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# RADEC vs PjBL: Adding make-a-match media to enhance students' creative thinking skills

Khaerunnisa Khaerunnisa[1], Nanang Rahman[1,*], Haifaturrahmah Haifaturrahmah [1], Emese K. Nagy[2]

[1]Universitas Muhamadiyah Mataram, Indonesia
[2]University of Miskolc, Hungary

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**Abstract:** This study focuses on the comparative analysis of the effectiveness of the Read, Answer, Discuss, Explain, and Create (RADEC) and the Project-Based Learning (PjBL) models equipped with make-a-match media on the creative thinking skills of elementary school students. This study used a quasi-experimental research design with a pre-test and post-test group design. The research sample consisted of 52 fifth-grade students divided into two classes, each consisting of 26 students. Data were collected using a test. The paired t-test was used to calculate data, and N-gain calculations were used to measure the level of effectiveness. The results showed that both groups using the RADEC model (sig. = 0.001 <0.05) and PjBL (sig. 0.000 <0.05) demonstrated an effect on improving students' creative thinking skills before and after learning. However, the N-gain value indicates that RADEC reached 12.19% (ineffective category) with a mean post-test of 59.85, while PjBL reached 45.3% (less effective) with a mean post-test of 70.12. The findings indicate that PjBL with make-a-match media is more effective in improving students' creative thinking skills than RADEC with make-a-match media. Although the RADEC model also contributes to developing students' thinking skills, its impact on creativity is not as great as the PjBL model. This study provides valuable insights for educators and policymakers by highlighting the effectiveness of this learning approach. It suggests applying the PjBL model to develop students' creative potential further.

**Keywords:** Creative thinking, make-a-match media, science learning

**Abstrak:** Penelitian ini berfokus pada analisis perbandingan efektivitas model *Read, Answer, Discuss, Explain, and Create* (RADEC) dan *Project-Based Learning* (PjBL) yang dilengkapi media *make-a-match* terhadap keterampilan berpikir kreatif siswa sekolah dasar. Penelitian ini menggunakan desain penelitian quasi eksperimen *dengan pre-test and post-test group design*. Sampel penelitian sebanyak 52 siswa kelas V yang dibagi dalam dua kelas yang masing-masing kelas terdiri dari 26 siswa. Pengumpulan data dilakukan dengan menggunakan tes. Perhitungan data menggunakan uji-t berpasangan dan perhitungan N-gain untuk mengukur tingkat efektivitas. Hasil penelitian menunjukkan bahwa kedua kelompok yang menggunakan model RADEC (sig. = 0,001 < 0,05) dan PjBL (sig. 0,000 < 0,05) menunjukkan adanya pengaruh terhadap peningkatan keterampilan berpikir kreatif siswa sebelum dan sesudah pembelajaran. Namun, nilai N-gain menunjukkan bahwa RADEC mencapai 12,19% (kategori tidak efektif) dengan rata-rata *post-test* 59,85, sedangkan PjBL mencapai 45,3% (kurang efektif) dengan rata-rata *post-test* 70,12. Temuan tersebut menunjukkan bahwa PjBL dengan media make-a-match lebih efektif dalam meningkatkan keterampilan berpikir kreatif siswa daripada RADEC dengan media *make-a-match*. Meskipun model RADEC juga berkontribusi untuk mengembangkan keterampilan berpikir siswa, dampaknya terhadap kreativitas tidak sebesar model PjBL. Studi ini memberikan wawasan berharga bagi para pendidik dan pembuat kebijakan dengan menyoroti efektivitas pendekatan pembelajaran ini. Studi ini menyarankan penerapan model PjBL untuk lebih mengembangkan potensi kreatif siswa.

**Kata kunci:** Berpikir kreatif, media *make-a-match*, pembelajaran IPA



*Corresponding author: nangrhm87@gmail.com

## INTRODUCTION

The changing times demand a shift in paradigms, particularly in education, to enhance the quality of human resources. This reflects efforts to holistically develop human potential, encompassing physical, creative, and initiative aspects, to enable individuals to function effectively in life (Novitasari & Fathoni, 2022). Creative thinking skills represent a critical component in education as they equip students to navigate challenges and solve problems with greater flexibility, innovation, and adaptability (Lasari et al., 2023). Emphasizing and fostering creative thinking skills in students is essential to help them effectively address diverse challenges (Erisa et al., 2021). Previous research findings indicate that students' creative thinking skills remain relatively low (Rahman et al., 2023).

