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THE EFFECT OF REACT MODEL TOWARD KNOWLEDGE COMPETENCE IN PHYSICS LEARNING

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ABSTRACT

The physics outcomes of learning by students cannot be said to be good due to several factors including the lack of activity and Students' participation in the learning process and the lack of understanding of students of teacher for material presented. To overcome this, an appropriate model of learning is needed to overcome the above problems by using the REACT model. The research purpose was to find out whether there was a influence in significant on the influence of the REACT model on the achievement of knowledge competence in physics learning at Class XI senior high school. This research type includes Quasi Experiment Research. The research design used was the Posttess-Only Control Design. The research population were all class XI natural science. The technique for sampling used was Purposive Sampling. Data on students' knowledge competency achievement were taken through the posttest using multiple choice questions. Based on the research data, The average value was discovered of the knowledge competency of the class for experimental was 81.94 and that of the class for control was 76.22. By carrying out a similarity test of two averages on knowledge competence at a significant level of 0.05, $t_{count} > t_{table}$ is obtained. Thus the research results got conclussion that there is a influence in significant on the effect of the REACT model on the achievement of knowledge competence in learning physics at class XI senior high school.

Keywords :*The REACT model, knowledge competence, physics learning.*

I. INTRODUCTION

Education in the 21st century is very meaningful for students to have skills for Innovation and learning, skills in using information media and technology, students can work using skills for life. The 2013 curriculum says A scientific approach to learning includes reviewing activities, formulating questions, collecting data with techniques, processing, making conclusions, also presenting results including the essence in order to gain knowledge, skills, and behavior [1]. Physics is a subject that is disliked, respected, boring, and also difficult for students to accept. Learning physics at school shows that overall student outcomes of learning are not good compared to other fields of research. Physics studies often experience problems including the use of inappropriate models, media and teaching materials, as well as the low awareness of educators about student interest and motivation in learning [2].

According to the 2013 curriculum, knowledge cannot be simply transmitted from instructor to student. Learners are individuals who actively seek, process, construct, and apply knowledge. Interactions in the process of learning between teacher and students, as well as learning resources, are regulated and supervised in a learning environment so that learning activities are directed according to educational goals that assist students in developing all of their potential, skills, and personal characteristics In a positive direction. To that end, every teacher is required to be able to organize, implement, and assess the process of learning [3].

In the subject of 21st century skills , *learning and innovation skills* are demanding participant educate for own prowess think and results research. Proficiency These include critical thinking skills, collaboration *(callaboration)* , communicate *(communication),* creativity and innovative (*creativity and innovation)* or which often called with skill 4C [4].

In application, Revision of Curriculum 2013 demand teacher for developing learning by combining four essential elements, which one of which is 21st Century Skills (4C) which require teacher creativity in concocting it. Understanding these demands, learning is no longer possible using models, approaches, strategies, methods, and techniques that are centered on teachers, but must activate students in learning *(active learning)* student-centered and enhance the abilities they needon century 21 [5].

After the initial research was carried out, based on the learning implementation that had been carried out, the reality on the ground was not in same with the expected ideal conditions. The outcomes of learning by students at senior high school class X natural science were obtained from document analysis. The document is in the form of a Final Semester Assessment (PAS) for even class X natural science students for the 2021/2022 academic year for physics lessons. This document was obtained from a class X physics teacher at senior high school From the document analysis result, it was obtained that the average PAS scores for physics class X natural science varied. Where the highest PAS average score was class X natural science 1 of 64.10 while the lowest PAS average score was class X natural science 5 of 38.47. While the value for class X natural science 2 is 56.68 , class X natural science 3 is 59.43 and class X natural science 4 is 38.86. This shows that students' physics outcomes of learning have not reached the Minimum Completeness Criteria (KKM). The KKM determined by the school for class X at senior high school is 75. According to [6] the cognitive outcomes of learning of class X students at senior high school cannot be said to be good. The outcomes of learning of the students in each class varied, three classes were categorized as sufficient, namely class X natural science 1, X natural science 2 and X natural science 3, then two classes were categorized as very lacking, that are class X natural science 4 and X natural science 5. The physics outcomes of learning of students could not be said to be good caused by several factors including the lack of activity and Students' participation in the learning process and the low of understanding of students in the material presented by the teacher.

