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Analysis of Collaboration Ability in the RADEC Learning Model for Elementary School Students

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Abstract. This study investigates the effectiveness of the Read, Answer, Discuss, Explain, and Create (RADEC) learning model in fostering collaboration skills among elementary school students during electricity science lessons. Collaboration is defined as a group effort aimed at achieving a shared goal. A descriptive qualitative research method was employed, involving 24 sixth-grade students from an elementary school in Bandung City, Indonesia. Data were collected using questionnaires and observation sheets. The results indicated that students' collaboration skills averaged 84% based on observations and 82% based on questionnaire responses, both categorized as good. The assessment was based on indicators of collaboration, including positive interdependence, face-to-face interaction, individual accountability, group communication, and group processes. These findings suggest that the RADEC learning model can serve as a useful approach for teachers to develop students' collaborative abilities. Furthermore, this model promotes student engagement and teamwork, enhancing the overall quality of learning experiences in elementary education.

Keywords: Collaboration Skills; RADEC Learning Model; Elementary Education; Science Learning

1. Introduction

According to Le, Janseen, and Wubbels (as cited in Cahya et al., 2023), one of the major issues in educational development is the low level of student participation in group discussions, which reflects weak collaboration skills among students. Several factors may contribute to this inability to collaborate effectively, including poor receptiveness to peer feedback, low engagement in group work, and limited problem-solving abilities (Mulyani et al., 2024). Addressing this issue requires the implementation of appropriate learning models, as collaboration is recognized as one of the essential 21st-century skills critical for students' future success (Ansyari, 2022). Furthermore, collaboration supports students' personal development and is strongly linked to outcomes in education, health, well-being, and life success, as emphasized by the OECD (Tang et al., 2021). The theory of collaborative learning posits that social interaction plays a key role in knowledge construction. Vygotsky (as cited in Pransiska et al., 2023) argues that learning occurs through dialogue and teamwork, where social interaction facilitates comprehension and encourages active engagement in learning activities.

This study is essential as it offers practical solutions to educational challenges and holds long-term benefits for improving academic quality and preparing students to meet future demands. Various studies have explored student collaboration in learning contexts. For instance, research conducted in Thailand by Ruijuan et al. (2023) reveals that collaborative learning enhances both social and academic competencies, which contribute to future career readiness. In Turkey, Baran et al. (2021) found that the integration of STEAM learning promotes 21st-century competencies, particularly collaboration, by increasing student participation and the effectiveness of group interactions. Similarly, in Indonesia, Pransiska et al. (2023) reported that fostering togetherness and cooperation among third-grade students positively impacts character development, social relationships, and academic achievement. These findings

collectively underscore the significance of cultivating collaboration skills in elementary education to prepare students for the future.

1.1 Problem Statements

Students' low collaboration abilities in learning can still be observed in various schools. Research conducted by Suswandari et al. (2020) on elementary students' social skills shows that collaboration skills remain limited, which can lead to suboptimal achievement of learning goals. Further research by Dian Sari et al. (2023) found that students initially demonstrated low collaborative abilities in class, appearing passive in discussions, lacking cooperation, showing little responsibility for assignments, and exhibiting limited respect for peer opinions. Similar findings were reported by Kuntala et al. (2021), who revealed that students' collaboration skills in group learning were very low before receiving any intervention. Several contributing factors to this condition include the persistence of traditional teaching methods, the lack of supporting facilities, and insufficient teacher training in applying collaborative learning models or strategies. Consequently, students become less capable of working effectively in groups, which leads to lower academic achievement and weaker social skills. It also hampers the development of critical competencies such as communication, empathy, and conflict management—skills that are essential for everyday life and future success.

Undertaking a comprehensive study on the implementation of learning models that might enhance students' collaborative skills is necessary to address this issue. The RADEC learning model—Read, Answer, Discuss, Explain, and Create—can be chosen as a potential solution due to its capacity to promote student engagement and group-based learning (Suryadi et al., 2024). The implementation of RADEC by Amar (2022) demonstrated promising results in improving student outcomes in thematic learning. Furthermore, Widodo et al. (2024) suggested that the RADEC model supports group interaction and active communication throughout the learning process. Students' collaboration skills have significant positive implications for their social development and the learning environment, making this research particularly important. Identifying effective instructional models for improving collaboration can make elementary education more adaptive and responsive to future challenges. Moreover, this study is expected to contribute to the development of more effective education policies, teacher training, and the wider adoption of innovative learning approaches across schools.

