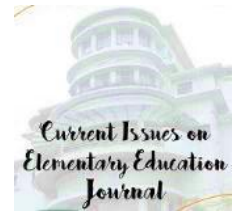




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CATEGORY ANALYSIS OF FIFTH GRADERS' CRITICAL THINKING ABILITY ON RESPIRATION USING THE RADEC LEARNING MODEL

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ABSTRACT

Critical thinking skills are an essential competency that need to be developed early on to face the challenges of the 21st century. This study aims to analyze the categories of critical thinking skills of fifth-grade students on the respiratory system material after the implementation of the RADEC (Read, Answer, Discuss, Explain, and Create) learning model. The research uses a quantitative descriptive method with subjects consisting of 23 fifth-grade students from SD Negeri Sukaratu in Garut City. The research instrument was a written test developed based on Ennis's indicators, including elementary clarification, basic support, inference, advanced clarification, and strategies and tactics. Data were analyzed using descriptive statistics and categorized into five levels: very good, good, enough, less, and very poor. The research results indicate that the average critical thinking ability of students falls into the sufficient category (mean 67.57), with the largest distribution in the good (34.8%) and very poor (30.4%) categories. Analysis by indicator shows that the majority of students master elementary clarification, but many still struggle with the aspects of inference and advanced clarification. These findings indicate that the RADEC model is effective in encouraging some students to achieve a good level of critical thinking, but reinforcement is needed on the indicators of deduction, definition of terms, and collaborative strategies. The implications of this research emphasize the importance of developing more adaptive and intensive learning strategies to enhance the equitable distribution of students' critical thinking abilities in elementary schools.

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1. INTRODUCTION

The rapid advancement of science and technology has fundamentally changed the way society thinks, not just making communication easier and better. In the present time, individuals are required to have an adaptive way of thinking and to be sensitive to diversity and the dynamics of social life. The ability to think critically becomes very important in facing the complexities of 21st-century life challenges. Therefore, the competencies required for learners in the contemporary context of the Fourth Industrial Revolution include creativity, communication, critical thinking, problem-solving, and collaboration (Susanti et al., 2022)). Those competencies and abilities become the main capital for someone to be able to compete with others.

The significance of analytical reasoning is reflected in the national education document, which states that the overall goal of national education is to enhance individual capacity, cultivate moral character, and promote a dignified civilization within the nation, while simultaneously enlightening the collective existence of the population (Sistem Pendidikan Nasional, 2003). The main goal is to maximize the inherent potential of the learners, enabling them to develop into individuals who have faith and respect for the Supreme Being, demonstrate high ethical standards, uphold optimal health, attain knowledge, improve skills, realize creativity, foster autonomy, and ultimately become part of a democratic society that always acts with full responsibility (Suparni, 2016). This statement shows that besides character building, education also emphasizes the development of cognitive aspects and higher-order thinking skills such as critical thinking. Thus, critical thinking skills are not only a global necessity but also part of the constitutional mandate of the national education system.

Critical thinking abilities are characterized as an essential capability needed for individuals who have the skills to address complex issues, make precise and well-informed choices, and evaluate information from a critical viewpoint. These abilities are regarded as crucial, particularly in the current era where information is nearly always accessible and its nature frequently varies swiftly (Aslan & Aybek, 2024). Additionally, critical thinking is acknowledged as one of the key thinking skills and serves as an indicator of the quality of student learning in schools (Alsaleh, 2020). Thus, critical thinking skills have become an essential need for students, so educators must be able to develop these skills.

In daily life as well as in career journeys, an individual's critical thinking ability will influence and guide them towards professional success or achievement. Therefore, we need to understand and explore critical thinking skills more deeply so that they can be applied in the field of education, especially in the learning process (Zakiah et al., 2019). Critical thinking skills are a comprehensive educational innovation in teaching 21st-century skills (Manassero et al., 2022). Recent studies have investigated critical thinking skills, starting from primary education, secondary education, and extending to higher education institutions (O'Reilly et al., 2022). It is very important to pay attention to the condition of students' critical thinking abilities. This is important because pedagogical exploration related to critical thinking tends to have educational implications and provides answers for the development of critical analysis skills (Liang & Fung, 2021).

The development of critical thinking skills from an early age is essential because it lays the foundation for lifelong learning, effective problem-solving abilities, and active participation in society (Trilling & Fadel, 2009). This ability allows students not only to listen to or receive learning information passively but also to analyze, evaluate, and synthesize information to produce deep understanding and responsible decision-making. Critical thinking skills are one of the aspects that can influence students' mindsets in problem-solving, allowing them to think accurately and systematically (Lestari et al., 2024).

Certain dimensions related to the capacity for critical thinking, namely (1) interpreting; (2) analyzing; (3) evaluating; (4) concluding; (5) explaining; and (6) regulating (Facione, 2015). Critical thinking in a rational and reflective manner emphasizes decision-making about what to believe or do. Critical thinking skills are divided into 12 categories, including asking and answering questions, analyzing arguments, deciding whether to trust a source or not, observing and evaluating reports of findings from observations, concluding and evaluating conclusions from deductions, concluding conclusions from inductions, determining the value of considerations, defining terms and evaluating them, identifying assumptions, deciding actions, and interacting (Wahdaniyah et al., 2023). The indicators of critical thinking ability used will refer to the framework developed by Ennis. Signs of critical thinking abilities according to (Ennis, 1985) used in this research. Indicator of critical thinking abilities based on (Ennis, 1985) divided into five that have several sub-indicators.