The lack of interactive learning models often leads to student boredom, which ultimately hinders their understanding of the material being taught. Therefore, educators must cultivate a more stimulating educational atmosphere to augment student engagement in the learning (Mardin & Zainil, 2019; Munir et al., 2018; Saputra et al., 2024; Syauqi et.al 2024). According to Wanggi et al. (2023) one effective strategy to increase student learning activity is the use of learning models. A learning model is a creative approach designed by teachers before the lesson, serving as a guide for the learning activities. This model can help prevent student boredom caused by monotonous teaching methods. To achieve an optimal learning environment, the efficacy of instruction is intricately connected to the application of the most suitable learning (Haifaturrahmah et al., 2020). The RADEC (Read, Answer, Discuss, Explain, and Create) learning is one alternative approach that can serve as a solution to the educational challenges in Indonesia.

The RADEC learning is a student-centered approach that involves a series of activities aimed at comprehending concepts, problem-solving, collaborating, and generating ideas or products. This model responds to the demands of 21st-century skills, where learners are expected to possess the 4Cs: critical thinking and problem-solving, communication, creativity, and collaborative skills (Pohan et al., 2021). The use of learning models motivates students to participate more actively in their educational lessons; meaningful learning experiences can be carried out. Teachers require alternative learning that is easy to implement, such as the RADEC learning (Nurjannah et al., 2023). Suryana et al. (2021) investigated the creative thinking abilities of students using the RADEC instructional model and concluded that initially, students' creative thinking abilities were at a moderate level. The findings suggested that learning through the implementation of the RADEC learning is effective in enhancing students' creativity (Pebriansah et al., 2023; Pratama et al., 2019; Wandani et al., 2020).

On the other hand, the PjBL model has emerged as a notable educational approach in the 21st century and can be applied in natural science education to enhance students' creativity, particularly in product creation as part of the learning activities. Students are the primary focus of the PjBL model during the learning (Mokambu, 2021; Novitasari et al., 2024). Teacher-centered approaches are less effective in fostering the students' creative thinking skills. In response to this issue, the author aims to address the challenge of students' difficulty in thinking creatively by implementing the PjBL learning model (Sari et al., 2019). The structure of PjBL includes steps such as: (1) presenting the problem, (2) creating a plan, (3) establishing a schedule, (4) monitoring project implementation, (5) conducting assessments, and (6) evaluation (Banawi, 2019). In addition, within the PjBL

model, teachers pose questions to students, design projects with groups, set schedules, monitor the project creation process, and assess and evaluate the learning in the classroom (Yamin et al., 2020). During the learning, students should be encouraged to reflect on the projects they have created to ensure that the relationships between the objects built are coherent. The more variations in relationships that students generate, the higher their creative thinking abilities. Choosing the appropriate learning model can create motivation in the learning. To support these models, the use of learning media becomes crucial in teaching activities.

The use of media in education is one alternative for teachers to assist and facilitate students in comprehending and learning the material being taught (Arnandi et al., 2022). Dewimarni et al. (2022) suggest that learning media are any tools that can be used to convey messages to achieve learning objectives. One type of media that can enhance students' creative thinking abilities is make-a-match. This media involves the activity of matching cards containing questions and answers, which encourages students to think creatively (Fathurrahmaniah et al., 2024; Nurfiati et al., 2020; Yuliawati et al., 2020). Through this activity, students are encouraged to develop new ideas and find creative solutions through group discussions (Nugraha et al., 2023). In general, students have the potential to think creatively during the learning process, such as generating innovative ideas, exploring various possibilities, developing new solutions, and presenting ideas in unique ways (Khirana & Metroyadi, 2024). Creative thinking abilities help students solve learning-related problems in more imaginative and flexible ways. Creative thinking also involves curiosity and the ability to generate innovative ideas to achieve a deeper understanding (Inaya & Setiyawati, 2023). By using the make-a-match media, students can enhance their creative thinking abilities and develop an innovative mindset (Nurfiati et al., 2020; Yuliawati et al., 2020).

