JPPIPA 10(1) (2024)

Jurnal Penelitian Pendidikan IPA

Journal of Research in Science Education

http://jppipa.unram.ac.id/index.php/jppipa/index

Implementation of the Inquiry-Oriented RADEC Learning Model

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Received: August 28, 2023
Revised: December 18, 2023
Accepted: January 25, 2024
Published: January 31, 2024

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DOI: 10.29303/jppipa.v10i1.5119

Abstract: The experiment activities carried out are not complete experiment activities. One of the learning models that includes investigative activities is the RADEC learning model. This research aims to implement inquiry-oriented RADEC learning. The method used in this research mixes methods by design-embedded experimental design. The subjects in this study were 45 elementary school students in class V, one of the elementary schools in Bandung Regency. Data collection techniques were collected using test and non-test instruments in the form of observation sheets, test questions, and questionnaires. Each stage of the RADEC learning model was good, with some stages increasing at each meeting and some optimally implemented. In investigative activities, students still need guidance in designing and making investigative reports and are required more than once to develop their skills in compiling, carrying out, and reporting investigations. Besides that, RADEC learning can increase students' mastery of concepts and encourage student collaboration skills.

Keywords: Inquiry; RADEC; Science

Introduction

Natural science (IPA) is one of the subjects taught from elementary school to university. It is a branch of science that studies the universe, its elements, and its events, carefully developed by professionals and presented as verifiable facts, concepts, principles, and laws (Sujana, 2014; Wahyuni, 2018). Education is crucial to develop competent and superior human resources. The key to keeping up with the times is education, which starts from elementary and secondary schools and continues through to tertiary institutions (Mardhiyah et al., 2021). To achieve these educational goals, Article 37 Paragraph 1 stipulates the subjects that must be taught in elementary schools, and the teaching and learning of Natural Sciences (IPA) is one of the subjects that must be included in the curriculum. The large amount of science material and its role in everyday life makes science learning in elementary schools influential in shaping students to become quality human resources as expected in educational goals. One of the studies in natural science is the water cycle that cannot be separated from human life.

Science learning is also closely related to investigative activities. In science learning, investigation activities are essential for students to carry out to help students solve problems in everyday life. Experimental activities stimulate students to understand concepts scientifically (Ratunguri, 2016) and allow them to believe facts or conclusions based on their investigations rather than simply obtaining explanations from teachers or reading books (Supandi et al., 2021). This investigative activity stimulates students to be able to solve everyday problems by applying the scientific concepts they learn, being able to make the right decisions based on their knowledge, learning will be more meaningful (Suryaningsih, 2017) and improving students' cognitive abilities (Zulqarnain et al., 2022).

However, in practice at school, the investigative activities carried out are not complete investigative activities. Investigative activities, often also called experiments, are carried out not starting from planning and preparing investigative activities. Investigative or experimental activities carried out by students are simply following the activities already in the teacher's

How to Cite:
Agustina, N. S., Sopandi, W., & Sujana, A. (2024). Implementation of the Inquiry-Oriented RADEC Learning Model. *Jurnal Penelitian Pendidikan IPA*, *10*(1), 80–91. https://doi.org/10.29303/jppipa.v10i1.5119

book or those prepared by the teacher, starting from the title, research questions, tools and materials, work steps, and the report format that must be prepared. The student book of investigation activities does not contain research questions, hypotheses, or variables.

In the thematic book theme 8 (Our Friend's Environment), there is only one investigation activity consisting of a title, activity steps, instructions for recording observations, and instructions for making reports and conclusions. Many research activities related to the water cycle can be carried out. Most learning activities are only in the form of direct knowledge transfer from teachers to students (Andriani & Riandi, 2015), so students tend to only listen and carry out orders from teachers and cause low mastery of student concepts (Anggoro et al., 2018). In addition, the lack of teacher competence in implementing collaborative learning influences students' lack of social interaction in groups because they are only focused on academic achievement (Hinyard et al., 2019) such as learning dominated by expository methods (Tanjung et al., 2022). Based on this, it can be concluded that the absence of inquiry activities in science learning causes low mastery of concepts and student collaboration skills, even though both are competencies that must be possessed by students.

Mastering concepts means being able to understand, comprehend, apply, classify, generalize, synthesize, and draw conclusions about various objects, not just simple understanding (Asmawati, 2015). Students' understanding of a concept will have an impact on the information they receive, because concepts provide a foundation for higher mental processes that allow the formulation of principles and generalizations (Dahar, 2011; Fatchurrohim et al., 2016). Based on this, mastery of science concepts is fundamental for students because when students have factual, conceptual, procedural, and metacognitive knowledge, they can improve their intellectual knowledge and skills that will influence students to take attitudes and actions towards issues and solve everyday problems (Ali & Jager, 2021; Anderson & Krathwohl, 2001).

