RADEC Model in Increasing Student Scientific Literacy Primary School Teacher Education Study Program

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Abstract.This research is motivated by the scientific literacy abilities of students in the Primary School/PGSD Teacher Education Study Program which are closely related to the scientific literacy learning process, where the reality in science learning shows that the scientific literacy abilities of PGSD students at one of the private universities in the city of Bandung are still low. This research aims to describe the application of the RADEC model in increasing the scientific literacy of PGSD students and to analyze the increase in scientific literacy abilities of PGSD students whose learning uses RADEC. The approach used is quantitative with a quasi-experimental method with a one group pretest-posttest design research design. The sample was taken using a purposive sampling technique, namely PGSD students at one of the universities in the city of Bandung consisting of 23 students. The data collection technique used a written test instrument for scientific literacy skills and an observation sheet for implementing the RADEC learning model. The data analysis technique uses paired sample t test statistics using SPSS version 26. The results of the research are that the application can be categorized as very good, and the use of the RADEC learning model is effectively used in improving the scientific literacy skills of students in elementary school teacher education study programs

Keywords: Scientific Literacy, PGSD Students, RADEC Learning Model

1 Introduction

Scienceis science, in this case the science of nature and the physical world.Literacy is a very important thing and has even become a benchmark in education in a country. The Program for International Student Assessment (PISA) every 3 years evaluates literacy skills in various countries. Some of the literacies that are measured include information literacy, numeracy and science. There are three scientific literacy competencies in PISA 2018, namely: (1) explaining phenomena scientifically; (2) evaluate and design scientific investigations; and (3) interpreting data and evidence from scientific investigations[1].

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According to the PISA survey in 2018, the scientific literacy abilities of Indonesian students tend to remain low, students' reading, mathematics and science scores of 371, 379 and 396 placed Indonesia in 75th position out of 80 countries that took part in the test and survey (OECD, 2019). Furthermore, TIMSS shows that the average score in mathematics and science for Indonesian students is 397 with a position in science at level 45 out of 48 countries participating in the assessment and survey (TIMSS and PIRLS, 2015). The low level of scientific literacy skills is thought to be related to the science learning process which does not provide opportunities for students to link the scientific knowledge they learn with the phenomena that occur.

According to Fuadi, H., et al (2020) The low literacy skills of students are influenced by the choice of textbooks, misconceptions, non-contextual learning, and students' reading abilities.[2].The low scientific literacy of PGSD students can be seen from the fact that there are still many students who have difficulty understanding lecture material and have difficulty analyzing itscience material taught and difficulty applying science skills when conducting experiments, students still find it difficult to identify questions, still find it difficult to explain scientific phenomena and draw conclusions based on evidence, this indicates that students' scientific literacy abilities are still relatively low.The low level of student scientific literacy in Indonesia is caused by several factors including: Students' low understanding of the nature of science (NoS) (Lestari & Widodo, 2021).

The tendency for PGSD students' scientific literacy abilities is still low, this is in line with several research results:The scientific literacy of PGSD students has not met expectations, there are still many PGSD students whose scientific literacy is still low[3]. Students' mastery of scientific literacy is still quite low, this is proven by student learning outcomes only focusing on one indicator of scientific literacy, namely science as a body of knowledge.[4].Most of the class teachers who participated in the research which aimed to determine the scientific literacy scores of teachers working in first level elementary schools in Mula Turkey had very low average scores.[5].The scientific literacy abilities of PGSD students in the competency aspect have not shown good and satisfactory results[6]. Overall, students have low scientific literacy skills, this is shown by the results of the scientific literacy test questions. Students can only determine the problem but cannot provide a scientific explanation.[7]. The scientific literacy of prospective teachers in Türkiye is low[8]

It is feared that the low literacy skills possessed by teacher education students will have an impact on the occurrence of misconceptions experienced by students in the futurehas an impact on the learning success of students in the schools where they will later teach. In addition, the low scientific literacy of prospective teacher students will result in misconceptions among students, resulting in low cognitive, affective and psychomotor learning outcomes.[3].Until now, elementary school students still experience misconceptions about science[9]. Further according[9], prospective elementary school teacher students who come from vocational schools experience higher misconceptions when compared to prospective elementary school teacher students who come from high schools majoring in social studies and natural sciences, while prospective elementary school teacher students who come from high schools majoring in social sciences experience higher misconceptions than prospective elementary school teacher students. who

came from high school majoring in science. The condition of misconceptions experienced by prospective elementary school teacher students also indicates that the level of scientific literacy skills is still lacking.

