

The Influence of the RADEC Learning Model (Read, Answer, Discussion, Explain and Create) on Student Self-Efficacy and Learning Outcomes

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ABSTRACT

This research aims to determine the effect of the RADEC on the self-efficacy and learning outcomes of class X SMAN 1 Peusangan students on stoichiometry material. The research was carried out in the even semester of 2022/2023 at SMAN 1 Peusangan. This research uses a quantitative approach, like an experiment, using the Plannon equivalent posttest-only control group design. The population of this study was all students of class X Science and Technology at SMAN 1 Peusangan, consisting of 4 classes. The sample in this study was class X IPAS 3, an experimental class with 21 students. The research sample has been tested for normality and homogeneity prerequisites. The sampling technique used was purposive sampling, which is a sampling technique with specific considerations. Data collection techniques used multiple-choice test questions and questionnaires. The test was done at the end (posttest) in the experimental and control classes. The hypothesis using a type of t-test independent sample t-test, and the sig value obtained. (2-tailed) was $0.000 < 0.05$ on student cognitive learning outcomes and questionnaire results in self-efficacy students. Based on the test results, it can be concluded that the RADEC learning model has an influence on the efficacy and learning outcomes of class X SMAN 1 Peusangan students on stoichiometry material.

Keywords: *RADEC, Self-Efficacy, Learning Outcomes, Stoichiometry*

1. INTRODUCTION

Chemistry discusses chemical reactions and calculations and involves abstract concepts. This makes chemistry material quite difficult for students to understand, and it is even considered by students to be relatively new material that they have never received in junior high school (Sunyono, et al. 2009). This is due to the abstract nature of chemical material, which is a characteristic of chemistry. Chemistry is not just about solving problems, but also having to study descriptions such as chemical facts, chemical rules, and a large amount of material (Kean, E and Middlecamp, 1895).

Stoichiometric material is a science that studies quantitative relationships in a chemical reaction (Winarni, S., Ismayani, 2013). Difficulty in understanding stoichiometry material is not only felt by students, but teachers also consider it an obstacle to smooth learning. In fact, one of the factors that influences the teaching and learning process is the teacher's teaching method (Hakim, F., & Prameswari, 2021).

Based on interviews with several class X Science and Technology students at SMAN 1 Peusangan, students still find chemistry material difficult. This is because they have never received this material at the junior high school level. In addition, students' low grades are caused by a lack of confidence in their abilities (self-efficacy). Bandura (2013) states that self-efficacy is the belief in an individual's ability to determine and carry out the various actions needed to produce an achievement. is closely related to learning outcomes. Students who have self-efficacy are highly confident that they can master tasks and regulate their own learning methods, and are the ones most likely to achieve good results at school (Diane E. Papalia, et al, 2019:49).

One of the newest learning models and not yet used by school teachers, is the RADEC learning model (Sopandi, 2019). The RADEC learning model RADEC is an innovative model for learning today. It was created in accordance with the Indonesian education system, which requires students to understand various concepts and knowledge in a limited time.

This model can encourage students to acquire 21st century skills. In the 21st century, there are several competencies that humans must possess, namely conceptual understanding, critical thinking, collaboration, communication, and creative thinking (Morocco, et. al., 2008). The model's name is adapted to the syntax, namely Read, Answer, Discussion, Explain, and Create. Active involvement from

students through the RADEC learning model means that learning objectives can be achieved effectively. According to Vygotski (in Sopandi, 2017) effective learning must involve students in important tasks and interactions in the learning process because students are required to be able to build their own knowledge.

2. METHOD

This research is quantitative with a quasi-experimental design because not all variables (such as symptoms) and experimental conditions can be strictly regulated and controlled. The author used two sample groups in this research: the experimental group and the control group. The research design uses a non-equivalent posttest only control group design, where the experimental group is given the RADEC model treatment while the control group is given the teacher center learning (TCL) model with the lecture method. At the end of the learning, is given to determine the learning outcomes of each group.

Table 1. *Non-Equivalent Posttest Only Control Group Design*

Group	Treatment	Posttest
Experiment	X ₁	O
Control	X ₂	O

(Source: Sugiyono, 2011:206)

Description

X₁ = Learning using RADEC

X₂ = Learning using *teacher center learning (TCL)*

O = Value *Posttest*

This research was conducted in class X Science and Technology at SMAN 1 Peusangan in the Even semester of the 2022/2023 academic year. The address is Jalan Banda Aceh - Medan, Keude Matang Glp Dua, Peusangan District, Bireuen Regency, Aceh Province.

Population and Sample

Population The population in this study were all students of class X. The sample for this research was 2 classes, namely X IPAS 3 (21 people) as the experimental class and class X IPAS 2 (20 people) as the control class. Sample selection was carried out by: *purposive sampling*, namely a sampling technique based on certain considerations (Sugiyono, 2011).

Instruments and Techniques for Data Collection

1. Written Test Instrument

The learning outcomes instrument is a written test designed that measures students' cognitive abilities after they have taken chemistry lessons on the topic of stoichiometry. The test used in this research is a post-test in the form of multiple-choice questions. choices.

