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THE EFFECT OF SCIENTIFIC INQUIRY LEARNING MODEL ASSISTED BY VIRTUAL LABORATORY TO STUDENT'S SCIENCE PROCESS SKILL ON DYNAMICS AND EQUILIBRIUM OF RIGID BODIES TOPIC

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Abstact *The purposes of this research are to know student's science process skills using scientific inquiry learning model on dynamics and equilibrium of rigid bodies topic, to know student's science process skills using conventional learning on dynamics and equilibrium of rigid bodies topic, to know the student's activity based on science process skills indicator during the learning process using the scientific inquiry learning model, and to know the effect of scientific inquiry learning model on student's science process skills on dynamics and equilibrium of rigid bodies topic. The type of this research is quasi experimental which using pre-test and post-test design. The population are all of students of class XI SMAN 1 Perbaungan, consist of 4 classes. Two classes of them are used for the sample. Experiment class using scientific inquiry learning model and control class using conventional learning. The result of research shows that the level of students' science process skills in experiment class is a good criteria with the developed as the first meeting is 53.08, the second meeting is75.61, and the third meeting is 85.49. The average of pre-test in experiment class is 34.35 and in control class 34.53. The average of post-test in experiment class is 66 while in control class is 60. From one tail t-test can concluded there is influence of scientific inquiry learning model on students' science process skills on dynamics and equilibrium of rigid bodies in class XI SMAN 1 Perbaungan.*

Kata kunci:
Scientific inquiry learning model; student's physics science process skills.

Introduction

Education is a conscious effort to prepare students through guidance, intruction, and training for its role in the days to come. School as a formal educational institutions, systematically plan the various environments, namely educational environment that provides opportunities for students to perform a variety of learning activities (Hamalik, 2011).

Based on the author's experience when doing program of integrated field experiences (PPLT), many students who stated that the physics lesson is a lesson that is less attractive. They also tend to think of that physics is one of the lessons which are boring and difficult because it is always synonymous with much formula and difficult to remember. In addition, teachers often use patterns of teaching by presenting the material and completion problems with the formula. Students can only count but cannot understand the concept of the real physics. In the process of learning, especially learning physics teacher is a figure that should be good at choosing

models, and media that will be used to explain the subject matter so that the learning objectives can be achieved.

According Zamista & Kaniawati (2015), "of the many skills to be developed through the study of physics, science process skills is one of the important skills to have students". According Ulmiah, Andriani & Fathurahman (2014), "Physics provides a great opportunity for students to develop these skills. This is because many of the concepts of physics that must be known to students through a process, not merely a concept in the form of rote ".

Science process skills do not just listen and observe the teacher's explanations. According Harlen & Elsegeest (1992), "there are several aspects of the science process skills students need to have in learning are: observe, formulate hypotheses, predict, find patterns and relationships, communicate effectively, designing experiments as well as measuring and calculating". If these aspects can be developed by teachers with good science process skills of the students will also be high. Therefore, it takes a learning model that can provide hands-on experience for students to develop the science process skills.

The learning model *Scientific Inquiry* is a design model that is expected to solve the problems described above. According to Joyce, Weil & Calhoun (2009), "the core of this model is to involve students in research problems are really original in a way exposes them to the field of investigation, helping them identify problems conceptually or methodology in the field, and took them to devise ways of solving the problem ". According to Muslim & Tapilouw (2015), "in *Scientific Inquiry is* the process of digging through investigation or observation is done naturally through an observation or phenomenon that occurs based reasoning and creativity of the students". According Ulmiah, Andriani & Fathurahman (2015), "when students investigate and investigate the problem scientifically by finding and collecting evidence, the students do a lot of learning activities that can help to develop science process skills that are now owned by every student ".

Based on the results of previous studies it is known that there is significant influence between the learning models *Scientific Inquiry* against science process skills of students. However, previous studies have difficulties with the allocation of time is not quite right, because students are still confused with what to do, especially when determining the formulation of the problem, ask questions, determine the study variables, and specify the experimental procedure. Therefore, researchers will conduct research in learning model *Scientific Inquiry* to increase the efforts that have been made previous researchers that the achievement of students' science skills will be better.

Wijaya, (2013) examined the influence of inquiry learning model-assisted virtual laboratory for understanding physics concepts to eighth grade student of SMP Negeri 1 Negara. Based on these results, it can be concluded that the implementation of inquiry learning model-aided virtual laboratory in physics learning is very effective in improving the understanding of physics concepts than models of inquiry learning and conventional learning model.

For physics materials that are difficult to be visualized by demonstrations or ordinary experiments then computer simulation can be used as an alternative strategy to approach the process of learning physics. One form of technology that has conformity with guided inquiry theory is a virtual laboratory. So that by integrating between the scientif inquiry learning model and virtual laboratory, it is expected that student's science process skills can improve.

