

The Effectiveness of RADEC as a Distance Learning Model to Improve the Understanding of Class XI SHS Students on Dynamic Fluid Materials

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Abstract. This study aims to determine the RADEC learning model's effectiveness in improving understanding of dynamic fluid material to XI students of Senior High School (SHS) in distance learning (distance learning). This study used a quasi-experimental method with a nonequivalent control group design. The research population was all students of XI SHS classes, totalling 154 people. The sampling technique used purposive sampling. The sample is XI-3 class as the control group and XI-4 class as the experimental group. The instrument used was a cognitive test. The data analysis technique used descriptive statistics and inferential statistics. The results showed that the two groups' average value is that the pre-test control group was 58.12, and the post-test was 78.13, while the pre-test and post-test experimental group were 76.72 and 87.19. Thus, it can be concluded that the RADEC learning model is more effective than the conventional learning model.

Keywords: RADEC Learning Model, Distance Learning, Students' understanding

1 Introduction

During distance learning, the teacher is required to be more creative in delivering learning materials (1), (2). This teacher's creative action is evidenced by the use of learning models and learning media used during the distance learning process (3), (4), (5), (6). One learning model that can be used during distance learning is the Read-Answer-Discuss-Explain-Create (RADEC) learning model. The implementation of this learning model has not been fully used in all subjects (7), (8), (9). One of the subjects that have successfully applied the RADEC learning model is Indonesian language lessons at the elementary school level (10).

This research used the RADEC learning model to be applied to physics subjects as a subject that requires critical thinking and can solve any problems related to everyday life (11), (12), (13). One of the sub-chapters of physics material that is related to everyday life is dynamic fluid material. The dynamic fluid material consists of discharge, the continuity equation, Bernoulli's principle, the application of the continuity equation, and the application of Bernoulli's principle (14), (15). The learning method that is often used when delivering dynamic fluid material is the practicum method (16), (17). However, during distance learning cannot apply the practicum method. Therefore, the learning model that can be used is the RADEC as a learning model.

The RADEC learning model's selection is based on the advantages in each of its syntax, which can build students' critical thinking and problem-solving abilities (18), (7). In the first

step, the learning model requires students to learn independently through reading. Furthermore, students are required to think critically through the questions asked, and the discussions and explanations carried out by the students. Finally, students are required to formulate solutions to the problems that have been discussed (8).

Based on the description above, the steps in the RADEC learning model are appropriate for the current conditions, because it require students to learn independently. This study focuses on students' understanding by examining the effectiveness of the implementation of the RADEC learning model to dynamic fluid material during the distance learning process.

2 Method

The method used was quasi-experimental. The pre-test is carried out before the students were introduced to the RADEC learning model, while the post-test was conducted after the students familiar with the RADEC learning model. The population is 154 students of XI SHS classes. The sampling technique used purposive sampling. The sample is XI-3 class as the control group and XI-4 class as the experimental group. The instrument used was a cognitive test. The data analysis technique used descriptive statistics and inferential statistics.

3 Results and Discussions

The score of the students of XI SHS classes before and after the RADEC was used as a learning model. Table 1. showed there is a significant improvement of the two groups of the pretest-posttest.

Table 1. Pre-test and Post-test Scores on the Comprehension of Experiment Group and Control Group

Group	Test	N	Mean	Lowest Score	Highest Score
Experiment Group	Pre-test	32	76.72	60	90
	Post-test	32	87.19	75	100
Control Group	Pre-test	32	58.12	20	90
	Post-test	32	78.13	55	100

The results of the normality test are normally distributed used the Kolmogorov-Smirnov test and the significance level was sig = 0.05. The calculation results obtained are as follows:

Table 2. Tests of Normality

Groups	Kolmogorov-Smirnov		
	Statistic	df	Sig.
Pre-Test Experiment Group	0.136	32	0.138
Post-Test Experiment Group	0.139	32	0.122
Pre-Test Control Group	0.138	32	0.124
Post-Test Control Group	0.149	32	0.067

The homogeneity test is known that the value of sig Based on Mean is $0.002 > 0.05$, it can be concluded that the variance of the post-test group of two groups is homogenous.

