

Physics Learning using Constructivism Approach in Palembang High School

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Abstract: The goal of this research is to produce education that is more meaningful. To achieve this goal, it is important to select media and educational strategies that can help students truly understand and participate fully in the teaching and learning process. In order to encourage students to think and understand the subject matter rather than just hear, receive, and remember it, as well as to be able to develop students' thinking abilities in achieving learning outcomes, the researcher chose constructivism education that was centered on students. This educational approach of constructivism was applied in pairs. the greatest. With a sequential exploratory design, this research is a type of qualitative and quantitative research in which qualitative methods are used in the first stage and quantitative methods in the second. The research information was gathered through observations, interviews, documentation, and exams to gauge the physics knowledge of the students and the success of this study. According to the research findings, there are variations between the pre-test and post-test learning outcomes for the experimental class employing the constructivism approach in physics teaching. Based on the outcomes, it can be concluded that the educational paradigm employed, particularly the constructivism method, produces superior outcomes.

Keywords: Constructivism Approach, High School, Physics Education

A. Introduction

A teacher and students who are involved in the educational process must try to understand and find solutions so that the physics learning process will continue to run well and effectively according to the goals to be achieved so that an education can be said to be effective and efficient. The elements that contribute to education's success must be taken into consideration by educators. The success of education depends on the strategy, method choice, media, teaching materials, and techniques used by the instructor as well as on their capacity to be applied to the subject matter being taught (Spiro, 2012). Particularly in physics education, students are expected to actively engage in the learning process and exercise critical thinking. They are also assisted by instructional resources that foster students' excitement for learning and interest in the subject matter being covered.

All parties must participate in order to learn. Since students come to class not empty-handed but with knowledge from prior experience, knowledge is not something that is passively absorbed by them but rather something that is actively found, built, and developed by them through experiencing and working on it in the process of entering the real world continuously. When students combine their existing knowledge and skills with new information, they are learning. In this situation, applying constructivism to the educational process makes a lot of sense. Suparlan claims that constructivism is a theory that fosters learning by enhancing students' abilities and comprehension (Suparlan, 2019).

The constructivism method of teaching physics allows students to develop their understanding by independently creating or by building on the abilities and knowledge they already have (Kalina and Powell, 2009). The teacher's tools help students feel more important and help teachers and students alike optimize the physics education process by increasing student engagement and allowing them to enhance their thinking in problem-solving. In a constructivist classroom, a teacher does not instruct pupils on how to solve problems; instead, they are presented with difficulties and encouraged to come up with their own solutions.

Experts believe that by implementing it in one of the Palembang high schools, students' abilities to understand physics will improve in light of the aforementioned description. This method to improve the caliber of physics instruction is better followed by the adoption of a constructivism approach in one of Palembang's high schools to make physics instruction more interesting for students. Based on the preceding description, we decided to call the study "Physics Learning Using a Constructivism Approach in Palembang High School".

The scientific structures of facts, concepts, principles, laws, postulates, and scientific theories and methodologies are among the characteristics of physics as a fundamental science. Standard procedures, often known as scientific methods or processes, are used by physics to examine the subject's objects, which take the shape of things and natural phenomena. The goal of physics is to comprehend the orderly, beautiful laws of nature that can be expressed mathematically (Mundilarto, 2010). The main components of physics as a branch of science (IPA) are: 1) knowledge gathering (a body of knowledge), 2) thinking (a way of thinking), 3) universe-related research (a way of researching the universe), and 4) interaction with technology and society (it's interaction with technology and society). Physics instruction aims to develop students' cognitive abilities so they can support systematic, objective, and creative thinking in addition to their psychomotor and cognitive abilities (Koballa & Chiapetta, 2010). Educators must be familiar with the definitions and concepts of three terms related to learning: approach, method, and technique. The following is the justification:

Approach

The educational paradigm that has up until now placed the teacher at the center of education, also known as the teacher centered approach, no longer emphasizes the teacher as an active technician who transfers knowledge, but rather places more emphasis on students being more actively involved in expanding their knowledge, also known as the student-centered approach (Sleeter, 2008). Consequently, constructivism was applied in this study by us.