Scientific literacy is an important thing to teach students. For this reason, this needs to be instilled in the education of teachers who will teach this to their students. Scientific literacy will really help everyone to respond critically to problems as phenomena that often occur, especially those related to science and technology. Someone who does not have scientific literacy skills will face difficulties in making decisions about various phenomena that occur in society, and will be left behind by increasingly modern technological developments.The development of scientific literacy is needed to prepare students to be literate in the field of science[10].Without scientific literacy, both our current and future generations of young people are at risk of not having the strength so that they are unable to compete on a global scale.Scientific literacy is very important in improving the academic abilities of students in science majors to connect with social issues[11].Science education is expected to be able to instill scientific literacy which in turn supports Indonesia's development. Scientific literacy has now become a widespread concern for scientists, professors and political stakeholders[12].

So far, the learning models that have been applied to improve scientific literacy are as follows:Guided inquiry learning has been proven to be able to increase scientific literacy effectively[13].However, of the several models that have been implemented in order to increase scientific literacy, it has not been seen that they are in accordance with the demands of Indonesian society and in accordance with the demands of 21st century competencies which can make students more competent in their fields, more critical, have the ability to think logically, think creatively, and be able to solve problems. problems, mastering technology and increasing students' scientific literacy. One model that can be applied in accordance with the demands of Indonesian society and the demands of the 21st century is the Read-Answer-Discuss-Explain-And Create learning model, abbreviated as RADEC.

The RADEC learning model is an alternative learning model that suits Indonesian conditions[14]. The RADEC learning model is a new alternative learning model that aims to help students acquire many useful competencies[15]. The RADEC learning model has a good impact on prospective teachers' ability to plan lessons[16]. The RADEC learning model can train 21st century skills[17].

The name of this model is adapted to the syntax, namely Read, Answer, Discussion, Explain, and Create (RADEC)[15]. The suitability of the syntax of the RADEC learning model to the Indonesian context, especially at the Read and Answer stages, is understood as a factor that facilitates students being better prepared for the next learning process, namely learning at the Discuss, Explain and Create stages.[18]. 1) Read, at this stage, students read information from various sources including books, other printed information sources and electronic information sources such as the internet and are provided with pre-learning questions in order to guide students in understanding the information. 2) Answer (Answering), at this stage students answer pre-learning questions based on the knowledge gained from Read activities. The pre-learning questions are arranged in the form of a worksheet (student worksheet/LKPD). 3). Discuss, at this stage students learn in groups to discuss their answers to pre-learning questions and

motivate each other students to complete the tasks in the LKPD. 4) Explain, at this stage, carry out presentation activities, in the form of presentations of answers to the LKPD and teaching materials that include all cognitive aspects of learning indicators that have been formulated in the lesson plan. 5) Create, at this stage, the teacher facilitates students to learn to use the knowledge they have mastered to produce creative ideas or thoughts.

Based on this background, the researcher intends to describe the application of the RADEC model in increasing the scientific literacy of PGSD students and analyze the increase in scientific literacy abilities of PGSD students whose learning uses RADEC.

2 Method

The Methods sections should be brief, but they should include sufficient technical information to allow the experiments to be repeated by a qualified reader. Only new methods should be described in detail. Cite previously published procedures in References.

The research method used in this research is quantitative research with a One Group Pretest-Posttest Design experimental design[19].

Pretest	Treatment	Posttest
O	X	O

Information:

O : Scientific literacy comprehension test

X : Lecture treatment using the RADEC learning model.

Fig. 1. One group pretest-posttest design research design

The instruments used in this research were 16 valid essay questions on the scientific literacy skills of PGSD students and an observation sheet on the implementation of the RADEC learning model. The questions for evaluating scientific literacy abilities are made according to the context, namely related to material changes, temperature and heat and the blood circulation system. They are used to determine students' scientific literacy abilities before and after learning using the RADEC learning model and the observation sheet on the implementation of the RADEC learning model is used to obtain information regarding behavior that emerges from students and lecturers during the implementation of learning using the RADEC learning model.

