MIREJ Multidisciplinary Innovation Research Journal
Volume 2 Issue 1 Year 2026 Pages 11-28 | e–ISSN 3089-4069 | DOI: 10.70152
https://journal.akademimerdeka.com/ojs/index.php/mirej

Analysis of Students' Creative Thinking Abilities in Science Learning in Elementary Schools

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Abstract: Creative thinking is a skill that student must posses to support the mastery of 21 st-century skills. In natural science (IPA) learning, this ability plays a role in facilitating students to create ideas, innovation, and constructive thinking. This research aims to explore the level of creative thinking ability of fourth-grade students in science learning at the elementary school level. The type of research used is the qualitative descriptive method. The subject of the research were 50 students, consisting of 28 female students and 22 male students. The data collection technique was carried out through observation, test, and documentation. The research instrument consist of eight essay question formulated based out five indicators of creative thinking ability, namely fluency, flexibility, originality, elaboration, and metaphorical thinking. The data analysis technique used was source triangulation. The result of the data analysis show that the aspect of fluency dominates the students achievement, followed by flexibility. Meanwhile, originality, elaboration, and metaphorical thinking fall into the less satisfactory category. These findings indicate that students tend to be able to present original ideas, but still need reinforcement in flexible thinking as well as in the use of analogies or metaphors.

Keywords: creative thinking; elementary school; science learning.

INTRODUCTION

Learning is an educational interaction process between educators and learners aimed at building knowledge and positioning teachers as facilitators in providing learning resources (Inaya & Setiyawati, 2023). The 21st century demands a strong mastery of knowledge and technology, necessitating human resources capable of competing globally (Ramdani et al., 2019). This demands humans to possess creative skills in order to balance knowledge and technology (Hidayat et al., 2018).One of the main objectives in the learning process is to develop higher-order thinking skills in students. In this context, the role of teachers is very strategic in preparing students with 21st-century skills to face various real-life challenges. These skills include communication, collaboration, critical thinking and problem solving, as well as creative thinking, collectively known as the 4Cs (Septikasari, R., & Frasandy, 2018).

Natural Sciences (IPA), as one of the subjects at elementary school level has great potential to be developed through a creative thinking approach, because this ability is a

fundamental element in science learning (Mahlianurrahman, 2017). Learning Natural Sciences (IPA) plays a role in developing students' creative thinking abilities and helping them understand various natural phenomena, everyday life problems, and their surrounding environment.(Yuliyono & Radia, 2020). To help students understand science concepts more deeply and independently, it is important to develop their creative thinking skills. Thus, creative thinking becomes an inseparable aspect of science learning, supporting a more active and meaningful understanding process. Creative thinking is someone's ability to create ideas or solutions that are unique and have never existed before.(Bash, 2015).

In the learning process, students with creative thinking skills can contribute by helping classmates who have difficulty understanding the material (Fakhirah et al., 2023). Therefore, the development of creative thinking skills becomes an important aspect, considering that this skill is one of the competencies needed in the workforce. As stated by (Leasa et al., 2021),the ultimate goal of education is to foster creativity within individuals. Munandarin Arini,(2017) also stated that students' creative thinking abilities are still under-stimulated, so students are not yet accustomed to thinking divergently or considering various possibilities in problem-solving. Therefore, creative thinking skills need to be developed in science education so that students can find various alternative solutions to the problems they face.

In addition to mastering Natural Science (IPA) material, students also need to have creative thinking skills as part of the competencies that support meaningful learning (Inaya & Setiyawati, 2023).Training in creative thinking skills can begin by equipping students with relevant knowledge from the elementary education level. A child's creative character will develop if trained from an early age, through activities that encourage them to create new things or modify existing ones into unique forms according to their ideas and creativity (Cahyaningsih, U., & Ghufron, 2016).Students are not only required to understand the content of the material, but they are also expected to interpret the meaning of that material, so that this understanding can be applied in everyday life contexts (Fakhirah et al., 2023).