1.2. Related Research

A study conducted by Nurnaningsih et al. (2023) explored the implementation of the RADEC curriculum in elementary schools, which emphasizes the development of critical and creative thinking—two essential 21st-century competencies. The findings revealed that students' critical thinking skills were reflected in their ability to provide clear explanations, analyze arguments, and respond to questions. Additionally, creative thinking emerged through students' varied perspectives during group discussions. Further research by Anggraeni and Badarudin (2024) in fourth-grade classrooms examined the enhancement of critical thinking and independent learning attitudes through RADEC-based instruction. The results showed a significant increase in students' critical thinking, rising from 48.34% in Cycle I to 96.67% in Cycle II, along with a marked improvement in learning independence. Another study by Hopipah et al. (2024) investigated the application of the RADEC model in science learning using a quantitative approach. Their research found that 85% of the learning model was implemented effectively, categorized as practical in supporting learning objectives. The t-test results indicated an increase in students' science process skills, from 43.67 to 70.67, with a t-value of 12.55 > 1.70 (t-count > t-table), confirming the positive impact of the RADEC model. Despite these promising findings, previous studies have primarily focused on cognitive outcomes. To date, little attention has been given to how the RADEC model influences students' collaboration in science learning. Therefore, this study aims to investigate collaborative abilities among sixth-grade students in electricity-themed science lessons using the RADEC learning approach.

1.3. Research Objectives

This study employs the RADEC learning model to examine students' collaborative abilities during electricity-themed science lessons. The research aims to provide a comprehensive depiction

of how collaboration emerges and functions within RADEC-based learning activities. Specifically, the study seeks to offer educators and researchers a clearer understanding of the types and quality of collaborative skills that develop throughout the implementation of this model. It is expected that the findings will inspire and inform educators in designing instructional strategies that not only focus on content mastery but also actively engage students in collaborative processes—thereby supporting the development of essential social competencies.

2. Theoretical Framework

2.1. Collaboration

Collaboration refers to an individual's ability to work cooperatively with others to achieve shared goals (Sarifudin et al., 2023). Key aspects of collaboration include communication, empathy, social awareness, and conflict management (Baiin & Purba, 2024). According to Roger and David Johnson (as cited in Siregar et al., 2022), the five core indicators of collaboration are positive interdependence, face-to-face interaction, individual accountability, group communication, and effective group processes. In today's educational context, teamwork has become an essential skill for all students. For elementary school learners, collaboration is particularly valuable in helping them comprehend, empathize, and work toward common objectives (Haryanti, 2020). Schools can foster these skills through learning activities that promote both individual and group engagement, using innovative models designed to nurture cooperative learning environments. Such activities also stimulate interaction, boost self-confidence, and form the basis for acquiring 21st-century competencies (Fathimatuzzahrah, 2020).

Collaborative learning activities—particularly those that require joint problem-solving—should be introduced as early as elementary school. These activities serve as a key component of character education, supporting students' social development during their formative years (Virdi et al., 2023). Given the importance of practicing cooperation at the elementary level, educators must adopt innovative learning models that go beyond traditional instruction. Unlike conventional approaches, innovative models allow students to take an active role in constructing knowledge, thereby enabling them to naturally acquire essential life and learning skills, especially those aligned with 21st-century demands (Astari, 2021).

2.2. Read, Answer Discuss, Explain, and Create (RADEC) Learning

Through its flexible and student-centered approach, the RADEC learning model enables students to develop more advanced skills and deeper conceptual understanding (Setiawan et al., 2019). RADEC is an acronym for the five sequential learning phases: Read, Answer, Discuss, Explain, and Create (Sopandi, 2019). These phases are organized temporally and spatially—meaning that the "Read" and "Answer" phases can be completed at home or outside of scheduled class hours, while the remaining phases—"Discuss," "Explain," and "Create"—are conducted during classroom sessions. Sukmawati et al. (2021) describe the RADEC syntax in detail: In the Read phase, students review learning materials independently to prepare for upcoming tasks. In the Answer phase, they respond to pre-learning questions based on those readings. During the Discuss phase, students are placed in small groups to share and evaluate their answers, comparing interpretations and drawing preliminary conclusions. This collaborative discussion sets the foundation for the Explain phase, where group representatives present their findings to the class. At this stage, the teacher plays an active role by providing clarification, correcting misconceptions, and facilitating class-wide dialogue to achieve a shared understanding. The final phase, Create, encourages students to apply what they have learned by designing original projects or proposing solutions to real-world problems related to the lesson. These creative outputs, which are often initiated during the pre-learning stage, are refined and realized through group work following in-class discussions. Observing the implementation of the RADEC model offers insight into student engagement throughout each stage and highlights the model's ability to foster collaboration. According to Kaharuddin (as cited in Andini & Fitria, 2021), the RADEC model makes learning more engaging, strengthens

