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PROFILE OF CRITICAL THINKING SKILLS OF GRADE IV ELEMENTARY SCHOOL STUDENTS ON ENERGY SOURCE MATERIAL

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Abstract

This study measured how well students can apply critical thinking skills when studying energy source materials in Natural Knowledge Science. In addition, research also reveals the factors that support or hinder the development of participants' critical thinking skills in the context of learning. The research method used is descriptive qualitative with a survey approach. The research subject is 40 participants enrolled in the IV Grade of SDN Tanggul, Wonoayu District, Sidoarjo Regency, with an institution in the form of a written thesis and an interview with the IV Grade's teachers of SDN Tanggul. Data analysis uses data reduction, data presentation, and conclusions drawn. The study results showed that, in general, the participants' ability to think critically. Interpretation indicators and analysis show more than good results compared to indicators of inference and evaluation. This indicates that the participants still have difficulties concluding and giving strong reasons to overcome their answers. The study's results also show that efforts to improve participants' critical thinking skills in the IV SDN Tanggul have been carried out but are still limited to conventional learning methods. This research suggests that teachers can use more interactive learning media and varied learning methods in learning science, especially energy source materials. In addition, teachers also need to provide trigger questions so that students can hone critical thinking skills and analyze information in depth. Thus, it is hoped that the ability of the participants to think critically will be improved so that they can face challenges in an increasingly complex era.

Keywords

Critical thinking, elementary student, skill, science, energy sources.

INTRODUCTION

In the era of Society 5.0, education must focus on developing the 21st eternal skills, including thinking critically. By cultivating these skills early on, we can prepare our learners to be productive, innovative, and able to face future challenges. Following the mandate of Law No. 20 of 2003, national education aims to nurture students to become individuals who can think critically, creatively and innovatively. The ability to think critically becomes more and more relevant in facing increasingly complex global challenges. Where are the participants being asked to analyze information evaluating arguments? Dani took the decision independently. High-level critical thinking is crucial in facing challenges and finding solutions. According to Prameswari (2018), critical thinking is a strong foundation for all aspects of life. In an independent curriculum emphasizing active learning, students need to be trained to think critically to learn independently with the guidance of teachers as facilitators. Critical thinking skills are an urgent need in the fourth industrial revolution era. However, there is a problem with the critical thinking skills of Indonesian elementary school students in science, which is far below international standards. Based on the results of the PISA assessment conducted by the OECD, the ability of Indonesian elementary school students to understand and analyze science information is still relatively low compared to students from other developed countries. In the 2022 PISA survey, the average score of Indonesian students in the field of science is far below the OECD average score. In addition, the TIMSS and PIRLS surveys also confirm that the quality of basic science education in Indonesia still needs to be significantly improved, considering Indonesia's very low ranking compared to other participating countries (Safitri & Mediatati, 2021)(Laudia, Widodo, & Sudibyo, 2023).

The objectives of learning science in elementary school are: (1) understanding the concept of science well. Students are expected to understand various concepts in science and how they relate to each other; (2) be able to use scientific methods. Students are trained to think scientifically, make observations, collect data, and draw conclusions to solve problems; (3) realizing the greatness of God, through science learning, students are expected to appreciate the beauty and order of the universe as God's creation; (4) applying the concept of science in daily life. Participants could use their knowledge of science to understand the natural phenomena around them and solve problems in their daily lives. Learning (Akmal, S. Pd., M. Pd., 2023) IPA focuses on students being directly involved in scientifically understanding and observing the surrounding nature. The special characteristic of learning science is doing scientific work to produce the product and process, which

gives rise to various thinking skills. The basic understanding of grade IV students of SDN Tanggul regarding energy sources is generally still concrete and limited to daily experience. They often associate energy with electricity used to power lights or other electronic devices. Most learners may still be unfamiliar with energy concepts such as sun, wind, and water. This shows that their understanding of energy sources still needs to be enriched with various examples and more varied experiments (Meryastiti, Ridlo, & Supeno, 2022).

