INCREASING THE MOTIVATION OF ELEMENTARY SCHOOL STUDENTS: READ ANSWER DISCUSS EXPLAIN AND CREATE (RADEC)-BASED STEM LEARNING MODEL

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ABSTRACT

This research was conducted to find out the influence of the Read, Answer, Discuss, Explain, and Create (RADEC) Learning Model based on Science, Technology, Engineering, and Mathematics (STEM) on Student Learning Motivation. This research uses a quantitative Quasi Experiment Research method. This design has two groups of individuals, one receiving experimental therapy with a sample of 22 students, and the other not receiving it with a sample of 22 students, within 5 meetings. Researchers obtained data from pretest-posttest results. Variable hypothesis testing produces a Sig value. (2-thailed) 0.000 < 0.05 for student learning motivation. Based on research findings, the application of the Read, Answer, Discuss, Explain and Create (RADEC) learning model based on Science, Technology, Engineering, and Mathematics (STEM) affects student learning motivation. Students increased intrinsic and extrinsic motivation after learning using RADEC-STEM. Appreciation and interaction at the explain and create stages help students increase their learning and motivation. Student motivation can be increased through the integration of reading activities and understanding initial concepts in project-based learning. During the reading phase, students become more curious and it continues to grow as they work on projects.

Keywords: RADEC Learning Model, RADEC-STEM, Motivation, Elementary School

INTRODUCTION

Teachers' work is inherently change-oriented, unfolding within policy cycles, evolving pedagogical expectations, shifting student needs, and continuous technological development. These pressures have intensified as school systems simultaneously pursue curriculum reform and respond to post-pandemic learning disruptions. In such conditions, teachers must repeatedly recalibrate how they interpret demands, regulate emotions, and adjust actions in the classroom and the wider school organisation, making adaptability a plausible capacity underpinning sustainable professional functioning (Collie & Martin, 2017; Collie et al., 2018).

In the world of education, the development of science and sophisticated technology has had a positive impact, namely changing conditions in almost all aspects of life, where some of these problems can only be resolved through efforts to master and improve science and

technology. Education plays a very important role in preparing students who have a mindset and work towards a sustainable future in order to be able to overcome an increasingly complex world problem (Hays & Reinders, 2020; Lynch et al., 2021; Reimers, 2020). Meanwhile, science education has an important role as a means of facing challenges in the era of globalization.

Especially to face the challenges and opportunities of the 21st century, we must be as flexible as possible. Because, in the 21st century, the very rapid development of information and communication technology has been marked by the nickname the digital century. Motivation is also a factor that contributes to producing active learning in students (Ferrer et al., 2022; Murillo-Zamorano et al., 2021; Owens et al., 2020). Students will always study seriously if they have very high learning motivation (Amar 2022). A human effort can answer the challenges of the times, one of which is the learning model. Basically, every country must provide human resources who have 21st century skills so that they can later face the world of globalization as stated by (Ghafar, 2020; Joynes et al., 2019). That in order for elementary school children to reach their maximum potential, they must be ready to learn independently and teachers must be able to support students' independent learning while providing good role models according to (Fitria, 2018).

This can be seen in students who are restless, uncomfortable with a particular learning process, do not pay attention to the teacher when explaining the material, or fail to complete the assignment given by the teacher (Jainiyah et al., 2023). If this continues to happen, students will become less and less concerned about the learning process and will no longer have motivation to learn. Based on the problems above, an alternative model solution is needed that is able to develop students' learning motivation. One of the models that can be applied in learning is the Read, Answer, Discuss, Explain and Create (RADEC) learning model based on Science, Technology, Engineering, and Mathematics (STEM), the syntax of which is easy to memorize and is in accordance with what has become the characteristics Indonesia.

The use of the RADEC model can help students become highly skilled, give them opportunities to engage and learn on their own, help them improve their communication and teamwork skills, and help them understand better (Abidin et al., 2021; Fauziyyah et al., 2024; D. I. Sari et al., 2022). This model is used for solutions in the process of learning activities that enable students to grow into independent individuals and work together in groups with their friends to share knowledge and solve problems. in line with opinion (Agustin et al., 2021).

