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The Role of RADEC in Developing Class V Students' Creativity and Understanding of Concepts in Human Growth Material

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Abstract: This research is based on the low level of creativity and conceptual understanding of grade 5 elementary school students, due to a lack of variety in learning. Students' creativity and understanding of concepts need to be developed through the implementation of RADEC learning. This research aims to determine the role of RADEC learning in developing fifth grade students' creativity and understanding of concepts in human growth material. The research method used was quasi-experimental with a pretest-posttest nonequivalent control group design. The research subjects were Class V students in one of the elementary schools in West Bandung Regency. Data collection techniques use tests and non-tests. The data is explained in detail through descriptive analysis, with non-parametric tests via the Kendalls' W test for creativity data and prerequisite and parametric tests for concept understanding results. The results of this research show that the Kendall's W test result of 0.92 shows that there is a high level of agreement between the 3 judges regarding the products that have been made by the students. The results of the mean rank of experimental class products show the top 4 rankings of the 8 products evaluated. The average N-Gain of students' conceptual understanding in the experimental and control classes was 0.72 and 0.31 in the high and medium categories. Therefore, it can be concluded that RADEC learning plays a positive role in developing students' creativity and understanding of concepts in human growth material.

Keywords: Concept Understanding; Creativity; RADEC

Introduction

The 21st century requires individuals to have 4 main skills including critical thinking and Problem Solving skills, communication, collaboration and creativity which are needed especially in the world of education (Aeni et al., 2023; Taar & Palojoki, 2022; Teo, 2019). Currently, 21st century skills have become the center of attention at every level of education, especially at the elementary school (SD) level (Monika et al., 2022). Elementary school is the initial stage for students in developing cognitive, social, emotional and skills so that it becomes a very crucial foundation for 21st century development.

21st century skills need to be integrated in every subject at school, including science learning. Yuniharto & Nisa (2022) reveal that science is a science that studies nature and all its contents through a process of observation and experimentation, in this context students are given the task of formulating new ideas or hypotheses about their environment. Science learning motivates students to develop their creativity by attracting students to take part in the process of observation and experimentation which can trigger the discovery of new ideas about nature and phenomena around them. However, in fact, creativity skills are not yet fully developed in elementary school students, especially in science learning.

Creativity is an element that needs to be considered within the framework of human social life and has various implications (Bahrami et al., 2021). Creativity is an individual's skill to produce something new in the

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form of ideas or work that is relatively dissimilar to previously existing results (Dwiana et al., 2021). Creativity needs to be developed from an early age, especially when applied to elementary school students. However, in fact, creativity problems are found both globally and locally. A survey conducted by the Martin Prosperty Institute (2015) shows that of the 139 countries tied to the Global Creativity Index (GCI), Indonesia is in 115th position with a global creativity index of 0.202 which is targeted at assessing three indicators, namely talent, technology and tolerance.

This indicates that Indonesia is still in a low category in terms of creativity (Perdana & Sugara, 2020). Based on observations made by Dwiana et al. (2021), the problem of creativity in local circles is that students lack confidence in expressing their ideas or views so they tend not to vary (monotonous) and their knowledge is limited to what the teacher provides and it is difficult to develop understanding. from what they have learned. The factor that influences the problems that occur is teachers' learning styles that are less varied, teachers need to utilize various learning methods so that students remain interested and do not feel bored (Nurhayati et al., 2022). This is also in line with the findings of an interview conducted with one of the elementary school principals in West Bandung regarding the problem found in the school, namely the creativity of grade 5 students which is still low, this is indicated when students are instructed to make a project, some students are silent. without direction and unresponsive to instructions.

Factors that cause students' lack of creativity are teachers' lack of recognition of students' potential, inadequate support from the environment, and conventional teacher learning models, so they do not emphasize students' creative abilities. Based on these two problems, elementary school students' creativity skills still need to be improved. So, the process of delivering learning material must be carried out in an interesting way and increase student enthusiasm (Aeni et al., 2022). The results of previous in-depth studies have identified that individuals with high creativity skills have strong enthusiasm and connect their knowledge and experience in creating new ideas (Conradty & Bogner, 2019; Feldhusen & Goh, 1995; Lubart, 1994; Thuneberg et al., 2018; Tran et al., 2021). Based on this, individuals who have creativity also depend on knowledge or conceptual understanding of something.

