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THE INFLUENCE OF PROJECT BASED LEARNING MODEL USING KWL CHART ON STUDENT PROCESS SCIENCE SKILLS IN PHYSICS LEARNING AT SMA NEGERI 2 LUBUK PAKAM

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ABSTRACT

This study aims to determine the effect of the Project Based Learning model on high school students' science process skills. The type of research used is a quasi experimental research design with a two group pretest posttest design. The population used was students of class XI MIA SMA Negeri 2 Lubuk Pakam, totaling 2 classes. The research sample consisted of two classes, the class taken was XI MIA I as the experimental class and XI MIA IIIas the control class. The instrument used is a science process skills test in the form of an essay consisting of 10 questions that hav been declared valid by the validator. Based on the results of the study, the average pretest score for the experimental class was 20,68 and the pretest for the control class 18,85. The results of testing the hypothesis showed that a significant value of 0,411 >α = 0,05 otherwise$H_o$is accepted or both classes have the same initial abilities. After applying the Project Based Learning model, the average posttest score of the experimental class was 77,68 and that of the control class was 64,71. The results of testing the hypothesis showed that a significant value of 0,00 <α = 0,05, it is stated that $H_a$is accepted, meaning that there is a significant influence of the Project Based Learning model on student's science process skills.

Keywords: Project Based Learning, Physics Learning, Science Process Skills

INTRODUCTION

Education is the main thing in creating better changes for the formation of quality Human Resources (HR). According to Law Number 2 of 2003 article 3, the purpose of education is to develop the potential in students so that they become human beings who are faithful and devoted to God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens. With the existence of education in a country, it is hoped that it can give birth to the next generation is able to make the best use of existing progress.

The learning process that takes place today is still mostly teacher centered learning while the activities carried out by students are limited to listening, taking notes, answering questions when the teacher asks questions. The teaching and learning generally takes place in one direction which is the transfer or transfer of knowledge, information, norms, values,

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and others from a teacher to students. This kind of process is built on the assumption that learnes are like empty bottles or write anything on the white paper. This system is called banking concept. Teachers need to present interesting and fun learning to learners, so that the material presented can be captured, understood, understandable and used by learners properly(Helmiati, 2012).

Scientific process skills are important for every individual because they can be applied in life, improving scientific abilities, quality and standard of living. Scientific process skills also affect social, personal and individual life in the global sphere (Hilman, 2014).Process skills can attract students attention to understand how to scientifically discover or develop concepts, which is necessary to better provide students with the ability to face the challenges of future life independently, rationally, and creatively(Haryono, 2006).

Based on the results of interviews the author conducted with one of the physics teachers at SMA Negeri 2 Lubuk Pakam said that teachers only occasionally use learning models and approaches such as cooperative models only on some learning materials. Teachers more often conduct learning using conventional odels and lecture methods. The demands of completing quite a lot of material make teachers overwhelmed to implement a variety of different learning models. In addition, the lack of time allocation leads to discussions and practicums that require a considerable time allocation.

In addition to conducting interviews with physics teachers, questionnaires were also distributed to students. Based on the result of the distribution of questionnaires conducted on class XI students of SMA Negeri 2 Lubuk Pakam, from the aspects of student knowledge and skills, it was found that 70% of students preferred learning by discussingrather than just listening to the teacher's explanation, 71% of respondents stated that they better understood the material by practicing, 72% of students were more interested in learning in groups.

In accordance with the problems encountered to assist students in improving science process skills, it is necessary to apply a learning model that suits the needs of students. Project Based Learning is an innovative learning model, which emphasizes contextual learning through complex activities (Istarani, 2014). In project based learning, students are encouraged to be more active, teachers provide convenience and evaluate both the meaningfulness and application in everyday life. So, in Project Based Learning, students play an active role in completing project tasks and are responsible for solving problems in various activities in the project process in order to improve students science process skills.

Based on the description above, this study aims to examine "The

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Effect of Project Based Learning Model Using KWL Chart on Students Science Process Skills in Physics Learning at SMA Negeri 2 Lubuk Pakam".