Ability to think of skills at a high level thinking critically, as involves complex cognitive processes. Critical thinking systematically collects, interprets, and evaluates information to understand and make rational decisions comprehensively. Facione, an expert in this field, underlines six interconnected cognitive abilities in critical thinking. These abilities allow us to analyze in-depth information, organize our thinking, and draw valid conclusions based on existing evidence. According to Nickerson, human thought processes are classified into two main categories: basic and complex. Basic thinking is a logical process involving steps ranging from simple to more complex. This rational thinking activity includes a variety of cognitive skills such as memorizing information, imagining things, grouping data, making generalizations, comparing, evaluating, analyzing, synthesizing, drawing conclusions, and making deductions. Skills (Fristadi & Bharata, 2015)(Nugraha, 2018) Think that the criticism of the participants of the IV grade of SDN Tanggul on the material of energy sources varies. Some participants could identify various energy sources and explain their uses. However, many students still have difficulty analyzing the advantages and disadvantages of each energy source and associating the concept of energy sources with environmental and sustainability issues. This hali shows that participants' ability to be educated in evaluating information and drawing logical conclusions still needs to be improved.

Based on initial observations, lecture and assignment methods still dominate science learning in grade IV of SDN Tanggul. Participants are taught to be passive. I only received information from the guru without much interaction. Learning media use is minimal, so the learning process becomes less interesting and effective. The learning process becomes less interesting and effective. In the context of learning, critical thinking is not only limited to memorizing facts or information but also the ability to connect various concepts, analyze problems, and find innovative solutions. The study of energy sources, as one of the important materials in natural sciences, is one of the important topics for (Rahmawati, Pujiastuti, & Cahyaningtyas, 2023) practicing the ability to think critically for student participants. Through the material on energy sources, students can be asked to analyze

various energy sources, their advantages and disadvantages, and their impact on the environment and human life.

The independent curriculum is designed to spark students' curiosity about the world around them, encouraging them to ask, observe, and seek answers to their questions. In addition, they are also invited to hone their critical thinking skills, analyze information, and solve problems. They are also encouraged to be able to develop new ideas and creative thinking skills in finding solutions. Several previous studies have shown the ability of thinking skills (Dina, Prahani, Marianus, Wibowo, & Sanjaya, 2024). The criticism of the participants still needs to be increased. Previous research shows that Indonesian students' critical thinking ability, especially in natural sciences, is still unsatisfactory. Such results show the need for further efforts, especially from teachers, to develop more innovative learning methods to encourage the growth of students' critical thinking skills. Research from (Putri, Sutarto, & Wahyuni, 2023)(Firdaus, Suryanti, & Azizah, 2020) This proves that interactive multimedia that is designed with the SETS approach is an instrument that is effective for mastering the ability to think critically about elementary school IV students. Validity practicality has been empirically tested. According to an analysis of nine SMPNs in Central Lombok (Ramdani, Jufri, Jamaludin, & Setiadi, 2020) the average ability to think critically about the participants is in a high category, namely 71.69. According to (Rachamatika, et al., 2021) Significant differences between the average assessment ability to think critically of participants students using the guided inquiry model (80.66) and Dani model cooperative type TPS (78.4). These results indicate that the guided inquiry model outperforms in stimulating critical thinking skills.

Meanwhile, according to the ability (Rahmawati, Pujiastuti, & Cahyaningtyas, 2023) Think about the criticism of the participants of the IV grade schooling in the sufficient category. Although several studies have shown the effectiveness of various learning methods in improving students' ability to think critically, there are research gaps that specifically study the implementation of the Independent Curriculum. Previous studies have tended to focus more on certain learning methods or a limited population of students.

In the independent curriculum of science education, especially energy source materials, teachers generally only show concrete examples of the daily life of students without exploring their abilities, skills, and critical thinking skills of students in the classroom. Developing this ability for students on energy source material is even more urgent considering the increasingly complex energy source problems facing the world today. Climate change, the energy crisis, and the demand for clean

energy are challenges that future generations must face (Kemdikbud, file: Kurikulum, 2024). Therefore, since the early participants, it is necessary to be equipped to think critically. It must be active in finding solutions to these energy problems. In digital, participants are expected to be able to think critically to create students who can compete following the development of the digital era (Asri, Haryani, Ellianawati, Subali, & Widiarti, 2024).