Creative thinking abilities encompass several indicators, such as fluency, which is the ability to generate various relevant ideas or answers; flexibility, which is the ability to produce diverse ideas and change approaches and directions of thought; originality, which is the ability to present unique and rarely found ideas; elaboration, which is the ability to develop and enrich ideas in detail and depth; and metaphorical thinking, which is the ability to use creative and relevant analogies or metaphors to clarify concepts (Nisa Auliyah& Elok Sudibyo, 2021) However, the results show that most students have not yet been able to demonstrate uniqueness in their thinking. Furthermore, students' responses tend to be uniform, indicating a lack of fluency in expressing ideas, as well as limitations in providing diverse alternative answers, reflecting a lack of flexibility in thinking (Widiastuti et al., 2021).This indicates that many students still often rely on teacher guidance and are not yet accustomed to thinking independently. And on the indicator that has not yet been optimally achieved is originality, where ideally students are able to present new and unique ideas, answers, and expressions, as well as develop concepts independently(Forte-Celaya et al., 2021).

Although science learning emphasizes the importance of developing creative thinking skills, in reality there is still a gap between these expectations and the real conditions faced by students. Many students still experience difficulties in important aspects such as flexibility and originality, and are not accustomed to thinking independently or generating varied ideas. On the other hand, previous studies tend to be general in nature and have not examined in depth the creative thinking abilities of students in science learning based on the five main indicators. As a result, there is still a lack of research that presents a comprehensive portrait of the creative thinking profile of elementary school students systematically. This situation

shows the need for further research that can fill the void and become the basis for designing more targeted and optimal science learning strategies.

Given these conditions, namely the importance of creative thinking skills in supporting the independent understanding of science concepts, this research focuses on examining the extent to which elementary school students have developed their creative thinking skills in the context of science learning. This study aims to explore students' creative thinking abilities through a question grouping approach based on five main indicators of creative thinking. Through this approach, it is expected to obtain a more comprehensive picture of students' creative thinking ability profiles and to serve as a basis for designing more effective science learning strategies.

METHODS

This research uses a qualitative method with a qualitative descriptive approach to gain a deeper understanding of students' creative thinking skills in the context of learning Natural Science (IPA) at the elementary school level. This qualitative descriptive approach was chosen because it is in accordance with the characteristics of the research which aims to present a clear and detailed description of the phenomenon under study without trying to build new theories and emphasizes that this approach is very appropriate for understanding individual experiences or abilities in detail and systematically through narratives (Kim, H., Sefcik, J. S., & Bradway, 2004) Qualitative methods allow researchers to explore phenomena from the participants' point of view and in a natural context, so that the data collected are written or oral narratives that describe the actions and thoughts of the subjects observed (Creswell, 2014; Sugiyono. (2014)., n.d.). Therefore, this study focuses on a detailed analysis of the indicators of creative thinking shown by students through responses to research instruments, where the entire data collection process is carried out in real conditions without any intervention, so that the results obtained reflect the state of the field objectively (Miles et al., 2014; Yin, 2011; Merriam, 2009).

The subjects in this study were 50 fourth grade students selected through purposive sampling technique, with 10 students each from five elementary schools. The selection was made based on certain criteria, such as students' involvement in science learning and teachers' recommendations regarding students' ability to express ideas. The composition of respondents consisted of 28 female students and 22 male students. The data collection techniques used included observation, written tests, and documentation. According to (Nurlaila et al., 2016) research instruments are tools used by researchers to collect data. The instrument used was a creative thinking ability test which was compiled by the researcher by referring to the indicators of Nisa Auliyah et al., (2021),namely fluency, flexibility, originality, elaboration, and metaphorical thinking. Each indicator is measured through description questions designed to explore students' creative thinking skills in depth.This test was chosen because it has the advantage of being able to measure higher-level student abilities (Stankous, 2016).

