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Science Process Skills Through The Read, Answer, Discuss, Explain And Create (Radec) Learning Model On Science Materials In High School

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Abstract. Natural Sciences (IPA) is a science related to nature that is systematically arranged through an investigation. The RADEC model as one of the solutions in the learning process that accommodates students to exchange information obtained and solve a problem. The purpose of this study is to implement the role of RADEC syntax in triggering student expertise in science process abilities (KPS). Increasing KPS requires the application of the RADEC Model to see the significance of increasing the use of the model, the measuring instrument used to measure KPS is a data collection instrument in the form of an observation sheet that has been prepared and then validated constructively (material experts). Sampling was carried out using convenience sampling, class sampling was carried out using a non-random technique which was then tested statistically as a basis for determining classes with the same abilities. The type of research conducted in this study is Pre-Experimental Design research. The posttest score of students' science process skills in the experimental class had the highest score of 96 and the lowest score of 78. While the posttest score in the control class had the highest score of 89 and the lowest score of 72. The average score of students' science process skills in the experimental class was 86 with a high category and in the control class was 80 with a very moderate category. The average score of students' science process skills in the experimental class was 81.66% with a moderate category. Students' science process skills in the Experimental class obtained the highest percentage on the observing indicator of 93.18% and the lowest percentage on the making a hypothesis indicator of 75.00%. Students' science process skills in the Control class obtained the highest percentage on the observing indicator of 86.36% and the lowest percentage on the making a hypothesis indicator of 61.36%.

Keywords: Science Process Skills, RADEC, Pre-Experimental Design

1. Introduction

The era of the industrial revolution 4.0 towards 5.0 has an impact on the development of human resources, one of which is in supporting the world of education (Dito & Pujiastuti, 2021). The world of education today, 21st century skills can help students to make it easier to understand science learning. Natural Sciences (IPA) is a science related to nature which is systematically arranged through an investigation of the concluded problems (Suharyat et al., 2022). The indicator components in IPA will be easy to understand conceptually in the learning process, if there is a match between theory and practice. The use of the right learning model will affect student knowledge.

Read, Answer, Discuss, Explain and Create (RADEC) learning model is a student-centered learning model with a series of activities to improve reading skills, collaboration, problem solving and producing ideas/works (Pratama et al., 2019). This learning model aims to be a solution in the learning process that accommodates students to exchange information obtained and solve problems given by the teacher. This learning model is in accordance with the Indonesian education system which currently uses the independent curriculum, where students must understand many lessons in a short time, both in the form of understanding concepts, practicums and creative thinking skills (Sri Wahyuni, Khaerudin, 2022).

One of the syntaxes of the RADEC learning model that can implement aspects of science process skills indicators is create (creating) where at this stage, students are encouraged to create the creativity they get based on the knowledge they have acquired. Research conducted by (Agriyana & Sopandi, 2022) shows that the RADEC learning model has a positive effect on students' science process skills compared to the Inquiry model.

Science process skills are activities carried out to encourage skills in acquiring knowledge (Mellyzar et al., 2022). The current reality is that students' science process skills are still low and students also assume that science lessons are difficult, teach a lot of theory and are boring (Setiya Rini et al., 2022). The purpose of science process skills is to develop students' creativity in the learning process. Students can actively develop and apply their abilities, which means that students not only get results but will learn about the process of obtaining results. Thus, this will be a provision for students to form competent personalities and will be able to compete with the people around them (Suryaningsih & Ainun Nisa, 2021). Science process skills are the most important thing for students to have, where science process skills will support students' understanding of science literacy (Mellyzar et al., 2022). One thing that must be considered in applying scientific knowledge in life is a sustainability-oriented application.

2. Methodology

2.1. Location and Subject of Research

The research was conducted at SMA Negeri 2 Bireuen. The research was conducted in the odd semester of the 2024/2025 academic year.

2.2. Population and sample

In this study, the students who were the research samples came from SMA Negeri 2 Bireuen. The population in this study were grade X students of the 2024/2025 Academic Year. The research sample consisted of 2 classes, namely the experimental class and the control class. The sample selection technique in this study used the convenience sampling technique. The convenience sampling technique was carried out because the research was conducted in a class that had been provided by the school.

2.3. Type and Design of Research

The type of research conducted in this study is Pre-Experimental Design research, namely a research method used by researchers to be able to control all external variables that influence the course of the experiment (Sugiyono, 2016). In this design there are two groups of subjects, one group received treatment as an experimental class and one group as a control class. Sampling was not done randomly because it used classes that already existed in the school. The research design pattern is the Intact-Group Comparison type.