students' critical thinking and reading interest, enhances problem-solving capabilities, and improves collaborative learning in group settings.

3. Method

3.1. Research Design

The methodology used in this study is qualitative descriptive. According to Rustamana et al. (2024), this approach aims to describe specific conditions, phenomena, and perspectives within a particular group—in this case, student collaboration in RADEC-based learning environments for sixth-grade elementary school students. To collect data on students' collaborative skills, preliminary study activities were conducted. Learning sessions were then implemented using the RADEC model, focusing on topics related to electrical meters. Observations were carried out during classroom activities to examine how students worked together throughout the learning process. After completing the sessions, students were asked to fill out a self-assessment questionnaire to evaluate their level of collaboration.

3.2. Participant

This study involved 24 sixth-grade students—11 boys and 13 girls—from an elementary school in Bandung, West Java, Indonesia. The school was selected based on preliminary investigations and its alignment with the prerequisites for implementing the RADEC learning model. One key consideration was that all students possessed strong reading skills, as confirmed through interviews with the class teacher. According to the teacher, the students demonstrated good independent learning abilities; however, they faced challenges when working collaboratively, particularly in achieving shared goals during group activities.

3.3. Data Collection

Data for this study were collected using two instruments: self-assessment questionnaires and observation sheets. The observation sheets were employed during the learning process to record student behavior using checklists aligned with key indicators of collaboration. To complement the observational data, a self-assessment questionnaire on collaborative abilities was administered to students after the completion of the learning activities.

3.4. Data Analysis

In this study, researchers employed descriptive analysis techniques to provide an accurate depiction of the problem being investigated (Rustamana et al., 2024). Several steps were undertaken during the analysis. The first step involved assessing students' collaborative abilities using observation sheets during learning activities such as discussion, explanation, and creation. Each observable indicator of collaboration was assigned a score for every student, allowing the researchers to quantify the presence and frequency of collaborative behaviors throughout the lesson.

$$\% = \frac{the\ total\ number\ of\ scores\ received\ by\ the\ student}{score\ maximum}\ x\ 100$$

After obtaining the percentage scores for each collaboration indicator from the observation results, the overall average score is then calculated using the following formula:

$$average = \frac{the\ total\ number\ of\ percentage\ scores\ received\ by\ the\ student}{score\ maximum}$$

After completing a series of learning activities based on the RADEC model, the researchers administered a self-assessment questionnaire to the students. The questionnaire consisted of 26 items, including 13 favorable statements and 13 unfavorable ones. Students responded to each item by selecting one of four response options: Highly Agree (HA), Agree (A), Disagree (D), or Highly Disagree (HD).

3.5. Validity and Reliability

The researchers calculated the scores by analyzing responses to both favorable and unfavorable statements, and then converted these scores into percentages using the following formula:

Table 1. Favorable and Unfavorable Scoring Criteria

Criterion	Scoring Favorable	Unfavorable Scoring
HA : Highly Agreed	4	1
A : Agree	3	2
D: Disagree	2	3
HD : Highly Disgraced	1	4

$$\% = \frac{the\ total\ number\ of\ scores\ received\ by\ the\ \ student}{score\ maximum}\ x\ 100$$

Subsequently, the percentages of the favorable and unfavorable responses were combined and averaged using the following formula:

$$Average = \frac{Scoring\ favorable + Scoring\ unfaforable}{2}$$

The average percentage score of students' collaboration is then interpreted based on the criteria presented in the table below:

Table 2. Categories of Student Cooperation Abilities

No	Categories	% Range Score
1	Very less	<55%
2	Not enough	56%-64%
3	Enough	65%-79%
4	Good	80%-89%
5	Very good	90%-100%

4. Findings

This study was conducted to describe students' collaboration skills through the application of the RADEC learning model in sixth-grade science lessons focused on electricity. The indicators of collaboration in this study refer to the framework developed by Johnson and Johnson (as cited in Siregar et al., 2022), which includes positive interdependence, face-to-face interaction, individual accountability, group communication, and group processing.

