component of Micrometer

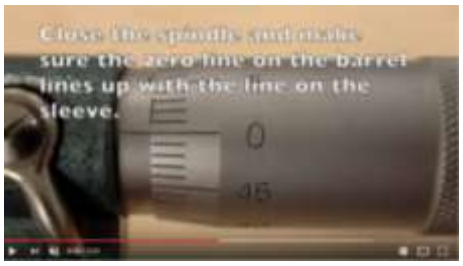

Figure 5. Explaining about How to Use Micrometer

3.1.3. The Video-Assisted Inquiry Modified Learning Model on Attitude Aspect

Students in the experimental group and the control group showed attitude on the medium category. This assessment was singular as an assessment of process skills. The result of hypothesis testing that attitude aspect was significant value 0.151 >0.05 as table 8. Both of group had same achievement level on attitude aspect though they had difference average achievement. The result like it because the student of the experimental group had opinion that measurement of micrometer and Hooke Law ever were used before they as students of the college and some of them had a problem from English language in the video. So they had low the curiosity and low the responsibility. Perry [12] stated that there had not significant difference on attitude aspect with using video or content studied but interview of student resulted they feel a positive impact on using it.

3.1.4. The Video-Assisted Inquiry Modified Learning Model on Achievement

Based on hypothesis testing of achievement overall obtained that 0.015<0.05. These was meant 1st Fundamental Physics Practice that used video-assisted inquiry modified learning model could improve student's achievement (average of three aspects) as Table 5. One of all aspect that more improving achievement were skill aspects. These was supported by questionnaire from the students that video could help and facilitate understanding of practice step. Suyanti and Sormin [17] stated that there were improving video-assisted inquiry modified learning model on student's achievement. Rante [15] stated that the learning outcomes of the students with the use of audio-video based multimedia on the electric dynamic experiment in the classical was said complete learning and learning disabilities more practice and effective. Research of Erchan [5] concluded that multimedia learning promotes more effective learning in science education. The multimedia was developed to improve information and data for their inquiry learning [14]. In another, Recktenwald [16] said that inquiry based lab exercises designed to develop qualitative reasoning skills, these are found when students can predict outcomes before making measurement as soon as those measurements are avalaible. The multimedia with Olabs helps students to supports in carrying out inquiry-based activities and helps understanding by facilitating different methods to investigate the same problem [10]. The video as media that to maximize learning achievement on the psychomotor and video was contained of audio, visual, and messages in form of concepts, principle, procedure, theories, and application [9].

4. Conclusion

The learning achievement of the experimental group had an average learning value was higher than in the control group. Video-assisted modified inquiry learning affects not only the difference in learning value of experimental group and control group, but was also able to improve the achievement of students in the experimental group. It can be concluded this research improve the achievement on knowledge and skills aspect but not for the attitude aspect. Based on video-assisted inquiry modified learning model, students capable discovered, inquired the principle of scientific, experiment and observation, as well as explained the experiment and observation's result so that the students be able to understand the materials which were explained on 1st Fundamental Physics Practice.

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