Education is the process of guiding someone to think correctly by allowing them to think for themselves (Swift, 2019). It involves the teacher working with students to form information, make meaning, seek clarity, be critical, and justify (draw conclusions). is true about an issue, thinking clearly is more important than having good solutions. A person with sound thinking skills can apply such skills to solve other difficulties. Students who can just find the appropriate answer lack this capacity, which may prevent them from being able to solve additional difficulties (Pealeu, 2015). According to this methodology, teaching is not the act of passing along knowledge from teacher to pupil but rather the responsibility of the students themselves who actively build their knowledge, form concepts from old knowledge into new knowledge, and do so under the direction of a teacher who aids them in learning how to construct their own knowledge (Moss, 2016). In constructivism, educational evaluation of students is ongoing from beginning to end.

The evaluation of constructivism learning is based on the processes that students engage in, rather than on the summative assessment's ultimate judgment of the work that was produced. Monitoring and demonstrating to students whether their thinking is functioning or not is among the things that are thought to be vital for the instructor to pay attention to. Because constructivism places a strong emphasis on how students can utilize their superior thinking abilities to solve problems and actively and autonomously construct meaning, understanding, concepts, and knowledge using the schemata they have chosen. In the constructivism learning process, thinking well and correctly takes precedence above just coming up with the correct response because, in certain situations, the answer may not always be the best one. Meanwhile, those with proper and decent thoughts will be able to find solutions to issues that are not directly related to them. In other words, constructivism places more emphasis on process appraisal than final product evaluation.

Application of the Constructivism Approach

In general, the steps for implementing the constructivism approach in the classroom are as follows: a) Develop the idea that children will learn more meaningfully by working alone, discovering themselves, and constructing their own experiences and new skills; b) Carry out as far as possible inquiry activities for all topics; c) Develop students' curiosity by asking questions; d) Create a "Learning Society" (study in groups).

Meanwhile, there are five steps to the constructivism approach to education which can be explained as follows (Lebow, 1993).

1. The Preparatory Stage aims to prepare students to be conditioned in taking the next phase by exploring their initial knowledge and ideas.
2. Knowledge Exploration Stage, students are formed in small groups between 2-4 students and given the opportunity to work together, test predictions, make and record observations and ideas so as to make new predictions.
3. Explanation of the concept, students are given the opportunity to present data or information that has been done and that has been obtained by students into a new concept.
4. Concept Development or Expansion, or the elaboration stage in this phase, students are given the opportunity to apply the concepts or skills they have learned in new situations or different contexts.
5. Evaluation or assessment phase, the teacher observes the effectiveness of the previous phases and also evaluates students' conceptual understanding or competency knowledge.

B. Methods

This type of research uses a sequential exploratory combination model/design (Bowen et al., 2017). The combination method model or sequential exploratory design is a combination research method that combines qualitative and quantitative research methods sequentially where in the first stage of the research using qualitative methods and in the second stage quantitative methods (Onwuegbuzie and Collins, 2007).

C. Results and Discussion

Physics Education before using the Constructivism Approach in SMA Palembang

1. Planning

It is essential to create a number of learning plans prior to conducting the education phases. Based on the documentation's findings and physics teacher interviews. One of the pieces of documents the researchers obtained was lesson plans and textbooks for physics education.

Regarding the Education Implementation Plan used by physics subject instructors, which specifically refers to the 2013 Curriculum, this educational plan is one that is carefully prepared from a specific subject matter or theme that corresponds to the syllabus. RPP consists of the following elements: (1) school (identification) data, subjects, classes, semesters, subject matter, and time allocation; (2) basic competency; (3) educational goals; (4) educational step; (5) assessment; and (6) educational approaches and methods. 7) learning resources, tools, and media for education.

One of the high schools in Palembang offers physics instruction once a week for a total of two periods of 45 minutes. The physics education book is the school's primary physics learning material educational physics standards.

One of the objectives for teaching physics at Palembang High School utilizing the physics education book, according to the researcher, was to develop students'

physics skills. The results of interviews with teachers in the field of study confirmed this, stating that "Students are also expected to be able to study on their own at home to work on existing questions and the purpose of physics education using this book is to hopefully be effective and make it easier for students to understand physics education."

2. Implementation

Education implementation is a key action done in class by teachers and students to reach defined goals and objectives. Education is implemented when it is carried out, which is a realization of the implementation of the education implementation plan that was created by the instructor at the beginning of time before the educational activities take place.