The syntax in the RADEC learning model is stated as follows: (1) Read means reading, meaning that students are expected to read many sources of educational information, including books and online sources, regarding the subject matter they will study. (2) Answer means answering, meaning that students can answer learning questions based on knowledge information that students have mastered from previous reading activities. (3) Discuss means discussion, meaning that students who have been formed in groups can discuss the answers to the questions being asked. (4) Explain means to explain, meaning students are asked to explain the material that has been discussed previously. (5) Create means to create, meaning that at this point the teacher encourages and supports students to learn by using the material that has been discussed previously to produce creative ideas that they already have. The stages of RADEC syntax are very important in the learning process, to increase student learning motivation by going through several stages (Pratama et al., 2019).

The learning model with the STEM approach involves learning that integrates the four components, namely science, technology, engineering and mathematics in the learning process, which really helps students to utilize technology and organize it into experiments that can be proven from concepts supported by data that has been managed mathematically, (Lestari & Rahmawati, 2020). It also helps students develop better reading habits by encouraging them to learn on their own and express what they have learned through producing work that shows their skills by reflecting (Sari & Sukmawati, 2023). That students who are involved in the learning process will feel more responsible and encouraged to learn through various learning activities. as in the statement by (Zandvakili et al., 2018). Students with a high motivation to learn are more likely to achieve well and low motivation to learn causes

low learning achievement (Filgona et al., 2020; Meece, 2023; Tokan & Imakulata, 2019).

STEM is a learning strategy that increases conceptual understanding, (Jehlicka & Rejsek, 2018). STEM is a learning technique that integrates several scientific subjects, (Syukri et al., 2013). The following are four definitions of STEM according to the National Academy of Engineering and the National Research Council as follows: (1) Science, is a type of knowledge that can be verified through a rigorous and comprehensive research process, which leads to the development of new knowledge. (2) Technology, is the entire system, information, processes and tools of humans and organizations that humans use to create and use technology specifically designed to meet their needs. (3) Engineering, is the development of knowledge concepts in the fields of science, mathematics and technology to be able to solve problems contained in human-made designs and products. (4) Mathematics, is a study that studies patterns and relationships between numbers, numbers and arithmetic, space forms, algebra, functions, geometry and statistics as well as probability, mathematics is used in science, technology and engineering (Nuryani, 2021).

Motivation to learn is the accumulation of all the driving forces in the minds of students which gives rise to learning activities that ensure the learning process continues and leads to learning activities so that the expected learning objectives can be achieved (Dörnyei, 2019; Felder & Brent, 2024; Seven, 2020). Motivation involves creating situations that lead to the desire to achieve something, and overcoming negative sentiments in the form of hatred by (Emda, 2018). So, although external influences can increase motivation, motivation develops within a person. The environment can motivate individuals to learn. The combination of RADEC and STEM can help students use their knowledge to create a project that functions as a solution to a problem in their life, thus enabling them to focus and be motivated to learn at school.

METHODS

Design

The experimental research used in this research is Quasi Experimental Research or Quasi Experimental research. Quasi Experiment is a method used to find the impact of a particular event under conditions characterized by uncertainty). This type of research is used because, as mentioned, it is difficult to obtain a control group to use for research. This research involves students as research subjects, which is a type of social research. Those who negatively impact the experience are the types of students who may present difficulties when analyzing external variables. This type of research is used because, it is difficult to obtain a control group to use for research. This research involves students as research subjects, which is a type of social research. Those who negatively impact the experience are the types of students who may present difficulties when analyzing external variables**.**

Research Subject and Procedures

This research covers all fifth grade students at Public Elementary Schools in Indonesia. There are 22 students in class V A and 22 students in class V B. In this study, the "Non-equivalent Control Group Design" design was used. This design is almost the same as the pretest-posttest control group design, knowing the initial condition before being given treatment is measured by pretest scores and after being given treatment is measured by post-test scores. In contrast, “Non-equivalent Control Group Design” is often used when randomization is not possible or unethical, but the results should be interpreted with caution because initial inequality between groups can make it difficult to control for threats to internal validity. The Pretest-Posttest Design, meanwhile, is simpler and does not involve a separate control group. In this design, the experimental group and control group are not chosen randomly. Therefore, in this research, there are also two class groups, namely the experimental class and the control class.

Data and Instruments

This research data collection includes tests and documentation. The tests used in this research were the initial test (pretest) and the final test (posttest). This exam uses a questionnaire-type test, which is given to the sample as a pretest and posttest to obtain initial and final results. This aims to assess the effectiveness of implementing the Read, Answer, Discuss, Explain, and Create (RADEC) model based on Science, Technology, Engineering, and Mathematics (STEM) on the learning motivation of class V students in one of the public schools in Indonesia. This research's non-test tools include questionnaires and documentation. Documentation can take the form of photos, text, or other types of mental activity. This research documentation consists of school archives and images.