Method of Research

The research was conducted in SMA N 1 Perbaungan which is located at Jl. May. Jend H.T. Rizal Nurdin Kec. Perbaungan. The time of this research is carried out

during the learning of Dynamics and Equilibrium of Rigid Bodies material takes place on semester I. Sampling was done randomly where samples were taken as many as 2 classes for the experimental class and control class. The experimental class is the class that is taught by applying the scientific inquiry learning model using media virtual laboratory and control class is the class that is taught by applying the conventional learning model.

Design research in the form of two group pre-test-post-test design as shown on Table 1.

Table 1. C*ontrol group pre-test – post-test design*

Class	Pre-test	Treatment	Post-test
E	T_1	X	T_2
C	T_1	Y	T_2

Note:
- E : Experiment Class
- C : Control Class
- T_1 : Pre-test for experiment class and control class
- T_2 : Post-test for experiment class and control class
- X : Treatment with Scientific Inquiry using model virtual laboratory
- Y : Treatment with conventional learning

Data have obtained tested of normality to know data of both sample was normal distribution used Liliefors test. Then homogenity test to know what is both of sampel homogen used same varians test. Hypothesis test used t tail one test. If $F_{count} > F_{table}$, so can concluded that both of sample have not homogen varians with $\alpha = 0{,}05$ (α significant level).

Result and Discussion

The data obtained in this study is the value of student's science process skills on dynamics and equilibrium of rigid bodies topic in class XI SMAN 1 Perbaungan, namely student's science process skills in the class using the scientific inquiry learning model and in other classes using the direct learning model. The research was conducted in two classes consisting of an experimental class with 36 person and a control class with 36 person. As for the recapitulation of the distribution of pretest and posttest result, the research sample group can be seen in table 2 and table 3.

Table 2. Data of Pretest Students' Science Process Skills for Experiment and Control Class

No	Value	Frequency of Experiment class	Frequency of Control Class
1	20-24	4	5
2	25-29	5	5
3	30-34	8	7
4	35-39	9	8
5	40-44	5	6
6	45-50	5	5
N		36	36
Average		34.35	34.53
Standard deviation		7.92	8.02

Table 3. Data of Posttest Students' Science Process Skills for Experiment and Control Class

No	Experiment class		Control class	
	Value	Frequency	Value	Frequency
1	43 – 49	2	43 – 48	4
2	50 – 56	4	49 – 54	7
3	57 – 63	10	55 – 60	8
4	64 – 70	13	61 – 66	8
5	71 – 77	4	67 – 72	6
6	78 - 84	3	73 - 78	3
N	36		36	
Average	66		60	
Standard deviation	9.66		8.72	

Whereas, for the test of data analysis requirements, namely the normality test and homogenity test the research data can be seen in table 4 and table 5

Table 4. Data Normality

Kelas	Perlakuan	Harga		Ket
		L_0	L_{tabel}	
Eksperimen	Pretes	0,094	0,147	Normal
	Postes	0,124	0,147	Normal
kontrol	Pretes	0,101	0,147	Normal
	Postes	0,087	0,147	Normal

Table 5. Data Homogenity

Data		F_{hitung}	F_{tabel}	Ket
Pretes	Eksperimen	1,026	1,74	Homogen
	Kontrol			
Postes	Eksperimen	1,229	1,74	Homogen
	Kontrol			

Initial ability students carried out by two tail t-test, the result from statistic count t_{count} is -0.10 and t_{table} is 1.997 so $-t_{table} < t_{count} < t_{table}$ (-1.997 < -0.10 < 1.997). There are similarities initial ability students from experiment class and control class.

To see the effect of scientific inquiry model learning carried out by the one tail t-test. Based on hypothesis testing criteria if $t_{count} > t_{table}$ (t_{count} is 2.78 and t_{table} is 1.996) then H_a is accepted and H_o is rejected. So we can conclude that scientific inquiry learning model has significant effect in learning process toward students' science process skills.

The science process skills of students using the scientific inquiry model are more influential than using conventional learning models. this is shown from the value of the pretest and the students in the experimental class and the control class which has increased. but a significant increase occurred in the experimental class. The average value of student pretest in the control class is 34.53 and the average posttest score is 60 has an increase of 25.47. Whereas, in the experimental class the average value of the drop is 34.35 and the posttest mean score is 66 has increased by 31.65. It can be seen that the experiment class that taught by Scientific Inquiry learning model had increasing science process skills higher than direct instruction class increasing. It means that Scientific Inquiry learning model is has influence on student's science process skills on topic Dynamics and Equilibrium of Rigid Bodies grade XI odd semester.