This implementation observation sheet consists of an observation sheet for students and an observation sheet for lecturers in the form of a checklist consisting of two options: 1. yes and 2. no. Scientific literacy is developed based on indicators of identifying scientific issues, explaining scientific phenomena, and using scientific evidence [20]

The implementation of the RADEC learning model was obtained using observation sheets from lecturers and students when using the RADEC learning model and student responses regarding scientific literacy learning using the RADEC learning model. To analyze the implementation of the RPS, the following calculation formula is carried out[21],

$$\text{RPS Implementation Value (NKR)} = \frac{Skor\ total\ yang\ diperoleh}{Jumlah\ item\ yang\ dinilai}$$

Next, the values obtained are categorized in the Table below.

Table 1. RPS implementation criteria

Number	Score	Criteria
1	3.6 – 4.0	Very good
2	2.6 – 3.5	Good
3	1.6 – 2.5	Not enough
4	0.0 – 1.5	Very little

The increase in students' scientific literacy skills is analyzed based on pre-test and post-test scores using normalized gain with the equation below[22].

$$\text{N-Gain} = \frac{skor\ postest - skor\ pretest}{skor\ maks - skor\ pretest}$$

Next, N-Gain is interpreted according to Meltzer's (2002) categories as seen in the Table below:

Table 2. Classification of interpretation of normalized gain values

Normalized Gain value	Normalized Gain Value (%)	Interpretation
$g > 0.70$	$g > 70$	Tall
$0.30 < g \leq 0.70$	$30 < g \leq 70$	Currently
$g \leq 0.30$	$g \leq 30$	Low

Fromnormalized gain value, then the results are interpreted based on the thick interpretation below.

Table 3. Categories of interpretation of n-gain effectiveness

Percentage (%)	Interpretation
< 40	Ineffective
$40 - 55$	Less effective
$56 - 75$	Effective enough
> 76	Effective

Next, the data in the form of pre-test and post-test scores for the control class and experimental class were tested statistically with the help of SPSS Version 26 to determine the significance of the difference between the two means by considering the test criteria first. If the distribution of the two groups is normal and homogeneous then it will then be processed using a parametric test, but if it is not normal and not homogeneous then a non-parametric test will be used.

3 Results And Discussion

Implementation of lectures by applying the RADEC learning model which consists of the stages read, answer, discuss, explain and create, some are carried out before learning and some during learning. The reading and answering stage is done outside of class before learning. At the reading stage, students are asked to read learning material that

is appropriate to what will be taught, either from sources provided by the lecturer, or the internet or other sources related to the material to be studied. After the reading stage, is the answer stage where students are provided with pre-learning questions. In the pre-learning questions, instructions are given for alternative reading sources (answer stages) which can be read before answering the pre-learning questions. After students carry out the read and answer stages, students in the class carry out learning with three other RADEC stages, namely discuss, explain and create.

At each stage of the RADEC learning model, lecture implementation is observed using the Gutman scale with an assessment scale of 1 and 0 which is adapted to the RADEC learning stages, namely activities at the read, answer, discuss, explain and create stages. This observation activity is carried out at every meeting, this observation is carried out on lecturer activities and student activities during lectures. The results of observations of lecturer and student activities during the lecture process are shown in the following picture.

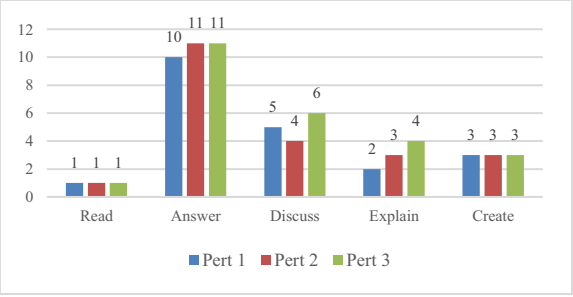

Fig. 2. Observation results of the implementation of the RADEC model by lecturers

Information:

Read	:	Provide reading and other reading sources according to the material to be taught and provide 1 item of pre-learning questions.
Answer	:	Provide pre-learning questions and motivate students to work on 11 items.
Discuss	:	Motivate students to carry out discussions on 6 items
Explain	:	Ensure that student explanations are correct and motivate other students to provide other questions, rebuttals or suggestions for 4 items
Create	:	Inspire students to come up with creative ideas and guide them to realize them in 3 items

Based on Figure 2. above, it appears that the results of the lecturer's observations regarding the implementation of the steps of the RADEC learning model are in accordance with its syntax. For the consistent reading stage, the lecturer carried out the lecture from the first to the third observation, where the lecturer consistently provided reading materials and reading sources related to the material being studied. will be studied from the first to third observations, for the answer stage between the first meeting there is 1 item that the lecturer does not do, then at the second and third meeting the lecturer consistently gives pre-learning questions and motivates students, for the discussion stage there tends to be an ups and downs of 6 new items achieved at the 3rd meeting, for the explain stage of the results of the 3 meeting observations, the lecturer ensures that the student's explanation is correct and motivates other students to give rebuttal

questions or suggestions, this tends to be done at the 3rd meeting, while for the create stage at each meeting the lecturer inspires the students to come up with creative ideas and guiding to realize them.