According to observations made by researchers at senior high school, it was found that students were less active during the physics process of learning. When the teacher asks questions, only a few students can answer the questions given by the teacher and only a few students want to ask questions. The lack of student involvement in the learning process is due to the less effective model of learning used by the teacher. Teachers usually use conventional model of learning. The syntax of the conventional model of learning is that the teacher conveys learning objectives, the teacher presents information to students, the teacher checks student success and provides feedback and the teacher provides further exercises and additional assignments to be done at home. Where the teacher plays an active role in providing information while students act as passive recipients of information. In the process of learning students only listen to the teacher's explanation, take notes and do the assignments given by the teacher individually. Students rarely do experiments and group discussions so that the lack of involvement of students and makes students bored in the process of learning causes a low understanding of students towards the subject matter.

The 2013 curriculum demands direct student-centered learning (student center). Teachers are required to be able to choose a model of learning that enables students to directly participate participate in the learning process. So to overcome this, a model of learning is needed that can motivate pupils to participate actively and directly involved in the learning process and increase student understanding. One model of learning that supports active students and is directly involved in the process of learning and increases understanding of students is to use the *REACT model.*

The model of learning was a learning planning framework that is used by teachers with certain syntax to achieve a desired learning goal [7]. *REACT* was known by *the Center of Occupational Research and Development (CORD)* which consists of 5 process, namely: (1) *relating* ; (2) *experiencing* (experiencing); (3) *applying* (applying); (4) *cooperative* (work together); and (5) *transferring* . The *REACT* stage is able to empower students' problem-solving performance and can provide opportunities for students to learn to "experience" not just memorize, apply concepts, and train students' thinking skills optimally. That is, students are not only passive recipients of teacher instructions but are engaged in the construction of their knowledge [8]

The model of *REACT* learning has several advantages, namely: it can deepen understanding of students,

providing chances for students to participate actively in the learning process, developing an attitude of connection and a sense of reciprocity , develop Skills for period front, form attitude love environment and make learning in an inclusive manner, making it easier for students to know the use of material in everyday life, and involving students in the process of solving problems through experiencing activities [9]. Therefore, learning using the model of REACT learning provides advantages, one of which is being able to deepen understanding of students that using the model of REACT learning can increase students' knowledge competence.

According to the description of the problems found in the field, the researcher is interested in examining the model of REACT learning effect Therefore, the title of this research is "The Influence of the *REACT Model* (*Relating, Experiencing, Applying, Cooperating, Transferring*) on the Achievement of Knowledge Competence in Physics Learning at senior high school class XI.

II. METHOD

The research purposes was to find out whether there was a influence in significant on the effect of *REACT* model on the achievement of knowledge competency in physics learning at Class XI senior high school.. Based on the problems and objectives that have been stated, this research type includes Quasi Experiment Research (quasi experiment). The characteristic of this experiment is that this experiment has a class for control, but it cannot completely functional to control external variables affecting experiment implementation [10].

The design for research used was the *Posttess-Only Control Design* . In In this research design, there were two groups, each of which was randomly selected random (RThe group that was assigned The experimental group received the treatment, while the control group did not treatment is called the class for control. The treatment given in class experiment that is using the *REACT model* and in the class for control ordinary learning is carried out in schools based on a scientific approach. At the end of this research both classes will be given a final test to see their outcomes of learning.

The population is a generalization area made up of objects or people with certain qualities and traits that researchers study and then draw conclusions. The population in this research were all class XI natural science senior high school which registered on Semester 1 Year teachings 2022/2023. The sample is a component of the population's number and features. Technique sampling which used on this research is *Purposive Sampling* . Class XI natural science 4 was selected as the class for experimental and class XI natural science 5 as the class for control.

This research variables included three variables, namely variables in independent, variables in dependent and variables for control. The variable in independent for this research is the *REACT model* on class experiment. The dependent variable in this research is the achievement of the knowledge competence of the participants educate on heat temperature material and the kinetic theory of gases class XI natural science 4 and XI natural science 5 senior high school Fields. Variable control in research this is the teacher who teaches in both classes, the number of lesson hours used, Theory lesson, amount and type about which tested same .

The data needed in this research consists of primary data and data secondary. Data primary in research this is data achievement competency knowledge of students taken through the posttest using questions in multiple choice form, while secondary data is the end of semester assessment (PAS) participant educate before research which obtained from a physics subject teacher at senior high school. For reach purpose research need arranged systematic research procedures. In general, the research procedure is divided into : three Step that is preparation phase, implementation, and settlement. The instrument is one of the data collection tools. The data collection instrument in this research is the assessment of knowledge competence.