But just knowing is not enough, skills are needed so that students become good and quality resources so that they can compete and adapt in social life. To realize the Revolutionary Era 4.0, a balance of knowledge and skills is needed as a foundation for developing into superior human resources in this era (Mardhiyah et al., 2021). Education is the key to building "21st century skills" to meet various socio-economic and community demands and needs so that they can succeed in this modern era of life (Ananiadou & Claro, 2009; Andersen & Rustad, 2022; Bayley, 2022; Trilling & Fadel, 2009). Collaboration skills are one of the skills that must be possessed by the 21st century generation to succeed in this era.

According to Kundarti, Latifah, Laili, and Susilo (2019) collaboration skills are very important for everyone to have because collaboration skills become a bridge between theoretical aspects and practical knowledge, for example in practicum activities, field activities, or outdoor activities. In addition, some problems are also the reason for the importance of collaboration skills as one of the 21st century skills as follows, 1) the sense of empathy in adolescents is diminishing, 2) with the ease of technology the millennial generation tends to be individualistic and apathetic to the environment, 3) in the world of work teamwork is needed to complete work tasks, 4) collaboration is a human need because naturally humans are social creatures will forever be in contact with other humans to work together and help each other (Kinanti, 2019; Kurniaputri, 2021; Saleh, 2020).

Analysis of the results of the final exam of the even semester of the 2021-2022 academic year in one of the elementary schools in Bandung Regency shows that out of 28 students, not a single student reached the KKM score, and on the material of the water cycle has an average score of 33.45. Most students answered that the water on earth was increasing, besides that most of the students' answers also showed that they did not understand the source of groundwater, the role of trees in the water cycle and human activities that affect the water cycle. This shows that students' concept mastery of the water cycle is still low. The results of other studies that lead to mastery of the water cycle concept show that learning outcomes on water cycle material are still low with an average score of 40.07 (Maulana et al., 2022). In addition, the results of other studies revealed that on the subject matter of the water cycle many misconceptions appeared related to the concept of condensation and the phenomenon of precipitation (Silvianty, 2016). The low mastery of concepts at the elementary school level is allegedly one of the causes of low mastery of concepts at the junior high school, high school, and university levels, because mastery of basic concepts in elementary school is the basis for mastery of subsequent concepts at higher levels (Rahmah et al., 2018; Suwarno, 2017).

In addition, students' collaboration skills at one of the public elementary schools in Bandung Regency also show that most students have low collaboration skills. This can be seen when in learning students are formed into groups, students are difficult to form into groups, in doing the tasks given there are significant differences in task completion time between groups, and in groups there is no effective discussion, only one or two students contribute while members only copy the work of their friends. The low collaboration skills of students are

caused by students being accustomed to being given tasks and learning individually (Hidayanti et al., 2020; Nurwahidah et al., 2021), this is the result of differences in environmental factors and the character of each student which causes less interaction between students directly (Sufajar & Qosyim, 2022). In addition, teachers' lack of competence in implementing collaborative learning influences students' lack of social interaction in groups because they only focus on academic achievement (Hinyard et al., 2019) such as learning dominated by expository methods (Supandi et al., 2021).

One way to develop mastery of concepts and collaboration skills more optimally in schools is to provide a problem to students and encourage them to solve problems through discussion activities with groups, then submit the results of discussions or group reports (Nisrina et al., 2017; Rahmah et al., 2018; Ridwan et al., 2020). Based on this, a contextual and student-oriented learning model is needed. One of these learning models is RADEC (read, answer, discuss, explain, and create). The syntax in the RADEC learning model is also able to create a collaborative and investigative climate during the learning process (Suryana et al., 2021). In the RADEC learning process, students are required to participate more actively in the learning process and provide opportunities for students to actively ask questions, discuss, propose investigation plans, and draw conclusions from the material studied (Handayani et al., 2019; Wahyuni et al., 2020). The create stage can be filled with work making, problem-solving, and investigation. The number of studies using the RADEC learning model as a variable is still limited. Therefore, further research is needed to validate and test this RADEC learning model. Based on the problems that have been described, this study used the RADEC learning model with the create stage in the form of investigation in water cycle learning.