In fact, students' understanding of concepts in Indonesia still needs to be paid more attention, especially in science learning. In the field of science, Indonesian students' presentations experienced a decline in 2018, gaining an average score of 396 points compared to 2015, which achieved a score of 402 points. Apart from that, the OECD explained that 35% of Indonesian students were still in competency groups at levels 1a and 17. % at a lower level (Wuryanto & Abduh, 2022). Based on this, it can be seen that the cognitive abilities of science learning in Indonesia are still low and efforts are needed to improve students' cognitive abilities in science learning. Several factors influence cognitive abilities in science learning, one of which is an understanding of science concepts that is not yet optimal.

Understanding concepts is the capacity to receive, absorb and understand material or information that has been obtained from a series of incidents or incidents, including those that can be observed directly or heard and stored in the mind, and then implemented in everyday life (Erina Susanti et al., 2021). Understanding science concepts is defined as a student's scientific ability to understand the meaning of a concept or theory to overcome the problems faced and a lack of conceptual understanding can be recognized by the student's inability to understand the meaning of knowledge content, as well as the reasons behind various parts of knowledge that are connected to each other (Kurniawan et al., 2020). Based on research conducted by Erina Susanti et al. (2021) regarding students' understanding of science concepts in elementary schools, it shows that the average score for all fifth grade students at SDN Gugus V, Cakranegara District, was 63 and was included in the low category when viewed based on benchmarks. The minimum completeness criteria that has been set by the school is 76 and the factor causing students' low understanding of science concepts is the teacher learning model that does not actively involve students in learning or is only teacher-centred. Most teachers only use learning models that are not varied and only use the lecture method (Aeni et al., 2022). Therefore, elementary students' understanding of concepts needs to be maximized, so that students can achieve learning achievements (Fauzi et al., 2022).

Based on the problems that occur in creativity skills and understanding of science concepts in elementary school students, the factors causing the same problems are caused by the lack of varied learning models so that they cannot make students active in learning and also do not foster students' creative spirit. In current Natural Sciences (Science) learning in elementary schools, students are often less active in the learning process because their orientation is still very dependent on the role of the teacher or teacher-centered learning (Fitriani et al., 2019). One learning model that is interesting and can combine students' conceptual understanding and creativity skills is the Read-Answer-Discuss-Explain-Create (RADEC) learning model.

RADEC is a learning model that has simple and easy to understand syntactic criteria and is able to

explore students' potential in terms of attitudes, knowledge and skills (Sujana et al., 2021). Sukmawati et al., (2021) state that the RADEC learning model has several advantages including: a model design that is simple to apply so as to create an interesting learning experience; able to develop students' critical thinking abilities; improving the quality of students' analytical abilities and reading skills; creating collaboration between student study groups; syntax that is easy for teachers to understand. The RADEC model can help students gain conceptual understanding (Nengsih et al., 2023). Not only that, RADEC is an approach that can change the educational paradigm which focuses on encouraging the growth of 21st century abilities, morals and literacy and also preparing students to face exams at future levels of education (Maulana et al., 2022).

Thus, a study is needed about the role of RADEC in developing elementary school students' creativity and understanding of concepts. The purpose of this research is to determine the role of the RADEC learning model in developing fifth grade students' creativity and understanding of concepts in human growth material.

Method

This research uses a quasi-experimental method using a pretest-posttest nonequivalent control group design. The classes used in this research are control and experimental. The RADEC learning model is the treatment that will be given to the experimental class. Meanwhile, the control class uses a conventional learning model with modifications to giving project assignments. This research was carried out in one of the elementary schools in West Bandung Regency. The sample in this research was class V students. Two classes were used as research samples, so there was an experimental class and a control class with a total of 35 students. The research sample was taken using class random sampling technique. Control class participants were class VA with a total of 17 students consisting of 7 women and 10 men while the experimental class was class VB with a total of 18 students consisting of 9 women and 9 men. The design form for this research is as table 1.