Table 1 Indicator of Critical Thinking Skills

Aspect	Indicator
Elementary Clarification	1. Focusing the question 2. Asking and answering classification questions and challenging questions
Basic Support	3. Considering the credibility (criteria) of a source 4. Observing and considering the results of the observation.
Inference	5. Make deductions and consider the results of the deductions 6. Making and considering the value of the decision
Advanced Clarification	7. Defining terms 8. Identifying assumptions
Strategy and Tactics	9. Deciding on an action 10. Interacting with others

Source: (Ennis, 1985)

The development of critical thinking skills has been widely recognized, but its implementation in primary school learning practices is often not optimal. Research reveals that the level of critical thinking skills among Indonesian students still needs to be improved at various educational levels, including elementary school (Wulandari & Surjono, 2013). Based on the research results (Susanti et al., 2022) The findings indicate a difference in students' critical thinking competencies before and after the implementation of the RADEC pedagogical model, which is based on scientific literacy, showing an improvement. However, despite the increase in critical thinking abilities, a weakness of this study is that the improvement in the experimental class's N-Gain score falls into the moderate category (0.42). Other research (Noerharyono et al., 2025) shows that the RADEC learning model has proven effective in

promoting active learning, enhancing students' understanding, and developing critical thinking skills. Additionally, the integration of animated videos has the potential to make a significant contribution in motivating students and facilitating the understanding of complex concepts. A weakness in the research is that although animated videos are said to increase motivation, the researchers did not separate the effects of animated videos from the RADEC model and did not explain the extent of each intervention's contribution.

This research will focus on the human respiratory system material for fifth-grade students. The selection of this material is based on its characteristics, which are rich in elementary clarification, basic support, inference, advance clarification, and strategies and tactics. Therefore, this study aims to descriptively analyze the categories of critical thinking skills of fifth-grade students on the human respiratory system material after participating in learning with the RADEC model. Previous studies have proven the effectiveness of the RADEC model in enhancing students' critical and creative thinking skills at various educational levels, but generally only focus on measuring score improvements or overall learning outcomes (Noerharyono et al., 2025; Susanti et al., 2022). Until now, there hasn't been much research specifically examining and categorizing the critical thinking abilities of fifth-grade students on the topic of the human respiratory system using the RADEC learning model at the elementary school level in Indonesia. Until now, there hasn't been much research specifically examining and categorizing the critical thinking skills of fifth-grade students on the human respiratory system using the RADEC learning model at the elementary school level in Indonesia.

This research presents a new contribution through a comprehensive descriptive analysis of various categories related to students' critical thinking abilities, with a more detailed and focused approach on respiratory material, thereby providing a more comprehensive overview as a basis for developing more targeted learning strategies. RADEC-based learning helps students acquire critical thinking skills. This activity begins with the reading stage, where students search for information from books, the internet, and other sources. Students must answer the pre-learning questions individually in the next stage. In the discussion stage, the questions are discussed in small groups. Then, the large group gathers to explain the discussion results in the explanation stage. Students decide what project they want to create during the create stage. The learning carried out by students encourages the formation of knowledge, character, and skills (Nurnaningsih et al., 2023) Thus,

the aim of this research is to analyze the categories of critical thinking skills of fifth-grade students on the topic of respiration after the implementation of the RADEC learning model and to describe the distribution of students based on categories (very good, good, enough, less, very poor).

2. METHODS

This study is a descriptive quantitative research, in quantitative research, the goal to be achieved is not hypothesis testing, but rather to describe or present a variable, symptom, or even a certain condition (Wikanjaya et al., 2022). This research aims to gather direct information from the field about the categories of critical thinking skills of fifth-grade students. This research was conducted by describing achievements without applying any treatment manipulation (Azizah et al., 2018). This research was conducted in May 2025. The subjects of this research are 23 fifth-grade students at SD Negeri Sukaratu, Garut City.

The research will be conducted in several stages. The first stage is preparation, which includes the development of critical thinking ability test instruments based on Ennis indicators and the preparation of RADEC model learning devices. The second stage is the implementation of learning, where the RADEC model (Read, Answer, Discuss, Explain, and Create) is applied to the respiratory system material. The final stage is data collection through the administration of critical thinking ability tests.

The instrument used is a written test developed based on five critical thinking indicators according to Ennis, namely Elementary Clarification, Basic Support, Inference, Advance Clarification, and Strategies and Tactics. Each question item is developed to measure each of those indicators.

The data collection technique was carried out through tests after the learning process. The test results were analyzed quantitatively by calculating each student's score on each indicator, converting the scores into percentages, and categorizing the results into very good, good, enough, less, and very poor categories. The category of critical thinking skills refers to the classification of (Rahmawati et al., 2023).

Tabel 2 Category Critical Thingking Skills

Critical Thinking Skills	Category
86 – 100	Vey Good
76 – 85	Good
60 – 75	Enough
55 – 59	Less
≤ 54	very poor

Source: (Rahmawati et al., 2023)

Formative assessment is conducted in a descriptive inquiry format related to the lesson material "Topic A: How Breathing Helps Me Perform Daily Activities?". The evaluation is conducted by correcting students' responses according to the established assessment rubric, which covers a scoring spectrum from 0 to 5.

3. RESULTS AND DISCUSSION

3.1 Result

The following are the descriptive statistics results of the post-test data on the critical thinking ability of 5th-grade students using the RADE learning model. The data was obtained through processing using the SPSS program, thus providing an overview of the score distribution, average, and characteristics of the students' post-test data comprehensively.

Tabel 3 Descriptive Statistics

Descriptive Statistics													
	N	Range	Minimum	Maximum	Sum	Mean	Std. Deviation	Std. Error	Statistic	Statistic	Statistic	Statistic	Statistic
posttest	23	68	20	88	1554	67.57	3.886	18.635	347.257	-1.088	.481	.445	.935
Valid N (listwise)	23												

Descriptive statistics provide a comprehensive overview of the distribution of critical thinking skills data among fifth-grade students on the respiratory system material after the implementation of the RADEC model. Based on the analysis results, the number of students

who were the subjects of the study was 23. The students' critical thinking ability scores range from 20 (minimum score) to 88 (maximum score), with an average (mean) of 67.57. The standard deviation of 18.64 indicates a considerable variation among students, meaning there are significant differences in critical thinking abilities among them. A skewness value of -1.09 indicates that the data distribution leans towards the left, meaning more students scored below the average. Meanwhile, a kurtosis of 0.45 indicates a relatively normal data distribution but slightly higher around the mean.

