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RADEC (Read-Answer-Discuss-Explain And Create) as a New Learning Model in Indonesia: How Does it Impact on the Science Literacy of Primary School Students?

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ABSTRACT

The article aimed to investigate in detail the impact of the RADEC (Read-Answer-Discuss-Explain And Create) learning model on primary school students' science literacy in the water cycle material. This study used a quantitative approach with a pre-experimental design. This research was conducted on 100 primary school students in Bandung, Indonesia. The data collection technique was using observation and science literacy tests. Observations were used to see the implementation of the RADEC learning model, and tests were used to see the impact of the RADEC learning model on students' science literacy. The results of this study indicated that the RADEC learning model on the water cycle material can be implemented well. In addition, the RADEC learning model has proven to have an impact on students' science literacy, this could be seen from the results of the N-Gain score of science literacy, which was 0.48 in the medium category. The results of the mean difference test show that there was a significant difference between the pretest and the posttest score, the sig. value of the mean difference test results was 0.000. So, the RADEC learning model had an impact on students' science literacy in primary schools. This research contributed to education in an effort to realize meaningful learning through the implementation of an innovative learning model, namely the RADEC learning model, and this model was very suitable to be applied in learning to develop various skills in the 21st century, including science literacy.

Keywords: *RADEC Learning Model, Science Literacy, Water Cycle Material*

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INTRODUCTION

The Industrial Revolution 4.0 has become a new global issue and trend in recent years (Tinmaz, 2019) in various countries (Yuberti et al, 2019). The industrial revolution 4.0 has four essential principles that characterize it, namely systemic impact, empowerment, future orientation, and usefulness (Philback, 2017). The industrial revolution is a form of change, even the industrial revolution 4.0 has a very broad scope, covering transportation in all production, management and government systems (Xu et al, 2018). The changes that occur have an impact on various abilities that a person must have in dealing with the complexities of the times, and this is also widely discussed in various fields, especially education. Many organizations and educators argue that 21st century skills should be possessed by students (Gravemeijer, 2017). According to Vooget & Pareja (2010), Some of the skills in the 21st century are the ability to think (critical and problem-solving), cross-network collaboration, adaptability, initiative, and entrepreneurship. According to Wagner (2014), accessing and analyzing information, effective communication, curiosity and imagination are also must-haves for students in the 21st century.

Analyzing information is closely related to literacy skills, and this is very important to teach students (Winarni et al, 2020), it should even be part of the competency that everyone should have. Literacy is very beneficial for children's lives as a provision in facing the times in the 21st century (Hasselquist et al, 2019), and this is also help in solving problems in real life (Crary, 2019), however, as information becomes more accessible and more difficult to evaluate nowadays, teachers face new challenges in helping students become intelligent independent readers (Kohen & Saul, 2018). Teachers must treat the concept of literacy as part of an ever-evolving concept, teachers must see cultural and linguistic diversity as a valuable resource for students to be directly involved in, not as consumers, but as critical and creative producers (Abidin et al, 2017). According to Sujana & Rachmatin (2019), The ability to read, understand and critically appreciate various forms of communication is part of the scope of literacy.

Science literacy is a very important literacy mastered by students (Knight et al, 2013), and it is very much needed in modern society, for the reason that there are many problems about science and technology (Truiman et al, 2011), According to Liu (2008), that science literacy is defined as a skill possessed by a person to be able to engage in strategic issues related to science and also provide scientific and concrete ideas in an effort to overcome and resolve various problems, especially in the social life of society, and of course this is part of reflective man (OECD, 2016). This science literacy has targets and goals to be achieved from science education (Holbrook & Rannikmae, 2009). In the context of primary schools, science literacy is the main goal of education. Science literacy requires a complete and thorough understanding of what science is, how and why scientific knowledge is developed (Bartels & Lederman, 2022). Based on the 2015 PISA Draft that science literacy is defined into four important aspects, namely aspects of context, knowledge, competence or process, and attitudes (OECD, 2018).

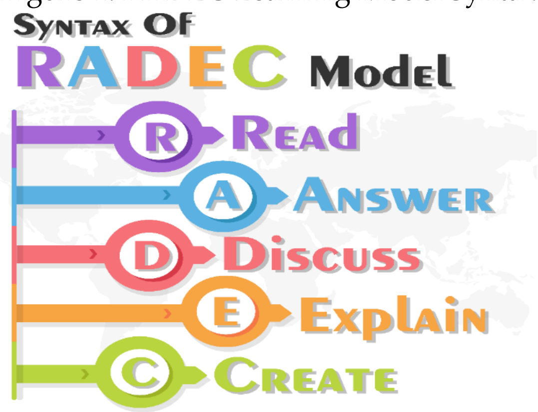
According to the (OECD, 2018), aspects of science literacy knowledge include, 1) content; 2) procedural, and 3) epistemic. Aspects of science literacy competence include, 1) explaining phenomena scientifically; 2) evaluate and design scientific inquiry; and 3) interpret data and evidence scientifically. Aspects of the science literacy context include, 1) personal; 2) local; and 3) globally. Aspects of science literacy attitudes include, 1) supporting scientific inquiry; 2) interest in science; 3) and responsibility for environmental resources.