The RPS implementation scores at each meeting can be seen in the Table below.

Table 4. Observation results of the implementation of the RADEC model by lecturers

Number	Stages	Pert			Total	%	Score	Category
		1	2	3				
1	*Read*	1	1	1	3	1	4	Very good
2	*Answer*	10	11	11	32	0.96	3.88	Very good
3	*Discuss*	5	4	6	15	0.83	3.33	Good
4	*Explain*	2	3	4	9	0.75	3	Good
5	*Create*	3	3	3	9	1	4	Very good
	Average						3.64	Very good

Based on the Table above, for each stage of the RADEC model at each meeting it is categorized as very good at the read, answer and create stages, while for the discuss and explain stages it is categorized as good. The results of observations of student activities during the lecture process are shown in the following picture.

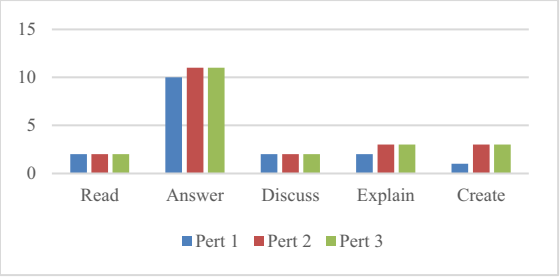

Fig. 3. Observation results of the implementation of the RADEC model by students

Information:

Read : Students read from various sources related to the material they will study, totaling 2 items.

Answer : Students answer pre-learning questions in the form of LKM with 12 items.

Discuss : Students form groups to discuss 2 items

Explain : Students carry out presentation activities totaling 2 items

Create : Students use the knowledge they have to come up with creative ideas by discussing 3 items.

Based on Figure 3 above, it appears that the results of student observations regarding the implementation of the steps of the RADEC learning model were carried out well in accordance with the syntax. For the reading stage, consistently from the first to the third observation, students read various sources related to the material they will study, for the stages The answer between the first meeting is different from the second and third. Students answer pre-learning questions in the form of LKM. For the discussion stage for the first to the 3rd, students are consistently carried out by forming groups and conducting discussions. For the explain stage of observation results, 3 items tend to be done at the 3rd meeting. namely students make presentations, while for the create stage

students use the knowledge they have to come up with creative ideas and discuss them consistently in the second and third stages.

The RPS implementation scores at each meeting can be seen in the Table below.

Table 5. Observation results of the implementation of the RADEC model by students

Number	Stages	Pert			Total	%	Score	Category
		1	2	3				
1	*Read*	2	2	2	6	1	4	Very good
2	*Answer*	10	11	11	32	0.97	3.9	Very good
3	*Discuss*	2	2	2	6	1	4	Very good
4	*Explain*	2	3	3	8	0.89	3.6	Good
5	*Create*	1	3	3	7	0.78	3.1	Good
	Average						3.72	Very good

Based on the Table above, for each stage of the RADEC model at each meeting it was categorized as very good at the read, answer and discuss stages. Meanwhile, the explain and create stages are in the good category.

Before learning in class, students are given a pre-test after they go through the read and answer stages and then carry out lectures with the devices that have been prepared. After carrying out the lecture, students are then given a post-test to find out whether learning using the RADEC model created can increase students' scientific literacy. PGSD. The results of the comparison of N-Gain values for the scientific literacy abilities of elementary school teacher education students are presented in the Table below.