Tabel 4 Category of Critical Thinking Skills

<i>Score</i>	<i>Category</i>	<i>Students</i>	<i>Presentation</i>
86-100	Very Good	2	8.70%
76 – 85	Good	8	34.78 %
60 – 75	Enough	5	21.74%
55 – 59	Less	1	4.35%
≤ 54	Very Poor	7	30.43%
<i>Students</i>		23	

Based on the obtained data, the distribution of fifth-grade students' analytical abilities regarding the respiratory system content shows that out of 23 students, most students fall into the Good (34.8%) and Very Poor (30.4%) categories. Only 8.7% of students reached the Very Good category, while 21.7% fell into the enough category and 4.3% into the less category.

3.2 DISCUSSION

The research was conducted on the subject titled "How Breathing Helps Me Perform Daily Activities." Before providing an assessment to the participants, it was confirmed that the individuals had engaged with the content intended for evaluation. Based on the analysis results, the quantity of participants in this research is 23 students. The range of students' critical thinking ability scores is between 20 (minimum score) and 88 (maximum score), with an average (mean) score of 67.57. The standard deviation value of 18.64 indicates a considerable variation among students, which signifies a significant difference in critical

thinking abilities among individuals. A skewness value of -1.09 suggests that the distribution of data is biased to the left, resulting in more students scoring below the average. Meanwhile, a kurtosis value of 0.45 indicates a relatively normal data distribution but slightly higher around the mean. The wide spread of values and the leftward skew of the distribution indicate that there are still groups of students who need further intervention to improve their critical thinking skills.

A significant variation in analytical reasoning abilities among primary school children proposed by (Andriani, 2021) which states that the differences are influenced by internal factors such as motivation and interest in learning, as well as external factors such as the teaching strategies applied in the classroom. Thus, the descriptive statistical results in this study reinforce previous findings that the critical thinking skills of elementary school students in Indonesia still need improvement, and the variation among individuals is quite significant. Innovative learning models like RADEC can improve the average critical thinking skills, but the final results are still greatly influenced by the students' initial readiness and the intensity of the training provided.

After determining the number of students who achieved a certain average score, the next presentation will explain the students' critical thinking scores, categorized accordingly. The next table illustrates the findings from the analysis of critical thinking scores, categorized according to the overall final scores.

Table 5 Result Category Critical Thingking Skills

Score	Category	Students	Presentation
86-100	Very Good	2	8.70%
76 – 85	Good	8	34.78 %
60 – 75	Enough	5	21.74%
55 – 59	Less	1	4.35%
≤ 54	Very Poor	7	30.43%
Students		23	

Based on the presented data, the critical thinking skills of fifth-grade students at Sukaratu Elementary School on the respiratory system material show a varied distribution. As

many as 34.78% of students fall into the Good category, followed by 30.43% in the Very Poor category, 21.74% in the enough category, 8.70% in the very good category, and 4.35% in the less category. These findings indicate a polarization of abilities, where some students have reached an adequate level of critical thinking, while others still face significant challenges.

These findings indicate that the implementation of the RADEC learning model has been able to encourage some students to achieve a good to very good level of critical thinking. This is in line with the research findings (Munjiah et al., 2024) which states that the RADEC learning model contributes to enhancing students' critical and creative thinking abilities through active involvement in structured learning. The high percentage of students in the very poor category indicates that not all students can optimally adapt to this learning model. Internal factors such as motivation and self-confidence, as well as external factors like learning environment support and teacher strategy variation, are suspected to also influence these results.

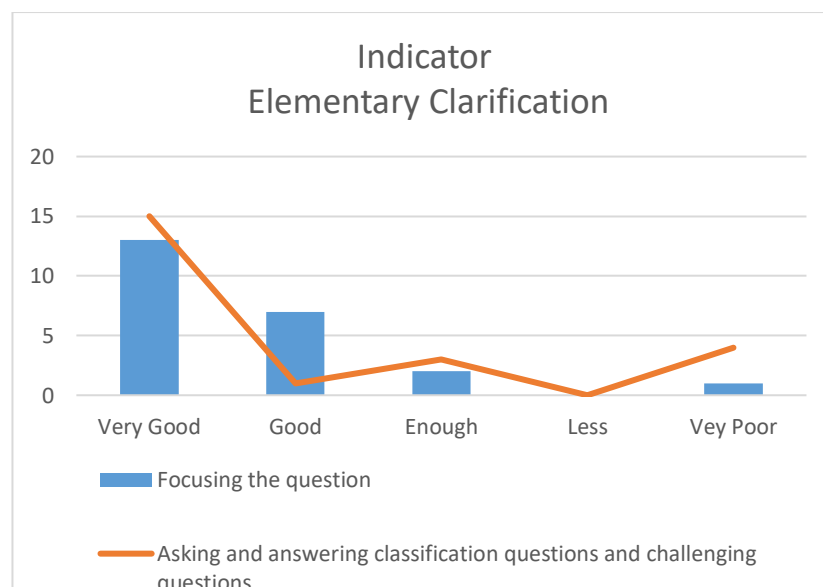
This result is consistent with the study (Fitriyanti et al., 2025) found that the percentage of elementary school students who fall into the very poor category is quite high, especially in the aspects of advanced clarification and problem-solving strategies, which is caused by the lack of critical analysis practice and problem-based learning in elementary schools. Research by (Sari et al., 2021) asserts that the low critical thinking skills in the less and very less categories are often related to learning methods that focus on memorization, rather than on the development of higher-order thinking skills. According to (Rohiat et al., 2018) In his research, he concluded that the majority of students have critical thinking skills in the adequate category. Students' critical thinking abilities are more evident in specific indicators (Azizah et al., 2018). Therefore, this research will present the outcomes of the analytical reasoning ability analysis for each indicator according to its category.