Table 3. Test of Homogeneity of Variance

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		Levene Statistic	df1	df2	Sig.
Learning Outcomes	Based on Mean	10.030	1	62	.002
	Based on Median	9.594	1	62	.003
	Based on Median and with adjusted df	9.594	1	56.225	.003
	Based on trimmed mean	10.035	1	62	.002

The hypothesis was tested used the t-test technique. It was found that a Sig. (2-tailed) value of $0.000 < 0,05$; it means that there was a difference in the average student learning outcomes in the pre-test and post-test from two groups. It can be explained in table 4.

Table 4. Paired Samples Test

		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2- tailed)
					Lower	Upper			
Pair 1	Pre Test Exper - Post Test Exper	-10.469	7.335	1.297	-13.113	-7.824	-8.073	31	.000
Pair 2	Pre Test Control - Post Test Control	-20.000	16.848	2.978	-26.075	-13.925	-6.715	31	.000

Table 5. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Pre Test Experiment	76.72	32	7.579	1.340
	Post Test Experiment	87.19	32	8.026	1.419
Pair 2	Pre Test Control	58.12	32	19.334	3.418
	Post Test Control	78.13	32	13.365	2.363

Based on table 5, there is a difference in the average student learning outcomes of the pre-test and post-test control on two groups. It can be inferred that there is a significant increase in XI SHS students on dynamic fluid material after used a RADEC learning model. The two groups' average value is that the pre-test control group was 58.12, and the post-test was 78.13, while the pre-test and post-test experimental group were 76.72 and 87.19. It can be concluded that the RADEC learning model is effective in improving understanding of class XI SHS students on dynamic fluid materials. This is a graph of the calculation of score study.

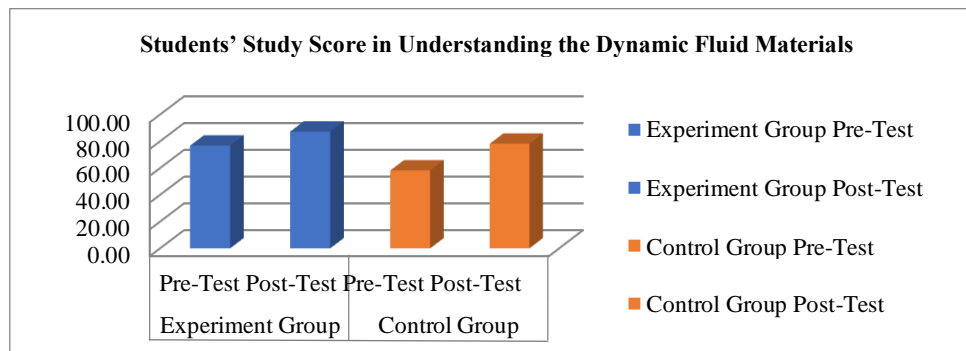


Fig. 1. Students' Study Score in Understanding the Dynamic Fluid Materials

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In conventional learning, students only get information from the teacher. Whereas in the RADEC learning model, students learn independently from various sources and apply material and discussion results through problem-solving. This approach facilitates the development of student problem-solving skills to increase motivation, develop networks among students; and enhancing the usefulness of learning, both individually and collectively (19), (20).

The students' exploration of the material independently provides stimulation for students to remember the material. Also, the explanations are given to other students also increase their understanding of the material. When students discuss, they will produce critical thinking that combines findings from others with information findings from themselves. Student-centered learning is a new implication. This model provides students with open problems, and then they develop viable solutions through critical or creative thinking. Also, involve students in independent and/or cooperative (team-based) learning (21).

4 Conclusions

The RADEC learning model is proven to be more effective in providing understanding of dynamic fluid material in distance learning conditions compared to conventional learning models which can make students bored and seem monotonous. This is based on the average post-test results obtained; the control group obtained was 78.13 while the experimental group was 87.19. Based on the independent sample t-test, the value of $\text{sig} = 0.002 < \alpha = 0.05$ means that there is a difference in the average grade XI SHS students in understanding dynamic fluid material with the RADEC learning model. The difference in students' understanding of the material is that students only get material from the teacher in the control group. Whereas in the experimental group students are more independent in finding material from various sources.

Acknowledgements

Thank XI SHS students and Universitas Muhammadiyah Sidoarjo for supporting this research.

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