Table 6. Student pre-test, post-test and n-gain scores

Ms	Material and change			Temperature and Heat			Circulatory System in Humans		
	Pre-test	Post-test	N-Gain	Pre-test	Post-test	N-Gain	Pre-test	Post-test	N-Gain
M1	38	74	0.51	48	69	0.70	46	74	0.62
M2	48	70	0.69	52	76	0.68	56	77	0.73
M3	66	83	0.80	57	82	0.70	55	86	0.64
M4	65	80	0.81	63	77	0.82	56	77	0.73
M5	39	79	0.49	59	86	0.69	60	89	0.67
M6	46	74	0.62	53	79	0.67	50	73	0.68
M7	43	74	0.58	50	83	0.60	48	75	0.64
M8	41	65	0.63	45	82	0.55	35	77	0.45
M9	52	70	0.74	58	65	0.89	53	81	0.65
M10	32	78	0.41	55	85	0.65	55	87	0.63
M11	52	69	0.75	51	87	0.59	54	66	0.82
M12	69	81	0.85	56	73	0.77	52	86	0.60
M13	0	63	0.00	45	60	0.75	27	62	0.44
M14	53	65	0.82	52	72	0.72	54	79	0.68
M15	62	72	0.86	44	61	0.72	55	88	0.63
M16	39	74	0.53	62	88	0.70	54	79	0.68
M17	43	76	0.57	0	79	0.00	29	63	0.46
M18	42	76	0.55	58	88	0.66	55	88	0.63
M19	54	77	0.70	47	83	0.57	52	74	0.70
M20	50	62	0.81	51	84	0.61	54	69	0.78
M21	55	82	0.67	52	86	0.60	32	89	0.36
M22	39	63	0.62	0	73	0.00	35	64	0.55
M23	36	68	0.53	45	65	0.69	35	69	0.51
Total	1064	1675	14.54	1103	1783	14.32	1102	1772	14.29
Average	46.26	72.82	0.63	47.95	77.52	0.62	47.91	77.04	0.621

Based on Table 6 above, it shows that the pre-test mean for the subject of material and changes is 46.26, for the subject of temperature and heat 47.95 and for the subject of the circulatory system in humans 47.91. This shows that students' previous learning experiences, in this case related to students' scientific literacy abilities, have not sufficiently equipped elementary school teacher education students with scientific literacy in teaching basic science concepts on this topic. Meanwhile, the post-test mean showed that for the subject of material and change it was 72.82, for the subject of temperature and heat it was 77.52 and for the subject of the blood circulatory system in humans 77.04. This indicates that applying the RADEC learning model can improve abilities. students' scientific literacy in this subject, however, the increase is still in the moderate category (N-gain for the subject of material and change 0.61, N-gain for the subject of temperature and heat 0.62 and N-gain for the subject of the circulatory system in humans 0.62).

To see the increase in scientific literacy skills for each aspect of students' scientific literacy competencies, a mean Table was created of the students' pre-test, post-test and N-gain scores in the aspects of scientific literacy competencies below.

Table 7. Mean pre-test, post-test scores and student n-gain on science literacy competency aspects

Subject	Aspects of Scientific Literacy Competency	Average Score			
		Pre-test	Post-test	NGain	Category
Matter and Change	Identify scientific questions	15.47	24.57	0.62	Currently
	Explain phenomena scientifically	18.52	24.35	0.51	Currently
	Using scientific evidence	12.39	23.91	0.65	Currently
	Average	15.46	24.27	0.61	Currently
Temperature and Heat	Identify scientific questions	17,17	25.52	0.65	Currently
	Explain phenomena scientifically	15.52	25.87	0.71	Tall
	Using scientific evidence	15.26	26.13	0.73	Tall
	Average	15.98	25.84	0.7	Tall
Circulatory System in humans	Identify scientific questions	17.21	24.65	0.58	Currently
	Explain phenomena scientifically	16.26	26.95	0.77	Tall
	Using scientific evidence	15.3	25.43	0.68	Currently
	Average	16.25	25.67	0.68	Currently

Based on Table 7. above, the average competency for each aspect of scientific literacy for each subject is different, for the subject of material and changes it is in the medium category, for temperature and heat it is in the high category and for the circulatory system it is in the medium category.

On the subject of material and changes to the competency aspectidentify scientific questions (N-gain = 0.62), explain phenomena scientifically (N-gain = 0.51), and using scientific evidence (N-gain = 0.65), all of them are in the medium category. Forthe subject of temperature and heat in the competency aspectidentify scientific questions (N-gain = 0.65) medium category, explaining phenomena scientifically (N-gain = 0.71) high category, and using scientific evidence (N-gain = 0.73) high category. And to.the subject of the human circulatory system in the competency aspectidentify scientific questions (N-gain = 0.77)high category, explaining phenomena scientifically (N-gain

= 0.68)medium category, and uses scientific evidence (N-gain = 0.68)medium category.This indicates that the use of RADEC-based lecture tools can improve students' scientific literacy skills in the subject matter for each aspect of scientific literacy competency, however the overall increase in aspects of scientific literacy competency is still in the medium category.