The findings of the documentation and observations show that the educational activities in the classroom are progressing smoothly. The teaching activities for the GLB and GLBB materials are divided into three categories: opening, core, and closing. The introductory activities set up the framework for student learning. Principal actions or application (1) presenting the subject matter (lecturing approach); (2) allowing students to relate the information they have learned through question and answer sessions; and (3) generalizing by assigning homework as a measure of student learning. The cover then includes an evaluation of student comprehension via oral, written, or assignment examinations.

The researcher continued by providing an explanation based on the physics curriculum at one of Palembang's high schools. Specifically, applying a traditional approach and a scientific approach to the study of physics utilizing textbooks. According to the findings of the interviews that have been done, the lecture technique is a scientific and traditional strategy that is employed in physics education.

It might be claimed that the educational process only moves in one direction because physics teachers frequently employ the lecture approach when putting instruction into practice. With responsibilities like answering questions, writing, and memorization, students are still actively participating. The educator concludes the lesson by encouraging pupils to examine the content and assigning more homework for them to complete at home. This illustrates how educational activities contain components that work together to form the basis for developing lesson plans or carrying out the educational process.

In contrast, some students have expressed dissatisfaction with the pedagogical methods and complained that the course material is too challenging. When the researcher spoke with students in class X.B, one of them remarked, "For me, learning physics is rather difficult, but if we can understand it, it will be easy to do it, there is satisfaction, depending on yourself, as long as you want" "The difficulty is the explanation in the textbook," he continued. Too brief. I'm therefore perplexed and baffled by that. I want the explanation to be brief yet in terms that I can easily comprehend. The researcher also inquired about the tone of the classroom and the

manner in which the instructor delivered the lesson. He added, "The class has a laid-back attitude for learning. The teacher also mentioned that "for the typical way of teaching, the teacher in class explains more lectures before giving assignments then collects them." However, some students who sit in the rear are preoccupied with themselves and do not pay attention to the teacher teaching. I'm doing it myself," he added. The teaching style is, in my opinion, rather effective; however, the learning process is stiff and monotonous, and the classroom environment is not friendly. so based on the student's response. We can conclude that ineffective teaching strategies, less absorbent textbooks, as well as a disruptive classroom environment, are to blame for students' perceptions of a lack of grasp of the subject matter.

From a summary of the outcomes of observations and interviews at a high school in Palembang. It is evident that teachers continue to adopt a traditional method in their instruction. Which education is structured with rigor, formality, and routine? This presumption eventually gives rise to education that only transmits information to students because learners who learn are more often perceived as things that know nothing. Education is not based on educational goals but rather on the order of the school's handbooks because the teaching and learning activities are more focused on them. The majority of students are capable of learning physics well; nevertheless, there is often a lack of enthusiasm for the teacher's ineffective teaching strategies. As a result, students' physics skills still need to be developed.

3. Evaluation

Evaluation is the process of recognizing assessments made verbally and in writing to establish the degree to which educational activities have been successful in accomplishing predetermined educational goals (Sadler, 1989).

The educational evaluation of their students was the subject of various inquiries from the researchers. indicated that "Physics education books are used to evaluate physics learning, specifically the first assignment in the book, and the second practice we take practice values."

In this instance, he added that he used a number of techniques that involved students in the review process as well. Regarding them, specifically through obtaining quizzes based on practice questions, obtaining daily test activities, midterm exams, and final semester exams based on physics education materials that students have covered in class. This was done to assess the physics education proficiency and growth of pupils in one of the Palembang high schools.

Application of Physics Learning using a Constructivism Approach in SMA Palembang

1. Planning

We initially create a plan based on the following before beginning their research:

1. It is evident from the findings of observations that pupils' scores are still incomplete, or in other words, they have not yet hit the KKM. This occurs as

a result of the current application of education not being in line with physics education.

2. By implementing a constructivism strategy that is supported by and guided by a constructivist approach that encourages participation from both students and teachers in the educational process, with the expectation that students' comprehension of physics instruction will improve in comparison to the prior one.

With this strategy, the researcher hopes to boost class X.A students' grasp of physics knowledge by using a constructivism methodology. Because of this, it is hoped that students' physics skills would improve in the future.