Data analysis aims The data gathering device put forward Is accepted or rejected in the research. The normality and homogeneity test results raise several possibilities. Based on the the normality and homogeneity tests results was conducted, it was found that the two samples originated from normally distributed groups and from populations with the same variance (homogeneous), so *the t test was used* . The t test formula is:

$$t = \frac{\overline{X_1} - \overline{X_2}}{s\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}} \quad (1)$$

Comparing the calculated t values obtained with t_{tables}. The test criteria accept H_0 if it is $-t_{1-\frac{1}{2}\alpha} < t_{hitung} < t_{1-\frac{1}{2}\alpha}$ at a significant level (α) 0.05 , while reject H_0 for other t values.[11]

III. RESULTS AND DISCUSSION

A. Research Result

This research was conducted at senior high school. This research used two classes for sample, known as the class for experimental and the class for control. sample that used as much 71 participant educate, 35 students as group experiment and 36 students as the class for control. The class for experimental was given treatment using the model of REACT learning, while the class for control was given treatment with scientific approach learning. The material used in this research is temperature, heat and gas kinetic theory in class XI natural science 4 and XI natural science 5 senior high school. After completing the research process, the researcher obtained data on the achievement of student outcomes of learning in knowledge competence .

B. Data Description

1. Description of knowledge competency data

Student knowledge competency data were obtained from the final test *(posttest)* in the class for experimental and class for control at the end of the research. Researchers used a written test instrument consisting of 25 multiple-choice questions. Description of the research data for the class for experimental and class for control include in Table 1.

Table 1. Post-test result data for class for experimental and class for control at senior high school

Class	**N**	**Score**		$\bar{x}$	S^2	S
		Highest	**Lowest**			
Experiment	35	96	56	81.94	109.53	10.47
Control	36	92	48	76,22	172.75	13,14

Table 1. Shows data on students' *post-test results for the class for experimental and class for control obtained statistically.* Where for the number of students (N), the average value ($\bar{x}$), standard deviation (S), and variance (S^2). Based on the table, it shown that the value in average of knowledge competence in the class for experimental is more than the national average for knowledge competency in the class for control.

The following is a graph of the average post-test students in the class for experimental and class for control in temperature is the subject of discussion, heat and kinetic theory of gases using the model of REACT learning and scientific approach.

Figure 1. The average *posttest* scores for the class for experimental and the class for control.

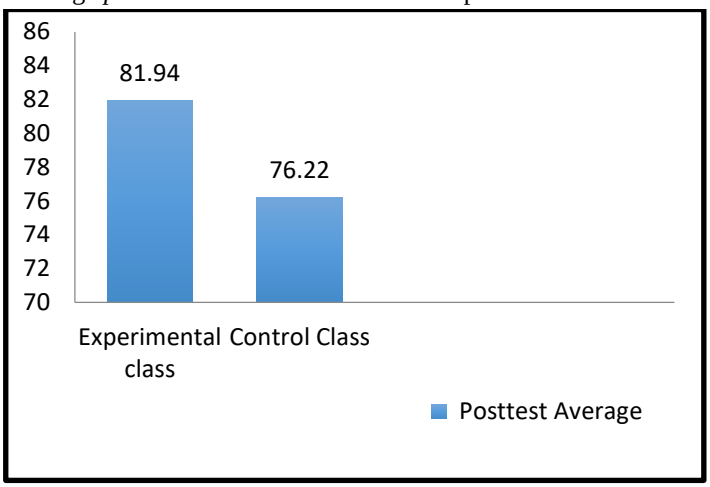

Figure 1 shows that the average value of the class for experimental has increased compared to the average value of the class for control. This shown from the calculation of the post-test average score of class for experimental students, namely 81.94 and the post-test average value of class for control students with a value of 76.22 so that get the conclussion that the model of REACT learning has an impact on competence achievement knowledge of students on the material Temperature, Heat and Gas Kinetic Theory.

2. Data analysis

Data analysis was carried out to see if the mean difference between the two classes for sample was significant or not. Before drawing conclusions from the research results, data analysis was carried out through statistical hypothesis testing. The hypothesis is tested to see if it is accepted or rejected. The hypothesis test in question is the similarity test of the two averages. The condition is that the test of normality and test of homogeneity for the two samples must be carried out first, then a hypothesis test is carried out.

Analysis of knowledge competency data is based on Table 1. The normality test is first performed to determine the statistics used in drawing conclusions. The normality test results was obtained L_0 and L_{tables} at a significant level of 0.05 as shown in Table 2.