2. Self-efficacy Questionnaire Instrument

Instrument self-efficacy of students in this research in the form of a questionnaire. A statement consisting of the options "SS (Strongly Agree), S (Agree), TS (Disagree), STS (Strongly Disagree).

Data Analysis Techniques:

Data analysis was carried out to test the hypotheses from the research that had been conducted. The first analysis was carried out on the instrument questions. The data analysis technique used parametric tests with a normality test (Shapiro Wilk), homogeneity test, and hypothesis testing using SPSS.

As the question instrument so that it is suitable to be a research instrument, it was tested with a validity test using the product-moment correlation formula, obtained were 0.80 - 1.00 = Very high and some of the questions were 0.40 - 0.60 = Fair. The reliability test results were 0.79, which stated that the research instrument was reliable because it was in the interval $0.60 \leq r_{11} \leq 0.80$. The results for the difficulty level of the criteria for medium questions are $0.00 < IK \leq 0.30$ and easy questions $0.70 < IK \leq 1.00$, and for the results, the discriminatory power is obtained with good criteria 0.40 DP 0.70 and fair 0.20 Downpayment 0.40.

The final stage is testing the hypothesis using the independent sample T test. This test was used to find out whether there was an influence of the RADEC learning model on the learning outcomes and self-efficacy of class X Science and Technology students at SMAN 1 Peusangan on stoichiometric material. The criteria for this test are if the Sig (2-tailed) value $< \alpha$ ($\alpha = 0.05$), then H_0 is rejected and H_1 is accepted (there is an influence of the RADEC model on the learning outcomes and self-efficacy of class), and if the Sig value (2-tailed) $\geq \alpha$ ($\alpha = 0.05$), then H_0 is accepted (there is an influence of the RADEC model on learning outcomes and self-efficacy of class).

3. RESULTS AND DISCUSSION

The normality test aims to determine whether the learning outcome data is distributed regularly or not. Using SPSS version 25 and the Shapiro-Wilk test with a significance threshold of 0.05 data analysis for normality.

Table 2. Data on Normality Test Results for Posttest

Kelas	Shapiro-Wilk		
	Statistik	Df	Sig
Posttest	.922	20	.106
Posttest	.918	20	.092

Table 3. Results of the normality test for the self-efficacy questionnaire.

Kelas	Shapiro-Wilk		
	Statistik	Df	Sig
Angket eksperimen	.923	20	.113
Angket kontrol	.911	20	.066

Based on Table 2, the experimental class posttest cognitive learning results have a significance value of $0.106 > 0.05$. The normality test hypothesis (H_0) is accepted if the sig (p-value) $> (= 0.05)$ is met, which indicates that the sample comes from a population with a normally distributed population.

Based on Table 3, the results of the experimental class students' self-efficacy questionnaire have a significance value of $0.113 > 0.05$. The normality test hypothesis (H_0) is accepted if the sig (p-value) $> (= 0.05)$ is met, which indicates that the sample comes from a population with a normally distributed population.

The homogeneity test in this study used the homogeneity of variance test using SPSS 25 software and the Lavene statistical test. The test criteria are: if the Sig value. (p-value) $< \alpha$ ($\alpha = 0.05$), then H_0 is rejected (variance is not homogeneous), and if the Sig. (p-value) $\geq \alpha$ ($\alpha = 0.05$), then H_0 is accepted (homogeneous variance).

Tabel 4. Posttest cognitive learning outcomes

Levene Statistic	Homogeneity of Variance Test		
	df1	df2	Sig
752	1	39	.391

Based on Table 4, the cognitive learning results in the posttest data are homogeneous, with a significant value of $0.391 \geq 0.05$. So the results are obtained with the conclusion that for homogeneous data, H_1 is rejected and H_0 is accepted (homogeneous data).

Tabel 5. Results of the self-efficacy questionnaire

Levene Statistic	Variant Homogeneity Test		
	df1	df2	Sig

Based on Table 5, the results of the self-efficacy questionnaire in the data show a significant value of $0.125 \geq 0.05$. So the results are obtained with the conclusion that for homogeneous data, H1 is rejected and H0 is accepted (homogeneous data).

Results from Posttest Data and Questionnaires

The results of the research that has been conducted are based on quantitative analysis data obtained from cognitive learning outcomes test instruments and student self-efficacy questionnaires. The test was given to 41 students, namely in the experimental class 21 students and in the control class 20 students. For data on cognitive learning outcomes, it is measured using a posttest, and for data on student self-efficacy, it is measured using a questionnaire, it can be seen in the following diagram.

