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The Effect of the RADEC Model on Mathematical Creative Thinking Skills in Phase C at Elementary School

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Abstract: *This study addresses the low mathematical creative thinking skills among elementary school students, consistent with international assessments like TIMSS and PISA, often attributed to conventional teaching methods that inhibit creativity. The research aims to investigate the influence of the RADEC (Read, Answer, Discuss, Explain, Create) learning model on elementary school students' mathematical creative thinking abilities. Employing a quantitative quasi-experimental design with a one-group pre-test-post-test approach, the study involved fifth-grade students from a primary school in Garut Regency in May 2025, selected via cluster random sampling. Data were collected using descriptive tests administered before and after the intervention. Statistical analysis, including descriptive statistics and paired-samples t-tests, was performed using IBM SPSS Statistics 29. Results indicate that the RADEC model significantly improved students' mathematical creative thinking skills, evidenced by an increase in mean scores from 37.12 (pre-test) to 59.00 (post-test), a difference of 21.88 points, and a t-test significance of $p < 0.001$. The high effect sizes (Cohen's $d = 2.520$ and Hedge's correction = 2.481) further underscore this impact. It is concluded that the RADEC model is effective in enhancing mathematical creative thinking skills in elementary students, positioning it as a robust pedagogical tool for fostering 21st-century competencies.*

Keywords: *RADEC Model, Creative Thinking, Mathematics, Elementary*.

Introduction

Amidst the ever-evolving dynamics of the 21st century, creative thinking skills have become a crucial skill, essential for individuals to adapt and contribute effectively to society, playing a significant role in problem-solving and driving innovation (Ratnawulan et al., 2024; Susiloningsih et al., 2022). The need for these skills is increasingly pressing to address the ever-evolving and changing challenges of the future, as well as future challenges that may yet be identified (Susiloningsih et al., 2022).

Creative thinking skills can be developed, among other things, through mathematics learning in schools (Sanidah & Sumartini, 2022). Mathematical creative thinking skills play a crucial role in problem-solving for students because they incorporate concepts and strategies that will be used in solving a problem (Sari & Afriansyah, 2022). In mathematics learning, this ability enables students to generate new and original solutions to problems and view problems from different perspectives (Hanifah et al., 2024; Nurhanifah, 2022). Furthermore, this ability empowers individuals to become more independent, critically evaluate information, and formulate effective solutions (Haile G, 2023).

Creative thinking skills are essential for students because science and technology are currently developing rapidly, allowing anyone to quickly and easily obtain abundant information from various sources and locations (Rahayu et al., 2022). Without these skills, students will be unable to process, evaluate, and retrieve the information they need to face

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various challenges (Sumartini, 2022). Therefore, creative thinking is a crucial skill that every student must possess.

However, the ability to think creatively in mathematics is still relatively low, this is in line with the results of international studies such as TIMSS showing that the average ability to think creatively in mathematics of Indonesian students is still relatively low compared to other countries, so there is a need for innovative efforts in the mathematics learning process (Sitepu & Amidi, 2024). Furthermore, from the results of the Programme for International Student Assessment (PISA) research, the creative thinking skills of students in Indonesia are relatively low, namely in the 2015 International Mathematics and Science competition, students' creative thinking skills were ranked 63 out of 72 countries participating in the competition (Handayani et al., 2018). From this description, one of the skills that must be developed to meet the objectives of mathematics learning is creative thinking (Aripin & Purwasih, 2017).

Students' low mathematical creative thinking skills are often caused by learning approaches that are still conventional and focus on memorizing formulas or standard procedures. In line with the opinion of (Marfilinda et al., 2025), learning methods that are still dominated by lectures and the lack of utilization of the environment as a learning resource further hamper the development of student creativity. This results in students being less trained in developing new ideas and choosing creative problem-solving strategies (Hanifah et al., 2024; Nurhanifah, 2022). Research shows that students with high mathematical abilities are able to carry out all three indicators of creative thinking, while students with medium and low abilities tend to only be able to fulfill one or two indicators (Hanifah et al., 2024). Therefore, a learning model is needed that can stimulate and train mathematical creative thinking skills optimally.