RESEARCH METHODS

The research was conducted at SMA Negeri 2 Lubuk Pakam, Jalan Hamparan Perak, Pagar Merbau III Village, Lubuk Pakam District, Deli Serdang Regency, North Sumatra Province. This research was conducted from July to August in the academic year 2023/2024 class XI odd semester.

The population in this study were all students of class XI SMA Negeri 2 Lubuk Pakam from 2 classes with 34 students in each class. The research sample ws taken from two population classes with the sampling. One class was used as an experimental class, namely XI MIA I class using the Project Based Learning model and one control class XI MIA III using conventional learning.

This study involved two classes that were given different treatments. To determine the science process skills of students obtained by two treatments on students given tests. The tests given were pretest before treatment and posttest after treatment. Thus the two group research design (prestest and postest) can be seen in table 1.

Table 1. Two Group (Pretest dan Posttest) resarch design

Class	Pretest	Treatment	Postest
Experiment	T_1	X	T_2
control	T_1	Y	T_2

Information:

T_1 = initial test (Pretest)of the experimental class
T_2 = final test(Posttest)of experimental class
T_1 = initial test(Pretest) of control class
T_2 = final test(Posttest)of control class
X = treatment with ProjectBased Learning model.
Y = treatment with conventional learning model.

Researchers gave pretests to experimental and control classes. The instrument used in this study consisted of 10 essay questions. The science process skills test was first standardized using content validity test by lecturers and forecast validity. After the pretest data was obtained, data analysis was carried out with a normality test, namely the Kolmogorov-Smirnov test using SPSS 26.0 with a significant level of 0.05, homogeneity test and variance equality test. After that, two-party t test hypothesis testing was carried out to determine the initial ability of students in the two samples groups in this case the initial ability of the two samples must be the same. Furthermore, researchers taught the subject matter using the Project Based Learning model in the experimental class and conventional learning in the control class. The posttest data was carried out a prerequisite test with a normality test and homogeneity test, then a t test was carried out to

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determine whether there was an effect of the Project Based Learning model on students science process skills compared to conventional learning on dynamic fluids.

RESULTS AND DISCUSSION

a. Research Result

Based on the pretest data, the average pretest score of students in the experimental class before being treated with the Project Based Learning model was 20,68 and the standard deviation was 9,25. While in the control class the average student pretest score was 18,85 with and standasd deviation of 8,92. A comparison of the pretest scores of the two classes can be seen in table 2.

Table 2. Comparison of pretest scores of experimental and control classes

Eksperimental Class				Control Class			
Value	**f**	**Average**	**Standard Deviation**	**Value**	**f**	**Average**	**Standard Deviation**
8-13	9	20,68	9,25	8-13	12	18,85	8,92
14-19	7			14-19	8		
20-25	10			20-25	6		
26-31	3			26-31	4		
32-37	2			32-37	2		
38-43	3			38-43	2		
$\sum = 34$				$\sum = 34$			

The pretest results of both classes can be seen in the following bar chart:

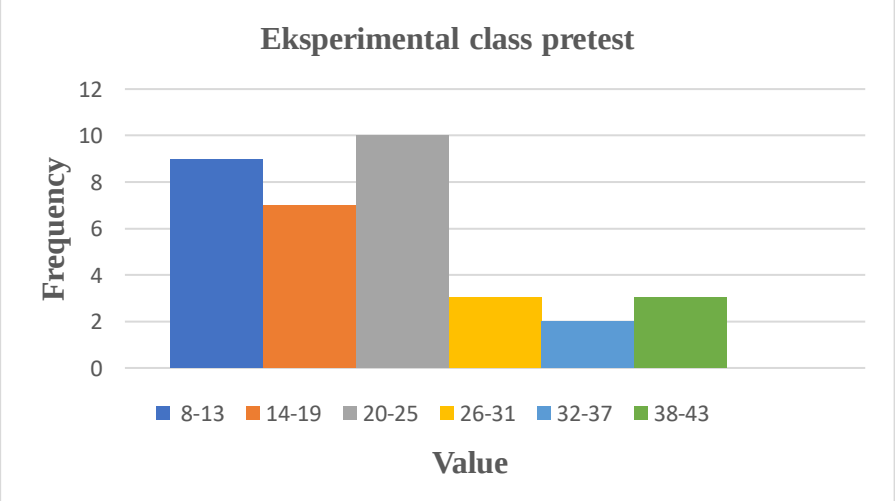

Figure 1. Eksperimental class pretest data

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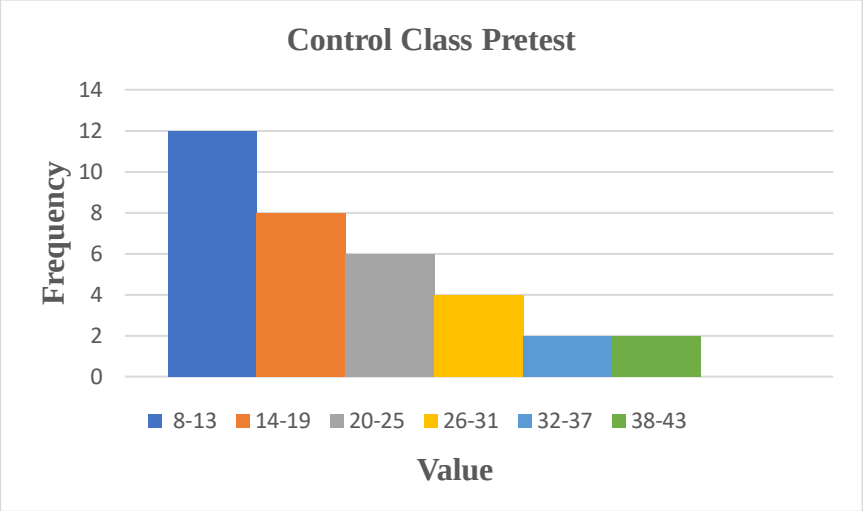

Figure 2. Control class pretest data

Based on the data from the pretest results of experimental and control class students, the normality test and homogeneity test of the pretest data were first carried out. The calculation results show that the pretest data is normally distributed and homogeneous, so the assumption test is carried out using the equality of varience and the average pretest value which is carried out by the independent sample t test. In summary, the data similarity assumption test can be seen in Table 3.

Table 3. Summary of t test calculation results for pretest data

		ttes for equality of means						
		T	Degrees of freedom	Sig (2-way)	Mean Difference	Standar deviation difference	Level of Trust 95%	
							Lower	On
Pretest Score	Assuming Equal Variances	0,827	66	0,411	1,824	2,204	-2,577	6,225
	Assumption of enequal variances	0,827	65,916	0,411	1,824	2,204	-2,578	6,225

Based on results of the t test calculation,it can be seen that the significant value(2-way) with the t test is 0,411 because the value of 0,411is significantly greater than 0,05 (0,411<0,05), it is consluded that the initial ability of students in the experimental class and control class is the same. The

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next step taken by the researcher after giving yhe pretest to the experimental class was to provide treatment using the Project Based Learning model.

After both classes were treated differently, both classes then received a posttest with the same questions as the pretest questions. The results obtained were the average posttest value in the experimental class after applying the Project Based Learning model of 77,68 with a standard deviation of 10,77. While in the control class the average student posttest score was 64,71 with a standard deviation of 9,41. A comparison of the posttest scores of the two classes can be seen in table 4

Table 4. Comparison of posttest scores of experimental and control classes

Eksperimental Class				**Control class**			
Value	**f**	**Average**	**Standard Deviation**	**Value**	**f**	**Average**	**Standard Deviation**
55-60	4	77,68	10,77	53-58	13	64,71	9,41
61-66	3			59-64	2		
67-72	3			65-70	11		
73-78	6			71-76	3		
79-84	5			77-82	3		
84-90	13			83-88	2		
$\sum = 34$				$\sum = 34$			

The posttest: results of both classes can be seen in the following bar chart:

Figure 3. Eksperimental class posttest data

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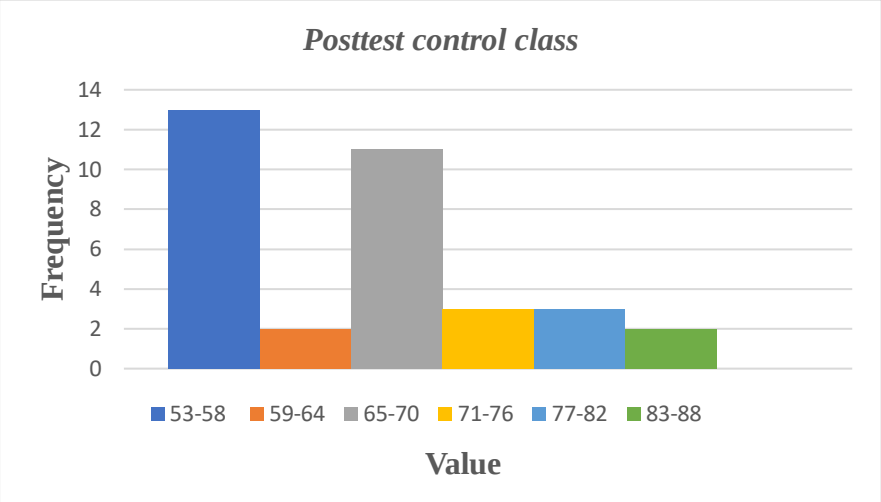

Figure 4. Control class postest data

The figure above shows the condition of the posttest value of class science process skills after treatment which shows the average posttest result of the experimentak class of 77,68 with a standard deviation of 10,77 and the average posttest result of the control class of 64,71 with a standard deviation of 9,41. The highest score in the experimental class was 90 with a frequency of 6 people and the lowest score was 55 with a frequency of 1 person.

Based on the data from the posttest results of students from the experimental class and control class, the normality test anda homogeneity test of posttest data were first carried out to determine the effect after different treatments were given to the two classes. The calculation results show that the posttest data is normally distributed and homogeneous, so the posttest data hypothesis test is carried ot using the t test. In summary, the posttest data hypothesis test for both clasess can be seen in Table 5.

Table 5. Summary of t test calculation results for posttest data

		T test for equality of means						
		T	Degrees of freedom	Sig (2-way)	Mean difference	Standard deviation difference	Level of trust 95%	
							Lower	on
Pretest Score	AssumingEqual variances	3,630	66	0,000	12,059	3,322	5,427	18,691
	Assumption of enequal variances	3,630	65.599	0,000	12,059	3,322	5,426	18,691

Based on table 5, it is obtained that the significant value is 0,00<0,05, it can be said that the test results reject H_0or accept $H_a$at the 5% alpha level, thus there isa significant influence between the results of students' science

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process skills using the Project Based Learning model and the conventional learning model on Dynamic Fluid material.

b. Discussion

Based on the results of research and data processing, it can be seen that the application of th Project Based Learning model has a significant effect on students' science process skills on Dynamic Fluid material at SMA Negeri 2 Lubuk Pakam. This can be seen from the pretest scores of control and experimental class students, which are 20,68 and 18,85 which are different. However, in the experimental class when treated with the application of the Project Based Learning model, the average posttest value of the experimental class increases to 77,68. While in the control class the average posttest value was 64,71. The difference in the results of the students' science process skills is due to the influence of the Project Based Leaning model using KWL charts on students' science process skills on Dynamic Fluid material. Similar research was also conducted (Roziqin, Lesmono, & Bachtiar, 2018)from his research concluded that the Project Based Learning model has a significant effect on learning interest and science process skills. The same thing was also revealed by (Fitriyani, Koderi, & Anggraini, 2018)from the results of this research which showed that the results ogf the posttest t test showed that $t_{count} > t_{table}$ so that $H_a$was accepted, which means that three is an influence on science process skills with the Project Based Learning model.