Science literacy according to PISA 2018 is the foundation in creating a literate society, but the fact is that there are still many students in Indonesia who experience difficulties in understanding science literacy. Several studies that explain this, such as Widodo et al (2019) in their research which took a sample of primary school students from West Java and Central Java and the result was that science skills were in the low category, namely 65%. The latest research from Fhilrizki et al (2022) is how online learning during COVID-19 is considered to have no impact on students' science literacy skills. According to him, online learning is considered not yet effective for students in understanding various materials, as a result students' science literacy skills are also low, the lowest science literacy competence of students is in interpreting data and evidence scientifically.

Based on observations in one of the primary schools in Bandung, the phenomenon of low science literacy is students often experience misconceptions and don't even understand when asked to solve problems based on phenomena or events that occur in everyday life. Less than 30% of students can evaluate or understand data in a straightforward manner, but many students find it difficult to analyze discourse that contains more complicated facts (Kadaritna et al, 2020). In research by Lestari et al (2017) which analyzed the low science literacy of primary school students in Bogor, West Java, the lowest indicators of science literacy were the aspects of understand and interpret basic statistics and solve the problem which still got 49.5 and 48 respectively from the scores max 100.

The phenomenon above indicates that it is very important to solve problems related to aspects of science literacy and even try to improve it. Science literacy should be developed as early as possible to be given to students. According to McDonald & Domingues (2015), science literacy have a positive impact on students' cognitive development, even this is needed in the era of digital literacy (Turiman et al, 2012). Using innovative learning models is an alternative that may be used to address and enhance science literacy issues. This is done to encourage students to participate actively in the learning process. The RADEC learning model is considered suitable to be implemented in the context of science learning and is an alternative learning model that is suitable for conditions in Indonesia (Sopandi, 2017). This model is adapted to the syntax of Read, Answer, Discussion, Explain, and Create (RADEC). The RADEC learning model syntax is easy for all teachers to memorize (Sopandi et al, 2019). The syntax for this model is described below:

Figure 1. RADEC Learning Model Syntax



This model is a novelty in education with the aim of achieving 21st century competence, character building, and student literacy skills. According to Setiawan (2020), there are several reasons why the RADEC learning model is very suitable to be applied, including being based on national education goals (Indonesia), developed on the basis of Constructivism theory, specifically developing 21st century skills, especially in the context of increasing literacy, and in accordance with the characteristics of education. in Indonesia and in accordance with national wisdom.

Research on the RADEC learning model has been carried out by several researchers, especially in Indonesia, and it shows that there are many positive results for learning, this can be seen from the increased learning outcomes in explanatory texts

(Setiawan et al, 2019), concept understanding (Lukmannudin, 2018), learning that is oriented to the ability to think creatively (Jumanto et al, 2018), HOTs (Agustin et al, 2021), and ability in critical thinking oriented to problem solving (Rahayu et al, 2021).

There have been many studies that examine science literacy skills at both the basic and higher education levels (Lestari & Siskandar, 2020., & Hestiana & Rosana 2020). However, his research only covered one of the four aspects of science literacy. So, three others aspects also need to be thoroughly investigated. The various learning models have also been carried out. In addition, in measuring science literacy, many researchers use innovative learning models, The RADEC learning model is something new for education in Indonesia, including in the world. This is what underlies the importance of the RADEC learning model to be applied in science literacy in primary schools. So far, no one has researched the science literacy skills of primary school students using the RADEC learning model, including how to improve primary school students' science literacy after the COVID-19 pandemic. So, this research needs to be carried out to obtain a comprehensive picture of science literacy and the RADEC learning model, and this research can also make a real contribution to education, especially in efforts to improve primary school students' science literacy skills through the RADEC learning model. This study explains in detail how the RADEC learning model impacts on primary school students' science literacy on water cycle materials. However, this research is limited to measuring 3 out of 4 aspects of science literacy (knowledge, competence and attitude). Some of the research questions discussed in this study are, 1) how is the implementation of the RADEC learning model on water cycle material in primary schools?, and 2) what is the impact of primary school students' science literacy on the water cycle material using the RADEC learning model?.

METHOD

This research uses a quantitative approach with the experimental method, a method used to test or look for the effect of causal relationships in a study. The research design used is pre-experimental design. Treatment success was determined by comparing pretest and posttest (Gall et al, 2010). The implementation of this research can be explained in the Table 1 below.

Table 1. Pre-experimental Research Design

Pretest	Treatment	Posttest
O_1	X	O_2

Based on Table 1 above, the first step that must be taken is to determine which sample is used as the experimental class. Next, give the class a pretest to see students' initial science literacy skills. The results obtained are an initial description of students' science literacy skills. After that, the experimental class is given treatment in the form of the RADEC learning model. In the final stage, students were given a posttest to see the improvement and impact of the RADEC learning model on science literacy skills in the water cycle material.

The population used in this study was taken from 1 sub-district in Bandung. The participants consisted of 100 students at a primary school in Bandung. Participants were determined based on the basic abilities possessed by class 5, the similarity of the facilities and the curriculum used was the same for each class and the competence of educators who had been given RADEC learning model training. In addition, the selection of class levels is appropriate because at this level students are expected to develop science literacy skills, one of which is to prepare students for the implementation of national assessments. This research also does not interfere with school programs in preparing students to take final exams. The details of the participants are explained in the Table 2 below.