4.1. Positive Dependency

Based on classroom observations of 24 students, 19 students (79%) demonstrated positive interdependence with their group members, while 5 students (21%) did not. During the observation process, students were seen to be aware of their group responsibilities and often reminded each other when tasks needed to be completed. In addition to the observational data, the results of the self-assessment questionnaire—comprising both favorable and unfavorable statements—were analyzed. Table 3 presents the distribution of student responses regarding the aspect of positive interdependence.

Table 3. Questionnaire Results on Positive Dependency Aspects

No	Statement Type	Question number	Statement Shapes	Number of Students				Score Percent
				HA	A	D	HD	
1	Favorite	18	I always remind my friends if they haven't worked on a task or a group project.	8	13	2	2	77
2	Unfavorable	21	I feel lazy to remind if there's a friend who hasn't done a task or a group project yet.	1	0	11	12	85
Average								81

Based on the data presented above, the overall positive interdependence aspect falls into the "good" category, with an average percentage score of 81%.

4.2. Face to Face Interaction

Based on the observation results for the face-to-face interaction component, 21 students (approximately 88%) demonstrated active face-to-face interaction, while 3 students (approximately 12%) did not exhibit this behavior during the learning activities. These findings indicate that the average percentage for face-to-face interaction falls within the "good" category. During the learning sessions, observers noted that most students actively engaged with their group members, rotated responsibilities, and supported one another. In addition, there was consistent verbal communication to complete group tasks collaboratively. The results of the self-assessment questionnaire further support the observational findings. Table 4 presents the distribution of student responses related to face-to-face interaction.

Table 4. Questionnaire Results on Face-To-Face Interaction Aspects

No	Statement Type	Question number	Statement Shape	Number of Students				Score Percent
				HA	A	D	HD	
1	Favorite	1	I'm always present in the group and follow the activities there.	7	16	1	0	81
		3	I can establish a good relationship with a group of friends	14	10	0	0	90
2	Unfavorable	6	I find it difficult to have a good relationship with a group of friends	0	1	14	9	83
		19	I often walk to other groups and don't follow the activities that are in my own group	0	2	13	9	82
Average								85

Based on the data presented above, the overall face-to-face interaction aspect is categorized as "good," with an average percentage of approximately 85%.

4.3. Individual Responsibility

Regarding the observation results on individual accountability, 22 students (approximately 92%) demonstrated a strong sense of personal responsibility during the learning process, while 2 students (approximately 8%) did not. According to the observation data, the average percentage for individual accountability falls within the "very good" category. Observers

noted that nearly all students actively completed their assigned tasks during group activities, indicating a high level of responsibility and task ownership. In addition to these observations, self-assessment questionnaire data were also collected. Table 5 presents the distribution of student responses regarding individual accountability during RADEC-based learning activities.

Table 5. Results of the Questionnaire on Individual Responsibility Aspects

No	Statement Type	Question number	Statement Shapes	Number of Students				Score Percent
				HA	A	D	HD	
1	Favorite	5	I know the goal that will be achieved by the group	12	11	1	0	86
		20	Together I complete the task of the group	16	7	1	0	91
2	Unfavorable	2	I don't know what the group's goal will be.	0	2	16	6	79
		25	I'm working on group tasks on my own.	2	6	10	6	71
Average								82

Based on the data presented above, the overall aspect of individual accountability falls into the "good" category, with an average percentage of approximately 82%.

4.4. Inter-Member Communication

Based on observation data, 19 students (approximately 79%) demonstrated active communication with their group members, while 5 students (approximately 21%) did not show consistent communication behavior. The average percentage of group communication, based on these observations, falls into the "sufficient" category. Most students were able to engage in effective communication with peers during the learning activities—expressing opinions, listening to others, giving constructive feedback, and accepting differing viewpoints. However, a few students were observed engaging in off-topic conversations and joking during moments of passive discussion, indicating that communication skills were not evenly distributed among all group members. In addition to the observational data, a self-assessment questionnaire was administered to further evaluate this aspect. Table 6 presents the student responses related to group communication.