To achieve a more comprehensive understanding of the critical thinking competencies demonstrated by fifth-grade students regarding the respiratory system subject matter after the implementation of the RADEC pedagogical framework, a descriptive analysis was conducted, based on critical thinking parameters as described by Ennis, specifically elementary clarification, basic support, inference, advanced clarification, and strategy and tactics. The results of categorizing students' critical thinking abilities on each of these indicators are presented in the form of a table, showing the number of students in each

category, ranging from Very Good to Very Poor. After determining the number of students based on their categories, the next step will present the number of students based on indicators.

Indicator Elementary Clarification

Elementary clarification indicator is identifying problems by highlighting the questions and elements present in the issue. Indicators explain simply by focusing on questions, posing, and providing answers regarding a challenging explanation (Friska Lumban Gaol et al., 2022)



Picture 1. Result Elementary Clarification Indicator

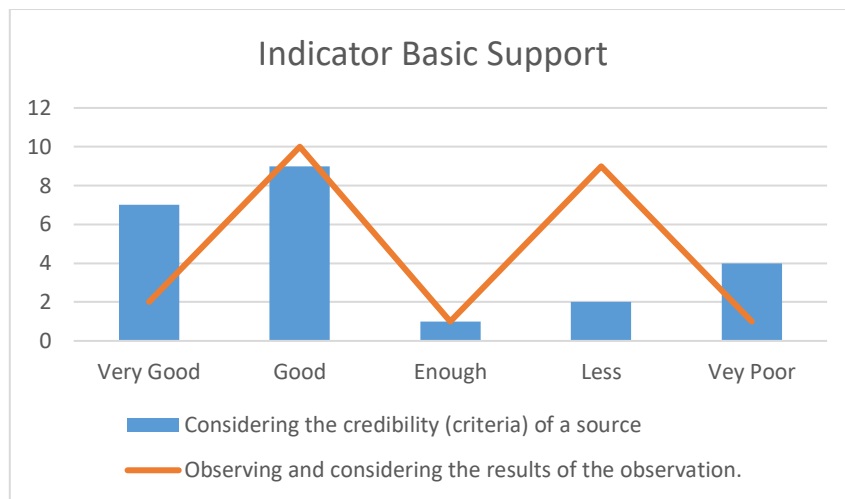
This finding aligns with the outcomes of the research carried out by the elementary clarification indicator question above, these results indicate that the majority of students (87%) have been able to identify the core issues and focus their attention on key concepts in the respiratory system material. This ability is reflected when students can identify the main respiratory organs and understand the gas exchange process as the main focus of learning. The sub-indicator of Asking and answering clarification questions shows better results, with 15 students in the very good category, 5 students in the good category, 3 students in the enough category, and no students in the less or very poor categories. This distribution shows

that almost all students are able to ask relevant clarification questions and provide accurate answers during the learning process with the RADEC model.

This finding aligns with the outcomes of the research carried out by (My et al., 2023), which found that the elementary clarification indicator received the highest score with an average of 82 on the posttest, indicating that elementary school students generally find it easier to master basic clarification skills compared to other critical thinking indicators. The superiority of the sub-indicators of asking and answering clarification questions compared to focusing on statements can be explained through the characteristics of the RADEC model, which emphasizes discussion and Q&A activities at the Answer and Discuss stages. The systematic stages of RADEC provide a learning structure that supports the development of questioning skills, where students are trained to clarify concepts through active interaction with peers and teachers. The context of the respiratory system material chosen in this study also supports the development of the two sub-indicators of elementary clarification. This material allows students to ask concrete questions about processes that can be directly observed. The results of this research reinforce previous findings that science education in elementary schools with innovative models can optimize students' basic clarification abilities as a foundation for developing more complex critical thinking.

Indicator Basic Support

Developing students' basic skills consistently so that they can utilize their thinking ability to carefully consider a source by paying attention to its credibility or criteria (Friska Lumban Gaol et al., 2022). This indicator consists of two sub-indicators, namely: (1) considering the credibility (criteria) of a source, which measures the extent to which students can assess the reliability and accuracy of the information used in their arguments; and (2) examining and reflecting on the results obtained from systematic observations.



Picture 2. Basic Support Indicator

According to the test outcomes regarding the basic support indicator in the sub-indicator of considering the credibility (Criteria) of a source, it shows that there are 7 students in the very good category, 9 students in the good category, 1 student in the enough category, 2 students in the less category, and 4 students in the very poor category. These results indicate that the majority of students (69.6%) have been able to evaluate and consider the credibility of the information sources used in the respiratory system material learning. This ability is reflected when students can distinguish between reliable information sources such as science textbooks and less credible sources, as well as identify the criteria for trustworthy sources.