The creative thinking skills test instrument applied in this study shows an adequate level of validity, as evidenced by most items having an outer loading value above the 0.70 threshold, so it can be said that the instrument consistently reflects the construct being measured. In terms of reliability, the instrument as a whole showed good results, especially in the elaboration construct which obtained high Cronbach's Alpha and Average Variance Extracted (AVE) values, indicating the stability and consistency of items in the construct. However, within the framework of a qualitative approach, the validity and reliability of the instrument are not only assessed through statistical measures, but also through a process of in-depth reflection and the application of data triangulation to ensure the suitability of the

instrument to the research context and produce credible and accountable data (John W. Creswell, 2019).

The data analysis technique in this study follows the qualitative data analysis model developed by Miles, Huberman, and Saldaña (2014).To ensure data validity, source triangulation techniques are applied, which involve comparing information from various parties such as students, teachers, and learning outcome documents to find data consistency (Patton, 2002; Sugiyono, 2018; Moleong, 2017). The application of this triangulation serves to enhance data reliability and strengthen the interpretation of the findings obtained (Creswell & Plano Clark, 2011; Flick, 2009; Denzin, 2009).

The data analysis process is carried out by reviewing students' written answers to essay questions. The answers were analyzed using a structured assessment rubric based on five indicators of creative thinking: fluency, flexibility, originality, elaboration, and metaphorical thinking (Nisa Auliyah1, Elok Sudibyo2, 2021).This rubric allows for the classification of student creativity into four categories: highly creative, creative, somewhat creative, and less creative. The use of the rubric also supports triangulation with other data sources, such as observations and documentation, which enhances the reliability of the analysis.

Table 1. Scoring Rubric for Creative Thinking Ability Test

Aspect Indicator	Assessment Indicators	Description	Score
Fluency	Number of parts mentioned, accuracy of functions described	Come up with many ideas/recommendations /answers that are relevant and varied	4
		Presents some relevant ideas but lacks variety.	3
		Limited ideas and lack of variety	2
		Only suggests one idea or even irrelevant	1
Flexibility	Provides ideas that are different from the norm	Demonstrates the ability to use a variety of approaches in solving problems and to think from multiple perspectives.	4
		Uses two or more different approaches, although not yet fully appropriate.	3
		The approaches used are limited and still focused on one way of thinking.	2
		Does not show any variation or change in thinking.	1
Originality	Uniqueness of form, relevance of function, creativity of story	Answers are highly original, uncommon, and not commonly found in other students.	4
		Displays fairly unique ideas, although they are still found in common contexts.	3
		The ideas presented are less original and tend to appear frequently.	2
		Does not show uniqueness or only imitates commonly used ideas.	1
Elaboration	Concept understanding	deas are clearly outlined, structured, and accompanied by logical explanations and supporting reasons.	4

	and own language	Ideas are elaborated fairly well, although explanations lack depth or reasoning is still limited.	3
		Explanations are general and not accompanied by strong reasons.	2
		Ideas are briefly explained without adequate explanation or reasoning.	1
Metaphorical Thinking	Creativity of parables, appropriateness of analogies, use of metaphors	Using appropriate, engaging, and helpful analogies or metaphors to explain concepts.	4
		Using an appropriate analogy, even if it is less profound or creative.	3
		The analogy is simple and only partially relevant.	2
		Not using metaphors or what is conveyed is not relevant.	1

The material tested in the exam refers to the topic "Parts of Plant Bodies," which has previously been studied by students in science lessons. The selection of this topic was made considering the appropriateness of students' understanding levels of the material and its potential to stimulate various types of responses that reflect students' creativity. This research explores the forms of answers, response patterns, and students' tendencies in mastering each indicator of creative thinking, particularly in science education.

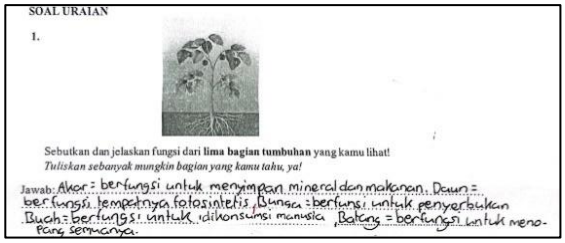
RESULT AND DISCUSSION

Based on the results of the students' creative thinking ability test in the 4th-grade elementary school science subject, measured using five indicators of creative thinking, namely fluency, flexibility, originality, elaboration, and metaphorical thinking. The test questions given consist of 8 essay questions, where each 2 questions represent one aspect of creative thinking ability. Questions number 1 and 2 represent the aspect of fluency, questions number 3 and 4 represent the aspect of flexibility, question number 5 represents the aspect of originality, questions number 6 and 8 represent the aspect of elaboration, and question number 7 represents the aspect of metaphorical thinking.