Table 6. Results of Questionnaires on Inter-Member Communication Aspects

No	Statement Type	Question number	Statement Shapes	Number of Students				Score Percent
				HA	A	D	HD	
1	Favorite	7	I can always listen to group friends' opinions	12	12	0	0	88
		11	I've always wanted to give ideas in every group activity	9	12	3	0	81
		12	I take the opinion of a group of friends seriously	10	11	3	0	82
		13	I give a friend a chance to talk	12	12	0	0	88
		23	I am delighted with the success of the group's friends in completing the task well.	17	7	0	0	93

		4	I don't want to listen to the opinions expressed by a group of friends	0	0	11	13	89
		9	I'll only give my opinion in the group activities at the time the teacher tells me to get a good score	3	3	14	4	70
2	Unfavorable	10	I'm talking all the time so I don't give my friend a chance to talk.	0	0	12	12	88
		14	I'm quietly watching the success of the group's friends in completing the task well	0	1	16	7	81
		16	I always joke when responding to the opinion of a group of friends	0	4	14	6	77
Average								84

The aforementioned data indicates that, on average, members' communication falls into the "good" category, with an 84% average.

4.5. Group Process

In the group process aspect, 20 students (approximately 83%) were observed to be actively engaged in discussions, presentations, and in contributing to the completion of group tasks or projects. One factor contributing to lower levels of participation among some students was the unequal distribution of group responsibilities, which led to an imbalance in task involvement. In addition to the observational data, a self-assessment questionnaire was administered to evaluate this aspect. The results are summarized in Table 7.

Table 7. Questionnaire Results on Group Process Aspects

No	**Statement Type**	**Question number**	**Statement Shapes**	**Number of Students**				**Score Percent**
				HA	A	D	HD	
		15	I'm always helping my group of friends in trouble.	8	12	3	1	78
1	Favorite	22	I'm actively involved in group presentation activities	7	13	3	1	77
		24	Together, me and the group managed to complete the task on time.	10	12	2	0	83
		8	I'm just quiet if there's a friend who's in trouble or needs help.	0	1	14	9	83
2	Unfavorable	17	I'm less actively involved in group presentation activities	1	8	8	7	72
		26	Me and the group couldn't finish the task on time	1	1	10	12	84
Average								80

Based on the observation data, the aspect of group process was categorized as "good," with an average percentage of 80%. Overall, the analysis of student collaboration across the five indicators—positive interdependence, face-to-face interaction, individual accountability,

group communication, and group processing—shows encouraging results. Specifically, positive interdependence and group communication were each observed at 79%, falling into the "sufficient" category. Face-to-face interaction scored 88%, while group processing reached 83%, both classified as "good." The highest score was recorded for individual accountability at 92%, placing it in the "very good" category. These findings indicate that, in general, students demonstrated a strong capacity for collaborative learning, with an overall average collaboration score of 84%, which falls within the "good" category.

In addition to the observational data, the results of the self-assessment questionnaires also revealed a consistent pattern. Students rated their collaboration abilities at 81% for positive interdependence, 85% for face-to-face interaction, and 82% for individual accountability—all of which fall into the "good" category. The overall average score from the questionnaire results was 82%, further confirming that student collaboration during RADEC-based learning was generally perceived to be effective.

5. Discussion

The findings of this study on students' collaboration within the RADEC learning model revealed several key observations across five collaborative indicators.

5.1. Positive Interdependence

When group members engage in positive interdependence, they exhibit a mutually supportive relationship, recognizing that the success of the group depends on each member's contribution. Students demonstrated an awareness of their roles and responsibilities in achieving shared goals. This aligns with Cohen's argument (as cited in Halpin, 2021) that mutual reliance is essential for accomplishing group objectives. Group-based learning that emphasizes positive interdependence fosters social interaction, communication, and a sense of shared accountability (Anitra, 2021). McCormick and Alavi (as cited in Forslund Frykedal et al., 2021) also emphasize that positive interdependence enhances group progress, thereby increasing the likelihood of achieving common goals. Developing this relational dynamic among students is crucial for improving their social skills and creating emotionally meaningful learning environments.