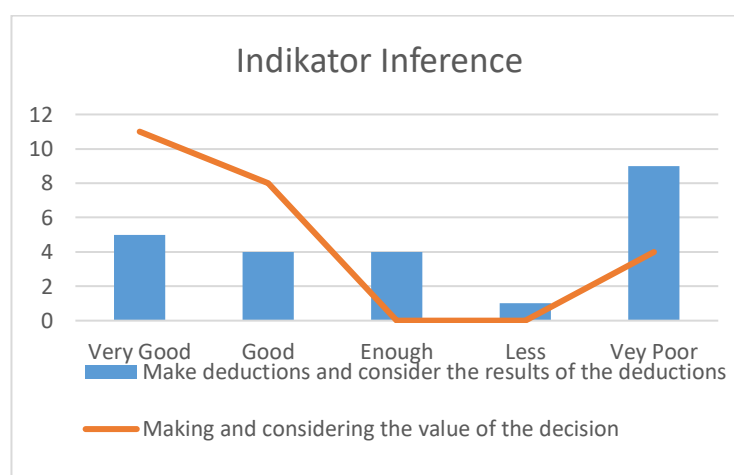
The sub-indicator of monitoring and taking into account observation results shows different outcomes, with 2 students in the very good category, 10 students in the good category, 1 student in the enough category, 9 students in the less category, and 1 student in the very poor category. This distribution shows that although the majority of students (52.2%) fall into the good and very good categories, there are still 39.1% of students who have difficulty in observing and critically considering the results of their observations. This is evident from the students' challenges in analyzing data from simple experiments on the respiratory process or interpreting diagrams of the respiratory system. The difference in achievement between these two sub-indicators is consistent with the findings (My et al., 2023) which states that the basic support indicators received varying scores, where the ability to evaluate the credibility of sources is generally easier for students to master compared to

the ability to observe and analyze observation results. The research shows that elementary school students tend to find it easier to identify credible sources than to conduct in-depth analysis of the observational data they obtain.

The context of applying the RADEC model to respiratory material provides a good opportunity to develop both sub-indicators of basic support. The Read stage allows students to identify credible sources about the respiratory system, while the Discuss and Explain stages provide opportunities for students to observe and analyze data together. However, the results of this study indicate that there needs to be a specific reinforcement at the Create stage, where students can practice analyzing and interpreting observational data more independently.

Indicator Inference

To find and ensure the necessary foundations to describe reasoned conclusions and to consider relevant information (Facione. 2015: 6) in (Friska Lumban Gaol et al., 2022). This indicator consists of two sub-indicators, namely: (1) Drawing conclusions and taking into account the outcomes of those conclusions, which measures students' ability to draw deductive conclusions from existing premises and assess the truth of those deductions; and (2) Making decisions and considering the value of students' ability to make decisions.



Picture 3. Result Inference Indicator

The sub-indicator for drawing conclusions and evaluating the outcomes of deductions shows that 5 students are in the very good category, 4 students are good, 4 students are in the enough category, 1 student is less, and 9 students are very poor. These results indicate

that only 39.1% of students are able to make deductions and consider the results of those deductions from good to very good. Most students (39.1%) still experience significant difficulties in drawing logical conclusions from the available information about the respiratory system, such as inferring the relationship between physical activity and respiratory rate or connecting the structure of the alveolus with its function in gas exchange.

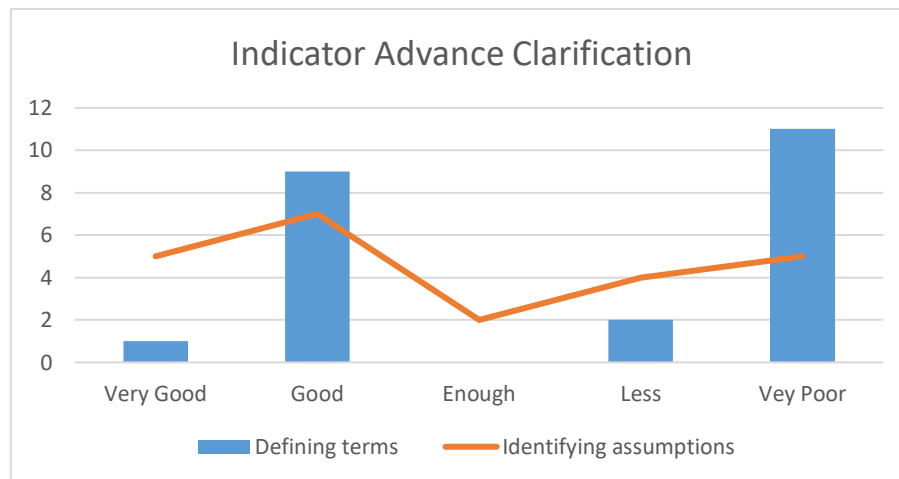
Contrasting results are shown by the subindicator that makes and considers decision values; 11 students are very good, 8 students are in the good category, 2 students are enough, 1 student is less, and 4 students are very poor. This distribution shows that the majority of students (82.6%) are able to make and consider decisions from good to very good. This ability is evident when students can make lifestyle choices that support respiratory health or decide on preventive measures for respiratory disorders based on the information they have learned.

The low achievement on the sub-indicator can be explained through the characteristics of cognitive development in elementary school students, who are still at a stage where they understand and process information through direct experiences and tangible objects. According to research (My et al., 2023), Elementary school students have difficulty in the deduction process because it requires hypothetical-deductive thinking skills that only develop at the formal operational stage. In the context of the respiratory system material, students have difficulty drawing conclusions from complex data or information, such as analyzing the cause-and-effect relationship between air pollution and respiratory disorders based on statistical data.

The context of applying the RADEC model to the inference indicator shows that the Discuss and Explain stages contribute positively to the development of value decision-making skills, but are not yet optimal in developing deduction skills. Research by (Susanto & Hapudin, 2024) emphasizing that the development of deductive skills requires more intensive scaffolding and gradual practice, starting from simple deductions to more complex ones. The RADEC model needs to be enriched with activities that specifically train students' ability to draw logical conclusions, such as through case analysis or tiered problem-solving at the Create stage.

Indicator Advanced Clarification

The advanced elucidation marker in essential reasoning abilities of students to provide a more in-depth explanation of a concept or statement. This indicator consists of two sub-indicators, namely: (1) defining terms, which measures students' ability to provide precise and clear definitions of terms or concepts used in a problem, and (2) identifying assumptions, which is the ability of students to recognize and state the assumptions underlying an argument or statement.