One of the learning models that can be applied by educators is the RADEC learning model. According to Sopandi (Sopandi et al., 2023), the RADEC learning model is based on the following points. First, the goal of national education is to develop various potentials of students to become people who believe in and fear God Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens. The use of this learning model requires students to be more active in the learning process so that learning becomes more meaningful. Educators need an alternative model that is easy to implement, such as the RADEC model, which stands for Read, Answer, Discuss, Explain, Create. There are several factors that support the implementation of this RADEC model, namely 1) the steps are in accordance with the name so that they are easy to

remember and understand. 2) In accordance with current learning where students must develop various skills, one of which is creative thinking skills.

The application of the RADEC model in mathematics learning in several elementary schools shows a significant increase in students' mathematical creative thinking abilities, both in terms of fluency, flexibility, and originality in solving mathematical problems (Ramadani et al., 2024). The results of an experimental study at MIN 4 Medan City, for example, showed that the class using the RADEC model obtained statistically higher mathematical creative thinking ability test results than the class using the conventional model (t-value 6.327 > t-table 2.0075; significance 0.174 < 0.05) (Ramadani et al., 2024). Similar findings were also obtained in a study at SDN 194 Pekanbaru, where the average mathematics learning outcomes and creativity of students in the experimental class were higher than those in the control class.

Furthermore, the RADEC model not only improves mathematics learning outcomes but also builds students' self-confidence and independent thinking. The learning process, which involves reading, answering, discussing, explaining, and creating, encourages students to actively explore ideas, test various alternative solutions, and communicate their thoughts creatively.

Overall, the RADEC model is explicitly designed to foster Higher-Order Thinking Skills (HOTS), a category of cognitive abilities that includes creative thinking, and research shows that RADEC is effective in enhancing HOTS (Rohmatillah et al., 2024; Tulljanah & Amini, 2021). This aligns with the broader goal of developing 21st-century skills, positioning RADEC as a valuable pedagogical tool for modern education (UNESCO, 2021; Haile G, 2023). Therefore, this study aims to determine the effect of the RADEC learning model on elementary school students' mathematical creative thinking skills. The benefit of this study is to provide a deeper understanding of the RADEC model's potential in improving the quality of learning and preparing elementary school students with essential skills for the future.

Research Methods

This study uses a quantitative approach by selecting a quasi-experimental design method (Creswell & Creswell, 2018). The experimental design used in this study is a pre-experimental design: one group pre-test-post-test, with two main variables, namely the RADEC Model (X) as the independent variable, and mathematical creative thinking ability (Y) as the dependent variable. This study was conducted in one of the elementary schools in Garut Regency in May 2025. The subjects in this study were fifth-grade students, the sampling method applied was clustered random sampling. This sampling technique is a procedure in

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which the group as a whole, not individuals, is selected randomly. The researcher chose class V A as the subject. Class determination was also based on learning outcome data from the previous semester.

In this study, the instrument used was a test. The type of test used was a descriptive test administered before treatment (pre-test) and after treatment (post-test). Before students underwent the scientific literacy skills test using the test, the research instrument development stage involved a series of processes to ensure the quality and validity of the test items.

The data analysis techniques in this study are descriptive analysis and inferential statistical analysis. The descriptive analysis conducted in this study was processed with the help of IBM SPSS Statistics 29 software, and the data analyzed were pre-test and post-test data. The values sought in statistical tests include the average, standard deviation, minimum value, and maximum value. Meanwhile, inferential analysis was conducted using a paired sample t-test. The analysis process began by analyzing the pre-test, post-test in mathematical creative thinking ability using the RADEC model. The inferential statistical analysis process was processed with the help of IBM SPSS Statistics 29 software with the assumption that the distribution of pre-test, post-test, and mathematical creative thinking ability population scores was normal and the population variance was the same (Creswell & Creswell, 2018).