Based on this background, this study aims to analyze the extent to which critical thinking skills critical participants are educated as a material consideration for the use of media and model learning deep series improve skills think criticism participants learn. As a research theory, this will add to the knowledge of science learning related to developing the ability to think critically in students. The results of this research can be used to fill research gaps that are still limited to the study of the implementation of the Independent Curriculum in the context of science learning. Pragmatically, the results of this study are expected to improve the quality of science learning in elementary schools, in energy source materials, applying an effective learning model, find that they are more active in participating in the learning process, their understanding of concepts and critical thinking skills can increase.

METHOD

In this study, researcher used a descriptive qualitative approach with a survey method to describe a way to explore the characteristics of the population. This research is a descriptive qualification in SDN Tanggul. The researcher explained the profile of thinking skills of critical participants at IV grade of SDN Tanggul. The research data results from analyzing the participant's ability to think they were enrolled in the IV grade of SDN Tanggul. Data collection techniques are carried out using questionnaires following the indicators of critical thinking or interviews. A questionnaire is used to measure the ability of student participants. The interview was conducted with a grade IV teacher. The researcher identified four main indicators from the questionnaire results, namely: (1) interpretation, (2) analysis, (3) inference, and (4) evaluation. The researcher presents data as a diagram or chart showing the percentage and number of students who achieved each indicator. The results of the analysis will later show the four indicators of critical thinking that students have achieved. The researcher argues that it is necessary to improve science learning to improve student participants' ability to think critically. However, the researcher also acknowledged that factors outside of school, such as the family and social environment, can also affect the

development of students' critical thinking skills. Follow the research flow carried out by the researcher:

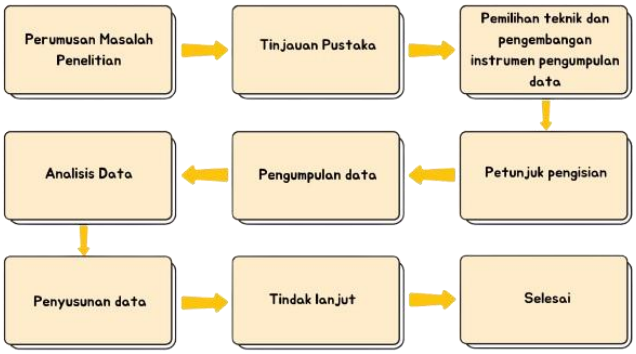

Figure 1. Research Framework

FINDINGS AND DISCUSSION

Findings

This research aims to describe the profiling of skills thinking critically of the participants who were educated in the IV grade of SDN Tanggul on the material of energy sources. Thinking skills are very important for participants in dealing with challenges in the information industry. Having critical thinking skills, they are expected to be able to analyze information and arguments and make the right decisions.

Table 1. Profile of Critical Thinking Skills of Grade IV Students of SDN Tanggul on Energy Source Materials

No.	Level of Critical Thinking Skills of Students	Learners' Critical Thinking Skills Level on Each Indicator	The use of media and learning models in developing students' critical thinking skills	Supporting and inhibiting factors for improving students' critical thinking skills
1.	Very high	1. Interpretation: 10 2. Analysis: 10 3. Inference: 10 4. Rating: 10	Media and learning models are integrated and innovative, significantly impacting the ability to think critically about student participants. The media used is diverse and interactive, and the learning models applied strongly support the development of higher-level thinking skills.	**Internal Factors:** • High interest in learning • Strong self-motivation • Good cognitive abilities • High confidence • Good reading and writing skills • High curiosity
2.	Tall	1. Interpretation: 8 2. Analysis: 8	Media and learning models are integrated and effective in	**External Factors:**