Several previous studies have proven that students' ability to express their ideas on each indicator of creative thinking varies(Inaya & Setiyawati, 2023).This indicates that students' creative thinking abilities are not always balanced across each indicator; some students can express ideas fluently but have not yet optimized the aspects of development or originality of their concepts. To obtain a more detailed picture of the characteristics of students' answers regarding creative thinking that emerge during the test process, here is a qualitative description based on the test answer results from several respondents:

Fluency

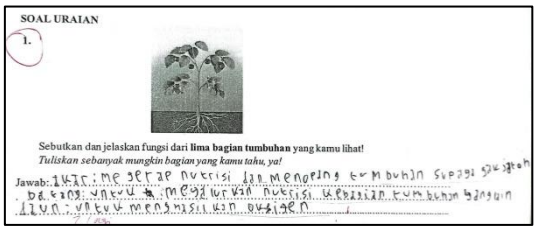
Based on the descriptive test results for questions number 1 and 2 that represent the aspect of fluency in creative thinking. According to (Arini, 2017)to enhance students' fluency in thinking, during each meeting, the teacher strives to encourage students to generate many ideas, answers, problem-solving approaches, or questions so that their fluency in thinking can develop. It was found that out of 50 student responses, there were four different variations of answers, namely very creative, creative, somewhat creative, and less creative as follows:



Answer: Roots function to store minerals and food. Leaves function as the site of photosynthesis, while flowers function for pollination. Fruit functions for human consumption, Stem = functions to support everything.

Figure 1. a Result of the Fluency (Very Creative)

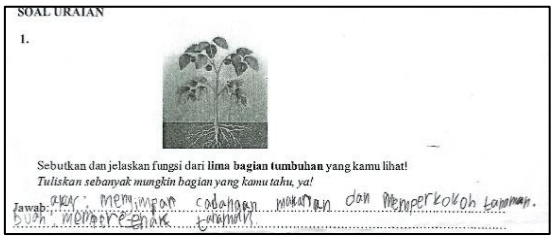
In the results of the fluency aspect with a very creative category, there were eight students who were able to solve the problem in Figure 1.a by providing more than one correct, complete, and relevant answer. This shows that students have the ability to generate various ideas or solutions that vary in answering the problems given, according to the fluency indicator in creative thinking. With such imaginative problem solving that can be the root of all human inventiveness (Newton & Newton, 2010). By presenting many ideas/recommendations/answers that are relevant and varied regarding the parts and functions of the plant body. Seeing the lack of students' fluency skills, teachers need to improve students' creative thinking skills on this indicator. What teachers can do in improving fluency thinking skills is to create learning that encourages students to create or think of many ideas.



Answer: roots; absorb nutrients and support the plant so it doesn't fall, stem: to transport nutrients to other parts of the plant, leaves produce oxygen

Figure 1. b Result of the Fluency (Creative)

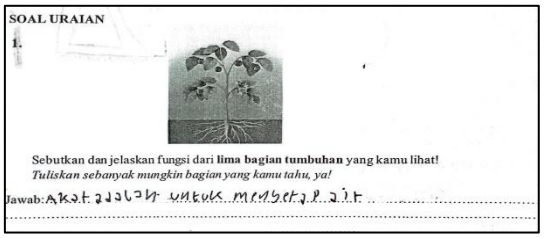
In the creative category, seen from Figure 1.b the test results show that there are 12 students who are able to provide more than one answer, but some of these answers do not meet the criteria of completeness and accuracy. This tells us that although students have shown effort in generating several ideas, the quality of the ideas presented still needs to be improved to be more in line with the fluency indicator in creative thinking, namely generating many relevant ideas, and complete, Improving this ability can be done by providing regular practice through open-ended problems. This type of question is considered effective in encouraging the development of creative thinking skills and training students to provide varied answers (Wahyuni & Palupi, 2022).