Other research findings show that PjBL and RADEC encourage active student participation in various activities to produce tangible outcomes (Pratama & Irwandi, 2021; Siskawati & Bachri, 2020; Yuniasih et al., 2024). Students are encouraged to convey unique ideas that are different from others and develop creativity by finding new things to share with their peers. Fitriani et al. (2021) emphasized that the use of make-a-match media can accelerate the enhancement of the education quality through the implementation of an effective learning process. Therefore, these two learning models are important to socialize teachers so that they can adopt these techniques to stimulate students' creative thinking skills (Puspitasari et al., 2023), which are assisted by make-a-match media. Analysis of the results of this study can provide direction to teachers in choosing the suitable learning model and media based on the subject matter being taught (Ariyanto et al., 2021; Syahriani & Hasruddin, 2024).

This study was conducted due to the lack of prior research comparing the effectiveness of the RADEC and PjBL instructional models, both supported by make-a-match media, in enhancing students' creative thinking skills. Although previous studies have investigated the impact of these models on creative thinking, a direct comparison between the two models in the same context remains unexplored. Findings from earlier research highlight several challenges that need to be addressed, including low student motivation, limited availability of instructional media, and insufficient opportunities for active participation in the learning. Additionally, creating a supportive and enjoyable learning

environment is essential to help students enhance their creative thinking skills, enabling them to solve problems and grasp the concepts being taught effectively. The primary aim of this study is to analyze the differences in the effectiveness of the RADEC and PjBL instructional models, both utilizing make-a-match media, in improving students' creative thinking abilities. This research seeks to fill the existing gap in the literature and provide valuable insights into the comparative advantages of these instructional approaches for fostering creativity in the classroom.

## METHOD

This study outlines how data were collected, the sources of the data, and the methods of data analysis. The approach employed in this research is quantitative. This comparative study aims to identify differences in students' creative thinking abilities (Arham & Pagarra, 2022). The research method applied is quasi-experimental, utilizing a pre-test post-test design. Before the implementation of the treatment, both experimental groups 1 and 2 underwent a pre-test to evaluate their initial conditions. Following the treatment, both groups participated in a post-test to assess their conditions after the intervention. Experimental group 1 received treatment using the RADEC model with the support of make-a-match media, while experimental group 2 was treated using the PjBL model, also with the support of make-a-match media. The research design is summarized in Table 1.

Table 1. The design of research

| Group | Pre-test | Treatment | Post-test |
|---|---|---|---|
| RADEC with make-a-match media | $O_1$ | $X_1$ | $O_2$ |
| PjBL with make-a-match media | $O_3$ | $X_2$ | $O_4$ |

In this context, $X_1$ represents learning using the RADEC instructional model, while $X_2$ represents learning using the PjBL instructional model. $O_1$ and $O_3$ indicate the pre-test results for experimental groups 1 and 2, while $O_2$ and $O_4$ represent the post-test results.. The samples of this study are all fifth-grade students at SDN 15 Mataram and SDN 28 Mataram, with a total of 52 students. The sampling technique used is group random sampling, where one experimental class is selected at SDN 28 Mataram and one class at SDN 15 Mataram, each consisting of 26 students. Data collection techniques for this study was test. The instruments used consist of essay-type question sheets, with a total of 10 items, designed to collect data on students' creative thinking abilities. The instrument for assessing students' skills consists of four indicators as outlined in Table 2.

Table 2. Creative thingking skills indicators

| Indicators | Explanation of the indicators |
|---|---|
| Fluency | The ability to express ideas quickly and confidently, ensuring clear communication. |
| Flexibility | The ability to accept differing viewpoints and identify solutions based on factual conditions. |
| Originality | The ability to present unique and distinct ideas that offer fresh insights. |
| Elaboration | The ability to provide detailed and expanded responses, enhancing the explanation. |

Before administering the tests to students, we conducted instrument validation. This validation process involved two experts who assessed the accuracy of the content, relevance to the objectives, and construction of the questions. Based on the instrument trial results, 10 valid questions were obtained through validity testing, where the calculated correlation coefficient ($r_x$) was greater than 0.374, and the reliability was $r_{26} = 0.909$. Therefore, all the items are deemed appropriate for use as pre-test and post-test questions in the class.