Method

The method used in this study is a qualitative method with a qualitative descriptive design. Descriptive research seeks to describe phenomena that occur realistically at this time because it makes descriptions, pictures, or paintings systematically, factually, and accurately regarding the facts, characteristics, and relationships between the investigated phenomena (Rukajat, 2018). The descriptive analysis in this study is an analysis of the implementation of each stage of the RADEC learning model.

The subjects in this study were 45 elementary school students in class V, one of the elementary schools in Bandung Regency for the 2022-2023 school year. However, only 27 students took part in the entire series of activities. Consists of 12 men and 15 women. Data collection techniques were collected using test and non-test instruments in the form of observation sheets, test questions, and questionnaires. In simple terms, the flow of this research is presented in the following figure 1.

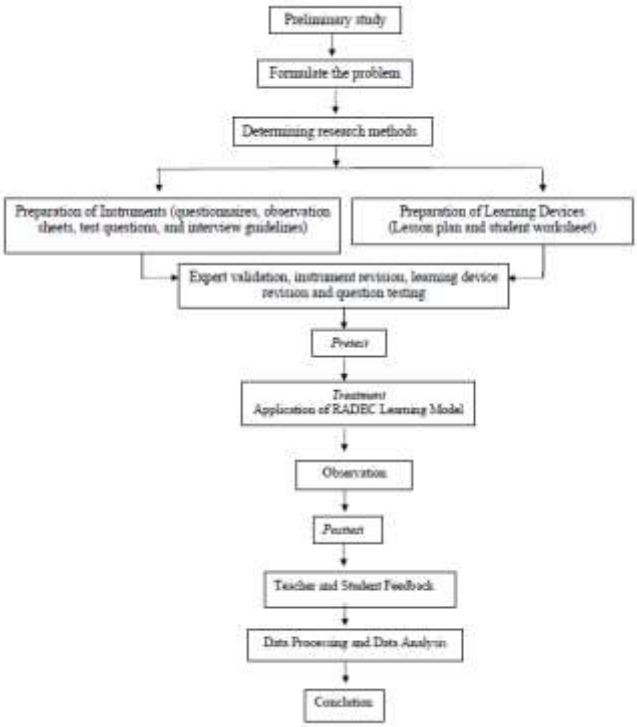

Figure 1. Research Flow

The score of the observations of the implementation of RADEC learning is presented in the form of a percentage and is interpreted based on the following table 1.

Table 1. Interpretation of Learning Implementation

Implementation of Learning	Interpretation
80% or more	Very good
60%-79%	Good
40%-59%	Currently
21%-39%	Less
0%-20%	Less than once

Result and Discussion

Learning activities are carried out according to the applicable curriculum, namely the 2013 curriculum. Based on the 2013 curriculum, learning is carried out thematically by integrating learning of Natural Sciences, Indonesian Language, and Cultural Arts and Crafts using the teacher's book guidelines. However, this research specifically focuses on science learning on the water cycle material. Learning activities with the

RADEC learning model are divided into six meetings: one for the pretest, one for the post-test, and four for learning activities. Of the four learning meetings, meeting 1 to meeting three consists of stages read, answer, discuss, and explain, and meeting 4 consists of stages read: discuss, explain, and create. Each meeting lasts 5 x 35 minutes with a total science content during learning 6 JP or 6 x 35 minutes.

Learning begins by giving an initial test (pretest), which 45 students attended. Previously, students were given reading materials and LKS containing pre-learning questions. The teacher gave them the task of reading and working on pre-learning questions in the self-answer section of the LKS. In the LKS, there are 14 pre-learning questions. The fourteen questions are divided into three parts: question no. 1-5 for activity one, nos. 6-8 for activity two, 9-14 for activity three, and in activity four, there is one question number for making or choosing a research idea. Students are assigned to read and do pre-learning assignments in the previous lesson. The implementation of the RADEC learning model is described in more detail as follows.

Read

At each meeting, before learning begins, students are given a questionnaire to find out students' reading activities. The information obtained from the questionnaire is the implementation of reading teaching materials at home, the completeness of reading the teaching materials provided, and the extent to which students understand the material being studied independently. The results of the questionnaire are presented in Table 2.