Results and Discussion

The results of descriptive research show that learning using the RADEC learning model has a significant impact on students' mathematical creative thinking abilities. This is indicated by the difference in the average value of mathematical creative thinking abilities between students taught using the RADEC learning model and students who learned before using the RADEC learning model, with a difference of 21.88. The average value of students taught using the RADEC learning model is higher, as explained in Table 1. Therefore, it can be concluded that the mathematical creative thinking skills of students taught using the RADEC learning model are better than the mathematical creative thinking skills of students taught before using the RADEC learning model. For the results of the hypothesis test analysis using the paired sample t test are presented in Table 2.

Tabel 1. Hasil Analisis Deskriptif

Treatment	N	*Minimum*	*Maximum*	*Mean*	*Standar Deviation*
Pretest	25	20	59	37.12	12.634
Posttest	25	27	100	59.00	17.616
Valid N (*listwise*)	25				

Tabel 2. Hasil Analisis uji Paired Samples Correlations

	N	*Correlation*	*significance One-side p*	*Two-side p*
Pretest & posttest	25	.589	<.001	<.001

From the Paired Sample Correlation output, it shows a relationship between the pre-test and post-test scores of students' mathematical creative thinking abilities, with a correlation value of 0.589 and a significant level of <0.001. where this value is smaller than the value of α = 0.05. This means that there is a significant positive relationship between the pre-test and post-test mathematical creative thinking abilities of students who learn with the RADEC model. In addition, from the coefficient value (r2 = 0.589) the determination coefficient can be determined as r2 = (0.589)2 = 0.3469 which means that 34% of the posttest score is determined by the pretest score.

Then, from the Paired Sample Test output, it turns out that the sig value is <0.001. This value is smaller than α = 0.05, which means that the hypothesis stating that RADEC learning has a significant effect on the acquisition of students' mathematical creative thinking skills is accepted. This is presented in Table 3.

Tabel 3. Hasil Analisis uji Paired Samples Test

	Paired Differences							*significance*	
				95% Condifidence Interval of the Difference					
	Mean	*Std. Deviation*	*Std. Error Mean*	*Lower*	*Upper*	*T*	*df*	*One-Sided p*	*Two-Sided p*
Pretest & posttest	-46.560	18.477	2.613	-51.811	-41.309	-17.818	24	<,001	<,001

The Paired Sample Effect Size shows a Cohen's estimated value of 2.520 and a Hedge's correlation of 2.481, where this value is more than 0.8. Therefore, the effect of RADEC learning on students' mathematical creative thinking skills is in the high category according to Cohen et al.'s (2018) criteria. This is presented in Table 4.

Tabel 4. Hasil Analisis uji Paired Samples Effect Sizes

		standardizer[a]	*Point Estimate*	*95% Confidence Interval Lower*	*Upper*
Pretest & posttest	Cohen's d	18.477	-2.520	-3.086	-1.947

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	Hedges' correction	18.766	-2.481	-3.038	-1.917

The results of the study indicate that the implementation of RADEC significantly impacts students' mathematical creative thinking skills. This is inseparable from the way the learning is prepared. The RADEC learning process is the main focus in learning activities, taking into account the needs and characteristics of students. Furthermore, the learning process using the RADEC model creates a more engaging learning process, considering that the use of the learning model takes into account the needs and characteristics of students in learning.

This study shows that there is an increase in the average value of mathematical creative thinking ability from 37.12 (pre-test) to 59.00 (post-test) with a difference of 21.88 points, and the results of the paired sample t-test show a significant correlation with a p value < 0.001. These results indicate that RADEC effectively improves students' understanding and creative thinking skills.

These findings align with previous studies examining the effectiveness of the RADEC model in improving higher-order thinking skills (HOTS), of which creative thinking is a key component (Pratama et al., 2019; Rohmatillah et al., 2024; Tulljanah & Amini, 2021). The RADEC model, with its Read, Answer, Discuss, Explain, and Create stages, systematically encourages students to actively engage in the learning process, which is key to developing 21st-century skills (Sopandi et al., 2021; Yulianti et al., 2023).

Specifically, the results of this study are supported by a study (Ramadani et al., 2024) that found a significant increase in students' mathematical creative thinking skills at MIN 4 Medan City after implementing the RADEC model. The study also reported that classes using RADEC achieved statistically higher test scores than conventional classes, similar to the improvements observed in this study. Similarly, a study at SDN 194 Pekanbaru showed higher mathematics learning outcomes and student creativity in experimental classes using RADEC (Ramadhani et al., 2023).