The data gathered in this research were analyzed using SPSS 16 for Windows to interpret the outcomes of the analysis. The acquired data were further examined using descriptive and inferential statistics. Descriptive statistical analysis was conducted to evaluate the creative thinking abilities of students in each treatment group. The inferential statistics used in this study included normality tests to ensure that the data followed a normal distribution. Subsequently, a homogeneity of variance test was performed to examine whether the variances between groups were equal. Additionally, the presentation of creative thinking abilities was calculated based on specific indicators. Following this, hypothesis testing was conducted using paired sample t-tests to compare students' creative thinking abilities before and after the implementation of the RADEC and PjBL models. Furthermore, N-gain scores were calculated to evaluate the effectiveness of both models in enhancing students' creative thinking abilities. The achievement categories for N-gain scores will be determined based on the N-gain values (Selis et al., 2023), with further details provided in Table 3.

Table 3. Learning effectiveness based on N-gain category

| % of N-Gain | N-Gain Interpretation |
|---|---|
| > 76 | effective |
| 56 - 75 | Fairly effective |
| 40 - 55 | Less effective |
| < 40 | Not effective |

## RESULTS AND DISCUSSION

Descriptive analysis of the data from the pre-test and post-test was conducted to provide a comprehensive overview of students' creative thinking skills before and after participating in two distinct experiments. The first experiment employed the RADEC model with the support of the make-a-match media, while the second experiment utilized the PjBL model also accompanied by make-a-match media. By measuring the pre-test results, we can gain insights into students' creative thinking capabilities prior to the intervention. Following the implementation of the treatment, the post-test serves as an indicator to evaluate any changes or improvements that may have occurred in students' creative thinking skills. Therefore, the descriptive analysis of both tests is essential for understanding the impact and effectiveness of each teaching model implemented to enhance students' creative thinking skills. Table 4 summarizes the results of the pre- and post-test.

Table 4. Descriptive data for pre-test and post-test

| Descriptive statistics | Group RADEC | | Group PjBL | |
|---|---|---|---|---|
| | Pre-test | Post-test | Pre-test | Post-test |
| Mean | 55.00 | 59.85 | 48.69 | 70.12 |
| SD | 17.170 | 18.008 | 18.583 | 16.934 |
| Variance | 294.800 | 324.295 | 345.342 | 286.746 |
| Minimum | 32 | 35 | 10 | 25 |
| Maximum | 92 | 96 | 93 | 100 |

The results presented in Table 4 suggest that students' creative thinking abilities in experiment group 1 were enhanced. The average pre-test score was 55.00, with a SD of 17.170. Following the treatment, experiment group 1 showed an increase, with a post-test average of 59.85 and a standard deviation of 18.008. These results suggest that the RADEC instructional model, supported by the make-a-match media, was effective in enhancing students' creative thinking abilities. Similarly, experiment group 2 also demonstrated improvement. The pre-test average was 48.69, with a SD of 18.583, while the post-test average increased to 70.12, with a decrease in standard deviation to 16.934. These findings indicate that the PjBL model, also supported by the make-a-match media, effectively enhanced creative thinking in group 2. Overall, both experimental groups showed improvement following their respective treatments. Additionally, the maximum scores in both groups increased, with a 4-point rise in Experiment Group 1 using the RADEC model and a 7-point rise in experiment group 2 using the PjBL model. To ensure the data's validity, a normality test was conducted on the pre-test and post-test results. The findings of this test are presented in Table 5.