This is relevant with the Anggraini & Sani's (2015) research stated that Skills of the student's science process taught with learning models Scientific Inquiry is better than with students taught with conventional learning. Then have a relevant resources also to Rofi'ah *et al* (2016) that stated The scientific inquiry learning strategy significantly improves student's science process skill, posttest value after being given a study with scientific inquiry significantly increased compared to pretest values, pretest grade control values and posttest control class values. Then have a relevant with S. Manlove *et al* (2006) that showed facilities effects for the fully specified support tool on learning outcomes and initial planning. Qualitative data elucidated how regulative guidelines enchanced learning and suggests ways to further improve regulative process within collaborative inquiry learning setting. And this is relevant with Ronald D. Anderson (2002) that stated Scientific inquiry refers to the diverse ways in which scientists study the natural world and porpose explanation based on the evidence from their work. Throughout the *NSES*, this form of inquiry is treates as being grounded in certain abilities and understandings. This definitons of inquiry reflects an understanding of how science proceeds and is independent of educational process.

This gives meaning that there is an influence given by the learning with Scientific Inquiry learning model. This is because the Scientific Inquiry learning model brings students directly by engaging students in truly original research problems by confronting students in the field of investigation to help students identify conceptual or methodological in a field an invite students to design ways to solve problems. In the experiment class the researcher begins by giving perception to the students. In accordance with the phase of Scientific Inquiry to bring students to the problems encountered in everyday life.

The Scientific Inquiry learning model make students tend to actively find out through the investigation process that finally arrived to the content of the knowledge itself so that it is good directly or indirectly students will have learning

outcomes in the form of process skills good science. Scientific inquiry model as a learning model scientific arguments of students to do investigation and prove whether claims and data submitted can be used as evidence and provide conclusion. The investigation activity itself contain thinking activities by following scientific procedures (methods) such as skill in making observations and measurements, making hypotheses, predict, find patterns and relationships and communicate the findings. That activities is an indicator of science process skills. So that it can be interpreted scientific inquiry can improve students' science process skills.

In classroom given the conventional approach, students listen more to the teacher's explanations in front the class, recording teacher-centered learning and teaching activities. This resulted in few student active in the learning process and the students became less enthusiastic. This is what affects the visible ability of students from physics science skills that are low. Sometime using demonstration is not enough to support students learning. Inquiry's inertial learning model positively affects students, this learning model is able to provide opportunities for students to become more active in the learning process, through the application of phase in this scientific inquiry learning model, students are directly involved in problems, finding principles and answer through trial. However, the scientific inquiry model has been able to improve student's science process skill.

In conducting research, researchers found obstacles in implementing scientific inquiry learning model is that students do not all have laptops and internet access so that experiments do not work well. it interferes with the student's experimental activities and it takes quite a lot of time to experiment. Lack of experience of researchers in managing classes so that research becomes less efficient. Researchers also found flaws in this study that researchers did not assess experimental activities in the control class to compare science process skills with the experimental class. It is hoped that further researchers will be able to overcome this deficiency by preparing research needs correctly and correctly in terms of providing equipment and materials and in the ability to do teaching and learning activities in accordance with the syntax in this regard learning model. Especially in terms of class management, it is desirable to get better research results. So it is necessary for researchers who want to continue this research are expected to assess practical activities for both classes. Because this is what can see the comparison of two class processes. So we can draw the conclusion that the science process skills of a class can be influenced by the inquiry learning model.

Based on previous theory and research, it was found that the results of this research have similarities with them. One of them is scientific inquiry learning models can affect student's science process skills in physics lessons. Thus the differences in average grade post test of experiment and control class due to differences in the treatment applied then it can be concluded that there was significant influence of students'science process skills taught by scientific inquiry learning model in the subject matter of dynamics and equilibrium of rigid bodies in class XI SMAN 1 Perbaungan.

Conclusion and Suggestion

Based on the results of analysis, statistical test, and discussion of the results of research on dynamics and equilibrium of rigid bodies topic in class XI SMAN 1 Perbaungan are: 1) Student's science process skills using scientific inquiry learning model has average posttest 66 is included in enough category; 2) Student's science process skills using conventional learning has average posttest 60 is included in enough category; 3) Student's learning activity taught by Scientific Inquiry learning model in experimental class got

good category according to the science process skills indicator during treatment (learning process); 4) The effect of scientific inquiry learning model to student's science process skills is better than effect conventional learning to student's science process skill in dynamics and equilibrium of rigid bodies.

There are also suggestions that can be delivered based on the experience of this research are: The results of this study indicate that scientific inquiry learning model can improve students' science process skills. On this basis inquiry learning model can be used as one model that teachers can apply in the learning process. The lack of completeness of tools and materials while doing the experiment can interfere with the effectiveness of the teaching and learning so it is advisable for the next researcher to use the tools and materials enough and can be used properly and correctly. Because the tools and materials used can be a support to improve students' science process skills. The lack of teachers' ability to manage the class greatly affects the effectiveness of learning. so it is hoped for further researchers to improve their class management skills before doing the research. For the next researchers, should assess the science process skills of both of class. Not only in the experimental class but also in the control class.

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