The effectiveness of RADEC in fostering creativity can be explained through the mechanisms of each stage. The Read and Answer stages build a foundation of knowledge and spark initial ideas, which are essential for fluent thinking (Iwanda et al., 2022; Rohmatillah et al., 2024). The Discuss stage is crucial because it facilitates collaboration, exposure to multiple perspectives, and discussion of ideas in a low-stakes environment, thereby directly increasing the flexibility and elaboration of ideas (Setiawan et al., 2022). This aligns with findings that social interaction and collaboration can expand reasoning skills and encourage

creative-productive thinking (Berestova et al., 2021; Suryanto et al., 2021). The Explain stage then refines students' elaboration skills by forcing them to clarify and elaborate on their understanding (Daley & Rawson, 2019; Tulljanah & Amini, 2021). The culmination of this model, the Create stage, is the most direct path to fostering originality and elaboration, where students produce unique products or solutions that synthesize their knowledge. The project-based approach integrated into the Create stage has been empirically proven to enhance student creativity (Nurdin & Wahyudin, 2020; Ratnawulan et al., 2024).

This significant improvement also indicates that the RADEC model successfully overcomes the limitations of conventional learning that often hinder the development of student creativity, as expressed by (Marfilinda et al., 2025). By encouraging the exploration of ideas, testing various alternative solutions, and communicating creatively the results of thinking, RADEC not only improves learning outcomes but also builds students' self-confidence and independent thinking (Ramadani et al., 2024). This is highly relevant considering the low mathematical creative thinking abilities of Indonesian students in international studies such as TIMSS and PISA (Handayani et al., 2018; Sitepu & Amidi, 2024), emphasizing the urgency of implementing innovative models such as RADEC.

Overall, the findings of this study strengthen empirical evidence regarding the effectiveness of the RADEC learning model in improving elementary school students' mathematical creative thinking skills. Its student-centered learning design, structured stages, and emphasis on HOTS make RADEC a powerful pedagogical tool for preparing students for the demands of 21st-century skills.

Conclusions and Recommendations

There is a significant influence of the application of the RADEC model on students' mathematical creative thinking abilities in fifth grade mathematics learning. It is concluded that the RADEC model can improve mathematical creative thinking abilities in fifth grade elementary school students.

Based on the research results, research conclusions, the recommendations that can be considered for further research on mathematical creative thinking abilities are that further researchers can consider applying the same learning, namely the RADEC model, by paying attention to the advantages and disadvantages of the model, in addition, researchers can also try to develop or combine other learning models to see their effectiveness in improving students' mathematical creative thinking abilities. Then RADEC learning can be applied to measure mathematical creative thinking abilities on different mathematical materials. This will

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provide a more comprehensive understanding of the effectiveness of learning models in improving students' mathematical creative thinking abilities on various mathematical topics.

REFERENCES

Aripin, U., & Purwasih, R. (2017). Penerapan Pembelajaran Berbasis Alternative Solutions Worksheet Untuk Meningkatkan Kemampuan Berpikir Kreatif. *AKSIOMA: Jurnal Program Studi Pendidikan Matematika*, *6*(2), 225. https://doi.org/10.24127/ajpm.v6i2.989

Berestova, A., Ermakov, D., Aitbayeva, A., Gromov, E., & Vanina, E. (2021). Social networks to improve the creative thinking of students: How does it works? *Thinking Skills and Creativity*, *41*(June), 100912. https://doi.org/10.1016/j.tsc.2021.100912

Creswell, J. W., & Creswell, J. D. (2018). Research Design Qualitative, Quantitative, and Mixed methodes Approaches. In *Writing Center Talk over Time*. https://doi.org/10.4324/9780429469237-3

Daley, N., & Rawson, K. A. (2019). Elaborations in Expository Text Impose a Substantial Time Cost but Do Not Enhance Learning. *Educational Psychology Review*, *31*(1), 197–222. https://doi.org/10.1007/s10648-018-9451-9

Haile G, A. M. and E. A. (2023). EFEKTIVITAS MODEL PEMBELAJARAN INKUIRI DALAM MENINGKATKAN KETERAMPILAN BERPIKIR KRITIS SISWA PADA MATA PELAJARAN IPS DI SEKOLAH DASAR Oleh. *วารสารวิชาการมหาวิทยาลัยอีสเทิร์นเอเชีย*, *4*(1), 88–100.