		3. Inference: 8 4. Rating: 8	improving students' critical thinking skills. The media used varies and supports the learning process, and the learning model applied is quite flexible and involves students actively.	• Conducive learning environment • Active and innovative learning methods • The use of varied learning media • The existence of a critical thinking model from teachers • There are frequent discussions and debates • Support from parents and the surrounding environment
3.	Keep	1. Interpretation: 6 2. Analysis: 6 3. Inference: 6 4. Rating: 6	The use of media and learning models is still limited and not fully optimal in developing the ability to think critically of student participants. The media tends to be conventional and less interactive, and the learning model still centers on the teacher.	
4.	Low	1. Interpretation: 5 2. Analysis: 5 3. Inference: 5 4. Rating: 5	The use of media and learning models is very minimal or even non-existent. The learning model is still very traditional and does not stimulate students to think critically.	
5.	Very low	1. Interpretation: 3 2. Analysis: 3 3. Inference: 3 4. Evaluation: 3	There is no use of media and learning models that support the development of students' critical thinking skills. The applied learning model is very passive and does not involve students actively.	

From this table, participants' critical thinking skills are presented in general. This level is divided into five categories: very high to very low. This category shows how well learners can interpret information, analyze data, draw conclusions, and evaluate arguments. The second unit describes the participants' critical thinking skills level in each indicator, specifically. The four indicators assessed are interpretation, analysis, inference, and evaluation. Each indicator is given a score from 3 to 10, where the story that is overestimated shows the ability of the overdog that is good. third unit is to divide the use of media and the learning model in developing the ability to think critically of student participants. The relationship between the use of mediation and the learning model, which varies with the level of critical thinking skills of the participants, is explained in detail. The more integrated, innovative, and significant the use of media and learning models, the higher the level of critical thinking skills of student participants.

Unit 4 identifies supporting factors that inhibit the skill improvement of student participants in thinking critically. These factors are divided into two categories: internal factors (which originate from the inner self of the student participants) external factors (which originate from the surrounding environment). Internal factors include learning interest, motivation, cognitive ability, confidence, and basic skills. Meanwhile, external factors include the learning environment, learning methods, media use, teachers' thinking models, discussions, and parental support.

To measure the ability to think critically, the participants were taught IV grade of SDN Tanggul to understand the material of energy sources. I have prepared a written thesis that consists of 8 questions. The questions are designed based on indicators of critical thinking ability. The interview aimed to learn about the science lessons on energy source materials, including whether the learning model has been applied to help grade IV students of SDN Tanggul improve their critical thinking skills. To determine the ability to think critically about the participants of IV grade of SDN Tanggul, their scores are calculated based on each indicator tested. The more points you earn, the higher your critical thinking skills. Points are given with the following conditions: 1) If the answer is correct, complete, and systematic, then it is given a score of 5; 2) If there are only two components, then it is given a score of 3; 3) If there is only 1 component of the correct answer, you get score 1; 4) However, the answer is wrong or incorrect, it will not add a score or score of 0. The highest score is 40. The final value is then calculated with the following formula: 1.

Table 2. Critical Thinking Skill Level Category

Skor Rentan	Tingkat Kemampuan	Deskripsi Singkat
36-40	Sangat Tinggi	Mampu menganalisis informasi secara mendalam, mengevaluasi argumen, dan mengajukan solusi kreatif
31-35	Tinggi	Mampu menganalisis informasi, mengevaluasi argumen, dan menerapkan pengetahuan dalam situasi baru
26-30	Sedang	Mampu memahami informasi dan menerapkan pengetahuan dalam situasi yang familiar
21-25	Rendah	Masih perlu bantuan dalam memahami informasi dan menerapkan pengetahuan
⩽ 20	Sangat Rendah	Perlu dukungan ekstra dalam mengembangkan kemampuan berpikir kritis.

This research was conducted to quantify student participants' ability level, skills, and critical thinking. The instruments used are essay questions based on Facione's critical thinking framework, including interpretation, analysis, inference, and evaluation skills. The profile of the ability to think

critically of the participants was observed in Figure 2.