The effectiveness of using RADEC-based lecture tools in increasing the scientific literacy of PGSD students using the t-test by first carrying out pre-requisite tests from the pre-test and post-test in the form of a normality test and homogeneity test. The normality test used is the one sample Kolmogorov-Smirnov test with the help of the SPSS version 26 program to determine whether a sample is normal or not. The normality test results appear in the Table below.

Table 8. Normality test results on pre-test and post-test scores

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistics	df	Sig.	Statistics	df	Sig.
Pre-test Science Literacy	,200	23	.018	,835	23	,001
Post-test Scientific Literacy	.122	23	,200*	,961	23	,493

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on Table 8 above, the normality test results can be seen from the Shapiro Wilk results because df < 50 with the normality test criteria being that if the significance value is < 0.05 then the data is not normally distributed and if the significance value is > 0.05 then the data is normally distributed. Based on the results of the test of normality in the Table above, the pre-test Sig significance value was 0.001 < 0.05 and the post-test Sig value was 0.493 > 0.05. Because the significance value (Sig) for the pre-test and post-test data is different, the data is not normally distributed.

TestThe second prerequisite is a homogeneity test. The homogeneity test used is the Levene test with the help of the SPSS version 26 program to determine whether a sample is homogeneous or not. The homogeneity test results appear in the Table below.

Table 9. Homogeneity test results

		Levene Statistics	df1	df2	Sig.
Scientific Literacy Ability	Based on Mean	3,079	1	44	,086
	Based on Median	1,249	1	44	,270
	Based on Median and with adjusted df	1,249	1	30,052	,273
	Based on trimmed mean	2,692	1	44	.108

Based on the Table 9 of results from the test of homogeneity of variance above, the significance value based on mean Sig = 0.086 > 0.05 is obtained with the test criteria being a significance value < 0.05, so the data is not homogeneous, the significance value is > 0.05, so the data is homogeneous. So, the data above is homogeneous, meaning that the data variants come from the same data population. Because the data is not normal, the next test was carried out using non-parametric statistics, namely the Wilxocon test with the help of SPSS version 26. The results of the Wilxocon test are shown in the Table below

Table 10. Wilxocon test results

	Post-test - Pre-test
Z	-4.198b
Asymp. Sig. (2-tailed)	,000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Based on Table 10. above, the significance values obtained (2-tailed) are 0.000 and <0.05, indicating that there is a significant difference between the initial variable and the final value (pre-test and post-test), this shows that there is an influence of the application of the model RADEC in increasing PGSD students' scientific literacy or assessment Basic science concepts based on the RADEC learning model are effectively used. With the RADEC learning model, lecturers can create effective learning experiences for students and build a strong understanding of science, and increase scientific literacy. This is in line with the opinion that the RADEC model can be one of the choices for teachers in conducting learning at school to increase scientific literacy [23].The results of the learning tools developed can be considered effective and suiTable for application in wider learning because there has been an increase in scientific literacy among all students in the field test.[24].

The RADEC learning model can be one of the teacher's choices and through its syntax, namely Read*, Answer, Discuss, Explain, and Create.* This learning model can help students improve critical thinking, collaboration skills, speaking skills and writing abilities.[23].RADEC can influence how students see science so that it can improve students' perceptions of science, can be used for various subjects, such as thematic lessons, can teach students the scientific process and traits such as environmental concern. Overall, the RADEC learning model has the potential to increase students' scientific literacy in schools through the use of active and participatory learning approaches. In addition, RADEC has the ability to teach scientific process skills and with the characteristics of RADEC has the ability to increase the scientific literacy of elementary school students.

RADEC is a learning model that combines various elements, such as reading learning materials or resources, answering questions before learning, discussing, providing explanations, and generating creative ideas to then carry out experiments. This model provides students with a comprehensive learning experience and helps them understand concepts, especially the concepts of temperature and heat, better. RADEC encourages students to talk and collaborate with classmates. This improves their understanding and speaking ability. All RADEC actions aim to increase students' scientific literacy. They gain skills to read scientific literature, interpret information, and speak in a scientific context.

4 Conclusion

The results of the research are that the application of learning using the RADEC model can be categorized as very good, because all the syntax can be implemented well by

lecturers and students and the use of the RADEC learning model is effectively used in improving the scientific literacy skills of students in elementary school teacher education study programs.

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