Handayani, U. F., Sa'dijah, C., & Susanto, H. (2018). Analisis Kemampuan Berpikir Kreatif Matematis Siswa SMP Dalam Menyelesaikan Soal Adopsi 'PISA.' *Jurnal Math Educator Nusantara: Wahana Publikasi Karya Tulis Ilmiah Di Bidang Pendidikan Matematika*, *4*(2), 143. https://doi.org/10.29407/jmen.v4i2.12109

Hanifah, N. N., Sari, C. K., Kholid, M. N., & Faiziyah, N. (2024). Kemampuan Berpikir Kreatif Matematis Siswa dalam Memecahkan Masalah Segitiga dan Segiempat. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *8*(1), 827–840. https://doi.org/10.31004/cendekia.v8i1.2532

Iwanda, C. N. S., Malika, H. N., & Aqshadigrama, M. (2022). RADEC sebagai Inovasi Model Pembelajaran Pendidikan Agama Islam Pasca Pandemi Covid-19 di Sekolah Dasar. *Jurnal Ilmiah Wahana Pendidikan, Desember*, *8*(24), 430–440. https://doi.org/10.5281/zenodo.7494585

Marfilinda, R., Nissa, A., Tulljanah, R., Rossa, R., Zuleni, E., & Mulia, W. (2025). *Pengaruh Model Pembelajaran Inkuiri terhadap Kreativitas Belajar Peserta Didik pada Pembelajaran IPA Sekolah Dasar*. *1398*(1), 34–42.

Nurdin, E. A., & Wahyudin. (2020). The Implementation of Project Based Learning to Improve Student Creativity and Learning Outcomes. *Proceedings of the 7th Mathematics, Science, and Computer Science Education International Seminar, MSCEIS 2019*, 1–5. https://doi.org/10.4108/eai.12-10-2019.2296340

Nurhanifah, N. (2022). Kemampuan berpikir kreatif matematis siswa kelas viii smp pada materi geometri. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *1*(2), 161–172. https://doi.org/10.31980/powermathedu.v1i2.2228

Pratama, Y. A., Sopandi, W., & Hidayah, Y. (2019). Model Pembelajaran Radec (Read-

Answer-Discuss-Explain And Create): Pentingnya Membangun Keterampilan Berpikir Kritis Dalam Konteks Keindonesiaan. *Indonesian Journal of Learning Education and Counseling*, *2*(1), 1–8. https://doi.org/10.31960/ijolec.v2i1.99

Rahayu, N. S., Liddini, U. H., & Maarif, S. (2022). Berpikir Kreatif Matematis: Sebuah Pemetaan Literatur dengan Analisis Bibliometri Menggunakan Vos Viewer. *Mosharafa: Jurnal Pendidikan Matematika*, *11*(2), 179–190. https://doi.org/10.31980/mosharafa.v11i2.697

Ramadani, S., Nur, L., & Siregar, K. (2024). *Pengaruh model pembelajaran RADEC (Read , Answer , Discuss Explain , Create) terhadap kemampuan berpikir kreatif peserta didik pada mata pelajaran matematika di madrasah ibtidaiyah negeri*. *10*(1), 730–736.

Ramadhani, K., Witri, G., & Fendrik, M. (2023). Pengaruh Model Pembelajaran Radec (Read, Answer, Discussion, Explaining and Create) Terhadap Hasil Belajar Matematika Siswa Kelas V Sdn 194 Pekanbaru. *Journal of Primary Education*, *6*(2), 190–199.