Table 2. Student Reading Activities

Reading Activity		Pretest	1	2	3	4	Meeting to Posttest
Total students present		45	40	39	32	39	40
R	Total	23	23	30	26	32	
	%		57	77	81	82	
RC	Total		21	26	24		
	%		91	87	92		
RU	Total		16	18	19		
	%		70	60	73		
ROS	Total		4	5	5		
	%		17	17	19		
NR	Total		17	9	6	7	
	%		43	23	19	18	

Information:
Total = Amount
R = Reading
RC = Read Complete
RU = Read Understood
ROS = Read Other Sources
NR = Not Reading

The number of students who completed reading activities at meetings 1 to 4 increased. In addition, from the first to the fourth meetings, students were still found who had not carried out the reading of the teaching materials provided. From the reading activity questionnaire, the students filled in several reasons why they had not carried out reading activities, namely playing, being lazy, too much, forgetting difficult material, and not going to school at the previous meeting, so they did not know the assignment. At meetings, one to three students read the material provided by the teacher related to the water cycle. In comparison, students found information about investigative activities related to the water cycle at four meetings. At the meeting, four students were not given special reading material; students were freed to find their own from various sources.

Reading activities at home are an alternative to fostering students' reading habits (Wiguna et al., 2022); students who carry out reading activities as fulfilling assignments from the teacher become accustomed and feel that reading is necessary. Pratama (2022) found that in the third week of the implementation of reading habituation, without being assigned by the teacher, students began to emerge the habit of students to do reading activities before learning began, besides that their reading comprehension skills also improved. Through the read stage, students who read teaching materials before learning at school are helped to master concepts so that they affect their learning outcomes. Reading is important because it is the beginning of obtaining new knowledge and insights, the more points that are understood in reading, the more knowledge is obtained (Ariesti et al., 2016; Tantri, 2017).

Answer

At this stage, there are 15 questions for measuring mastery of concepts adapted to learning indicators. The questions are in the form of description questions divided into three meetings. In the first meeting, there were five questions, consisting of 4 questions regarding the water cycle process and 1 question regarding the benefits of water. The second meeting contained three questions regarding the water cycle's impact on Earth's events and the sustainability of living things. The third meeting has six questions consisting of 3 questions about the impact of the water cycle on events on earth and the survival of living things and three questions regarding efforts to maintain the availability of clean water. The fourth meeting consists of 1 question regarding investigations related to the water cycle. Data on students who carry out activities answering pre-learning questions is presented in Table 3 and the reason is presented in Table 4.

Table 3. The number of students who answered and did not answer pre-learning questions.

Meeting	Answering		Not Answering	
	Amount	%	Amount	%
1	26	65	14	35
2	33	83	7	17
3	27	84	5	16
4	33	84	6	16

Table 4. The reasons students did not work on pre-learning questions are presented in Table 4.

Meeting	Reason	%
1	Playing	50
	Lazy	29
	Too many	7
	land	7
	Fall asleep	7
2	Playing	29
	Lazy	29
	Forgot	29
	Difficult Problem	13
3	Forgot	80
	Studying religion	20
4	Confused	67
	Forgot	33

Some students still did not carry out the stages of the three meetings. The reasons given by students who do not carry out activities answer, including playing, being lazy, forgetting, and the questions are difficult. However, the average score on each pre-learning problem increased compared to the value pretest. This shows that students gain new knowledge from reading activities and answering questions. At meeting four, only one pre-learning question asked students to make investigative questions or choose one of several examples of investigative questions in the questions section. The research questions prepared were regarding the water cycle based on what they had learned during the three previous meetings. No student can create their investigative questions. Of the thirty-three students, all provided answers by writing one of the three examples of available investigative questions. Meanwhile, the other six students did not provide answers to questions because they did not have an inquiry idea and were confused about choosing one example. There are three examples of inquiry questions, firstly between humus soil and sand, which is better at absorbing water?, secondly between clear water and murky water, which evaporates faster?, and thirdly can water purify water?

Based on the test results obtained from the pre-reading test and the pre-learning test, there was an increase in the average test results. This is because students carry out activities to read teaching materials so that better understanding is formed. Better understanding will be obtained by students when they are accustomed to reading. Giving pre-learning questions can stimulate students to improve their understanding of the reading and concepts to be learned so as to increase students' readiness and activeness in learning, and encourage students to criticize and analyze each question (Maspiroh & Eddy Sartono, 2022; Wijaya & Windayani, 2020; Yulianti et al., 2022). In addition, pre-learning questions also build students' independent character (Setiawan et al., 2020).

Discuss

Based on the observation sheet of the implementation of RADEC learning stages, at meetings one to three, the discussion process did not run optimally. This happens because the knowledge possessed by students is limited. This is influenced by the less-than-optimal implementation at the stage of reading and answering. At the first meeting, students find it difficult to form into groups. During stages one to three, the discussion process did not increase. The activeness of students influences this in discussions. During the four ongoing meetings, not all students actively expressed opinions, asked questions, or explained, and only 2 or 3 students dominated group discussion activities. In contrast, other students only listened or followed.