Data Analysis Technique

The technique in data analysis applied by researchers is inferential analysis. Inferential analysis is a data analysis format that can be used to determine whether a hypothesis is accepted or rejected in a study. There are several stages that are prerequisites for carrying out a hypothesis test analysis, namely data normality test analysis and the data homogeneity test analysis. What is in accordance with the aim of the hypothesis in this research is that there is a significant influence of the Read, Answer, Discuss, Explain, and Create (RADEC) learning model based on Science, Technology, Engineering, and Mathematics (STEM) on class V learning motivation. Therefore, this hypothesis will The truth was tested through the t-test based on the independent variable using the Read, Answer, Discuss, Explain and Create (RADEC) learning model based on Science, Technology, Engineering and Mathematics (STEM) as the experimental class and the lecture method for the dependent variable as the control class.

In this study, after the data were normally distributed, a paired sample t-test was carried out in SPSS 26.0 for Windows software. The paired sample t-test is a parametric test used to assess the efficacy of treatment, as evidenced by the difference in mean values before and after therapy. The paired sample difference test (paired sample t-test) can only be used if all the data in the normality test is normally distributed. The decision to test the hypothesis is based on the following: (1) If the significance probability value is <0.05, then reject Ho and accept Ha; (2) If the significance probability value is >0.05 then Ho is accepted and Ha is rejected. So, the t-test findings will be used to find out whether Read, Answer, Discuss, Explain And Create (RADEC) learning based on Science, Technology, Engineering, and Mathematics (STEM) affects the learning motivation of class V students.

RESULTS AND DISCUSSION

Data from descriptive statistical tests on student learning motivation in the experimental class in the form of pre-test and post-test scores can be seen in the following table.

TABLE 1 | Average value of experimental class learning motivation

No	Mark	Experiment	
		Pretest	Post-test
1.	The number of students	22	22
2.	The highest score	79	100
3.	Lowest Value	52	73
4.	Average value	63,32	84,82
5.	Standard Deviation	6,074	5,989

Based on the data from the pre-test and post-test scores in the experimental class, it can be concluded that there is a significant difference. This can be seen from the results of the

students' pre-test score before receiving the treatment, namely 63.32 and when they were given learning treatment using the Read, Answer, Discuss, Explain And Create (RADEC) learning model based on Science, Technology, Engineering and Mathematics (STEM) it was obtained the post-test score was 84.82. Data from descriptive statistical tests on student learning motivation in the experimental class in the form of pre-test and post-test scores can be seen in the following table.

TABLE 2 | The average value of the control class for learning motivation

No	Mark	Control	
		Pretest	Post-test
1.	The number of students	22	22
2..	The highest score	75	90
3.	Lowest Value	54	61
4.	Average value	62,18	73,50
5.	Standard Deviation	5,179	7,360

Based on the data from the pre-test and post-test scores in the control class, it can be concluded that there are differences. This can be seen from the results of the students' pre-test scores before receiving treatment, namely 62.18 and when they were given learning treatment using the lecture learning model, the post-test scores were 73.50. The results of the analysis of the average pretest and posttest between the experimental class and the control class are presented in Figure 1. as follows.