Picture 4 Result Indicator Advance Calrification

The sub-indicator for defining terms shows that there is 1 student in the very good category, 9 students in the good category, 2 students in the enough category, 2 students in the very poor category, and 11 students in the very poor category. These results indicate that only 43.5% of students are able to define terms well to very well. Most students (47.8%) still have difficulty defining scientific terminology related to the respiratory system, such as providing accurate definitions for the terms alveolus, diaphragm, or the process of diffusion in the context of gas exchange.

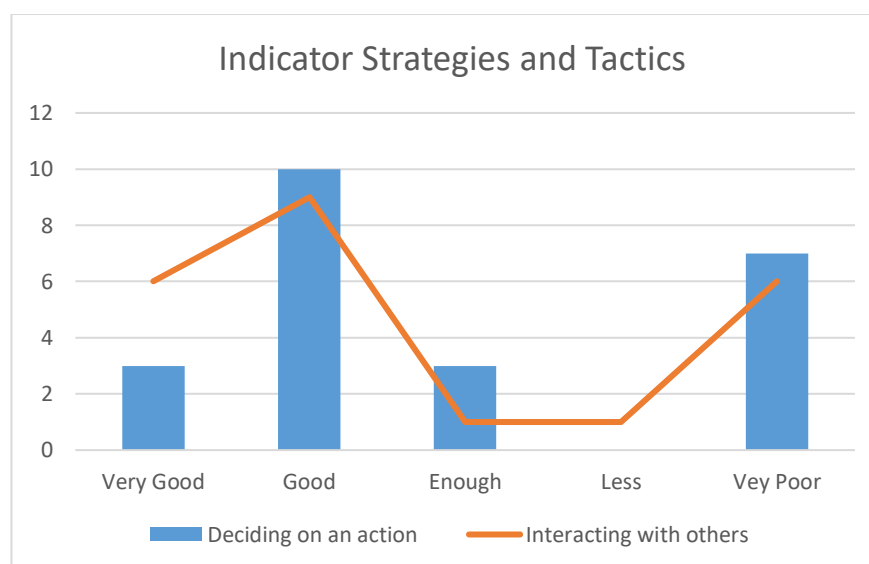
Sub-indicator identifying assumptions shows better results, with 5 students in the very good category, 7 students good, 2 students enough, 4 students less, and 5 students very poor. This distribution shows that 52.2% of students are able to identify assumptions from good to very good. This ability is evident when students can recognize the assumptions underlying statements about the respiratory system, such as identifying the assumption that "breathing is only important during exercise."

The low achievement in the sub-indicator defining the term can be linked to the findings (Khafah et al., 2023) which states that advance clarification achieved a percentage of

79% in the experimental class, but still faced challenges in the aspect of concept definition that requires a deep understanding of scientific terminology. This indicates that the innovative learning model can enhance the ability of advance clarification, while the aspect of term definition requires special strategies such as the use of science dictionaries, glossaries, or concept elaboration techniques. The context of applying the RADEC model to the advance clarification indicator shows that the Read and Explain stages contribute positively to the development of the ability to identify assumptions, where students are trained to analyze texts and explain their understanding in depth. However, to improve the ability to define terms, there needs to be reinforcement at the Create stage.

Indicator Strategies and Tactics

Strategy and tactics are related to determining actions and communicating with others. This indicator consists of two sub-indicators, namely: (1) Deciding on an action, which measures students' ability to determine the right solution or decision based on problem analysis, and (2) Interacting with others, which is the ability of students to use communication strategies, discuss, and collaborate to maintain or adjust the decisions made.



Picture 5. Result Strategic and Tactics

The sub-indicator for decision-making shows that there are 3 students in the very good category, 10 students in the good category, 2 students in the enough category, 2 students in the less category, and 6 students in the very poor category. This data indicates that the

majority of students (43.5%) are able to make decisions well, such as choosing the right steps in solving problems related to the respiratory system. However, there are still 26.1% of students in the very poor category, indicating a group of students who require further guidance in making strategic decisions.

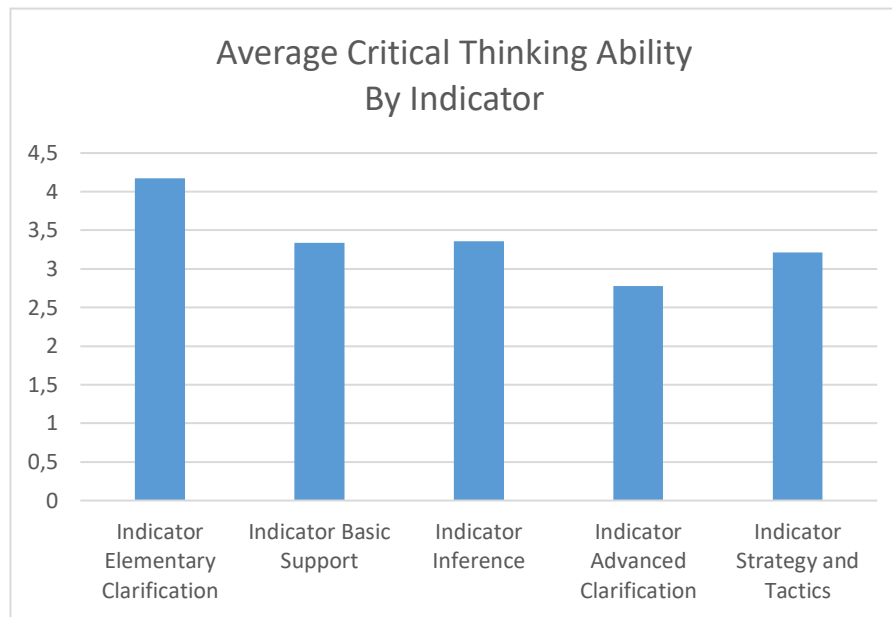
The sub-indicator of interacting with others shows a different pattern, where the highest number of students falls into the good category with 9 students, followed by the very poor category with 6 students, very good with 3 students, enough with 1 student, and less with 1 student. These results indicate that the ability to interact with others in the context of strategy and tactics, such as discussing, collaborating, and receiving feedback, is categorized as good for most students, but there are still a number of students who struggle with this aspect.