At the fourth meeting, students discussed arranging investigative activities, carrying out investigative activities, and reporting the investigation results. In preparing investigative activities, students must agree on which investigative questions will be carried out, bearing in mind that there are differences in the choice of investigative questions in one group. After agreeing on which questions will be carried out, students arrange investigative activities by determining the title of the investigation, the inquiry questions, the reasons for choosing the investigation, and the hypothesis based on the selected investigative questions. These variables concern the investigation (independent, dependent, and control variables), tools and materials, and work steps. However, students experienced difficulties in compiling investigative activities. Students do not know hypothesis variables and can not determine the title, tools, and materials needed and the steps to be taken. This happened in all groups. So, a class discussion was conducted to determine the investigative questions so that the investigations carried out by each group were the same.

This is done so teachers are more effective and efficient in guiding students to compose investigations. In this activity, the teacher guides students to choose one of the investigative questions by considering cost efficiency, convenience in providing tools and materials, and available time. Based on the results of class

discussions, the research question chosen was question a, namely, "Between humus and sand soils, which one is better at absorbing water?". After being agreed, the teacher guides students to determine titles, develop hypotheses, and determine variables. Furthermore, students discussed determining the tools, materials, and work steps.

The step discussed at the RADEC stage can improve social skills; one of the most prominent skills at this stage is collaboration and communication. Students are challenged to express and defend their opinions, develop original thinking, share these ideas with peers, consider multiple points of view, ask questions, and engage in higher-order thinking skills such as managing, organizing, critically analyzing, problem-solving, and creating learning. And deeper new understanding (Septikasari & Frasandy, 2018). Such learning will create a fun and student-centered class.

Teachers and students also respond to the discussion. According to the teacher's response, some students are still inactive in discussion activities. However, the discussion activities were going well from meetings one to four. Some students have been able to express opinions and agree on answers. However, it is still homework for the teacher to motivate other students who are still passive. Students also gave very good responses. Through discussion, students feel motivated to guide other friends who do not understand and ask questions if they do not understand, practice communication skills, and are motivated to provide ideas or opinions, learn to respect others, and cooperate with others.

Explain

At this stage, in general, students convey or explain the results of group discussions that have previously been carried out. Students are expected to be able to build concepts on their thoughts. The percentage of student participation explains these in the following table 5.

Table 5. Student Participation in Explain

Meeting	Total students present	participating students	%
1	40	16	40
2	39	10	26
3	32	15	46
4	39	14	35

Students who participated in meeting three had the highest percentage due to positive reinforcement in the previous meeting for participating students. Through positive reinforcement, students feel cared for and valued. It positively impacts self-confidence and stimulates student motivation and activity to make learning activities more productive (Anwar, 2022; Mahanani, 2018). In addition, the number of questions at the third meeting was also more than the other meetings.

Before the series of RADEC learning activities, the researcher found out how far the students' habits in expressing opinions were. The data obtained from the reading and study habits questionnaire are presented in Table 6.

Table 6. Habits of Students in Expressing Opinions

Opinion Habits	Percentage (%)		
	Of	Sometimes	No
Dare to express an opinion	20	40	40
Shame when the opinion is wrong	62	22	16

Table 6 shows that the courage of students to express opinions is still low; only a small number of students dare to express opinions. Students did not dare to express their opinions because of several reasons presented in Table 7.

Table 7. Reasons Students Are Embarrassed in Conveying Opinions

Reason	Percentage (%)
Afraid of being wrong	56
Shy	25
Not confident	13
Lack of understanding of the material	6

Table 4 shows that students do not dare to express opinions because of fear of being wrong, shy, insecure, and lack of understanding of the material. From the table, it can be seen that the fear of being wrong is the reason most students do not dare to express their opinions. Students feel afraid of speaking in front of a crowd because of a lack of confidence to speak in public, lack of opportunities for students to speak in public, fear of the wrong concept being expressed, fear of being ridiculed or laughed at, lack of experience in public speaking, lack of preparation, fear of making grammar mistakes, nervous when speaking in public, fear of making mistakes and low or insufficient vocabulary (Dansieh et al., 2021).