The planning done by researchers in the educational process is described in the following detail:

- a. Compile a list of pre-test inquiries to ascertain the level of physics proficiency of SMA Palembang pupils.
- b. Create an Educational Planning Draft (RPP) and follow the processes in it to organize and structure the educational process.
- c. Prepare material to be taught.
- d. Develop posttest questions related to students' understanding of physics skills based on previously taught material to determine the extent to which students understand the physics education provided and how successful this research was for them.

The educational material used in this study, which is applied to students in class X.A as an experimental class, adopts a constructivism approach, but class X.B, which serves as the control class, simply employs the method employed by the previous instructor only class X.A is treated, in that sense. In order to determine the success of improving students' physics skills, it is important to assess or pay attention to concerns of quality and quantity. However, when quality is considered, student behavior during the educational process is examined. For instance, students who were initially passive then changed to become more confident and active, students' interest in education was carried out, more students were enthusiastic about participating in education, and so on. And when considered in terms of quantity, namely by examining the outcomes of the student posttest tests and then contrasting them with the outcomes attained from the prior pretest exams. This exam is used to determine whether there has been improvement in physics knowledge following the implementation of constructivism in the educational process.

2. Implementation

This research's implementation process took place from May 23–25, 2022, and lasted 2–45 minutes. There are two classes for class X at one of Palembang's high schools: X MIPA and X IPS. X MIPA has a superior class, and each class has a regular class of 32 students. Class X.A served as the experimental class in this case, and class X. B served as the control class. Of course, the researcher ran a pretest to gauge the students' physics skills before to adopting this physics instruction.

The findings of the pretest revealed that students' physics skills still truly needed a teacher's guidance because it was discovered that they were still reluctant to voice their thoughts or to learn to take initiative and think imaginatively. Because this educational process is more focused and involves more action from students and teachers only as companions, it is hoped that new characters will be formed and their physics abilities will improve from before. This is because constructivism is being used to implement physics education. Students are asked to study in groups. In contrast to the past, when the teacher was more involved than the students.

This education is delivered in accordance with lesson plans created by earlier researchers, and the teaching and learning process starts with an introduction that includes greetings, prayer, and a brief explanation of the goals and outlines of the subject to be studied. The instructional process then begins, with the teacher forming groups of two students from among the students. The teacher then explains the learning material, "GLB and GLBB," asks students to give examples related to the material, gives instructions on how to perform, and students discuss the material in their groups to discuss it. Education then begins by focusing students' attention on a real incident in their lives. Each student shares his or her opinion during group discussions, the teacher provides guidance, the groups that don't understand are found by the teacher by prodding them with activities that students typically engage in, each group representative shares the outcomes of their discussion, and other groups may also provide responses to the discussion's outcomes, and the teacher provides explanations and reinforcement or recognizes and corrects the explanation of student answers.

The teacher offers conclusions and directs students in finding the course outline after asking the class to repeat the results of the lesson. The instructor then concludes the lesson by wishing everyone a good day.

3. Observation

Students are very passionate about engaging in the teaching and learning process while employing a constructivism approach to education. Due to modifications from the old system of education, they participate more actively during the educational process. Each group member started to exhibit confidence and interest in following the planned educational steps. Every group was quite passionate throughout the process, but during the group talks in particular, the group they had chosen was especially so since they did not want to be surpassed by the other groups. They also appeared to genuinely like the on-going instruction when they focused on the advanced group's errors.

When the lesson is being taught, the researcher distributes the material to be naturally discussed in groups while also remembering to explain the material about “GLB and GLBB”, ask students to provide examples of GLB and GLBB material, and remember to give each group questions which they will later discuss. The GLB and GLBB content is then discussed in each group, and the outcomes of the conversation are then shared with the class. In order to keep the class atmosphere positive, students were told to identify the correct response to each question that had been discussed by each group collectively under the researcher’s direction at the conclusion of the lesson.

According to the study’s findings, students were actually quite eager to participate in the learning process; they only required creative learning methods and a different kind of classroom environment than usual. This was evident when the education was being provided since the student’s state at the time of the initial observation, which occurred before the research was conducted, was inversely proportionate to what was discovered when the education was commencing. Additionally, students have started using their analytical skills to the concerns raised. At that point, all of the students—including those who had previously appeared quiet and infrequently engaged in class—became involved, critical, and cooperative. Results from the pre- and post-tests in the control class and the experimental class show this.