Table 2. Participant Detail

Total students		
Male	Female	Total
53	47	100

In this study, there were two instruments used, namely the science literacy test and the observation sheet. The test instruments used to test science literacy skills were pretest and posttest questions which were made in the form of essay questions which were given to students before and after the treatment was given. Indicators for developing science literacy test questions based on the dimensions of knowledge, competence and context in science literacy according to PISA 2018. The questions used in the pretest are the same as the questions used in the posttest. The science literacy test instrument in this study is described in the Table 3 below.

Table 3. Indicators of Science Literacy on the Water Cycle Material

	Water Cycle Material Competency	Science Literacy Indicator	Aspects of Science Literacy		
			Knowledge	Competence	Contex t
1	Mention the factors that cause the supply of clean water to decrease	Presented a text about the phenomenon, students can identify references and explanations regarding the factors that cause a decrease in clean water supply	Content	Explain phenomena scientifically	Local
2	Identify the impact of water pollution on the sustainability of living things	Presented texts about phenomena, students can find representations explaining the impact of pollution on the sustainability of living things	Content	Explain phenomena scientifically	Local
3	Analyze the behavior of saving clean water resources	Presented a text about the phenomenon, students can make predictions regarding factors in efforts to preserve clean water resources	Epistemic	Explain phenomena scientifically	Person al
4	Identify the	Presented texts about	Epistemic	Explain	Local

	process of the water cycle	phenomena, students can identify representations explaining the benefits of water for living things		phenomena scientifically	
5	Identify the process of the water cycle	Presented pictures related to phenomena, students can find representations explaining the process of the water cycle	Content	Explain phenomena scientifically	Local
6	Analyze examples of water cycle process events in everyday life	Presented a table containing events, students can evaluate event explanation data based on the water cycle process	Content	Evaluating and designing scientific investigations	Local
7	Identify the impact of water pollution on the sustainability of living things	Presented about phenomena, students can make predictions about human activities and natural factors that can affect the water cycle	Content	Explain phenomena scientifically	Global
8	Analyze the occurrence of the groundwater cycle	Presented a text containing phenomena, students can analyze the occurrence of groundwater	Content	Explain phenomena scientifically	Global
9	Analyze the characteristics of clean water resources	Presented a table containing the results of the investigation, students can identify evidence related to the type of water based on the characteristics of clean water	Procedure	Interpret data and evidence of scientific inquiry	Person al
10	Analyze the characteristics of clean water resources	Presented a table containing the results of the investigation, students can analyze data about the characteristics of clean water	Prosedure	Interpret data and evidence of scientific inquiry	Person al
11	Analyze the characteristics of clean water	Presented the text of phenomena and research questions,	Epistemic	Evaluating and designing	Personal

	resources	students can differentiate scientific investigation questions to prove water quality		scientific investigations	
12	Analyze examples of water cycle process events in everyday life	Phenomenon texts and research questions are presented. Students can identify reasons based on the answers to investigative questions about water quality	Epistemic	Evaluating and designing scientific investigations	Personal
13	Analyze the behavior of saving clean water resources	Presented experimental reports, students can evaluate the results of investigations based on efforts to save water resources	Epistemic	Evaluating and designing scientific investigations	Personal
14	Analyze the behavior of saving clean water resources	Presented infographics related to the impact of water pollution, students can analyze data regarding the factors and behavior of saving clean water resources	Epistemic	Interpret data and evidence of scientific inquiry	Global
15	Analyze the behavior of saving clean water resources	Presented infographics related to the impact of water pollution, students can identify asumi ways to save clean water resources	Epistemic	Interpret data and evidence of scientific inquiry	Global

Observation sheets are also used to determine teacher and student activities during learning activities that are related to the implementation of the RADEC learning model in science learning in primary schools. The observation sheet instruments have been validated by experts in the field of RADEC learning models and science learning which are explained in detail in the Table 4 below.

Table 4. Learning Activity Observation Sheet through the RADEC Learning Model

Learning Stage	RADEC Stage	Learning Activities	Implementation	
			Yes	No
Pre-learning	Read	• Provide resource material about the water cycle a few days before learning activities		
	Answer	• Provide pre-learning questions about the water cycle		
Preliminary activities		• Answering greetings, giving health news, and answering attendance.		

Learning Stage	RADEC Stage	Learning Activities	Implementation	
			Yes	No
		• Pray together led by student representatives • Collect pre-learning assignments • Answer random teacher questions about pre-learning practice questions • Listen to the results of the teacher's analysis regarding students who collect and do not collect pre-learning answers directly • Provide motivation as needed (groups that are still reading, groups that have read but have not been able to understand the reading and groups that have read and understand what they have read)		
Core activities	Discuss	• Students are divided into several groups heterogeneously, consisting of a maximum of five members to carry out discussion activities • Carry out discussion activities to agree on answers to pre-learning questions that are discussed sequentially according to number • Complete the tasks in the worksheet in groups.		
	Explain	• Each group is asked to present their work. Each group presented a different question indicators • Groups that do not present are asked to provide feedback, either support or refutation or repeat scientific statements that have been submitted by the presenting group • Listening to the teacher's explanation regarding the discussion which absolutely cannot be answered by each group		
	Create	• Making works on the water cycle in groups based on the results of the model designs that have been made • Confirm the results of the work that has been made with other groups and the teacher		

Learning Stage	RADEC Stage	Learning Activities	Implementation	
			Yes	No
Closing activities		• Provide conclusions about the things that have been learned by answering questions based on student understanding • Reflect on learning together • Get the task to study the next learning material • Pray together led by student representatives and answer greetings from the teacher		

According to Sugiyono (2011), data analysis is an activity carried out after data collection from respondents or other data sources. There are several activities in conducting data analysis. Data analysis is an activity in grouping data based on variables and types of respondents.