At meetings one through three, students presented the results of answers to pre-learning questions that had been discussed with the group. In contrast, at meeting four, students presented the investigation designs and the investigation results. During the four RADEC learning meetings, not all students actively expressed opinions, asked questions, and argued during the explanation. At the first meeting, none of the students volunteered to make presentations. After being appointed by the group, no group members were

willing. Students must be appointed directly by the teacher, and even students who are not willing have been appointed. At the first meeting, students presented in their place. Only at the third meeting did students appear willing to present and respond to the presentation without being appointed by the teacher. The students who participated in meetings one to four were mostly the same. Over 50% of students at each meeting have not participated in the explained activities.

These findings show that there are still deficiencies in the stages explained. Even so, this does not rule out that stage-explain Student participation is improving at each meeting. Learning with small groups becomes a place for students to practice speaking, and mastery of the concepts being studied encourages students to be more courageous in public speaking (Rambe et al., 2023). In addition, providing opportunities and creating a learning atmosphere that allows students to speak in public often boosts students' skills and confidence in speaking.

Teachers and students also gave positive responses to the stages explained. The teacher thinks that from meeting one to meeting three, there is an increase in student involvement in presenting the results of discussions with groups and providing responses. This shows that RADEC learning can increase student activity. Students also respond well by feeling motivated to ask, answer, argue, or add material.

Create

At the level of creation, after students learn the concepts regarding the water cycle for three meetings, it is expected that students can plan, organize, and carry out an investigation. Before the research began, through a questionnaire, information was obtained that all students had carried out an investigation before. However, most of them could not mention what experiment they had done. The creation stage in this learning is an investigation carried out at meeting four, including activities to seek information on matters relating to the investigation, answering questions, group discussions, presenting the investigation design, carrying out the investigation, and reporting the investigation results. Researchers obtained several findings during the stage create. First, most students have been able to choose an inquiry idea but have not been able to create their inquiry idea. Second, a small number of students have not been able to create an inquiry idea and have not even been able to choose one example of an inquiry idea. Third, students have not been able to compose an investigation. This is evidenced by students who need guidance in determining the title of the investigation, hypotheses, determining variables, determining tools and materials, and preparing work steps. Fourth, most students already have the initiative to collect and share tasks in collecting tools and materials needed for investigations. Even so, some students were engrossed in playing catch-up and did not help collect tools and materials, for which the teacher finally reprimanded them. Fifth, in writing down the investigation results, students are still confused, so the teacher helps guide students by making examples of tables on the blackboard.

Students still need guidance in preparing an investigation plan because students are not used to preparing their investigations. These findings indicate that encouraging students to create a creative and innovative idea cannot be done with one investigation activity; consistent learning with investigative activities is needed. Based on the questionnaire, students felt happier if the work steps for preparing the investigation were given directly by the teacher. These difficulties arise because students are not used to composing their investigations. They are used to just following what is needed and the steps in the investigation in the book. In learning activities, when students carry out experimental or investigative activities, everything from the title, investigative questions, tools and materials, and work steps to the format of writing the findings is already in the textbook or given by the teacher. Teachers often feel that experimental activities are too difficult for students and that resources and time are inadequate (Pallotta et al., 2021). Even though learning like that is not an activity that can optimally improve students' attitudes, skills, and scientific knowledge (Zulqarnain et al., 2022).

When carrying out research activities, students look enthusiastic and happy. After learning is complete, students respond positively at the create stage. Through stages created In RADEC learning, students are motivated to generate investigative ideas and can work with groups to plan and carry out an investigation. The teacher believes students still need guidance to compile and conduct investigations. Learning with experimental activities needs to be applied in everyday learning practices to be effective, and commitment from the teacher is required in designing these learning activities (Pallotta et al., 2021). It is necessary to apply experiments in every school because, with experiments, students are more able to think critically, be skilled, understand the material presented, understand how to use practicum equipment, gain new experiences, communicate results, ask questions, and be able to solve problems (Candra & Hidayati, 2020).

At the level of creating in this way, students are trained to use their knowledge to arrange investigative activities. Experimental learning stimulates students to understand concepts scientifically and allows students

to believe facts or conclusions based on their investigations rather than simply obtaining explanations from teachers or reading books (Ratunguri, 2016; Supandi et al., 2021). This investigative activity stimulates students to be able to solve everyday problems by applying the scientific concepts they learn, being able to make the right decisions based on their knowledge, learning will be more meaningful (Suryaningsih, 2017) and improving students' cognitive abilities (Zulqarnain et al., 2022). Learning with experimental activities that encourage students to inquire through designing experiments, preparing tools and materials, formulating hypotheses, making observations, analyzing data, interpreting findings, and drawing conclusions significantly influence skills and can construct knowledge (Supeno et al., 2022). Investigation-based learning improves science process skills and student learning activities (Juniar et al., 2021).