Table 1. Nonequivalent Control Group Design

Class	Pretest	Treatment	Posttest
Experiment	X_1	Y_1	X_3
Control	X_2	Y_2	X_4

Description:
X_1 = Experimental class Pre-Test
X_2 = Pre-Test control class
X_3 = Experimental class Post-Test
X_4 = Post-Test control class
Y_1 = Learning with the RADEC model
Y_2 = Learning with conventional models

The variables used in this research consist of independent variables and dependent variables. The independent variable is the implementation of RADEC. Creativity and understanding of concepts are dependent variables whose changes will be seen after being given treatment. The data collection techniques used in this research were test and non-test. The instrument used to measure student creativity is the consensual assessment technique (CAT) in the form of a Likert scale of 1 to 5, with assessments carried out by 3 judges. Next, the creativity score is processed by calculating the agreement between the judges using Kendall's W coefficient. Meanwhile, the science concept understanding test is an instrument used to collect data on the understanding of science concepts for class V students, consisting of 9 essay questions that have been tested for validity, reliability, difficulty index and strength. differentiator.

The data analysis technique used in this research for creativity is the Kendall's W coefficient test to calculate agreement between teams assessing student creativity. As for the results of understanding the concept, normality, homogeneity, t-test and N-Gain tests were carried out. Next, a test of the validity and reliability of the questions was carried out on students. The validity test process is supported by SPSS version 26 software, and the results show that all questions are considered valid with probability values between 0.000 and 0.001. In addition, the test instrument's reliability test value reached 0.847, in this context indicating that the instrument being tested is reliable. This confirms that the measuring instrument used in this research has good reliability, resulting in consistent and reliable results. Here is the flow of this research.

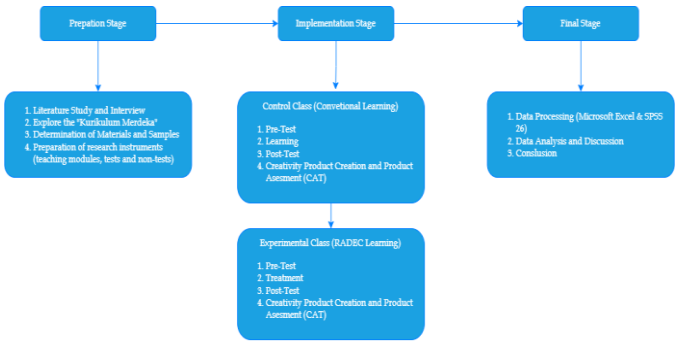

Figure 1. Research flow

Result and Discussion

Creativity

Creative individuals are those who have the capability or tendency to create innovative and valuable products (Sánchez-Dorado, 2023). The creativity results

show that there were 8 products (P1-P8) made by students, 4 of these products came from the experimental class and 4 products came from the control class. The indicators assessed in creativity products consist of: 3 main dimensions and each dimension has 3 indicators, so the number assessed is 9 indicator fruit. The list of sub-indicators related to the main dimensions developed by Denson et al. (2015) can be seen in Figure 1.