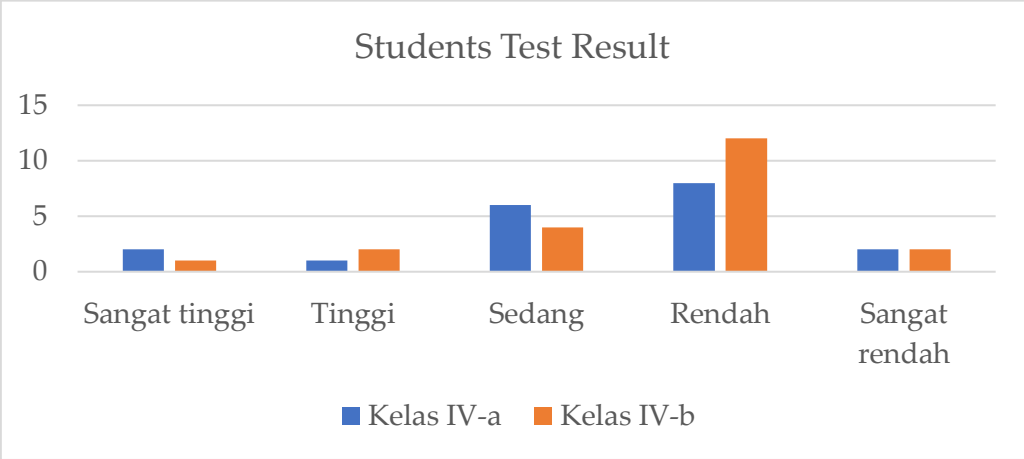

Figure 2. Level of Critical Thinking Skills of Learners

Based on the data obtained from 40 students in classes A and B, the distribution of critical thinking skills tends to be lower. A total of 20 students (50%) were categorized as having low critical thinking skills, followed by four students (10%) who were very low. In contrast, only three students (7.5%) showed very high critical thinking skills, and the other three students (7.5%) were high.

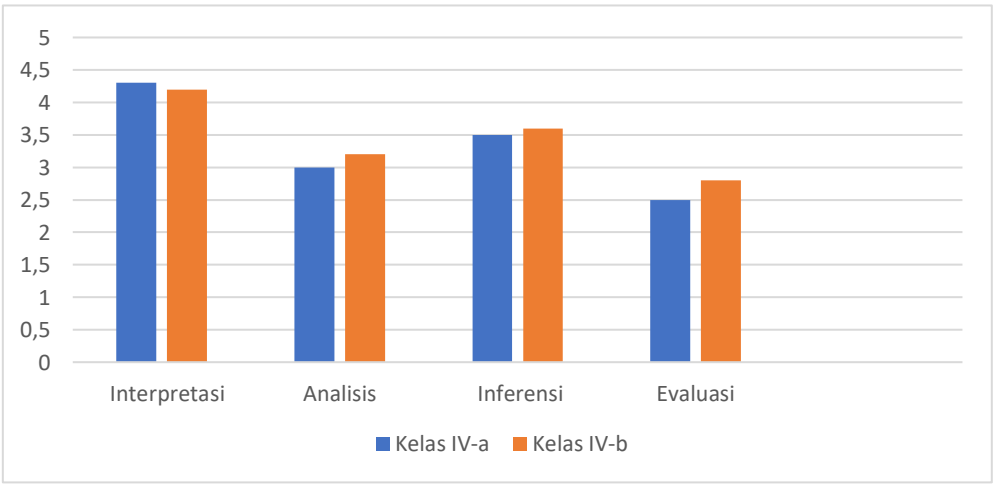

Figure 3. Learners' Critical Thinking Skills Level on Each Indicator

Data analysis in Figure 3 shows disparity, average values, and critical thinking ability between grade IV-A and IV-B SDN Tanggul students. Although there were differences in the average script indicators of critical thinking ability, including interpretation, with the highest score, showed that students were generally able to master basic skills in understanding and responding to the problems presented. The second highest indicator is inference, followed by analytical indicators,

and the last is evaluation. A low average score on the evaluation indicator indicates that students have not been able to explain in detail the assessment process that they have carried out to solve a given problem or have not given a detailed reason for their conclusion. Examples of learner questions and answers on each indicator, including interpretation, analysis, inference, and evaluation, are provided below:

1. Interpretation

   This indicator shows that students must understand the questions given. Presented with a picture of a car emitting smoke, students were asked to explain how the negative impact of the use of fossil fuels was faced with the surrounding environment.