Table 2. The Knowledge Competency Normality Test results of Class for Experimental and Class for control

Class	**N**	**A**	L_0	L_t	**Information**
Experiment	35	0.05	0.11	0.15	Normal
Control	36	0.05	0.11	0.15	Normal

Table 2 shown that the two classes for sample have a value of $L_0 < L_t$ at a significance level of 0.05. This means that the data on the final test the two classes for sample results on knowledge competence come from normally distributed populations.

Furthermore, the homogeneity test used is the F test. This test is carried out with the aim of seeing both sample classes originate in populations that have a homogeneous variance or not. After calculating the two

classes for sample, the results are as shown in Table 3.

Table 3. The Knowledge Competency Homogeneity Test results of Experiment Class and Class for control

Class	N	S	S^2	F_h	F_t	Information
Experiment	35	10.47	109.53	1.57	1.76	**Homogeneous**
Control	36	13,14	172.75			

The homogeneity test results for the two classes for sample are shown in Table 13, with $F_h = 1.57$ and F_t with a significance level of 0.05 with dk 34 in numerator and dk in denominator 35 is 1.76. The results show that $F_h < F_{(0.05),(34:35)}$. This means that the data for both sample classes come from populations that have a homogeneous variance.

After the normality test and homogeneity test were carried out on the final test data for the two classes for sample, The data in the two classes for sample were determined to be normally distributed with a homogenous variance. To test the research hypothesis, the two average similarity tests were used using the t-test statistic. The similarity test results for the two averages of the two classes for sample shown in Table 4.

Table 4. The Knowledge Competency Test results of Experiment Class and Class for control

Class	N	$\bar{x}$	S^2	t_{count}	t_{table}
Experiment	35	81.94	109.53	2.035	1,668
Control	36	76,22	172.75		

Table 4 shows that p has a significant level α = 0.05 and dk = 69 from the distributed table t obtained $t_{0,975:69} = 1{,}668$.with a significant level α = 0.05 obtained $t_{tabel} = 1{,}668$ and $t_h = 2{,}035$. Acceptance criteria H_0 if $-t_{1-\frac{1}{2}\alpha} < t_{hitung} < t_{1-\frac{1}{2}\alpha}$, the price $t_{hitung} = 2{,}035$ is outside the acceptance area H_0. So, the working Hypothesis H0 is rejected, while Hypothesis Hi is accepted, so the research got conclussion that there is a influence in significant on the influence of the *REACT model* (*Relating, Experiencing, Applying, Cooperating, Transferring*) on the achievement of knowledge competence in teaching physics at senior high school class XI.

C. DISCUSSION

Based on the data description and analysis that has been completed, There were distinctions in the outcomes of learning by students who use the model of REACT learning and students who use a scientific approach. This shows that the use of the *REACT model* on temperature, heat and gas kinetic theory can improve student outcomes of learning in knowledge competence. For the assessment of knowledge competence is done by holding a final test (*post test*) at the end of the research to class class for experimental and class for control which aims to see ability end participant educate after conducted learning with using the model of REACT learning in class XI natural science 4 (class for experimental) and a scientific approach to class XI natural science 5 (class for control). Before the final test is conducted, the questions that will be used for the final test are tried out in advance in a class other than the sample class. After completing the test questions, the questions are calculated using statistical tests, and for the final test questions valid and feasible questions are used. The final test results shown from the average value of the knowledge competence of the class for experimental , namely 81.94 and that of the class for control, 76.22. After that, a hypothesis test was conducted and the normality and homogeneity tests were carried out with a significance level of 0.05 in both sample classes. The two samples results were found to be normally distributed and to have a variance in homogeneous. The t-test was used to test the hypothesis, and the results were t_{count} 2.035 > t_{table} 1.668. Acceptance criterion H_0 if $t_{table} < t$

$_{count} < t_{table}$ then it is in the area of rejection of H_0. Then H_0 is rejected and Hi is accepted, meaning that there is a influence in significant on the effect of the *REACT* model on the achievement of knowledge competence in physics learning at class XI senior high school.

The research results are in line with research conducted by [12] From the hypothesis test results It may be stated that the consequences of student learning using the model of REACT learning are better than the outcomes of learning by students using conventional model of learning so that there is an effect of using *REACT* model of learning to increase student outcomes of learning.

The research results are in line with research conducted by [13] showing that the application of the model of REACT learning to chemistry material can improve outcomes of learning by obtaining a tcount value of 3.10 while for a ttable value at a significant level of 5% obtained of 1.68 and students' critical thinking skills with values obtained tcount more than ttable, namely 2.01 > 1.69 are in the area of rejection.