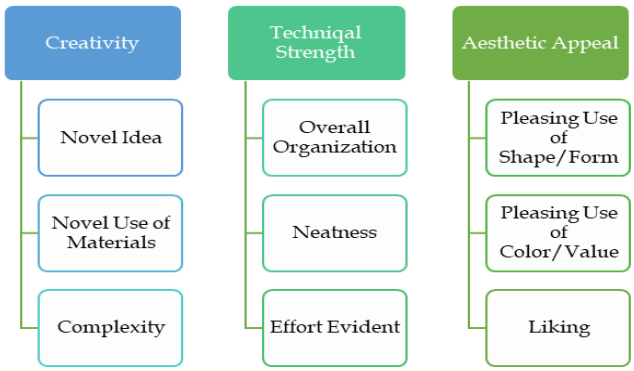

Figure 1. Creativity Indicators

Student creativity is measured using the CAT instrument. CAT is a wise alternative to the problem of criteria in researching product creativity which was developed by Teresa Amabile in 1982 and provides speculation that a product is considered creative if the assessors in their expert fields independently agree/agree that the product is creative (Ivcevic et al., 2023). CAT is an instrument used in creativity research to assess a product using a rating scale. Reliability between creativity raters in CAT research focuses on "perspective consistency" or is linked to ranking relatively similar products (Barth & Stadtmann, 2021; Eckes, 2023; Hung et al., 2012). To measure the level of agreement and consistency in giving ratings between the judges, calculations using the Kendall's W coefficient were used (Premelč et al., 2019).

There are 3 assessors or judges appointed to assess the students' work. They are people who are experienced in assessing students' creative products in the field of education. Analysis of student creativity results aims to identify variations in student creativity after implementing treatment by the RADEC learning model in the experimental class and the conventional learning model in the control class. Analysis of student creativity data was carried out using the Microsoft Excel and SPSS version 26 applications. The research data that will be described is in the form of non-parametric hypothesis testing results and research data. To provide more in-depth information, student creativity data will be described which was obtained from the accumulated assessments of 3 judges who were given creativity assessment sheets according to predetermined indicators. The nonparametric test results consist of the Kendall's W test. The results can be seen in Table 2.

Tabel 2. Kendall's W and Mean Rank

Product	Class	Mean Rank
P1	Experimental	1.00
P2	Experimental	2.67
P3	Experimental	2.67
P4	Experimental	4.00
P5	Control	5.17
P7	Control	6.13
P6	Control	6.17
P8	Control	8.00

The table above depicts the mean rank results for products P1 to P8. Analysis of the information obtained is about the preferences or assessments given by the three judges. P1 shows the lowest mean rank, indicating that P1 is a product that consistently achieves the highest ranking from each jury. This means that P1 is the product that best meets the predetermined creativity assessment criteria. Furthermore, P2 and P3 achieved the second lowest mean rank after P1, this shows that they both received consistent assessments from the three judges. Next, the order of products that has the third lowest mean rank is P4, followed by the fourth lowest mean rank is P5, the fifth lowest is P7 and the sixth lowest is P6. Meanwhile, P8 has the highest mean rank, meaning that this product consistently gets the lowest rating from the judges.

A lower rankingposition indicates a lower or less good assessment compared to other products, meaning that the P8 product isnot fully optimal according to the determined assessment criteria. It can be seen that P1-P4 are products made by the experimental class and P5-P8 are products made by the control class. This shows that the experimental class obtained the top 4 positions compared to the control class. It can be concluded that the RADEC learning model given to experimental classes can develop student creativity compared to classes given conventional learning models.

In addition, evaluation of the jury's agreement in ranking each product according to the indicators determined in Table 3.

Table 3. Kendall's W value

3 Judges Deal	N	Kendall's W[a]	Chi-Square	df	Sig
Deal Value	3	0.924	19.41	7	0.007

The Kendall's Wa value of 0.924 shows that there is a high level of agreement between the 3 judges regarding the products that have been made by the students. This provides reinforcement and confidence that the judges are providing ratings with strong and reliable alignment. This learning project produces various creative products that reflect students'

understanding of human growth. The first product or P1 is a podcast created by experimental class students. The podcast was the product that received the highest score from the judges due to its uniqueness and novelty which uses audio or student recordings as material that is made into creative products in the classroom. This reflects that this podcast is a product of students who have an audio learning style. The podcast content displayed is about the characteristics of puberty in humans, the cover design, narration, delivery style and interesting podcast background sound are something new and become additional points for the student creativity products that have been produced.

The second product or P2 is a work in the form of a miniature made from `which visually depicts the stages of human growth from babies to the elderly and presents a creative understanding of human physical changes. This miniature growth is the only 3D work created by the students. The third product or P3 is a poster made from cardboard which visually explains the characteristics of puberty in boys and girls, packaged in attractive shapes and colors. Furthermore, P4 is in the form of a digital poster created with the help of the Canva platform which provides an overview of how to keep your body healthy. The P5 product is in the form of a cardboard-based poster that explains the entirety of human growth. The P6 product is a mind map made from cardboard that depicts the stages of human growth which is packaged and decorated with attractive colors.