Answer: Roots: store food reserves and strengthen plants, fruits; enhance food.

Figure 1. c Result of the Fluency (Quite Creative)

Based on the test results presented in Figure 1.c, 19 students fall into the moderately creative category. This indication can be seen from their ability to mention more than one part of the plant with a relatively clear explanation of its function. Although most students only mentioned two parts, namely fruit and roots, they were able to convey their ideas fluently and showed an understanding of the general function of the plant parts. This achievement reflects the potential for creative thinking, especially in the dimensions of fluency and mastery of basic concepts. However, the ideas generated were still limited and did not meet the criteria of the question that required mentioning five plant parts. This finding indicates that students' creative thinking skills, especially in the aspects of flexibility and elaboration, still need strengthening through a more contextual and diverse learning approach. (Zubaidah et al., 2017) suggested that the application of the inquiry approach combined with mind mapping techniques proved effective in improving students' creative thinking skills in science learning, taking into account differences in individual and gender characteristics in the learning process.



Answer: roots are for absorbing water

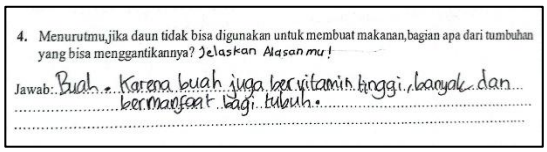
Figure 1. d Result of the Fluency (Less Creative)

Based on the test results shown in Figure 1.d, 12 students showed a low level of creativity. This indication can be seen from the answers that only list one part of the plant, namely the root, accompanied by a very basic description of its function. The ideas expressed are still limited and less developed in depth, and are expressed in simple sentences with minimal elaboration. This situation reflects the low fluency in conveying ideas and has not fulfilled the question's request to mention several parts of the plant. Research conducted (Handayani et al., 2021) revealed that students' creative thinking skills in learning biology were still low in all indicators, including aspects of fluency, flexibility, originality, and elaboration. This finding underlines the importance of implementing innovative learning strategies that can stimulate student creativity, one of which is through an inquiry-based learning model combined with a mind mapping approach.

According to Guilford's theory, fluency is one of the main components in creative thinking, in addition to flexibility, originality, and elaboration. The low ability of students to provide various relevant solutions or ideas indicates that the fluency aspect of thinking has not developed optimally. This is thought to be due to learning that still emphasizes single answers procedurally, not on the exploration of ideas. However, science learning in elementary schools tends to focus on memorization and understanding of rigid concepts, thus not encouraging students to think creatively. Therefore, a shift to student-centered learning is needed so that they are more free to think divergently. Teachers can adopt approaches such as problem-based learning, project-based learning, or open-ended learning that gives room for a variety of answers. A learning environment that values unique ideas and is non-judgmental of different answers is also important to build students' confidence in thinking creatively. The overall findings show that although there are students who have shown good fluency in thinking, most still need proper assistance and stimulation. This emphasizes the importance of the teacher's role in creating learning that consistently supports the development of students' creativity.

Flexibility

Based on the results of the description test on questions number 3 and 4 which represent aspects of flexibility in creative thinking, research conducted by (Zabelina et al., 2016) revealed that individuals with high levels of creativity tend to have flexible attention patterns, which allow them to switch between selective focus and receptivity to new information. This finding supports the view that flexibility in creative thinking is strongly related to the ability to adapt their attention and cognitive strategies to the needs of the situation at hand. The following found that from 50 student answers, there were 2 different variations of answers, creative, and less creative as follows:

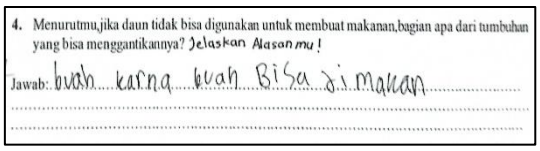

4. Menurutmu,jika daun tidak bisa digunakan untuk membuat makanan,bagian apa dari tumbuhan yang bisa menggantikannya? Jelaskan Alasanmu!