This finding is consistent with the study results (Khafah et al., 2023) which states that the indicators of strategies and tactics are one of the most challenging aspects of critical thinking for elementary school students. The research found that although project activities at the end of the learning process can enhance students' decision-making abilities, many students still require further training in interacting and collaborating in groups.

In the context of learning the respiratory system using the RADEC model, the discuss and create stages are highly potential for developing these two sub-indicators, as students are encouraged to discuss, design solutions, and make decisions collaboratively. The results of this study indicate that although most students have been able to make decisions and interact well, there are still groups of students who require special attention to optimally develop critical thinking strategies and tactics. The practical implication is that teachers need to increase collaborative activities, problem-solving simulations, and group reflections in their teaching.

The essential competency that students need to possess in facing the challenges of the 21st century is critical thinking; however, to this day, there are still variations in the level of mastery of each critical thinking indicator according to Ennis. Each indicator, ranging from elementary clarification, basic support, inference, advanced clarification, to strategy and tactics, shows varying levels of achievement. The average differences in each indicator reflect

the strengths and weaknesses of students in certain aspects of critical thinking, thus serving as a basis for designing more targeted learning strategies.



Picture 6. Result Average Critical Thinking Ability by Indicator

According to Ennis, the elementary clarification indicator scored the highest and is classified as good based on the average findings of each critical thinking ability indicator. This suggests that pupils are comparatively competent to recognize, define, and comprehend issues at a basic level. The basic support, strategy, and tactics indicators, on the other hand, are in the sufficient group, meaning that students still need to work on their abilities to choose problem-solving techniques and offer justifications. Students struggle to draw inferences and carry out in-depth follow-up clarifications, as seen by the indicators of inference and advanced clarification, which obtained the lowest scores and are classified as bad.

5. CONCLUSION

The research findings on the critical thinking abilities of fifth-grade students after implementing the RADEC learning model conclude that this model can encourage an improvement in critical thinking skills among some students. However, there is still a significant variation in achievement among individuals, especially in the indicators of deduction, definition of terms, and collaborative strategies. The majority of students demonstrated a good grasp of basic clarification aspects, but still require strengthening in analysis, inference, and the application of collaborative problem-solving strategies. These results indicate that the use of the RADEC learning model has been successful in building a foundation for critical thinking, but it needs to be optimized through in-depth analysis

exercises, problem-based learning, and structured collaborative activities. The practical implication of this research is the need for intensive mentoring and strengthening of learning strategies on the indicators that are still weak, so that the development of students' critical thinking skills can be equitable and optimal. This study also recommends that teachers increase discussion activities, problem-solving simulations, and group reflections in science learning, particularly on the respiratory system material, to support the comprehensive development of critical thinking skills. Additional studies are anticipated to advance a more adaptive learning model to the needs and characteristics of students, as well as to integrate a scaffolding approach to support the mastery of more complex critical thinking indicators.

6. REFERENCES

- Alsaleh, N. J. (2020). Teaching Critical Thinking Skills: Literature Review. *TOJET: The Turkish Online Journal of Educational Technology*, 19(1). <https://doi.org/http://www.tojet.net/articles/v19i1/1913.pdf>
- Andriani, M. W. (2021). Gambaran Kemampuan Berpikir Kritis Siswa Sekolah Dasar Saat Pandemi Serta Implikasinya Dalam Bimbingan Dan Konseling. *Nusantara of Research : Jurnal Hasil-Hasil Penelitian Universitas Nusantara PGRI Kediri*, 8(2), 86–94. <https://doi.org/10.29407/nor.v8i2.16464>
- Aslan, S., & Aybek, B. (2024). Development of Critical-Thinking Skills Rubric within the Scope of Multicultural Education. *Educational Process: International Journal*, 13(3), 139–158. <https://doi.org/10.22521/edupij.2024.133.8>
- Azizah, M., Sulianto, J., Cintang, N., Pendidikan Guru, J., & Dasar, S. (2018). ANALISIS Keterampilan Berpikir Kritis Siswa Sekolah Dasar Pada Pembelajaran Matematika Kurikulum 2013. In *Jurnal Penelitian Pendidikan* (Vol. 35).
- Ennis, R. H. (1985). *A logical basis for measuring critical thinking skills* (Vol. 43). *Educational Leadership*, (Vol. 43).
- Facione, P. (2015). Critical Thinking: What It Is and Why It Counts. In *Measured Reasons LLC and distributed by Insight Assessment*. <https://www.researchgate.net/publication/251303244>
- Fitriyanti, D., Mudiono, A., & Suciptaningsih, O. A. (2025). Analysis of critical thinking skills of primary students in IPAS learning. *Journal of Research in Instructional*, 5(1), 52–61. <https://doi.org/10.30862/jri.v5i1.539>
- Friska Lumban Gaol, A., Studi Pendidikan Fisika, P., & Riau, U. (2022). Implementasi Media Pembelajaran Berbasis Pendekatan Saintifik Menggunakan Augmented Reality pada Materi Tata Surya untuk Meningkatkan Keterampilan Berpikir Kritis Peserta Didik Kelas VII SMP. *Jurnal Pendidikan Tambusai*.
- Khafah, F., Suprpto, P. K., & Nuryadin, E. (2023). The effect of project-based learning model on students' critical and creative thinking skills in the ecosystem concept. *JPBI (Jurnal Pendidikan Biologi Indonesia)*, 9(3), 244–255. <https://doi.org/10.22219/jpbi.v9i3.27461>
- Lestari, P. D., Baiduri, B., & Ummah, S. K. (2024). Problem-based learning with iSpring assisted inquiry method on critical thinking skills. *Journal of Education and Learning*, 18(1), 148–153. <https://doi.org/10.11591/edulearn.v18i1.21089>