Table 5. Normality test results

| Group | Statistic | df | Sig. | Description |
|---|---|---|---|---|
| Pre-test RADEC | 0.930 | 26 | 0.076 | Normal |
| Post-test RADEC | 0.927 | 26 | 0.064 | Normal |
| Pre-test PjBL | 0.973 | 26 | 0.703 | Normal |
| Post-test PjBL | 0.959 | 26 | 0.372 | Normal |

Table 5 presents the pre- and post-test normality test results in both experimental groups. For the RADEC pre-test, the sig. value was 0.076, indicating a normal distribution. Similarly, the PjBL pre-test yielded a sig. value of 0.703, confirming normality. Moving to the post-test results, the RADEC class also demonstrated normality with a sig. value 0.064. Likewise, the PjBL post-test showed a sig. value of 0.372, confirming normal distribution. These findings indicate that the pre-test and post-test data for creative thinking abilities in the RADEC and PjBL classes are normal, as the significance values are greater than 0.05. A homogeneity test was then done to verify the collected data's homogeneity. The results of the homogeneity test on students' creative thinking skills are shown in Table 6.

Table 6. Homogeneity test of variances

| Data Source | Levene Statistic | df1 | df2 | Sig. | Decision |
|---|---|---|---|---|---|
| Pre-test creative thinking abilities | 0.041 | 1 | 50 | 0.840 | Homogen |
| Post-test creative thinking abilities | 0.436 | 1 | 50 | 0.512 | Homogen |

Table 6 indicates that the significance values for the pre-test and post-test of creative thinking skills are 0.840 and 0.512, respectively, as indicated by the homogeneity test results. The data for students' creative thinking abilities are homogeneous, as both values are more significant than 0.05. The subsequent phase is to gather data on the presentation of students' creative thinking abilities using the four indicators of creative thinking, as illustrated in Table 7. This is done after the data has been confirmed to have a normal distribution and homogeneous variances.

Table 7. Percentage of students' creative thinking abilities based on indicators

| Indicator | Category | RADEC | PJBL |
|---|---|---|---|
| Thinking fluency | 4 | 46% | 54% |
| | 3 | 38% | 27% |
| | 2 | 15% | 15% |
| | 1 | 0% | 4% |
| Thinking flexibility | 4 | 35% | 50% |
| | 3 | 31% | 35% |
| | 2 | 27% | 15% |
| | 1 | 8% | 0% |
| Thinking originality | 4 | 42% | 54% |
| | 3 | 27% | 31% |
| | 2 | 23% | 15% |
| | 1 | 8% | 0% |
| Thinking elaboration | 4 | 35% | 38% |
| | 3 | 19% | 27% |
| | 2 | 35% | 31% |
| | 1 | 12% | 4% |

Table 7 illustrates the percentages of students' creative thinking skills based on four key indicators, which are categorized into four groups. Category 4 includes students demonstrating a very high level of proficiency in all four aspects, while Category 3 comprises students with a good level of proficiency. Category 2 consists of students with adequate proficiency, and Category 1 encompasses students who require improvement in their skill levels. The analysis indicates that the average scores of the PjBL model are higher than those of the RADEC model. A comparison was also made based on the percentages of the top categories (scores of 3 and 4) and the bottom categories (scores of 1 and 2), revealing that students in the top categories exhibited higher mastery of creative thinking aspects compared to those in the bottom categories. These discoveries offer valuable insights into the efficacy of both instructional models and the accomplishments of students.

Furthermore, to determine which model influences students' creative thinking abilities, a t-test will be conducted, and the results can be found in Table 8.

Table 8. Results of t-test for students' creative thinking abilities

| Group | Mean | SD | t | df | Sig. |
|---|---|---|---|---|---|
| RADEC with make-a-match media | 4.846 | 6.839 | 3.613 | 25 | 0.001 |
| PjBL with make-a-match media | 21.423 | 8.860 | 12.330 | 25 | 0.000 |

Based on the results presented in Table 8, the t-test analysis for the pre-test and post-test data revealed the-values of 3.613 for the RADEC model and 12.330 for the PjBL model. Both values exceed the critical to-value of 1.711, indicating a significant difference in students' creative thinking abilities between the two instructional approaches. The mean for creative thinking skills in experimental class 1, utilizing the RADEC model, was 4.846. In contrast, experimental class 2, which implemented the PjBL model, achieved a notably higher mean of 21.423. These findings demonstrate that the PjBL had a more pronounced impact on students' creative thinking skills compared to the RADEC model. Furthermore, the N-gain test results provided additional support for the effectiveness of both instructional models. The average N-gain values for the two approaches are detailed in Table 9, further substantiating the differential impact of the RADEC and PjBL models on enhancing students' creative thinking abilities.