Observation sheet data processing is carried out using the following steps, 1) examining the observation sheets that have been collected; 2) determine the observation score; 3) grouping the scores of each research respondent; and 4) the answer score of each observer is calculated based on the average, then the results of these calculations are examined in detail.

There are several things that are done in the analysis of science literacy test data, 1) the researcher calculates students' science literacy scores based on descriptive statistics (mean, standard deviation, minimum score and maximum score) of the scores students get; 2) Calculates the magnitude of the increase in students' science literacy obtained from the pretest and posttest data by calculating the N-Gain. According to Meltzer (2002), the N-Gain formula is explained as follows.

$$\text{N-Gain} = \frac{\text{Posttest score} - \text{pretest score}}{\text{Maximum possible score} - \text{pretest score}}$$

The interpretation of the N-Gain results is as follows.

Table 5. N-Gain Score Criteria

Gain Score	Interpretation
$g > 0{,}7$	High
$0{,}3 < g \leq 0{,}7$	Medium
$g \leq 0{,}3$	Low

Source: Hake (1998)

3) after all conditions are met, the researcher calculates inferential statistics by calculating the mean difference test, while the hypothesis and decision making are as follows.

H_0 : there is no significant increase in science literacy of primary school students in learning the water cycle using the RADEC learning model

H_1 : there is a significant increase in science literacy of primary school students in learning the water cycle using the RADEC learning model.

RESULT AND DISCUSSION

The Implementation of the RADEC Learning Model on Water Cycle Material

Learning activities are based on the syntax of the RADEC learning model (Read, Answer, Discuss, Explain, and Create) on the water cycle material. Data on the implementation of the RADEC learning model on water cycle material were obtained through teacher observation sheets to determine the implementation of the RADEC learning model in learning activities. The results of the implementation of learning activities using the RADEC learning model are as follows.

Table 6. Percentage of Observations of Teacher Implementation of the RADEC Learning Model

Meeting	Learning Activities	RADEC Stage	Implementation
1	Pre-learning	Read	100%
		Answer	100%
	Preliminary activities	-	98%
	Core activities	Discus	100%
		Explain	100%
		Create	100%
	Closing activities	-	100%
2	Pre-learning	Read	100%
		Answer	100%
	Preliminary activities	-	100%
	Core activities	Discus	100%
		Explain	100%
		Create	100%
	Closing activities	-	100%

Based on Table 6, all stages previously planned by the teacher were carried out very well. In the RADEC learning model syntax, the percentage is 100%, meaning that the teacher's learning is appropriate. At the reading stage, the teacher provides teaching materials in the form of module reading texts, books and learning videos that are used as reading material for students online which are given to students a few days before learning in class. Links to reading sources distributed by the teacher through the WhatsApp group application. Teaching materials provided by the teacher are given in stages according to the learning objectives of each meeting. The distribution of teaching materials includes: 1) water pollution, the function of water and the groundwater cycle; and 2) characteristics of clean water, efforts to conserve clean water and the water cycle in plants.

In the answer stage, students develop their knowledge by answering practice questions related to the concept of the water cycle that would be studied. Just like at the reading stage, the teacher provides reading references a few days before learning or also called pre-learning activities. Students are given question sheets to work on at home. Before students answer questions, the teacher directs students to carry out the process of reading from the reading sources that have been given. The teacher gives instructions and work steps.

In the discussion stage, students form discussion groups of 5-6 people. This discuss stage provides an opportunity for students to discuss the difficulties experienced by each student and find solutions to problems that would be agreed upon by all group members. The implementation of the discuss stage is to discuss each question contained in the worksheet that has been given. The questions on the worksheet are the same as the questions on the pre-learning questions. The teacher ensures that each group member carries out discussion activities in an active and communicative manner.

At the explain stage, students are asked to convey and explain the results of discussions that have been carried out in groups regarding the results of answers on worksheets or conclusions from a discussion that has been discussed by each group together. At this stage, the teacher asks each group to come forward to present and explain the results of the discussion that was carried out before. The teacher asks all group members to come forward and each member conveys the results of the discussion in turn, this method aims to make all students ready and understand the results of their own group work. One of the objectives of the explain stage is none other than for students to have the courage to speak.

At the create stage, the teacher inspires and encourages students to learn to use the knowledge they already have to create creative ideas or thoughts. In this study, the teacher asked students to create a problem-solving work related to the water cycle material. The create stage is carried out in groups and under the supervision of the teacher. The purpose of supervision is so that the process of the create stage runs smoothly. Teachers can also give opinions and suggestions on works that students design.

The Impact of Primary School Students' Science Literacy on the Water Cycle Material Using the RADEC Learning Model

According to OECD (2018), science literacy consists of four aspects, namely knowledge, competence, context and attitude. Three of these four aspects (knowledge, competence, and context) are studied in this research. The pretest and posttest questions are prepared based on indicators of science literacy that are adapted to aspects of knowledge, competence, and context which are translated into 15 essay questions. The results of science literacy descriptive statistics are as follows.