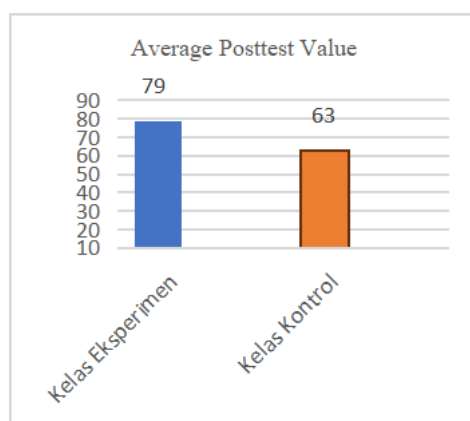


Figure 1. Chart of average posttest results

Based on Figure 1 above, the learning outcomes in terms of students' cognitive aspects show that the average posttest score for the experimental class is 79 and for the control class is 63. It can be concluded that the average learning outcomes for the experimental class are higher than the average learning outcomes in the control class.

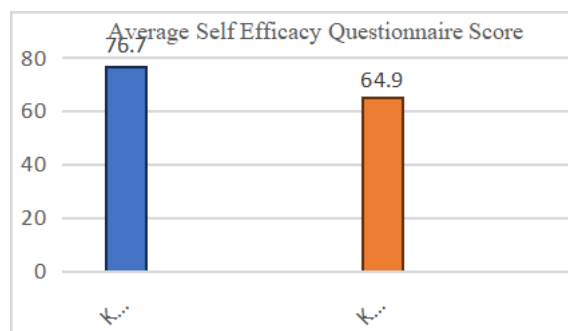


Figure 2. Diagram of the average score on the self-efficacy questionnaire

Based on Figure 2 above, the learning outcomes in terms of students' affective aspects, there is an average score on the self-efficacy questionnaire for the experimental class of 76.7 and for the control class of 64.9. It can be concluded that the average self-efficacy questionnaire score for the experimental class is higher than the average questionnaire score for the control class.

Test the Hypothesis

Based on the results of post-test hypothesis testing and student self-efficacy questionnaires, using independent-samples t-tests, the following data were obtained.

Table 6. Data from the results of the independent sample t-test on cognitive learning outcomes

Independent Samples Test		
Student Posttest Results	df	Sig. (2-tailed)
	39	.000

Table 7 shows data from the results of the independent sample t-test on the Self-efficacy Questionnaire score.

Independent Samples Test		
Results of student questionnaires	df	Sig. (2-tailed)
	39	.005

Based on Table 6, it is evident that the independent sample t-test posttest results obtained a Sig. (2-tailed) of $0.000 < 0.05$. So, there is an influence of the RADEC learning model on the learning outcomes of class X students at SMAN 1 Peusangan on stoichiometry material. This aligns with previous research by Amar Halim (2022), which states that the RADEC learning model in thematic learning, moderated by learning motivation, can improve student learning outcomes.

This RADEC model makes students more active in learning because they become the center of learning. In stage I (Read), students are encouraged to find information from various sources. At this stage, it successfully increases students' reading interest because students will answer questions. Stage II (Answer) students are trained to use their reading comprehension skills. This stage increases their independence in solving queries. In Stage III (Discussion) students are formed into discussion groups. In discussion groups, students collaborate to complete and understand the material for the day. In Stage IV (Explain) Students in each group explain the results of the discussion from the previous stage. At this stage, students exchange opinions, ask questions, and refute other groups' explanations. So, the learning atmosphere more active, and students are interested in solving a question. The teacher's role in the RADEC model is as an assistant in delivering material and correcting students if there needs to be a better understanding. In Stage V (Create) students conclude the lesson material they have completed that day. At this stage, students also create a work, namely a drawing in the form of formulas for the mole concept, which is made according to each student's creativity. So, it can be seen in each syntax of the RADEC model, students continue to be active in class and innovate to solve existing problems. Learning outcomes are closely related to student self-efficacy. As in the theory of Schunk, D. & Dibenedetto (2020) which states that self-efficacy influences activity, effort, persistence, achievement, self-regulation, motivation, and achievement.

Based on Table 7, it shows that the independent sample t-test results from the student self-efficacy questionnaire obtained a Sig. (2-tailed) of $0.005 < 0.05$, indicating an influence of the RADEC learning model on the self-efficacy of Class X SMAN 1 Peusangan students on stoichiometry material.

The RADEC model influences students' self-efficacy (belief in their abilities) through stage III (Discussion). Students who initially do not understand the material can gain understanding by exchanging information, namely discussing with other group members. As a result, when the teacher asks another question with the same material, the student is confident that they can answer it because they have already understood the learning material.

Therefore, all students will have an interesting learning experience. The RADEC learning model actively involves all students, ensuring that not just one or two students stand out in the learning process. Nevertheless, all students have the same opportunities as their peers. Students also have the opportunity to try and seek answers to various problems presented by the teacher.

4. CONCLUSION

Based on research data analysis using the independent sample t-test in the posttest and the results of the student self-efficacy questionnaire, it was found that the value was $0.000 < 0.05$, so H_0 was rejected, and H_1 was accepted. Therefore, the RADEC learning model has an influence on the self-efficacy and learning outcomes of class X students at SMAN 1 Peusangan on stoichiometry material.

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