The application of the Project Based Learning model has the advantage to providing equal opportunities for all students, including students with different ability levels, to understand the material through experimentation without any difference in treatment. During the learning process all students actively conduct experiments on Dynamic Fluid material in this case students make a simple atomizer project to cntrol the flow of liquid. Hile conventional learning ther is a tendency for students to be required to remember concepts instead of being invited to do activities to get where to concept are obtained, so that in the end it will affect the length of storage of knowledge in the memory of students. Therefore, students cannot develop science process skills that exist in the students themselves. This is what causes the Priject Based Learning model to produce a higher level of learning achievment compared to conventional learning. This is in line with research(Asmi, Hasan, & Safitri, 2018)stating that the Project Based Learning model can provide opportunities for students to be actively involved in problem solving, making projects so that students can better know and understand the material.

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During the implementation of the research, the Project Based Learning model has learning stages that have a positive influence, namely providing more meaningful learning. From thisstage it can be found that students are actively involved in learning activities. Where in these activities it begins by confronting students with a problem and inviting students to make observations of reality related to the concept, students are given the opportunity to convey ideas related to solutions that can solve the problems given. The goal is to provide stimulation to students in formulating problems and instilling prior knowledge that students knoe beforehand, it is estimated that 50% of students in the class have been able to make observations and provide basic explanations such as conveying ideas about the Bernoulli's Azas problem. In the experimental class, students who seemed active inconveying ideas were around 50%, some other student were still in the process of self-adjustment.

The next stage Background knowledge, the teacher starts by explaining a little about the stages of working on the student worksheet that must be completed by each group and explaining the limit for conducting experiments or working on projects. The Generated Ideas stage where students are grouped into several groups, each group conducts a brainstorming session they can create ideas related to the experiments or project they will do, they understand and seek information related to experiments or projects that will be carried out through books, research or internet acess. Implement solution and Reflect stage, students then sit together with one group to star working on the learner worksheet and do the dvision of tasks. Learners build a physical model or project design that they will work and prepare what learners want to focus on through this project. During group work, students collaboration with each other and provide information to each other that leads to the process of practicum activities and opens a question session as a form of student curiosity.

The Generalize stage where researchers invite students to re-discuss the data that has been processed and present the project results that have been obtained in groups where students compare their findings with the theories or concepts they have learned whether their projects support or oppose existing theories or concepts. Students are more skilled and better understand the content of the projects that have been carried out, so that students bettter understand the concepts and technology of the project.

The application of the Project Based Learning model using KWL Chart has an impact on student activity which has increased from the first meeting to the third meeting. At meeting I 62,33 (Less Active), meeting II 73,16 (Moderately Active) and the meeting III 90,66 (Very Active) This

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increase in student activeness is due to students startig to adjust to the learning model being applied, so that the learning process gets better and students have actively participated in the learning process. Students activeness in the learning process greatly affects the learning outcomes of students' science process skills.

CONCLUSION

Based on the research results obtained from the results of data analysis and hypothesis testing, it can be concluded that there is a significant effect of the project-based learning model on science process skills on dynamic fluid material in class XI at SMA Negeri 2 Lubuk Pakam.

1. Students science process skills by applying the Project Based Learning model using KWL Chart on Dynamic Fluid Material increased. This can be seen before learning, students were given a pretest obtaining an average value of 20,68. After being treated and carried out the posttest obtained an average value of 77,68.
2. The science process skills of students by applying conventional learning models on Dynamid Fluid material, before learning students were given a pretest obtained an average value of 18.85. After being treated and carried out the posttest obtained an average value of 64.71.
3. There is a significant effect of Project Based Learning model on students science process skills on Dynamic Fluid material. This is indicated by the significant value (1-way sig) which is 0,00 because the significant value is smaller than 0,05 (0,00 < 0,05) so it can be stated that there is an effect of the Project Based Learning model using KWL *Chart*.
4. The activity of science process skills by using the Project Based Learning model in physics learning at SMA Negeri 2 Lubuk Pakam has increased. At meeting I 62,33 (Less Active), meeting II 73,00 (Moderately Active) and meeting III 90,66 (Very Active).

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