Table 7. Descriptive Statistics of Science Literacy Skills

Data	Experiment Class		
	Pretest	Posttest	N-Gain
Lowest Score	44	64	0
Highest Score	96	100	1
Average Score	71,15	84,33	0,48
Median	71	84	0,38
Mode	69	84	0,00
Standard Deviation	10,68	9,225	0,264

This study was initiated by conducting a pretest with the aim of knowing students' initial science literacy skills in the water cycle material. The results show that the lowest student score is 44 and the highest score is 96 with an average of 71.15.

After students get treatment through the RADEC learning model, students are given a posttest with the aim of knowing the final ability of students' science literacy, this posttest also aims to be able to see the improvement and impact of the RADEC learning model on primary school science literacy in water cycle material. The posttest results show that the lowest score is 64, and the highest score is 100 with an average of 84.33.

Based on the results of the descriptive statistics presented in table 6, the average N-Gain score for science literacy in primary schools is 0.48. The N-Gain interpretation of the increase is in the medium category, because the gain value is at between 0.3 to 0.7.

To see the improvement and impact of the RADEC learning model on science literacy of primary school students, a pretest and posttest average difference test was carried out, while the results are as follows.

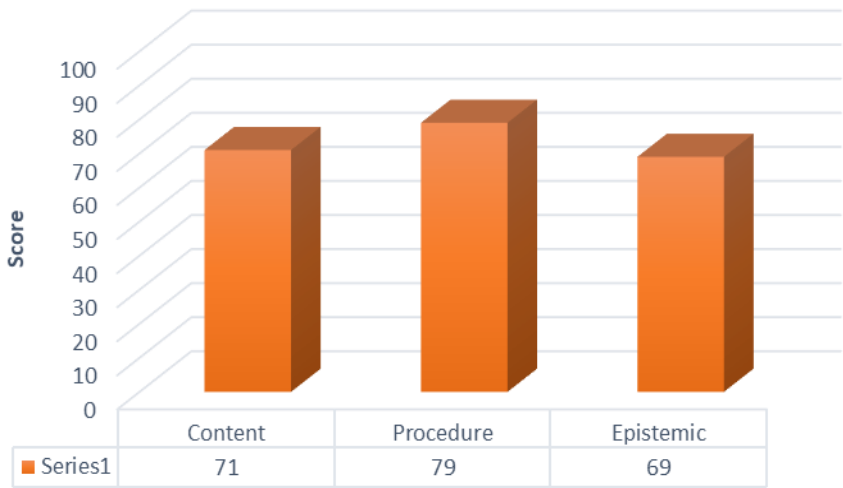
Table 8. Results of the Average Difference Test in Science Literacy

Paired Samples Test			
	t	Df	Sig. (2-tailed)
Pretest-Posttest	-13.544	99	.000

From Table 8, that the significance value is 0.000, meaning that the significance is less than 0.05, then H1 is accepted, then there is a significant increase in the science literacy of primary school students in learning the water cycle using the RADEC model. The analysis of students' science literacy skills is divided into three aspects, namely aspects of knowledge, competence and context, this is of course based on the theory explained by the OECD (2018).

The science literacy pretest on the knowledge aspect is given to determine students' initial abilities. Knowledge aspect skills in science literacy are divided into three elements, namely content, procedure and epistemic. The division of the items related to the knowledge aspect of science literacy is divided into three parts, namely the content (6 questions), procedure (2 questions) and epistemic (7 questions). The results of the pretest from the knowledge aspect of science literacy are explained in the Figure 2 below.

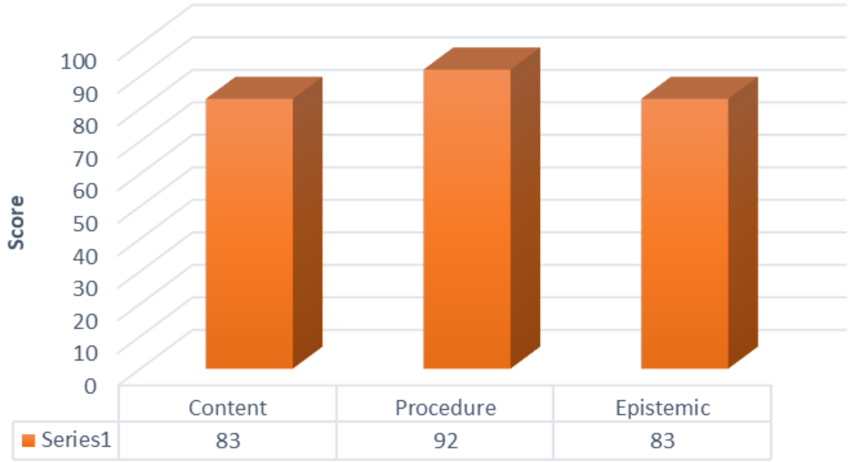
Figure 2. Pretest Results on Science Literacy Knowledge



Based on Figure 2, from the three aspects of science literacy knowledge. The aspect with the highest average score is the procedural aspect with a score of 79, and the knowledge aspect with the lowest average score is the epistemic aspect with a score of 69.

After students get learning using the RADEC learning model, the results of the science literacy knowledge score increase in all aspects. The results can be seen in the Figure 3 below.