Jawab: Buah. Karena buah juga bervitamin tinggi, banyak dan bermanfaat bagi tubuh.

Answer: Fruit, because fruits are also high in vitamins, abundant, and beneficial for the body.

Figure 2. a Result of the Flexibility Aspect Test (Creative)

In Figure 2a the results of the fluency aspect with the creative category there are 21 students who are able to provide alternatives or other answers that are relevant to the question appropriately. This can be seen from the student's answer in the first picture which proposes another plant part, namely fruit, as an alternative to leaves. The reasons given reflect an understanding of the benefits of fruit for the body, showing flexibility in thinking and the ability to see problems from different perspectives. Thus, the skills in responding to the dynamics of learning and designing various solutions to overcome problems that have never been faced (Barak & Levenberg, 2016).


4. Menurutmu,jika daun tidak bisa digunakan untuk membuat makanan,bagian apa dari tumbuhan yang bisa menggantikannya? Jelaskan Alasanmu!

Jawab: buah karna buah Bisa di makan

Answer: fruit because it can be eaten

Figure 2. b Result of the Flexibility Aspect Test (Less Creative)

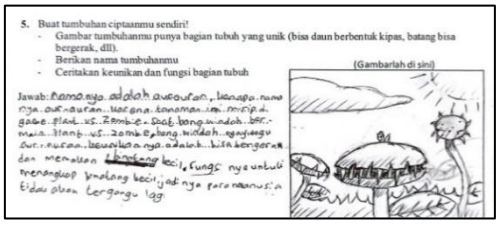
Based on Figure 2b, it can be seen that there are 30 students who answered the test. The answers show that students show an underdeveloped level of thinking ability. Although the alternative choices proposed (fruit) are correct, the reasons given seem too simple and do not reflect the development of ideas or considerations from various aspects. The results on this indicator show that most students have been able to produce diverse answers and solutions. However, some answers still contain errors. This finding is in line with research conducted by Hasanah, (2021) which states that in the flexible thinking indicator, many students can work on problems even though there are still errors in the answers they give. Flexible thinking skills refer to the ability to generate various approaches in solving problems (Rahmazatullaili et al., 2017).

The findings of this study indicate that some students demonstrated creative thinking flexibility by providing relevant alternative answers along with well-reasoned justifications that reflect deep understanding. This aligns with the study by Zabelina et al., (2016), which suggests that creative individuals tend to exhibit adaptive patterns of attention. However, a considerable number of students offered relatively simple explanations, suggesting limitations in the development of flexible cognitive strategies. These results underscore the

importance of instructional approaches that go beyond merely emphasizing correct answers and instead focus on cultivating students' flexible and critical thinking skills. Therefore, educators are encouraged to implement learning strategies that stimulate idea exploration and critical reflection to enhance student creativity. Future research is recommended to investigate instructional interventions that effectively strengthen cognitive flexibility among elementary school students.

Originality

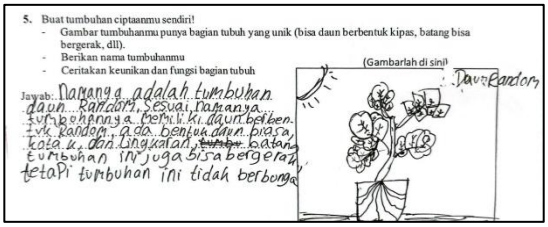
The originality aspect of creative thinking, as described by (Runco & Jaeger, 2012) is the ability to produce unusual but still logical and acceptable answers, reflecting the level of novelty and functional value of an idea. Creativity, according to him, not only includes differences from existing ideas, but also involves the creation of useful new ideas. Referring to this understanding, the results of the elaboration test on question number 5 designed to assess the originality aspect showed that out of 50 student answers, there were four categories of response variations based on the level of uniqueness and novelty of the ideas expressed. The four categories are very creative, creative, moderately creative, and less creative, which reflects the level of students' ability to generate original ideas in the context of solving the given problem.