5.2. Face-to-Face Interaction

The study also found that effective face-to-face interaction among students played a significant role in fostering communication and building comfort within group settings. Good communication nurtures supportive relationships and enhances the effectiveness of group activities (Salmiah et al., 2021). Face-to-face interaction enables students to become one another's learning resources, broadening their access to information and simplifying the learning process (Yulia, 2020). Additionally, this interaction positively influences student motivation and provides external encouragement to help them reach learning goals (Asyhari & Islamia, 2023). In the context of collaborative learning, face-to-face communication is essential for exchanging ideas, clarifying concepts, and building academic engagement.

5.3. Individual Accountability

Within group learning, each student must demonstrate responsibility for their assigned tasks. Students must understand what they are expected to do and perform these duties to the best of their ability. Clear task division ensures that students have a sense of purpose and accountability, which are both critical to the success of group-based learning models (Alim & Tirtoni, 2023). Yalçın and Güleç (2022) affirm that emphasizing individual responsibility enhances students' academic achievement and fosters a positive learning atmosphere. Furthermore, clearly defined roles reduce the risk of dominance by more capable students and prevent marginalization of those who struggle. The teacher's role in reinforcing individual accountability is therefore essential to the success of collaborative learning.

5.4. Group Communication

Effective group communication requires mutual trust, active listening, respectful dialogue, and a willingness to resolve conflicts. These elements contribute significantly to group success

(Hasanah & Himami, 2021). Establishing open and responsive communication channels among students fosters active involvement in discussions, which is particularly important in project- and problem-based learning environments. Meina and Merve (2021) note that such communication begins even before formal instruction, as students prepare by reading and responding to pre-learning prompts—consistent with the RADEC model's emphasis on pre-class engagement. Encouraging communication at each stage of learning enhances participation and ensures more equitable group dynamics.

5.5. Group Processing

Group processing involves students' ability to work together in problem-solving, task completion, and collective evaluation. When students assist each other to meet shared goals—such as completing projects on time—it indicates that group processes are functioning well (Aziz & Akgül, 2020; Hasanah & Agusta, 2024). This process includes evaluating whether group outcomes align with initial plans and offering feedback to peers. In RADEC-based learning, group motivation often evolves: what may begin as an individual goal gradually transforms into a shared purpose as students better understand their roles within the group. This motivational shift is shaped by the learning model itself, which encourages active participation and collective responsibility. To support this shift, it is crucial that students are guided toward clearly defined learning goals and understand how those goals can be achieved through group collaboration.

6. Conclusion

This study demonstrates that students' collaborative learning skills fall within the "good" category when facilitated through the RADEC learning model. The findings are supported by observational data showing an average collaboration score of 84%, and self-assessment data indicating an average score of 82%. These consistent results highlight the model's effectiveness in fostering essential components of collaboration among sixth-grade students, particularly within the context of science learning on electricity. The five core indicators—positive interdependence, face-to-face interaction, individual accountability, group communication, and group processing—emerged clearly throughout the RADEC-based learning process. These indicators not only reflect the theoretical underpinnings of collaborative learning but also provide a practical framework for observing and evaluating student interaction. The Discuss, Explain, and Create phases of the RADEC model, in particular, play a pivotal role in nurturing students' ability to work together, negotiate meaning, and pursue collective goals. Overall, the study confirms that the RADEC model offers a structured and effective approach to cultivating collaboration in elementary classrooms. It promotes active participation, equitable task distribution, and the development of both social and cognitive skills. These findings imply that the integration of the RADEC model into broader instructional practice may contribute significantly to preparing students for the demands of 21st-century learning—especially in building interpersonal competence, critical thinking, and cooperative problem-solving. Future research may further explore the long-term impact of this model and its application in other subject areas and educational levels.

Limitations

This study was limited by the short duration of the research, which was conducted over only a few sessions due to the timing at the end of the academic year for sixth-grade students. Additionally, the research involved only a single class, as the school where the study took place had only one sixth-grade group available. Another limitation lies in the scope of the study, which focused exclusively on students' collaboration abilities in science learning, specifically within the topic of electricity.

Recommendations

Given that this research was conducted only in one elementary school and limited to sixth-grade science learning, the findings may not be generalizable across subjects or educational levels. Future studies are recommended to explore the implementation of the RADEC model in

other subjects and grade levels to examine its broader applicability. More comprehensive research could also investigate additional components of 21st-century skills that may emerge through extended and varied applications of the model.

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Conflict of Interest

The author declares that there are no conflicts of interest—financial or non-financial—related to this research. This includes the absence of any affiliations, financial relationships, or institutional support that could influence the objectivity or outcomes of the study.

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