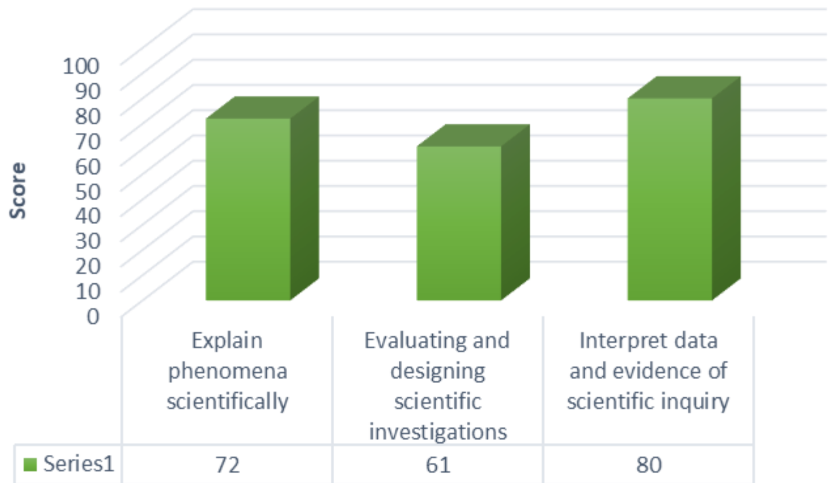
Figure 3. Posttest Results on Science Literacy Knowledge



After students receive treatment in the form of the RADEC learning model, all aspects of student knowledge increase, the aspect that has the highest average score is procedure with a score of 92, the content and epistemic aspects have the same score of 83. This indicates that the RADEC learning model has a positive impact towards increasing science literacy in the aspect of knowledge.

Science process competence is a basic ability that is possessed, mastered, and applied in scientific activities so that it can enable scientists to discover new things (OECD, 2016). Based on the results of the item analysis, there is a distribution of items based on the competency aspects of science literacy, namely explaining phenomena scientifically (7 questions), evaluating and designing scientific investigations (4 questions), and interpreting data and evidence of scientific investigations (4 questions). The results of the pretest from the aspect of science literacy competency are explained in the Figure 4 below.

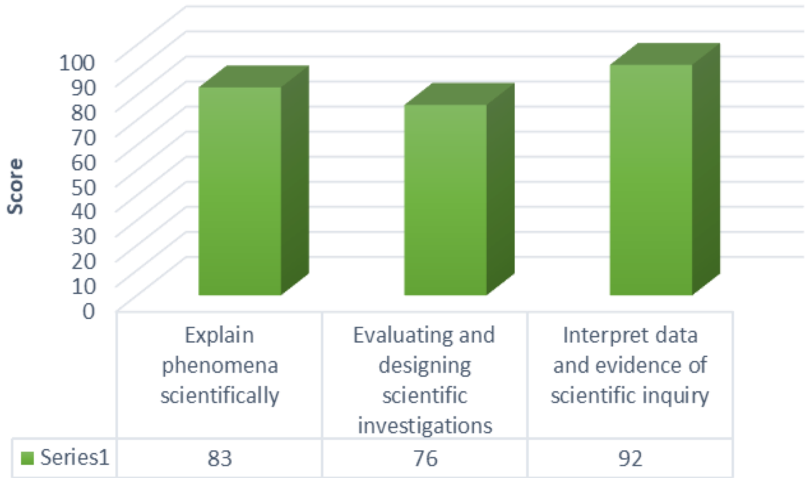
Figure 4. Pretest Results on Science Literacy Competencies



Based on Figure 4, from the three aspects of science literacy competence, the aspect that gets the highest average score is the competency aspect of interpreting data and scientific investigation evidence with a score of 80, and the aspect of competence that gets the lowest average score is the competency aspect of evaluating and designing investigations scientific score of 61, and in this aspect, students still find it difficult to explain and evaluate scientific investigations.

After students get learning using the RADEC learning model, the results of science literacy competency scores increase in all aspects. The results can be seen in the Figure 5 below.

Figure 5. Posttest Results on Science Literacy Competencies

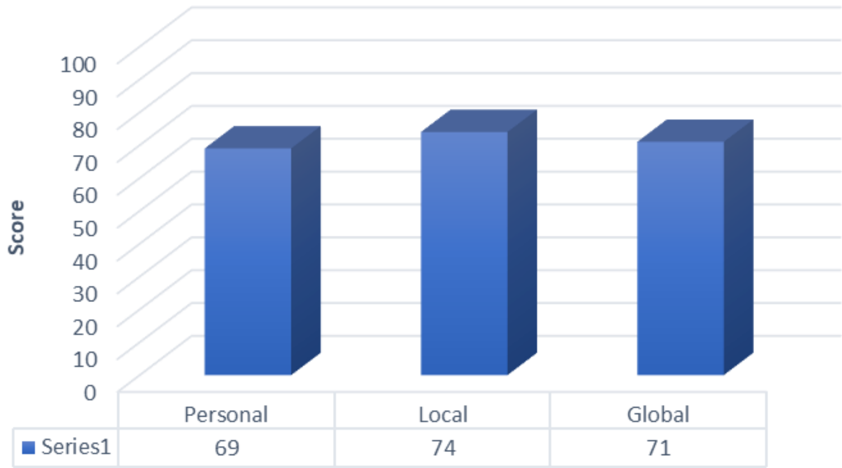


The RADEC learning model has a significant impact on increasing science literacy in competency aspects. The competency aspect with the highest average score is interpreting data and scientific investigation evidence with a score of 92, and the competency aspect with the lowest average score is the competency to evaluate and design scientific investigations with a score of 76, but in this competency aspect the increase is the greatest among another.