Answer:
Its name is the aur-auran plant because it resembles the plants in the game Plant vs. Zombie. The uniqueness of this plant is that it can move and eat small animals, so humans no longer depend on small animals.

Figure 3. a Originality Test Result (Very Creative)

In the test results Figure 3.a shows a high level of originality with the results of the creation of plant images that are unique and imaginative and there are 8 students in the very creative category, as students are able to develop several ideas related to images of plants that can move and prey on small animals as a form of protection against humans. The idea was unique, even though it was inspired by a digital game. The resulting images reflect rich visual details, such as the shape of the teeth, environmental background, and sunlight, which overall enriches the appearance of the illustration. This shows the students' courage in expressing their imagination and ideas visually.

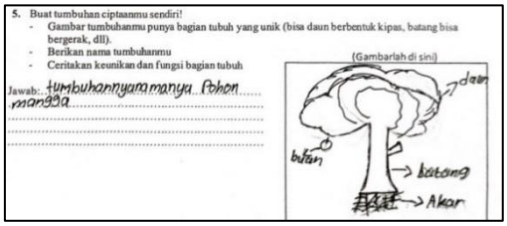


Answer:
Its name is the random leaf plant, and true to its name, this plant has leaves of random shapes. Some are shaped normally, square, and circular. The stem of this plant can also move, but this plant does not flower.

Figure 3. b Originality Test Result (Creative)

In the test results Figure 3.b shows the level of originality with the creative category, there are 6 students whose creation of plant images is unique and imaginative and creative Students show the level of creativity in the aspect of originality by creating an imaginative plant called "Random Leaf". The ideas put forward are unique and unusual, such as the variety of different leaf shapes (regular, square, circle), as well as stems that can move. The naming and description of the plant illustrates unconventional and imaginative thinking,

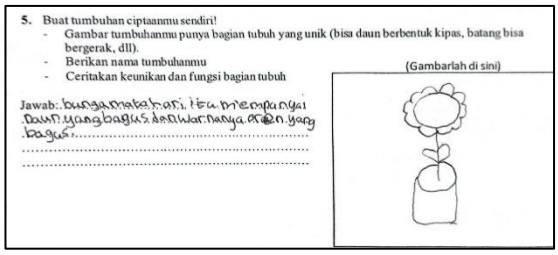
showing that students are able to produce ideas that are original and different from the norm.



Answer:
The plant is called a mango tree.

Figure 3. c Originality Test Result (Quite Creative)

While the results of Figure 3.c also show creative thinking efforts by describing the plant "tree" by giving information on the parts of the plant. However, the form and concept of the originality level is still low in the moderately creative category because the visualization is still closer to the real form, and has not been able to develop the idea of thinking his imagination. The results on this indicator are seen when students are able to express ideas or ideas in unusual ways. the results of this test there are 13 students in the originality aspect. Original thinking ability is shown through ideas that are unusual and different from those commonly found in book references, which reflect individual creativity in responding to given problems or situations (Candra et al., 2019).



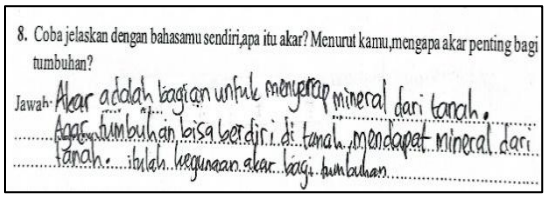
Answer:
The sunflower has beautiful leaves and a very nice orange color.

Figure 3. d Originality Test Result (Less Creative)

In the test results of Figure 3.d, students showed a low level of creativity in the aspect of originality or in the less creative category, because they chose a very common plant, namely sunflowers, without providing new or unique elements. The explanation given is also simple descriptive and does not reflect original ideas, such as only mentioning "nice leaves" and "nice orange color." No part of the plant's body was modified or created imaginatively according to the question's instructions. Original thinking ability is the capacity to express ideas or solve problems in ways that are not common or different from others. This ability can develop along with the expansion of student knowledge, so that the opportunity to create new or unusual ideas is getting bigger (Ika Mustika Sari, Evi Sumiati, 2019).