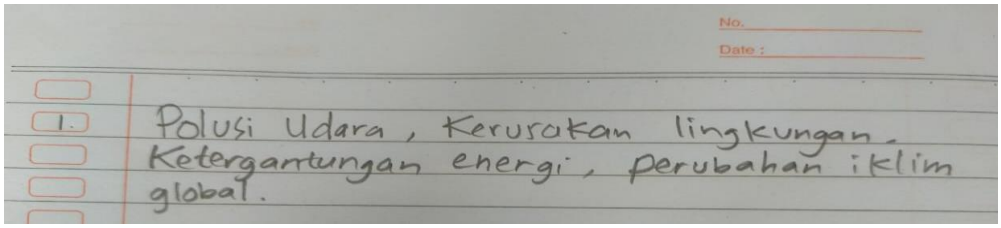

Figure 4. Students' Answers

2. Analysis

   In analyzing this indicator, students must understand the problem more deeply. In this indicator, students compare flashlights. Flashlight A uses batteries, while flashlight B uses a hand-actuated dynamo. If you want to make a toy car model that can move without batteries, what energy source is best? Explain your reason!

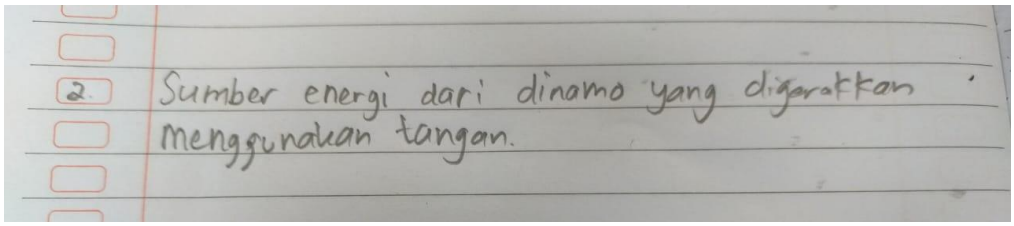

Figure 5. Students' Answers

3. Inference

   The inference indicator asks the learner to conclude. To conclude, they must know the necessary elements to do so. The question for the inference indicator is: Every morning, Budi always turns on the light in his room. The lamp's light makes the room bright so Budi can

study comfortably. Explain why the lights can turn on and provide light. What is the energy source that lights use?

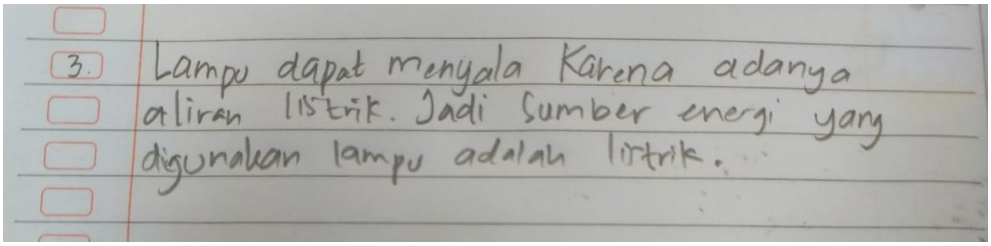

Figure 6. Students' Answers

4. Evaluation

The evaluation indicator asks students to assess the credibility of the conclusions produced. In the evaluation indicators, students were asked to answer the following question: Rina saw her mother drying her clothes in the sun. Explain how sunlight can dry clothes and what energy the sun produces.