In addition to the two aspects that have been described, namely aspects of knowledge and competence, another aspect that is also very important in science literacy is the context aspect. This aspect includes the material context related to self, family, and peers (personal), local and global. The purpose of this aspect for students is to understand that science has value for individuals and society to improve and maintain quality of life (OECD, 2016).

The division of the items related to aspects of the context of science literacy is divided into three parts, namely personal (6 questions), local (5 questions), and global (4 questions). The results of the pretest from the context aspect of science literacy are explained in the Figure 6 below.

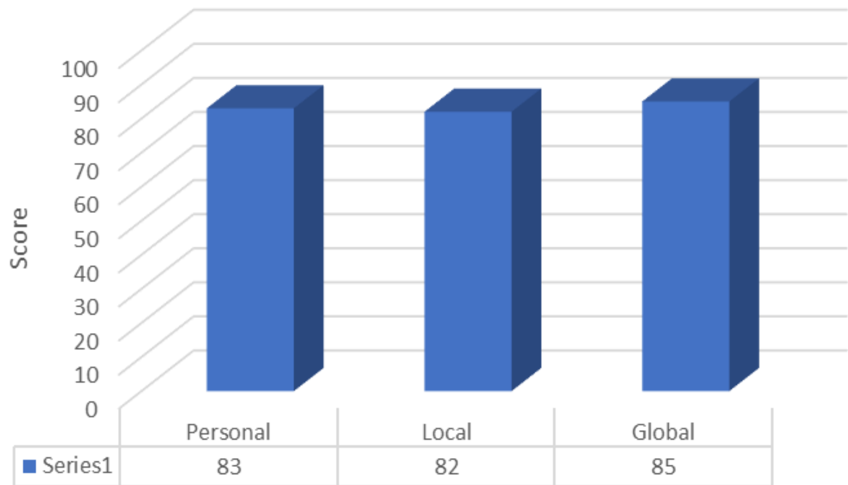
Figure 6. Pretest Results on Science Literacy Context



Based on Figure 6, from the three aspects of the science literacy context, the aspect that gets the highest average score is the local context aspect with a score of 74, and the context aspect that gets the lowest average score is the personal context aspect with a score of 69.

In this aspect of the context there was also an increase after students were given treatment in the form of the RADEC learning model. The posttest results are explained in the Figure 7 below.

Figure 7. Posttest Results on Science Literacy Context



If in the two previous aspects (knowledge and competence) there was an increase in each aspect after receiving the RADEC learning model treatment, as well as in the context aspect also experienced an increase in all aspects, this means that the model is very effective in increasing context aspects in science literacy. Based on Figure 7, the aspect that gets the highest average score is global with a score of 85, and this global aspect also has the highest increase with the personal aspect, and the aspect that gets the lowest average score is the local aspect with a score of 82.

DISCUSSION

Science literacy does not only measure the level of understanding of students' science knowledge, but science literacy aims to measure various aspects where the ultimate goal is that students can apply them in real situations in everyday life as members of society at large (Usmledi, 2016). These aspects include knowledge, competence, and context.

Students' science literacy in primary schools has increased in all aspects, this happens because the learning is very meaningful, and there are lots of changes that have occurred both in the learning context and in the students themselves. According to Ashburn (2006), meaningful learning can create opportunities to achieve understanding of complex ideas, and skills in working with complex problems that are relevant to students' lives. In learning the water cycle using the RADEC learning model, students think a lot, look for ideas and solve problems through various learning sequences, including making learning projects, and this is related to science literacy. This meaningful learning is based on using an innovative learning model, namely RADEC. Through the stages in the RADEC learning model (Read, answer, discuss, explain, and explain), students construct science literacy skills on water cycle material.

Science literacy aims to form literate humans, and of course the basis is how to shape students to have an interest in reading. According to the OECD (2009), explains that reading literacy is an individual's ability to understand, use, contemplate and engage with written texts that aim to achieve goals, develop knowledge and individual potential to participate in society. In this RADEC learning model, the reading stage is the initial syntax that students must do. The reading stage is carried out outside the learning activities in the classroom and it is a provision in understanding the concept of prior knowledge that would be discussed, the more reading material students read, the more it equip them to explore knowledge. According to Pasaribu (2016), reading is like giving nutrition to the mind, with which you can get various kinds of new knowledge about science, technology and other world advances. Interest in reading must be grown both inside and outside of school. According to Mckool (2020), interest in reading is also defined as reading activities that can be carried out by students outside of school. This means that it can be done outside of school.

The answer stage in the RADEC learning model is carried out outside the learning activities in class, previously the teacher has facilitated students with various reading sources that can be read by students, and the teacher also provides worksheet materials that must be answered by students related to the previous reading. Answer activities carried out by students are an initial description of students in understanding the water cycle material and developing initial science literacy before later this can be obtained through reinforcement from students or from the teacher.