The increase in students' mastery of concepts increased after learning RADEC. This can be seen from the results of the pretest and posttest. The following is a comparison of students' pretest and posttest scores.

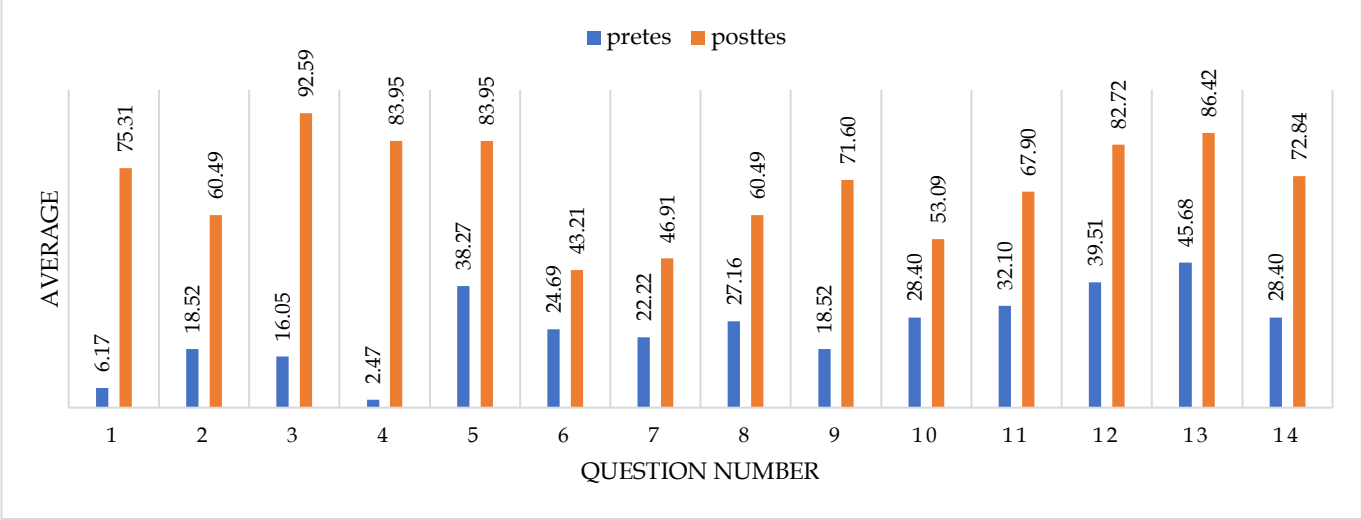

Figure 2. Bar chart pretest and posttes scores

From Figure 2 it can be seen that each question of students' mastery of concept scores increased from pretest to posttest. This change occurs after students are taught with the RADEC learning model, so it can be said that the RADEC learning model has a positive influence on students' conceptual mastery abilities.

Through the RADEC learning model, cognitive apprenticeship occurs, namely students learn gradually from reading to creating to gain knowledge through interaction with experts (Kusumaningpuri & Fauziati, 2021). This is in line with the teacher's opinion who stated that students' mastery increased with RADEC learning, this can be seen from the learning activities in the classroom as well as the results of students' tests/posttests. Students also revealed that by learning with the RADEC learning model, students gained a lot of new knowledge and made it easier for students to understand the learning material.

The read stage improves reading comprehension skills and expands students' information, insights, and knowledge (Pohan, et al., 2020; Wijaya et al., 2023). This reading activity shows students' readiness to learn more effectively because students have obtained information and knowledge before carrying out classroom learning so that students can take part in classroom learning more effectively (Pratama et al., 2020). In the answer stage, students solve pre-learning questions based on the knowledge they get in the reading stage, students independently identify difficulties in answering pre-learning questions (Kusumaningpuri & Fauziati, 2021).

Through the stages of the inquiry-oriented RADEC learning model, students will get meaningful learning experiences. Students who take part in each RADEC learning meeting in full have better concept mastery those who do not participate in every lesson. RADEC learning will increase students' reading motivation, train reading comprehension, and facilitate the development of social character; apart from that, students' creativity in creating research ideas and problem-solving and students' creative work will also increase (Sopandi. W, 2017).

In addition, researchers also find out students' collaboration skills through observation and questionnaires. Student collaboration skills at each meeting based on indicators of Greenstein collaboration skills are presented in Figure 3.