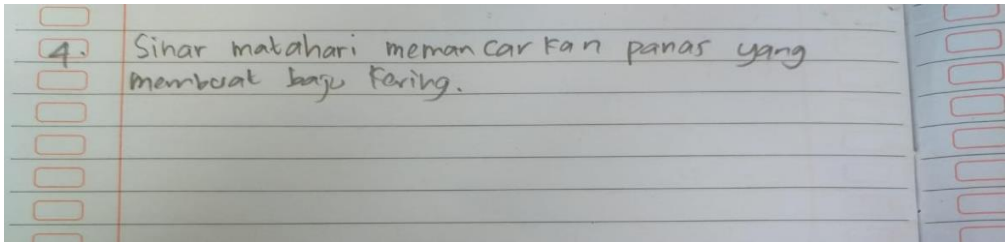

Figure 7. Students' Answers

This research involves grade IV students and teachers who have important skills in the teaching and learning process. Teacher provide input on the learning model, and the media they obey can improve the ability to think critically. Participants are educated on learning energy source materials. The results of interviews with the teacher of the student IV grade SDN Tanggul found that the ability to think critically is very important in studying the material of energy sources. I realized that this material is very relevant to the daily life of students, so the ability to analyze, evaluate, and draw conclusions is very important. To improve the ability to think critically of student participants, teachers have tried to implement various learning strategies. The efforts that are carried out are to use various learning media. Using textbooks, laptops, LCDs, and videos about energy sources is expected to provide interesting visual and auditory stimulation for students to be more active in thinking and analyzing information. In addition to the use of media, teachers also involve students in hands-on practical activities. Through practical activities, students are expected to learn more than understand concepts related to energy sources in depth. With this method, participants passively receive information and actively participate in learning.

In an interview with the teacher, he said that thinking critically is useful for learning energy sources;it can train participants to think logically and systematically. To improve the ability to think critically, IV SDN Tanggul participants were invited to analyze basic questions about energy sources. These questions are designed based on events or occurrences that are familiar to students. In science lessons, teachers still use a simple method, explaining the material on the board with the help of textbook media and sometimes displaying PowerPoint presentations or videos containing learning materials. Previous research was conducted to measure the ability of the critical thinking skills of participants to be taught in science lessons. Some of the findings that I have found to develop critical thinking skills include:

Interactive Media. Interactive learning media such as simulations, educational games, and learning videos stimulate the active involvement of students in teaching and learning activities. They can explore concepts independently, conduct virtual experiments, and get immediate feedback. This stimulates the students' ability to analyze and evaluate.

Learning Model *of* Based Learning. I PBL found that placing students as problem solvers has improved critical thinking skills. By facing authentic problems, students are trained to identify problems, gather information, evaluate alternative solutions, and make decisions.

Collaborative Learning. Learning activities involving students' cooperation encourage them to exchange ideas, provide input, and construct mutual understanding. This process stimulates communication, negotiation, and critical thinking skills.

Lighter Question. The use of trigger questions that require analysis, synthesis, and evaluation encourages participants to be able to master their critical thinking skills and connect various concepts. Ask questions like this to stimulate the ability to think critically and encourage them to seek more complex answers.

Discussion

This research aims to reveal the skills of critical thinking participants in the IV grade of SDN Tanggul in material energy sources. The results of my research show that, generally, participants are still in the level of ability to think critically, which is low to moderate. The analysis showed that students tended to be stronger in interpreting information and drawing inferences but still weak in analyzing deeply and evaluating critically. This condition can be attributed to cognitive development factors, as Grade IV students are typically still in the concrete thinking stage. It is easier to understand the concept of concrete and concrete than it is compared to the abstract concept.

According to Bloom's learning theory, critical thinking is a very important skill. This ability helps learners not only to remember information but also to analyze, evaluate, and create new knowledge. In other words, critical thinking equips students with the tools necessary to solve complex problems and innovate. According to Anderson and Krathwohl, critical thinking in the world of knowledge involves the ability to dissect information, assess its truth, and create new ideas. Critical thinking is a cognitive process that emphasizes assessing information and arguments. The main objective is to achieve convictions and rational decisions. (Yulianti & Herpratiwi, 2024) (Daga, Wahyudin, & Susilana, 2022). This is in line with several previous types of research that have also shown that the ability to think critically of the participants is especially at the level of basic education. It still needs to be improved. Based on Facione's critical thinking framework, this study measures four main indicators: interpretation, analysis, inference, and evaluation. Strengthened by another study shows that the lack of practice in solving contextual problems and requiring deep reasoning is one of the factors causing students' low thinking skills. Passive learning, where students receive more material than actively seeking solutions, hinders the development of higher cognitive abilities. The lack of connection between the subject matter and real problems also contributes to this condition (Khishaaluhussaniyyati, Faiziyah, & Sari, 2022)(Yampap & Bay, 2020).