Meanwhile, P7 is a product in the form of a concept map that explains the characteristics of puberty in boys. This concept map is made from HVS paper and is designed with attractive colors. Meanwhile, P8 is a picture collage made by students using HVS paper which explains how to keep the body healthy. Of the eight products that have been made by students from both the experimental and control classes, they have been able to provide good and interesting creative products. However, some products are not yet fully optimal in obtaining value according to the creativity dimension. Images of the P1-P8 products can be seen in Figure 2 and Figure 3.

Figure 2. Experimental Class Products

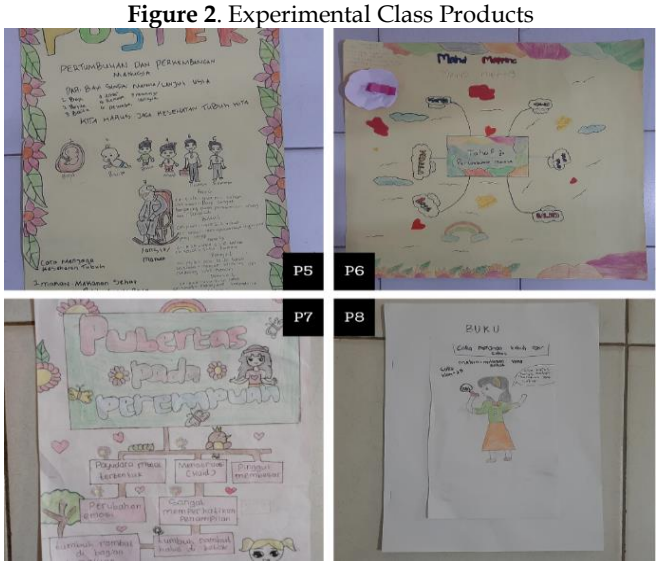

Figure 3. Control Class Products

Apart from that, there is accumulated data on the percentage of the three judges in assessing each dimension of creativity obtained by the experimental class and the control class which can be seen in Table 4.

Table 4. Creativity Values per Indicator

Dimensions of Creativity	Experiment (%)	Control (%)
Creativity	79	61
Technical Stregth	82	71
Complexity	81	71

Table 4 shows the percentage of creativity for each dimension in both the experimental and control classes. Based on the results of data analysis, it can be seen that creativity in the RADEC learning model has the highest percentage in the "Technical Strength" indicator with a value of 82%. Meanwhile, the control class which applied conventional learning obtained the highest percentage in the "Technical Strength" and "Complexity" indicators with a score of 71%. It can be seen that in each

dimension assessed the experimental class obtained superior scores compared to the control class.

It can be concluded that RADEC learning can build students' creative spirit assisted by the understanding that students have built themselves based on the stages that have been implemented (H. Lestari et al., 2022; Utsman et al., 2022). Meanwhile, the conventional learning model cannot optimally build students' creative spirit, even though conventional learning only focuses on providing material by the teacher and minimal modification by giving project assignments, it can be interpreted that students with knowledge that only focuses on the teacher alone cannot fully develop the appropriate creative spirit. with predetermined criteria.

Concept Understanding

Concept understanding is demonstrated when students can express, mention characteristics, provide examples and non-examples and apply a concept (Nuriya et al., 2023). Analysis of the results of students' conceptual understanding aims to identify changes and variations in students' conceptual understanding after implementing treatment by the RADEC learning model in the experimental class and the conventional learning model in the control class. The research data that will be described will be the results of prerequisite tests and parametric tests and research result data. To provide more in-depth information, data on students' conceptual understanding will be described obtained from students' pretest and posttest scores. The prerequisite test results are in the form of normality tests and homogeneity tests. The normality test is shown in Table 5.