The discussion stage is the initial stage in the RADEC learning model which is carried out in class activities. The teacher divides students into several heterogeneous groups. The benefits of implementing the discuss stage are that students can interact with each other to discuss the right answers to solve the problems given. In the context of learning, students need to interact with their environment including with their friends to discuss ideas and solve problems. Scientific thinking skills, critical thinking, communication skills, self-confidence and mutual respect among friends would be developed in the discussion activities. Piaget explained that activities that stimulate social interaction are very important so that students experience cognitive conflicts that result in instability (disequilibrium) in their minds and trigger accommodation. According to Putri (2017), cognitive conflict is a state in which a person's perception is aware of differences between cognitive structures and their environment, or between different components, for example, conceptions, beliefs, substructures and so on from a person's cognitive structure. By realizing these differences, students are motivated to try to explore something and are also motivated to solve these problems, so this is where the process of forming knowledge occurs in students. An understanding would be obtained by students from the phenomena of the surrounding environment. So, the social interaction that is formed from this discussion stage form scientific students. According to Danoebroto (2015), in Vygotsky's constructivism, knowledge is obtained through two things, namely biologically basic processes and sociocultural psychological processes. The concept presented by Vygotsky focuses on the relationship between humans and the socio-cultural context, where they play a role and interact with each other in sharing experiences or knowledge. Thus, Vygotsky's theory, known as the theory of sociocultural development, emphasizes social and cultural interactions in relation to cognitive development. This means that it can be concluded that the cognitive development that occurs in children including increased science literacy in this study is obtained from and the results of social interaction (discussion) with other people. What other people mean here is not only limited to adults or parents, but also peers.

The explain activity is carried out after the discussion stage. Students can explain directly the results of the discussion. Explanation activities can also contain social interaction between various individuals and groups, so that this also results in cognitive conflict. If this atmosphere can be used properly by the teacher, the process of creating knowledge is not only obtained in small groups but interactions with other groups by commenting, ask, refute, argue or provide suggestions in accordance with the views of each individual, and of course it gives be beneficial for increasing students' science literacy skills. Explaining activities also train students how to communicate well and this is very important and needed in competence in the 21st century (Chalkiadaki, 2018., Afandi et al, 2019., & Laar et al, 2020). In the 21st century classroom, students need to be able to collaborate and communicate both online and in person. Direct communication skills are trained by students collaboratively in solving problems, engaging in inquiry-based activities (such as science experiments), or in specific research topics (Larson & Miller, 2011).

The create stage is the final activity carried out by students in the RADEC learning model. This stage allows students to create a product from a series of activities they have done. The stages of creating have many benefits that students can get, including problem solving, critical thinking, creative and also innovative. The acquired abilities are very relevant to competencies in the 21st century. The creates stage is a very complex stage because it involves various things and this also makes it possible to build a new paradigm in 21st century learning. According to Janah et al (2019), the learning paradigm of this century emphasizes students' ability to think critically, use technology and communicate, collaborate, and connect information with the real world. In addition, this creates stage can also build cognitive domains in 21st century skills. According to King et al (2012), the cognitive domain in the 21st century is divided into several sub domains including information management skills, namely the ability to use tools, resources and discovery process skills, the ability to build and construct knowledge by processing information, giving reasons, and critical thinking, the ability to use knowledge through processes analysis, assessing, evaluating, and solving problems, and the ability to solve problems using metacognition and creative thinking skills.

All stages of the RADEC learning model are clearly very supportive of increasing science literacy of primary school students, and this is also in accordance with the objectives of the RADEC learning model, namely how to shape students to have skills and prowess in the 21st century, have insight into literacy knowledge in various fields including science literacy, and also form a positive character in students. The RADEC learning model is an alternative that can be used in the learning process to improve student literacy, several studies have conducted trials and proven to improve literacy (Ulfa et al, 2024), writing skills (Setiawan et al, 2020., & Setiawan et al 2019), reading interest (Adriana et al, 2024), reading comprehension (Fhilrizki et al, 2022), communication skills (Widodo et al, 2024), including in science literacy (Hasbi et al, 2023). This study has several limitations in using limited participants, namely only 1 school, no comparison group to prove whether the RADEC model is more effective, 3) has not examined in detail the impact of the RADEC learning model in terms of several factors (gender, age, and other backgrounds).

The recommendations for future research are research participants to be more varied taken from several schools, the need to compare with other models, and the impact of RADEC learning models seen from various factors.

CONCLUSION

Based on the results of the research above, the RADEC learning model can be implemented well in water cycle material, and has an impact on primary school students' science literacy. through the RADEC stage students can show improvement in aspects of knowledge, competence, and context. The increase in science literacy of primary school students can be seen from the results of the N-Gain which is equal to 0.48 in the medium category, and this can also be seen from all aspects of science literacy experiencing a significant increase. This means that the RADEC learning model has a positive effect and has an impact on learning, especially in increasing students' science literacy. Based on the results of the mean difference test that there is a significant difference between the pretest scores and posttest scores, the significance value of the mean difference test results is 0.000. It can be concluded that there is a significant increase in the science literacy scores of primary school students through the RADEC learning model. So in the end the conclusion is that the RADEC learning model is very impactful and able to increase primary school students' science literacy in the water cycle material.

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Salma Ihsani Fhilrizki (SIF), involved in the overall research (conducting research, implementing, evaluating research, and writing research reports), Wahyu Sopandi (WS), Mimin Nurjhani Kusumastuti (MNK), and Irfan Fauzi (IF) reviewed the research results.

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