The majority of the pupils in both the experimental class X.A and the control class X.B scored below the KKM, indicating that the scores were insufficient. According to the pre-test results, pupils in classes X.B and X.A achieved average values of 50.25 and 65.46, respectively. As can be observed, class X.B’s pre-test results were less impressive than class X.A’s. As a result, the researcher in this instance will select class X.A as the experimental class. As a result, researchers will work to support the implementation of a constructivism approach, which can prevent students from becoming disinterested in their studies because it encourages greater student participation in the learning process.

After making observations, conducting interviews, and administering pretest questions to the control and experimental classes, the experimental class will then apply constructivism-based physics instruction in accordance with the researcher’s plan. In this instance, the researcher used a constructivist approach to education while closely monitoring all aspects of the learning process, including the researcher’s teaching and delivery methods in the experimental class. Researchers test each student using a posttest that has been created by researchers in order to determine the degree of success of students in engaging in the physics education that has been provided.

Posttest questions were also presented to the control class in addition to the experimental class; however, this class did not receive any assistance from the experimental class’s application of constructivism. This wasn’t a problem, though, as the posttest findings from the control group served solely as a comparison point for the experimental group’s outcomes.

4. Reflection

This education is implemented effectively and efficiently. based on data gathered following the deployment of constructivist teaching methods in physics. The educational process is being followed by students with great enthusiasm. Students develop into critical, cooperative, and engaged persons.

The following are the general conclusions drawn from the study's findings:

- a. Teachers invite pupils to participate in engaging, unique, and practical instruction. Specifically, by carrying out the learning process in groups, teachers can inspire students and break the silence in a class that is otherwise silent and inert. By employing this constructivism approach, students demonstrate their ability to be active learners and are more motivated to learn than they were before the researcher's initial goal of making the classroom environment active rather than passive.
- b. Due to the fact that contemporary education essentially requires students to be more active than the teacher, students appear to appreciate the learning process more than in the past.
- c. The group has a process in place for exchanging viewpoints.
- d. Students have improved their ability to engage in debates while showing more respect for the viewpoints of their group members.
- e. There is excellent student collaboration.
- f. Students now answer questions with greater assurance than they did in the past.

The Effectiveness of the Application of Physics Education using a Constructivism Approach in Palembang High School

1. Normality Test

For the normality test, the researcher used the one sample Kolmogorov-Smirnov and Shapiro-Wilk test formulas. This normality test is used to determine whether the experimental class and control class data are normally distributed or not. In this test, researchers calculated it with the help of the SPSS application.

With the following benchmarks:

- a. If the sig value > 0.05 then the data is normally distributed
- b. If the sig value < 0.05 then the data is not normally distributed

For the pre-test and post-test learning outcomes of students from the experimental class and the control class can be seen in the following table:

Table 1. Normality Test

	Class	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Student Learning Outcomes	Pre-Test Experiment	,150	32	,066	,966	32	,388
	Post-Test Experiment	,135	32	,145	,943	32	,090
	Pre-Test Control	,106	32	,200*	,967	32	,411
	Post-Test Control	,151	32	,061	,954	32	,184

*. This is a lower bound of the true significance.
 a. Lilliefors Significance Correction

We can conclude that the study data produced is normally distributed if the value (sig) of all the data in each test in the Kolmogroff-Smirnov and Shapiro-Wilk categories is more than 0.05, as we already know. According to the table, the pre-test data for the experimental class were normally distributed because the significance values for Shapiro-Wilk and Kolmogrov were both greater than 0.05 and, respectively, 0.066 and 0.388 for Kolmogrov. The results of the pre-test data in the control class were then regularly distributed because the significance values for Kolmogrov and Shapiro-Wilk obtained in the control class pre-test were both greater than 0.05 and 0.200 and 0.411, respectively. Additionally, there were post-test results from the experimental class and control class that were 0.145 and 0.090, respectively, and these two findings were declared to be greater than 0.05, indicating that the post-test results data from the two classes were normally distributed.

2. Homogeneity Test

In the homogeneity test, the basis or guidelines for making decisions based on the results of the homogeneity test are as follows:

- 1). If the significance value is greater than 0.05 in the based on mean section, then the data is said to be homogeneous
- 2). If the significance value is less than 0.05 in the based on mean section, then the data is declared not homogeneous.