Table 5. Normality Test

Normality Test	Saphiro Wilk			a=	Conclusion
	Statistic	df	Sig.	0.05	
Pre-test Experimental (RADEC)	0.960	18	0.604	0.05	Normal
Post-test Experimental (RADEC)	0.950	18	0.423	0.05	Normal
Pre-test Control (Konventional)	0.958	17	0.591	0.05	Normal
Post-test Control (Konventional)	0.980	17	0.956	0.05	Normal

The Table 5 depicts the normality test results of students' conceptual understanding in the experimental class who were treated with the RADEC learning model and the control class used the conventional learning model. The probability value (sig) for the experimental class at pretest was 0.604 and posttest 0.423. Meanwhile, for the control class, the pretest probability value was 0.591 and posttest 0.956. All the resulting probability values show that the probability value is greater than the value a (0.05). It can be concluded that both classes, both pretest and posttest, come from normally distributed data. The next prerequisite test is the homogeneity test, the results of this test are shown in table 6.

Table 6. Homogeneity Test

Homogeneity Test	Levene Statistic	df1	df2	Sig
Pemahaman Konsep	.677	1	33	0.417

The table describes the homogeneity test results of the creativity results of experimental and control class students. The results show that the probability value is 0.417 (>0.05). In this case, indicating that the data is homogeneous, this indicates that the variability between classes has a sufficient level of uniformity. Because the data is normally distributed and homogeneous, a t-test was carried out to see the average difference in conceptual understanding results from both the experimental class and the control class.

Table 7. T test

Data	Pre-test		Post-test	
	Exp	Cont	Exp	Cont
Paired Sample Test (Sig)		0.624		0.000

Based on Table 7, it shows that the results of the t-test on the initial abilities of the experimental and control classes have a probability value of 0.624 (>0.05), this shows that the initial abilities of the experimental and control classes have no significant differences or are relatively the same. Meanwhile, the probability value in the experimental and control post-tests has a probability value of 0.000 (<0.05). Therefore, it can be explained that students' conceptual understanding in the experimental class and control class is significantly different or not the same. Next, the results of the pretest and posttest scores that have been obtained based on students' concept

understanding tests will be presented which can be seen in Figure 4.

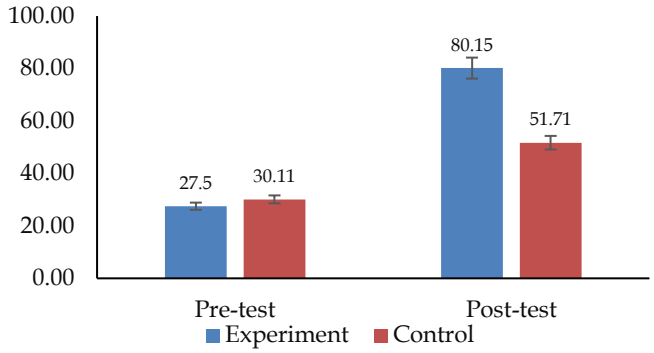

Figure 4. Graphic mapping of average concept understanding scores

Figure 4 shows the results of the overall average description of the concept understanding indicators in the experimental class and control class. The results of data analysis show that the experimental class given the RADEC learning model had a high final average score compared to the control class given the conventional learning model. Additional findings in this study reflect the diversity of students' answers in the experimental class when taking the posttest exam. Student responses show variations that are not always focused on the material presented by the teacher in class. This diversity may arise from their knowledge exploration activities through various sources previously at the "Read" stage, thus opening up opportunities for different points of view. This indicates that students have the ability to think creatively based on developing the mindset that each student has (Amalia, 2017; Yasiro et al., 2021).