In research [14] showed that there were differences in concept mastery between groups of students who studied using the REACT learning model and groups of students who studied using the conventional learning model, and that there were differences in physics concept mastery between groups of students who had high motivation and groups of students who had low motivation. There is no link between the model and motivation for REACT learning among groups of students that do research using a standard learning paradigm. Meanwhile, [15] claims that the REACT learning approach, when combined with a virtual laboratory, will improve conceptual grasp of rigid body equilibrium content.

The research results are consistent with the findings of study [16] which shows that there is an increase in scientific attitudes and student outcomes of learning. From pre-cycle to cycle 2, there was a significant increase in scientific attitude, namely an average of 60.72 to 75.00, while the average outcomes of learning increased from 68.18 to 79.5. The research results show that the implementation of the REACT model can improve scientific attitudes and science outcomes of learning.

Based on the explanation described above, there is an influence of the REACT model on student outcomes of learning, especially in the achievement of knowledge competence. Where by using the model of REACT learning students can be more active and dare to express opinions in the process of learning and can relate and apply the material learned in real life.

Before the process of learning took place the researcher divided the students into 6 groups consisting of 5-6 people per group and the researcher distributed student worksheets to each group. At the *Relating stage* (connecting/associating) the researcher asks questions that direct students to associate/connect the subject matter with the experiences of students in everyday life, so that students are engaged in responding to questions posed by the teacher because students feel they have experienced it. In the *Experiencing* (experiencing) stage , students conduct experiments on temperature, heat and kinetic theory of gases using the phet application for their experiments. Experiments can make students enthusiastic and not bored in learning, so that students can prove the truth of a theory. Then at the *Applying stage the* researcher gives a number of questions so that students can apply the knowledge they have method solve the problems that exist in the student worksheets and the questions given. At the *Cooperating stage*, students who have sat in groups and have received student worksheets are asked to be able to discuss solving problems in student worksheets in groups. At this stage the researcher visits each group and guides students who do not understand in solving the problems contained within student worksheets. With the cooperation stage, students can identify and solve problems together. Then it can make students active with interaction and communication between teachers and students and between one student and another student in the learning process. At stage *Transferring*, the researcher asked the representatives of each group to present results discussion they in solve the problems that exist in the student worksheets and the questions given, and open a question session and other groups respond. With the *transferring stage* , it can make students more confident and dare to express opinions based on the knowledge and experience that students have previously. After finishing the presentation, at the end of the lesson the researcher asked students to conclude the material that had been studied. Next is the researcher also strengthen return to conclusion that has been submitted participant educate [17].

The model of *REACT* learning has several advantages, including deepening understanding of students so, providing chances for students to participate actively in the learning process, developing an attitude of togetherness and belonging, building future skills, forming an attitude of environmental love, and making learning inclusive. makes be able for students to know the use of material in everyday life, and involves students

in the process of solving problems through experiencing activities. Therefore, learning using the model of *REACT* learning provides advantages, one of which is being able to deepen understanding of students that using the model of *REACT* learning can increase students' knowledge competence in the learning process. However, the model of *REACT* learning has drawbacks, namely: it requires a long time and demands certain characteristics from the teacher. However, these deficiencies can be overcome by researchers by asking students to research the topics to be discussed at home and dividing time as effectively as possible in the process of learning and asking all students to work together on the topics discussed in order to achieve learning objectives.

IV. CONCLUSION

After completing research and data processing using statistical tests, it shown that $t_{count} > t_{table}$ so that the working hypothesis H_0 is rejected and the hypothesis H_i is accepted. Thus it can be concluded that there is a influence in significant using the *REACT* model on the material of Temperature, Heat and Gas Kinetic Theory on the achievement of knowledge competency in physics learning at class XI senior high school. In addition, The average score of students' knowledge competency increased, indicating an improvement in learning outcomes, namely 81.94 in the class for experimental and 76.22 in the class for control.

The model of *REACT* learning has several advantages, including deepening understanding of students so, providing chances for students to participate actively in the learning process, developing an attitude of togetherness and belonging, building future skills, forming an attitude of environmental love, and making learning inclusive. makes be able for students to know the use of material in everyday life, and involves students in the process of solving problems through experiencing activities. Therefore, learning using the model of *REACT* learning provides advantages, one of which is being able to deepen understanding of students that using the model of *REACT* learning can increase students' knowledge competence in the learning process.

However, the model of *REACT* learning also has drawbacks, namely: it requires a long time and demands certain characteristics from the teacher. However, these deficiencies can be overcome by researchers by asking students to research the topics to be discussed at home and dividing time as effectively as possible in the process of learning and asking all students to work together on the topics discussed in order to achieve learning objectives.

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