Table 9. N-gain score test

| Group | N-Gain Score (%) |
|---|---|
| RADEC with make-a-match media | 12.9 % |
| PjBL with make-a-match media | 45.3 % |

Based on the data from the N-gain test presented in Table 9, the results show that the average N-gain score for the RADEC model increased by 12.9%, which falls into the "ineffective" category. In contrast, the average N-gain score for the class using the PjBL model showed an improvement of 45.3%, placing it in the "less effective" category. From this data, it can be concluded that the PjBL class exhibited a higher improvement compared to the RADEC class. Therefore, it can be inferred that the PjBL model, supported by the make-a-match media, is more effective than the RADEC instructional model in enhancing students' creative thinking skills.

Based on the data analysis using SPSS version 16, the t-test calculations for the pre-test and post-test scores in experimental classes 1 and 2 revealed a t-value of 3.613 and an N-gain of 12.9%, which is categorized as ineffective for the RADEC class. In contrast, the set value for the PjBL class was 12.330, with an N-gain of 45.3%, placing it in the "less effective" category. The post-test score for the RADEC model, supported by the make-a-match media, was 4.85 points. Meanwhile, the PjBL group demonstrated a significant improvement in creative thinking skills, achieving a post-test score of 21.43 points after undergoing the PjBL intervention, assisted by make-a-match media. These results confirm that the implementation of the PjBL model, supported by make-a-match media, is more effective in enhancing students' creative thinking skills than the RADEC learning.

The utilization of the PjBL model, supported by the make-a-match media, demonstrates significant value in enhancing students' creative thinking skills. This effectiveness is influenced by several factors, one of which is the systematic and student-centered nature of the instructional model's syntax. Generally, PjBL consists of six stages: Project identification, Project planning, Scheduling project steps, Project completion with teacher facilitation and monitoring, Report preparation and project presentation, and Project evaluation and results (Febriyanti et al., 2021; Husein et al., 2023; Wanggi et al., 2023). PjBL is an innovative learning that emphasizes contextual learning with the addition of complex and challenging tasks (Kristiyanto, 2020). Mahendra (2017) posits that PjBL is learning that enables students to create their knowledge, resulting in a concrete outcome autonomously.

The PjBL model greatly aids the learning process as it deepens students' knowledge by engaging them in creating a project, forming groups, and directly practicing how to develop a specific product. In addition to discussing and practicing product creation, students are also trained to present in front of their classmates or within the school environment, thus broadening their experiences (Permana et al., 2023). This conforms with the view of Fuadiyah et al. (2024) who argue that PjBL provides students with opportunities to design tasks and gather information to be applied in real-life situations. While the RADEC teaching model experienced a decline in enhancing students' creative thinking abilities, this can be attributed to several factors observed in practice. These include the passivity of some students and a lack of confidence when speaking in front of the class, which hindered the learning process. This aligns with (Yulisdiva et al., 2023) who identified that: (1) the RADEC learning model is often used only in specific subjects, and (2) RADEC is more suited to narrative-based topics. The RADEC learning consists of five stages: Read, Answer, Discuss, Explain, and Create (Setyawan et al., 2023). However, there are also limitations in the application of the PjBL model. These include: (1) time constraints, as this method often requires longer durations to complete tasks, especially when combined with media like make-a-match, which can extend each learning session; (2) student disorganization during the learning process, which can disrupt group work; and (3) difficulties in effectively identifying problems, which may impede the achievement of optimal learning outcomes (Rodiyah, 2023). Efforts to address these challenges include providing support for students who are less active and lack confidence in participating, applying effective classroom management techniques to ensure students remain focused and organized during the learning process, efficiently managing time by creating structured schedules, and involving students in decision-making and lesson planning so that they feel more engaged in the learning activities.