- Liang, W., & Fung, D. (2021). Fostering critical thinking in English-as-a-second-language classrooms: Challenges and opportunities. . *Thinking Skills and Creativity*.
- Manassero, M. A., Salvo, A. M., & Alonso, A. V. (2022). *Development of an instrument to assess young people's attitudes toward critical thinking*.
- Munjiah, A. U., Fajriani, M. H., Puspitasari, N. W., & Dewi, R. S. (2024). Model Pembelajaran Radec Sebagai Upaya Meningkatkan Evaluasi Pembelajaran Hots Di Sekolah Dasar. *Pendas : Jurnal Ilmiah Pendidikan Dasar*, 4.
- My, N., Nurlina, & Ruf, M. '. (2023). Analysis of Critical Thinking Skills of Elementary School Students Through Integrated Problem-Based Learning Model with Mind Mapping. *EDUKASIA: Jurnal Pendidikan Dan Pembelajaran*, 4, 1373–1380. <http://jurnaledukasia.org>
- Noerharyono, M., Suliyanthini, D., Ginting, F. B., Haerunnisha, I., & Febrilias, A. (2025). Strategi Pembelajaran Metode RADEC : berfikir kritis dan kreatif pada hasil produk ecoprint mahasiswa. *IKRAITH-HUMANIORA*. <https://doi.org/10.37817/ikraith-humaniora.v9i2>
- Nurnaningsih, N., Hanum, C. B., Sopandi, W., & Sujana, A. (2023). Keterampilan Berpikir Kritis dan Berpikir Kreatif Siswa Sekolah Dasar dalam Pembelajaran Berbasis RADEC. *Jurnal Basicedu*, 7(1), 872–879. <https://doi.org/10.31004/basicedu.v7i1.4773>
- O'Reilly, C., Devitt, A., & Hayes, N. (2022). Critical thinking in the preschool classroom - A systematic literature review. *Thinking Skills and Creativity*, 46. <https://doi.org/10.1016/j.tsc.2022.101110>
- Rahmawati, H., Pujiastuti, P., & Cahyaningtyas, A. P. (2023). Kategorisasi Kemampuan Berpikir Kritis Siswa Kelas Empat Sekolah Dasar di SD se-Gugus II Kapanewon Playen, Gunung Kidul. *Jurnal Pendidikan Dan Kebudayaan*, 8(1), 88–104. <https://doi.org/10.24832/jpnk.v8i1.3338>
- Rohiat, S., Amir, H., & Yunita, S. (2018). *Analisis Kemampuan Berpikir Kritis Mata Pelajaran Kimia Pada Siswakelas Xi Ipa Sman 1 Kepahiang*. 2, 33–38.
- Sari, R. M., Sumarmi, Astina, I. K., Utomo, D. H., & Ridhwan. (2021). Increasing Students Critical Thinking Skills and Learning Motivation Using Inquiry Mind Map. *International Journal of Emerging Technologies in Learning*, 16(3), 4–19. <https://doi.org/10.3991/ijet.v16i03.16515>
- SiSistem Pendidikan Nasional, Pub. L. No. No. 20 Tahun 2003, Lembaran Negara RI Tahun 2003 (2003).
- Suparni, N. (2016). *Humanisme, teologi, dan nasionalisme*. . UNY Press.
- Susanti, W., Fatmawati Saleh, L., Nurhabibah, Salamoon, G., & Acai Ndorang, T. (2022). *Pemikiran Kritis dan Kreatif*. CV. MEDIA SAINS INDONESIA.
- Susanto, R., & Hapudin, M. S. (2024). Improving Primary School Students Critical Thinking Abilities with the Help of Online Media: Effective Learning Strategies in Elementary Schools. *Mimbar Sekolah Dasar*, 11(2), 252–267. <https://doi.org/10.53400/mimbar-sd.v11i2.71790>
- Trilling, B., & Fadel, C. (2009). *21st Century Skills Learning for Life in Our Times*. Jossey Bass.
- Wahdaniyah, N., Agustini, R., & Tukiran, T. (2023). Analysis of Effectiveness PBL-STEM to Improve Student's Critical Thinking Skills. *IJORER : International Journal of Recent Educational Research*, 4(3), 365–382. <https://doi.org/10.46245/ijorer.v4i3.312>

- Wikanjaya, I. K., Yoda, I. K., & Tisna, G. D. (2022). Tingkat Partisipasi Siswa SMA Melakukan Aktivitas Olahraga di Luar Jam Mata Pelajaran Penjaskes (Pendidikan Jasmani dan Kesehatan). *Indonesian Journal of Sport & Tourism*, 4(1), 1–9. <https://doi.org/10.23887/ijst.v4i1.45026>
- Wulandari, B., & Surjono, H. D. (2013). Pengaruh problem-based learning terhadap hasil belajar ditinjau dari motivasi belajar PLC di SMK. *Jurnal Pendidikan Vokasi*, 3(2). <https://doi.org/10.21831/jpv.v3i2.1600>
- Zakiah, L., Pd, M., Lestari, I., Pd, S., & Si, M. (2019). *Berpikir Kritis Dalam Konteks Pembelajaran*. Erzatama Karya Abadi. www.erzatamapress.com