Table 2. Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
Student Learning Outcomes	Based on Mean	,089	3	118	,966
	Based on Median	,095	3	118	,962
	Based on Median and with adjusted df	,095	3	111,654	,962
	Based on trimmed mean	,036	3	118	,991

The significance value based on the average value according to the output table is 0.966, which is greater than 0.05. Therefore, it can be said that the post-test data type is homogeneous.

3. Mann Whitney Test

The basis for making decisions on the Mann Whitney test are:

- a) If the value of Asymp, Sig (2-tailed) < 0.05, then Ho is rejected and Ha is accepted.
- b) If the value of Asymp, Sig (2-tailed) > 0.05, then Ho is accepted and Ha is rejected.

Ho: There is a significant difference between before the application of physics education using the constructivism approach and after it was implemented.

Ha: There is no significant difference between before the application of physics education using the constructivism approach and after it is implemented.

Table 3. Ranks

	Class	N	Mean Rank	Sum of Ranks
Student Learning	Pre-Test Experiment	32	16,73	535,50
Outcomes	Post-Test Experiment	32	48,27	1544,50
	Total	64		

The mean ranks – the average rank for each group – are displayed in the table above. The average rank in the first group was 16.73, which was lower than the average in the second group, which was 48.27. The statistical significance, also known as sig, of the mean ranking differences between the two groups above can be seen in the table below.

Table 4. Test Statistics

	Student Achievement
Mann-Whitney U	7,500
Wilcoxon W	535,500
Z	-6,783
Asymp. Sig. (2-tailed)	,000

a. Grouping Variable: Class

The U value is 7,500, and the W value is 535,500, as seen in the above table. The magnitude is -6,783 when expressed as a Z value, a Sig or P Ha is approved since the value of 000 0.005 indicates that there is a difference, and the output ranks statistics also show that there is a difference in the mean value between the pretest and posttest in the experimental class. The average value before the test was 16.73, and the average value after the exam was 48.27.

As a result, class X is taught physics using constructivism. A student's presence has an impact since it enhances class X pupils' capacity to understand physics student A.

4. N-Gain Test

The N-Gain test will be continued by researchers because it was used to evaluate the efficacy of using a treatment or treatments in this study. This test involves comparing the results from the pretest and posttest.

The references in research using this test are:

If $g > 0.7$ High
 $0.3 \leq g \leq 0.7$ Moderate
 $g < 0.3$ Low

The categories of interpretation of the effectiveness of N-gain are:
 <40 Not effective
 40-55 Less effective
 56-75 Moderately effective
 >76 Effective

Table 5. Descriptive

N-Gain Percent	Class	Statistic	Std. Error	
	Experiment	Mean	61,7007	
		95% Confidence Interval for Mean	3,28730	
		Lower Bound	54,9962	
		Upper Bound	68,4052	
		5% Trimmed Mean	62,3276	
		Median	63,0682	
		Variance	345,803	
		Std. Deviation	18,59578	
		Minimum	20,00	
		Maximum	90,00	
	Range	70,00		
	Interquartile Range	25,49		
	Skewness	-,549	,414	
	Kurtosis	-,284	,809	
	Control	Mean	51,8455	3,05096
		95% Confidence Interval for Mean	45,6230	
		Lower Bound	45,6230	
		Upper Bound	58,0680	
		5% Trimmed Mean	52,3964	
		Median	50,0000	
Variance		297,868		
Std. Deviation		17,25885		
Minimum		12,00		
Maximum		79,17		
Range	67,17			
Interquartile Range	23,62			
Skewness	-,517	,414		
Kurtosis	-,193	,809		

The N-gain score for the experimental class, or the class that received the treatment, was 62% with an N-Gain score of at least 20% and a maximum of 90%, as can be seen from the aforementioned N-Gain test results. The control class, on the other hand, has an average N-Gain value of 52%, a minimum of 12%, and a high of 79%.

According to the N-gain rule, the experimental class's average grade of 62% is deemed Effective Enough to boost students' physics knowledge in one of

Palembang's high schools. The technique utilized in the control class, however, was thought to be less successful in enhancing students' physics skills.

D. Conclusions

The conclusion of the research is the educational model used, namely the constructivism approach, gives better results.

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