At the beginning of the implementation of PjBL, students were given a test before starting the learning process. After the pre-test, many students appeared confused, as the instructor posed questions without first providing a clear understanding of the project. Most students remained silent, with only a few able to respond. This indicates that the initial introduction to PjBL left students feeling uncertain. However, after the method was explained emphasizing PjBL as a project-based learning approach that focuses on collaborative problem-solving students began to participate more actively. The RADEC model aims to enhance understanding through active participation in each stage of learning (Setyawan et al., 2023).

These findings suggest that the PjBL is effective in training students in problem-solving and enhancing creative thinking skills. The use of the make-a-match media within PjBL supports deep understanding, thereby contributing to the improvement of students' creative thinking abilities. Make-a-match is an instructional tool that involves students matching question cards with corresponding answers, fostering interaction and promoting a better grasp of concepts. Through questions posed about this media, teachers can boost students' learning motivation, creative thinking skills, and conceptual understanding during group discussions (Yanuar et al., 2022). The primary goal of applying PjBL with make-a-match media is to stimulate students' analytical thinking by presenting information that requires careful matching. The PjBL model positions students as active agents in the learning process, allowing them to deepen their conceptual understanding through collaboration in small groups. Additionally, the use of make-a-match helps students comprehend difficult concepts while making learning more engaging. This cooperative learning approach also hones communication skills and encourages respect for others' opinions, both of which are essential in navigating everyday challenges.

The implications of these findings are highly significant in the context of primary education, where the enhancement of creative thinking skills can lay a strong foundation for students' intellectual development and their ability to adapt to more complex learning tasks (Anggraini et al., 2023; Nabilah et al., 2024; Saogo & Hardjono, 2024). Additionally, the analysis of student's creative thinking skills based on four key indicators revealed that students in the PjBL group consistently outperformed those in the RADEC group across all indicators. Furthermore, PjBL is regarded as an appropriate teaching method for students in science-related subjects (Rahardjanto et al., 2019).

Furthermore, the outcomes of the paired t-test demonstrate a significant difference in the effectiveness of the RADEC and PjBL models in enhancing students' creative thinking skills. Therefore, selecting an appropriate teaching model should be a key priority (Ardilansari et al., 2023). The advantage of selecting the right instructional model lies in its ability to foster a wide range of competencies, such as critical thinking, academic achievement, problem-solving skills, independence, creativity, and the capacity to view situations from broader perspectives (Mursid et al., 2022). These findings emphasize the importance of choosing teaching strategies that align with the desired learning outcomes, particularly in promoting critical and creative thinking among students. The focus should be on learning principles that are comprehensible, targeted, and suitable for students' cognitive development and needs (Biazus & Mahtari, 2022).

In summary, the results of this research offer crucial insights for educators and curriculum designers who seek to enhance students' creative thinking capabilities. By recognizing the varying effects of different teaching models, educators can make better-informed decisions to optimize their instructional methods for student learning. Additionally, this study highlights the necessity of further research to understand the underlying factors that contribute to the effectiveness of various pedagogical strategies in developing students' creative thinking skills. Such initiatives are essential for continually advancing educational practices and preparing students to succeed in a rapidly changing and innovative environment.

## CONCLUSION

Based on the data analysis, it can be concluded that the PjBL model, supported by the make-a-match media, has a more significant effect on enhancing the creative thinking skills of elementary school students compared to the RADEC teaching model. This is evidenced by the higher N-gain values and t-test results. These findings underscore the importance of integrating innovative teaching methods that encourage creative thinking, imagination, and experimentation with new ideas. Furthermore, the implications of this research include fostering students' self-confidence. Additionally, it provides insights for educators and policymakers regarding the effectiveness of the two learning approaches: PjBL and the RADEC model supported by make-a-match media, in enhancing primary students' creative thinking abilities. The results of this study can serve as a foundation for developing more effective learning strategies aimed at improving students' creative thinking skills at the primary education level. Moreover, the implications of this research can also assist in developing a curriculum that is more relevant and focused on fostering creative thinking skills. Future research should consider exploring additional variables such as students' learning styles, levels of motivation, and environmental factors to provide a more comprehensive understanding of effective learning strategies for developing students' creative thinking abilities. By addressing these factors, future studies can significantly contribute to our knowledge of best practices in enhancing students' creative thinking skills.

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