Ratnawulan, T., Wahyu, A., Suprayoga, H., Sukarna, H. R., & Yoseptry, R. (2024). Implementasi Pembelajaran Berbasis Proyek dalam Meningkatkan Kreativitas Belajar Peserta Didik di SMAN 14 Bandung. *Jurnal Pendidikan Dan Kewirausahaan*, *12*(2), 475–492. https://doi.org/10.47668/pkwu.v12i2.1172

Rohmatillah, N., Maspiroh, I., & Pujiastuti, P. (2024). *Implementation of RADEC Model for Improving Higher Order Thinking Skill (HOTS) in Science Learning at Elementary Schools*. *1*(5), 46–54.

Sanidah, S., & Sumartini, T. S. (2022). Kesulitan siswa kelas viii dalam menyelesaikan soal cerita spldv dengan menggunakan langkah polya di desa cihikeu. *Jurnal Inovasi Pembelajaran Matematika: PowerMathEdu*, *1*(1), 15–26. https://doi.org/10.31980/powermathedu.v1i1.1912

Sari, R. F., & Afriansyah, E. A. (2022). Kemampuan Berpikir Kreatif Matematis dan Belief Siswa pada Materi Persamaan dan Pertidaksamaan Linear. *Plusminus: Jurnal Pendidikan Matematika*, *2*(2), 275–288. https://doi.org/10.31980/plusminus.v2i2.1104

Setiawan, T. Y., Destrinelli, D., & Wulandari, B. A. (2022). Keterampilan Berfikir Kritis Pada Pembelajaran IPA Menggunakan Model Pembelajaran Radec di Sekolah Dasar : Systematic Literature Review. *Justek : Jurnal Sains Dan Teknologi*, *5*(2), 133. https://doi.org/10.31764/justek.v5i2.11421

Sitepu, C. P. B., & Amidi, A. (2024). Studi Literatur: Kemampuan Berpikir Kreatif Matematis Ditinjau dari Gaya Belajar Kolb Siswa dalam Model Pembelajaran Creative Problem Solving (CPS). *PRISMA, Prosiding Seminar Nasional …*, *7*, 129–136. https://proceeding.unnes.ac.id/prisma/article/view/2945%0Ahttps://proceeding.unnes.ac.id/prisma/article/download/2945/2406

Sopandi, W., Sukardi, R. R., & Riandi, R. (2021). Repackaging RADEC learning model into the online mode in science class. *Journal of Physics: Conference Series*, *1806*(1). https://doi.org/10.1088/1742-6596/1806/1/012142

Sopandi, W., Sutantri, N., Wahyu, W., & Latip, A. (2023). *MODEL PEMBELAJARAN RADEC (READ, ANSWER, DISCUSS, EXPLAIN, AND CREATE) DITINJAU DARI PERSPEKTIF PEMBENTUKAN PROFIL PELAJAR PANCASILA Nursida*. *7*(2), 254–269.

Sumartini, T. S. (2022). Pengaruh Habit of Mind terhadap Kemampuan Berpikir Kreatif Matematis melalui Metode Pembelajaran Improve. *Mosharafa: Jurnal Pendidikan Matematika*, *11*(1), 167–178. https://doi.org/10.31980/mosharafa.v11i1.696

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p-ISSN: 2829-0976

Suryanto, H., Degeng, I. N. S., Djatmika, E. T., & Kuswandi, D. (2021). The effect of creative problem solving with the intervention social skills on the performance of creative tasks. *Creativity Studies*, *14*(2), 323–335. https://doi.org/10.3846/cs.2021.12364

Susiloningsih, W., Hanim Faizah, & Eko Sugandi. (2022). Profil Berpikir Kreatif Siswa pada Mata Pelajaran Matematika SD Kelas 4. *Inventa*, *6*(1), 65–69. https://doi.org/10.36456/inventa.6.1.a4955

Tulljanah, R., & Amini, R. (2021). *Model Pembelajaran RADEC sebagai Alternatif dalam Meningkatkan Higher Order Thinking Skill pada Pembelajaran IPA di Sekolah Dasar: Systematic Review*. *5*(6), 5508–5519.

Yulianti, M. T. (2023). Pengaruh Model Pembelajaran Radec Terhadap. *Jurnal Cakrawala Pendas*,