Table 3.1 Intact-Group Comparison Type Research Design

Class	Treatment	Posttest
Experiment	X	O1
Control	-	O2

Information :
X : Treatment
O_1 : Posttest to see the ability after treatment KPS/Experimental Class
O_2 : Posttest to see the ability after treatment KPS/Control Class

This study measures science process skills. The type of measuring instrument used in this study is a non-test in the form of an observation sheet used to measure science process skills. Data collection techniques can be seen in Table 3.2.

Tabel 3.2 Data Collection Instruments and Techniques

No	Target	Metode	Instrumen
1.	Science Process Skills	Observation Sheet	Observation Sheet to review aspects of KPS (Observation, Interpretation, Prediction, Communication, Hypothesis, Planning Concepts, and Asking Questions)
2.	Student practical activities	Practice	Student Worksheet (LKPD)
3.	Valid research instruments	Validation	Validation sheet (validation of observation sheets and LKPD)

2.4 Data analysis

In this study, two data analyses were conducted, namely improving students' science process skills by implementing the RADEC learning model. Improving students' abilities by comparing students' posttest achievements in science process skills.
Data analysis Students' science process skills were analyzed with categories of very high, high, medium, low, and very low. Values and criteria based on Azwar's theory (Azwar, 2010) are presented in Table 3.3.

Table 3.3 Student KPS Level Intervals

No	Cognitive Ability Interval	Category
1	$M + 1,5\ SD < X$	Very high
2	$M + 0,5\ SD < X \leq M + 1,5\ SD$	High
3	$M - 0,5\ SD < X \leq M + 0,5\ SD$	Currently

4	M - 1,5 SD < X ≤ M - 0,5 SD	Low
5	X ≤ M - 1,5 SD	Very Low

3. Result and Discussion

The posttest scores of students in the experimental class can be seen in the following diagram:

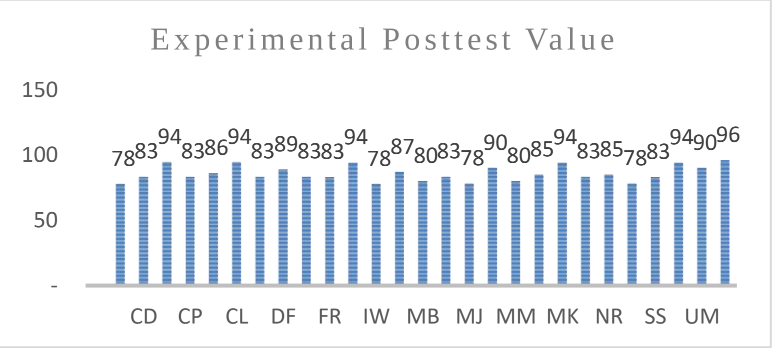

Figure 4.1 Posttest scores of experimental class students

Based on Figure 4.1 above, the posttest scores of students' science process skills in the experimental class, there is a highest score of 96 and the lowest score of 78. The posttest scores of students in the control class can be seen in the following diagram:

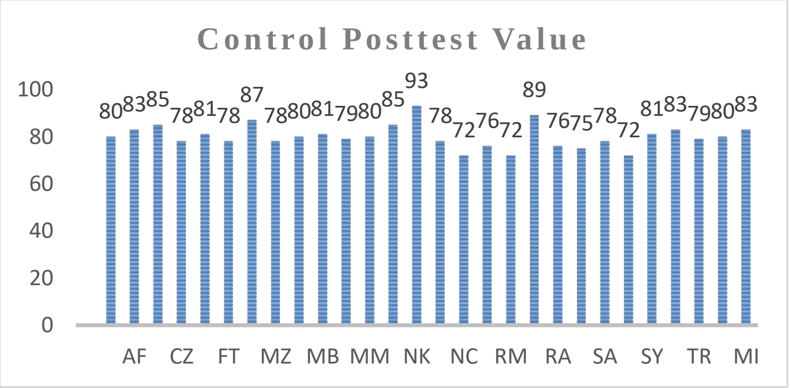

Figure 4.2 Posttest scores of control class students

Based on Figure 4.2 above, the posttest scores of students' science process skills in the control class, there is a highest score of 89 and the lowest score of 72. Based on the posttest scores of students in the experimental class and the control class, the calculation of the average posttest scores of students can be made in the following diagram:

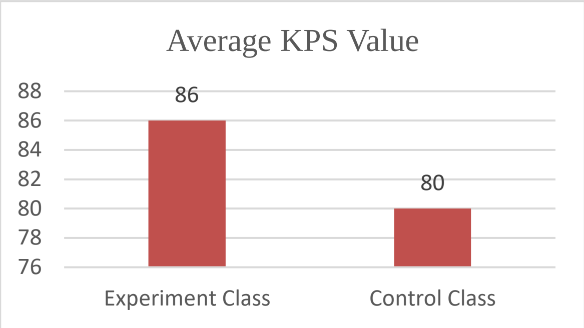

Figure 4.3 Average Score of Students' Science Process Skills

Based on Figure 4.3 above, the average value of the students' science process skills test, there is an average value of the experimental class of 86 with a high category and the control class of 80 with a very moderate category. It can be concluded that the average value of the science process skills test of the experimental class students is higher than the average value of the science process skills test of the control class students.