The difference in students' conceptual understanding between the experimental class and the control class, which is based on indicators of conceptual understanding, is depicted in Figure 5**.**

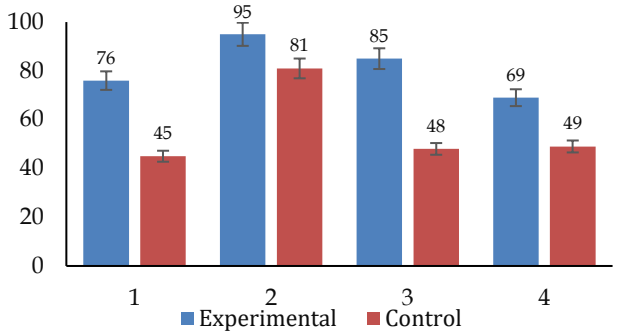

Figure 5. Graphic mapping of average score of concept understanding indicators

Based on Figure 5, the RADEC learning model, which was implemented in the experimental class, showed superiority in understanding concepts compared to the conventional model applied in the control class. This can be seen from the score of the first indicator, where the experimental class students were able to restate the concept with a score of 76, while the control class only achieved 45. The second indicator shows further differences, the experimental class was able to state the characteristics of the concept with a score of 95, while the control class only reached 81. The third indicator emphasizes the ability to provide examples and non-examples, and in this case, the experimental class achieved a score of 85, while the control class only scored 48.

In the last indicator, the RADEC model also succeeded in achieving better results but was not yet fully maximized. a score of 69, while the control class only achieved 49. These results indicate that the application of the RADEC model significantly increases students' conceptual understanding compared to the conventional model in the control class. The average amount of increase in students' understanding of concepts is determined by Normalize Gain (N-Gain). You can see the N-Gain obtained in the experimental and control classes in Table 8.

Table 8. N-Gain

Class	N	Average	Category
Experimental	18	0.72	High
Control	17	0.31	Medium

Table 8 shows the n-gain results in the experimental class which applied the RADEC learning model showing a significant increase with a value of 0.72. Meanwhile, the control class that applied the conventional learning model showed an n-gain of 0.31. The high N-Gain value in the experimental class indicates that the RADEC learning model is effective in developing students' conceptual understanding compared to conventional learning models. In this context, the low N-Gain results in the control class indicate that conventional learning models do not provide comparable improvements. This supports the implication that the RADEC learning model can be a more effective approach in facilitating the development of students' conceptual understanding compared to conventional learning models.

The RADEC learning model is able to develop students' conceptual understanding because the learning phase begins by providing pre-learning questions the day before students will study human growth material. Followed by the "Read" stage, namely the stage of reading reading sources obtained by students by using the internet or books and referring to pre-learning questions. Next, they enter the "Answer" phase, students answer pre-learning questions with answers obtained from the reading phase. After that, proceed to the "Discuss" phase, namely the discussion

stage between group members to work on the student worksheet that has been given by the teacher. The fourth phase is "Explain" this is the stage of explaining the results of discussions held with group members as well as presenting the results of the group's work.

The teacher guides students representing each group to prepare a presentation about the material that has been discussed. At this stage, the teacher verifies the presentation of the material and ensures that other students can understand the explanation given by the representative student. Apart from that, the teacher also encourages other students to actively ask questions, provide rebuttals, or add information according to their understanding and the teacher also concludes what has been discussed during class learning. Next, in the final phase, namely "Create", students are asked to work on creativity challenges. Starting with stimulating idea generation by implementing the knowledge they have gained during learning in various forms. Through the steps of the RADEC model, students are asked to be active because they are involved in activities to independently search for information, provide varied answers, express opinions, ask questions, solve problems and create work to increase their creativity (Nurliana & Sukmawati, 2023; Suryana et al., 2021).

Based on the presentation of research results on both students' creativity and understanding of concepts, it is proven that RADEC has a positive role in developing these two things. When student creativity is high, learning outcomes tend to be good because creativity acts as an element of high-level thinking (A. Lestari & Suhandi, 2020).

Conclusion

Based on the results of research that has been carried out, it can be concluded that the RADEC learning model has a positive role in developing class V students' creativity and understanding of concepts in human growth material.

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Author Contributions
All authors in this research contributed actively. Tias Siti Nurafifah is responsible as a writer and researcher who is directly involved in the field. Meanwhile, the role of Atep Sujana and Ani Nur Aeni is to provide input and make corrections to the preparation of research results. All authors worked together to structure this assignment with their respective roles focusing on their unique contributions to the research.

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Conflicts of Interest
This research does not involve the interests of any party. This research is fully intended to help complete a final assignment in the world of education.

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