Ennis grouping the indicators of activity thinking critical KEI in the following five large activities In practice, we find that uniting and combining to form an activity or to separate only a few indicators are: (1) give a simple explanation, yang contains: focusing questions, analyzing the question, Dani asked, also answer questions about the ability to explain or make statements; (2) build basic skills, that is to be addressed, to consider whether the source is to be found to be reliable or not, to observe, to consider the report, to make observations; (3) conclude which consists of overcoming deduction activities or considering the results of deduction, inducing or considering the result of induction. Dani participates in determining the value of consideration; (4) gave further explanations established to identify the terms and definitions to consider and dimensions, including identifying assumptions; I (5) Strategic and technical, which is what is established is overcoming the actions of the person interacting with other people. Students tend to interpret better information presented visually or through concrete examples; learning environment factors also influence this. Although teachers have tried to implement various learning strategies, the use of learning media is still limited, and learning models that tend to be conventional can hinder the development of skills (Zubaidah, 2020) think of high-level criticism (Asiza & Irwan, 2019). This

aligns with Bruneri's view that a learning environment rich in stimulation and opportunities to interact with various ideas will stimulate students' cognitive development (Sit, M. Ag, et al., 2016).

Fisher (2009) defines critical thinking as an activity that can be perfected through practice. Good critical thinking is characterized by several intellectual standards: clarity, relevance, completeness, and coherence. Characteristics of thinking (Apiati & Hermanto, 2020) The criticism is: (1) be able to distinguish ideas that are relevant and irrelevant; (2) be able to identify differences or gaps in information; (3) be able to recognize in detail the parts as a whole; (4) be able to relate the relationship of one problem with another problem; (5) able to analyze back and evaluate answers to solve problems to produce answers or conclusions. Of the five critical thinking characteristics, grade IV students of SDN Tanggul still have not shown their critical thinking skills, especially in learning science energy source material. Study (Agustin, M. Pd. & Pratama, M. Pd., 2024) Science is an effort to recognize everything around us. even answered various questions about why and how all these things happened. I fix it with nature, such as planting animals and even invisible things to the human eye. (Muhlas, 2023) Science lessons are fun lessons. Responding to new knowledge, Dani opens up opportunities for practicing new skills by asking questions. To prepare you to make important decisions when you come. According to (Inabuy, Sutia, Maryana, Hardanie, & Lestari, 2021) Živkovici, the 21st eternal students need participants who are ready to face the problems of the world, which involve them in great skills thinking about the higher level. The results of (Hartati, Damaianti, Gustiana, Aryanto, & Jannah, 2022), align with several previous studies that show that the ability to think critically of student participants still needs to be improved. Some studies have also found that factors such as the use of varied learning media and active learning models, as well as the involvement of participants in teaching and learning activities, can improve critical thinking skills (Atiaturrahmaniah, Aryana, & Suastra, 2022).

CONCLUSION

This research aims to identify the profiling ability of critical thinking participants in the IV grade of SDN Tanggul in the material of energy sources. The results of my research show that, in general, the ability to think critically of the participants is still at a low to moderate level. Students are stronger in interpreting information and drawing inferences but still weak in analyzing in-depth and evaluating critically. Several factors that affect these are the cognitive development of the participants, learning environment, the learning methods that are still conventional. To improve

student participants' ability to think critically, it is recommended to strengthen teacher teachers in implementing more effective learning strategies, developing more interactive learning media, integrating the curriculum with actual issues, and increasing collaboration between various parties involved in the educational process. Thus, students can be better prepared to face increasingly complex challenges. It is necessary to stimulate students' critical thinking skills through various media and learning methods that are more interesting and interactive, including *game-based learning* in science learning in elementary school.

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