The observation sheet of the science process skills indicator is arranged based on the aspects of observing, predicting, making hypotheses, conducting experiments, interpreting data, concluding, and communicating, through the RADEC learning model in science practicums to students in the form of making soap on Colloid material that has been carried out at SMAN 2 Bireuen class X and is divided into Experimental class and Control class.

Table 4.2. Percentage of process skills of the Experimental class

Indikator	Percentage
Observing	93,18
Predicting	77,273
Making a Hypothesis	75,000
Conducting an Experiment	88,636
Data Interpretation	77,273
Conclude	81,818
Communicating	78,409

Based on table 4.2, it is obtained that the average value of the science process skills of students in the experimental class is 81.66% in the moderate category. According to (Ningsi & Nasih, 2020), science process skills are important skills for every student to have. Based on table 4.2, the science process skills of students in the Experimental class obtained the highest percentage in the observation indicator of 93.18% and the lowest percentage in the hypothesis making indicator of 75.00%. Based on table 4.3, the science process skills of students in the Control class obtained the highest percentage in the observation indicator of 86.36% and the lowest percentage in the hypothesis making indicator of 61.36%.

Table 4.3. Percentage of science process skills of students in the Control class

Indicator	Percentage
Observing	86,364

Predicting	72,727
Making a Hypothesis	61,364
Conducting an Experiment	77,273
Data Interpretation	68,182
Conclude	71,591
Communicating	76,136

The highest indicator of observing means that students use several senses in describing the objects observed in the form of seeing the tools and materials for the practicum, listening to instructions on the working mechanism of the practicum, being skilled in holding directly, this is in accordance with what was said by Sitompul et al (2018), that good education can be seen from the independence and enthusiasm of students in the learning process. As stated by (Ningsi & Nasih, 2020) that students tend to be active and skilled in carrying out practicum activities. One example in the practicum of making soap, students are already familiar with the tools used in making soap, students are already familiar with the materials being tested.

The lowest indicator makes a meaningful hypothesis, students make hypotheses based on observation data and existing theories. This is because it is difficult for students to describe estimates from the results of the practicum that are in accordance with the theory that has been obtained. One example in the soap-making practicum, the lack of students' cognitive knowledge of the names of compounds in soap solutions.

This RADEC model places students at the center of learning and allows them to become more active students. In Stage I (Read), students are encouraged to seek information from various sources including textbooks, the internet, and so on. At this stage, students are able to stimulate their skills regarding new knowledge obtained through reading activities related to colloid material before receiving an explanation from the teacher. Teachers play a role in students' reading literacy learning and have succeeded in increasing students' interest in reading by asking students to answer the teacher's questions before learning (Safitri & Dafit, 2021).

Stage II (Answer) students are trained to use their own reading comprehension skills to answer pre-learning questions based on information that has been read previously. This stage increases students' independence in answering pre-learning questions. Therefore, each student tries to answer the questions asked before learning, as evidenced by the student's worksheet. In this way, the teacher plays an active role in determining students' understanding of the material discussed based on information obtained through reading activities (Pohan et al., 2020).

Stage III (Discuss) discussion groups are formed according to teacher instructions, and function as a place for students to exchange information and discuss pre-learning questions and questions listed on student worksheets. In this discussion stage, students who have understood the material help students who do not understand. The teacher plays a role in encouraging students to think critically and express opinions, as well as instilling mental courage to express opinions (Sholihah & Amaliyah, 2022). So collaboration between students who do not understand the material and train collaboration between students in their groups, so that initially group members can understand the questions given by the teacher.

Stage IV (Explain), after group discussion, students present the results of their discussion to other groups. At this stage, students' oral communication skills improve, teachers also play an active role in helping students deliver material and correcting any misunderstandings in students' concepts (Rambe et al., 2023). Stage V (Create), students from other groups create new ideas in the form of questions about what was discussed and ask questions to the group that presented the results. Students who present the material then answer questions so that good communication is created between them which will continue continuously (Sa'baniyah & Riyandari, 2022). At this stage, students can conclude the material they have learned that day. The practicum of making soap itself was created by students using materials found in everyday life and practiced directly in front of the class.

4. Conclusion

A series of research stages have been carried out including pre-research stages including surveys of research implementation locations, LKPD, and validation of observation sheets. The research has been carried out at SMA N 2 Bireun, the sample of this study was students of class X.

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