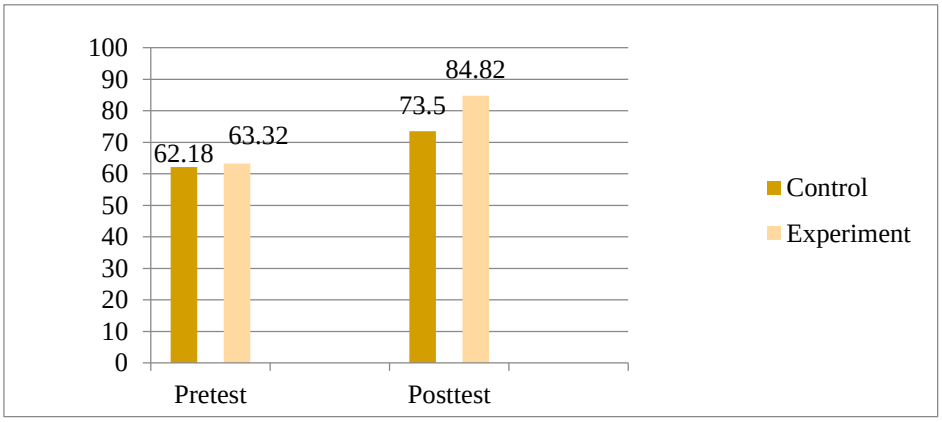


FIGURE 1 | Average value of experimental and control class learning motivation

From the table and graph of student scores above, it can be concluded that there is a significant difference between the experimental class science learning motivation scores that were treated with the Read, Answer, Discuss, Explain And Create (RADEC) learning model based on Science, Technology, Engineering and Mathematics (STEM) and learning motivation and the control class given lecture learning treatment by looking at the average score in each treatment. The Normality Test is carried out for the classes used as samples whether they are normally distributed or not. If the distribution is normal then data analysis can use parametric statistics and if the data is not normally distributed then data analysis uses non-parametric statistics. The following is a summary of the data from the sample normality test results which can be seen in the table 3.

TABLE 3 | Normality test results for experimental and control classes for learning motivation

Shapiro-Wilk					
Data	**Class**	**Statistic**	**df**	**Sig.**	**Information**
Pre-test	Experiment	0,913	22	0,054	Normally distributed
Post-test		0,971	22	0,725	Normally distributed
Pre-test	Control	0,923	22	0,086	Normally distributed
Post-test		0,957	22	0,428	Normally distributed

The normality test used in this research is the Shapiro-Wilk test. This is because in accordance with the provisions if the sample is no more than 50 then use the Shapiro-Wilk normality test. Table 4.3 shows that the pre-test data for the experimental class and control class are normally distributed. Post-test data for the experimental class and control class were also normally distributed. This decision is made based on a value (Sig) > 0.05 with a level of 5%. The Homogeneity Test is used to determine whether the sample used comes from a homogeneous population or not. The homogeneity test in this research uses the Leven statistical test, the decision making criteria for the homogeneity test is if the significance value (Sig) is > 0.05 then the data variance is homogeneous. If the significance value (Sig) <0.05 then the data variance is not homogeneous. The results of the homogeneous test analysis can be seen in table 4 as follows:

TABLE 4 | Results of the homogeneity test for the experimental and control classes of learning motivation

Data	**Levene Statistic**	**df1**	**df2**	**Sig.**	**Information**
Pre-test Experiment	2.019	3	84	0,118	Homogeneous
Post-test Experiment	1.730	3	84	0,167	Homogeneous
Pre-test Control	1.730	3	83.388	0,167	Homogeneous
Post-test Control	2.029	3	84	0,116	Homogeneous

Based on the results of the homogeneity test with Levene Statistics in the experimental pre-test, it was obtained (Sig.) = 0.118. If we look at the decision making criteria, the value is 0.118 > 0.05, so it can be concluded that the variance of the experimental class pre-primary group is homogeneous. In the experimental post-test, it was obtained (Sig.) = 0.167. If we look at the decision making criteria, the value is 0.167 > 0.05, so it can be concluded that the variance of the experimental class post-test group is homogeneous. Also, in the control pre-test, it was obtained (Sig.) = 0.167. If we look at the decision making criteria, the value is 0.167 > 0.05, so it can be concluded that the variance in the control class pre-rest group is homogeneous. In the control post-test, it was obtained (Sig.) = 0.116. If we look at the decision making criteria, the value is 0.116 > 0.05, so it can be concluded that the variance of the control class post-test group is homogeneous. After carrying out the normality test and homogeneity test as a prerequisite test before carrying out the hypothesis, the data obtained meets the requirements for carrying out the t test. Next, a t test will be carried out to answer the hypothesis that has been prepared previously. The hypothesis test used in this research is a parametric test with a paired sample test analysis technique. The paired sample test is used if the data in the normality test is normally distributed after previously carrying out the analysis prerequisite tests, namely, the normality test and homogeneity test, the results obtained are that the data is all normally distributed and in the homogeneity test the results obtained are that all the data is homogeneous. The results of the hypothesis test analysis are as follows:

TABLE 5 | Results of the experimental class hypothesis on learning motivation

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Pretest - Posttest	-21.727	7.192	1.533	-24.916	-18.538	-14.16	21	.000

The results of the hypothesis test analysis using a paired sample test are allowed (Sig) = 0.000. In accordance with the basis for decision making, if the hypothesis test significance probability value is <0.05 then (Ha) is accepted and the null hypothesis (Ho) is rejected. It can be concluded that the Read, Answer, Discuss, Explain And Create (RADEC) learning model based on Science, Technology, Engineering and Mathematics (STEM) has an influence on class V learning motivation at elementary school. The following results for the motivation aspect can be seen in the graph below:

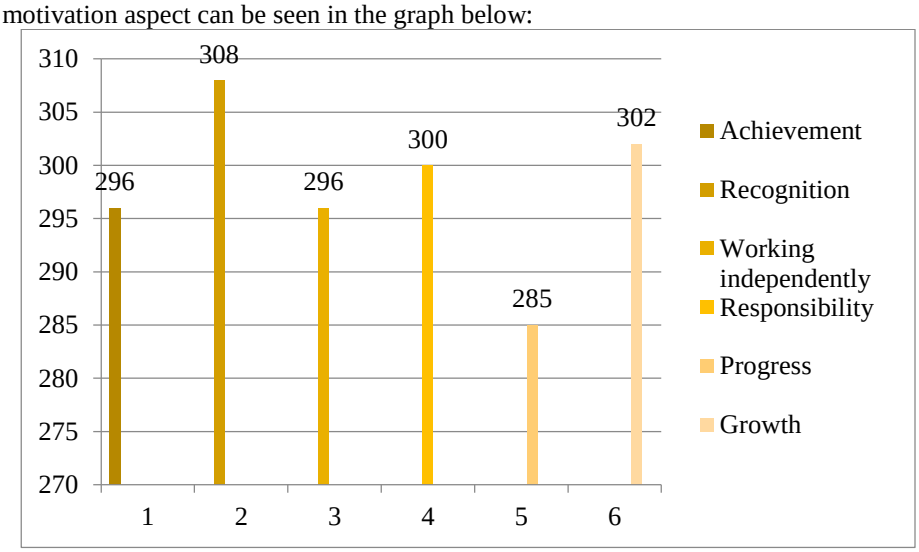


FIGURE 2 | Perspective level results on science motivation

Information: (1) Achievement (2) Recognition (3) Working independently (4) Responsibility (5) Progress (6) Growth Based on the graph above, the highest aspect is the aspect (Recognition) with a total of 308. Results of the researcher's observations , when the learning process uses the Read, Answer, Discuss, Explain And Create (RADEC) learning model based on Science, Technology, Engineering and Mathematics (STEM), students look more active. In the Read, Answer, Discuss, Explain and Create (RADEC) learning model process based on Science, Technology, Engineering and Mathematics (STEM) in discussing environmental pollution material, it begins with the teacher opening the lesson and first explaining the objectives of the material to be studied.

The RADEC learning process is effective in achieving good results and motivating students to learn. Student involvement or student-centeredness is a result of the learning process becoming more visible. Student involvement or student-centeredness is a result of the learning process becoming more visible. Student involvement or student-centeredness is a result of the learning process becoming more visible. When working on projects, students have opportunities to exchange ideas, opinions, and suggestions through

collaborative learning activities. Students are made more open to the opinions and thoughts of other students through this process. Collaborative learning enables students to comprehend others' opinions and accept suggestions on projects being carried out, resulting in a greater desire to carry out learning activities in groups.

After that, the teacher distributed students an instruction sheet by scanning a barcode containing articles on environmental pollution. Next, students read until they finish and the teacher asks what the students have read. Then, the teacher distributes it to several groups to work on the worksheet and group representatives to explain the results of the discussion. The group that has been formed will work on a project to recycle liquid waste into liquid fertilizer. Then the teacher explains the project assignments that will be carried out by the students. Next, students design and modify the project by reading the existing guidebook. The results of the project are applied to everyday life by being poured onto plants. The teacher gives students the opportunity to ask questions and respond to the group of performers. After explaining the results of the project that has been made, the teacher guides students to make conclusions and provides reinforcement to students from the learning that has been carried out.

The application of RADEC learning helps improve student motivational internal and external by encouraging students to fully engage with learning material and collaborate with their friends (Suryana & Sopandi, 2021). The STEM approach is an educational approach that combines science, technology, engineering and mathematics into the educational process as stated by (Yuanita & Kurnia, 2019). It focuses on problem solving in real-world situations and shows students how concepts, principles, science, technology, engineering, and mathematics are used in developing products, processes, and systems that improve lives. With that, RADEC learning which includes several aspects is also combined with the use of STEM which has several aspects that are interesting, fun and easy to access so that it can increase student learning motivation.

CONCLUSION

The influence of the RADEC-based STEM learning model on learning motivation of fifth grade students at the Elementary School level, researchers can conclude that there is an influence of the STEM-based RADEC learning model on learning motivation. So it can be concluded that the learning motivation of fifth-grade public elementary school students has an effect using the RADEC-based STEM learning model.

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