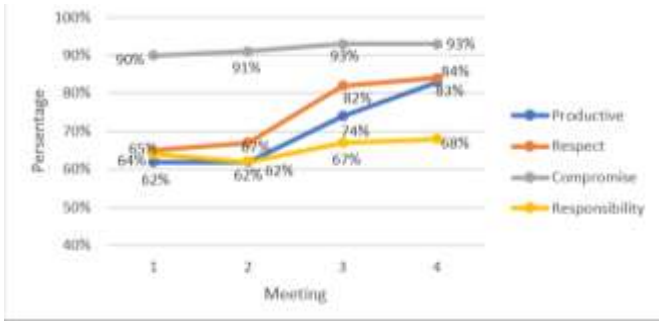

Figure 3. Chart percentage of Student Collaboration Skills Indicators Participating in All Meetings

Based on the graph, it can be seen that in general, each indicator of collaboration skills has increased, and the fourth meeting has the highest percentage compared to other meetings. From the percentage of each indicator, the average value of the collaborative skills of class V students in RADEC learning was obtained, which was 70% based on observation results and self-assessment results of 74% in the high category.

Read and answer encourages students to find out and build their own knowledge with teacher guidance in the form of reading materials and pre-learning questions. However, apart from that, students are also free to seek information from sources other than those provided by the teacher. Stageread improves reading comprehension skills and broadens students' information, insight, and knowledge (Pohan et al.., 2020; Wijaya et al., 2023) this reading activity shows students' readiness to learn more effectively because students have obtained information and knowledge before carrying out learning in class so students can participate in class learning more effectively (Pratama et al., 2020). At stage answer, students complete pre-learning questions based on the knowledge they get at the reading stage, students independently identify difficulties in answering pre-learning questions (Kusumaningpuri & Fauziati, 2021).

By asking questions to students and encouraging problem-solving activities through discussion activities, then presenting the results of group discussions, learning activities can be carried out more effectively (Ridwan et al., 2020). Through discussion, students actively build their ideas, respect the opinions of others, avoid emotional traits, speak politely and clearly and not to beat around the bush, are not afraid of criticism, express their ideas boldly, and be open and honest (Suryanti, 2019). Based on this description, it can be concluded that the RADEC learning model can develop students' collaboration skills.

Read and answer encourages students to find out and build their knowledge with teacher guidance in the form of reading materials and pre-learning questions. However, apart from that, students are also free to seek information from sources other than those provided by the teacher. Stageread improves reading comprehension skills and broadens students' information, insight, and knowledge (Pohan et al.., 2020; Wijaya et al., 2023) this reading activity shows students' readiness to learn more effectively because students have obtained information and knowledge before carrying out learning in class so students can participate in class learning more effectively (Pratama et al., 2020). At stage answer, students complete pre-learning questions based on the knowledge they get at the reading stage, students independently identify difficulties in answering pre-learning questions (Kusumaningpuri & Fauziati, 2021).

Discuss and explain also develop students' mastery of concepts through brainstorming activities and stages create through planning, implementing, and reporting investigative activities. At stage-discuss and explain students are active in the learning process to build their knowledge, and provide opportunities for students to share the knowledge they already have (Marwati, 2022; Sudiasih & Margunayasa, 2020), that students who learn to use RADEC learning are more mature and ready to discuss, more specifically skills evaluation of C5 domains through communicative learning processes as well as in investigations also builds students' cognitive abilities from solutive ideas generated by students in the experimental class which are very clear at the C6 cognitive level (Pratama et al., 2020).

Conclusion

Based on the research that has been done, each stage of the RADEC learning model is well implemented, with some stages experiencing an increase at each meeting and some stages having been implemented optimally.

Acknowledgments

With the completion of this research, we thank to all parties who have provided participation, motivation, assistance, and direction on the reseach.

Author Contributions

Conceptualization, Nurul Saadah Agustina, Wahyu Sopandi, And Atep Sujana.; methodology, qualitative descriptive; software, Microsoft Excel, SPSS.; validation Novi Yanthi.; formal analysis, Skala Likert.; investigation Nurul Saadah Agustina.; resources, 5thgrade students of SDN Palipurna.; data curation, Nurul Saadah Agustina.; writing—original draft preparation, Nurul Saadah Agustina.; writing—review and editing, Wahyu Sopandi, Atep Sujana; visualization, Nurul Saadah Agustina.; supervision, Wahyu Sopandi, Atep Sujana; project administration, Nurul Saadah Agustina.; funding acquisition, Nurul Saadah Agustina. All authors have read and agreed to the published version of the manuscript.

Funding
This research no external funding.

Conflicts of Interest
The autors declare no conflict of interest

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