Elaboration

Based on the results of the elaboration test on questions number 6 and 8, which were designed to assess the elaboration aspect of creative thinking, where students were asked to answer with a more in-depth and detailed explanation, it was found that out of 50 student answers, there were four levels of variation in the answers, namely very creative, creative, moderately creative, and less creative. This variation reflects the extent to which students can develop their ideas by providing more detailed explanations, elaborating on relevant details, and enriching answers with additional in-depth information.

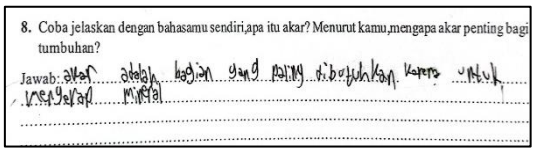

8. Coba jelaskan dengan bahasamu sendiri,apa itu akar? Menurut kamu,mengapa akar penting bagi tumbuhan?

Jawab: Akar adalah bagian untuk menyerap mineral dari tanah. Agar tumbuhan bisa berdiri di tanah mendapat mineral dari tanah. itulah kegunaan akar bagi tumbuhan

Answer:
Roots are the part that absorbs minerals from the soil, so that plants can stand in the ground and obtain minerals from the soil. that is the function of roots for plants

Figure 4. a Elaboration Test Result (Very Creative)

The test results shown in Figure 4.a show that a number of students were able to answer and explain the questions using their own language, according to their understanding. They were also able to elaborate the answers quite clearly, providing in-depth reasons related to the answers given. Based on the criteria of the elaboration aspect indicator, these students' answers can be categorized as very creative, because they managed to explain the importance of roots for plants with detailed arguments. However, only five students met the criteria for the highly creative category in the elaboration aspect, showing their ability to develop and expand ideas in depth.

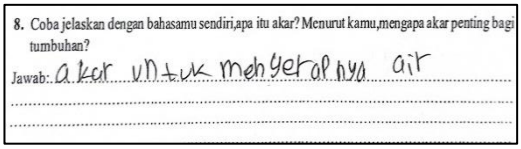

8. Coba jelaskan dengan bahasamu sendiri,apa itu akar? Menurut kamu,mengapa akar penting bagi tumbuhan?

Jawab: akar adalah bagian yang paling dibutuhkan karena untuk menyerap mineral

Answer:
roots are the most needed part because they absorb minerals

Figure 4. b Elaboration Test Result (Creative)

Meanwhile, in the test results of Figure 4.b, there are 9 students who are able to fulfill the elaboration aspect in the creative category. Because students' answers show good elaboration skills in creative thinking. Students not only mention that roots are an important part of plants, but also explain the reason, namely "to absorb minerals." This explanation shows that students are able to develop their ideas by providing additional relevant and supporting information. Despite using simple sentences, there is an attempt to describe the function of roots in more detail than just mentioning its main role, which reflects completeness in thinking. Elaboration ability is a person's skill in developing a simple thing into a broader and deeper explanation (Ika Mustika Sari, Evi Sumiati, 2019).

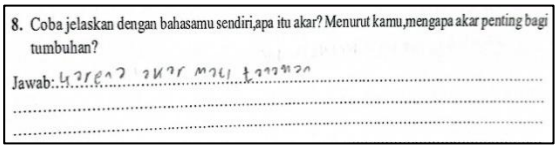

8. Coba jelaskan dengan bahasamu sendiri,apa itu akar? Menurut kamu,mengapa akar penting bagi tumbuhan?

Jawab: akar untuk menyerap air

Answer:
roots to absorb water

Figure 4. c Elaboration Test Result (Quite Creative)

In the test results in Figure 4.c, there are 14 students who show that students are quite capable (quite creative) of elaborating their explanations in accordance with the criteria for the elaboration aspect. as in the test results in the picture, students only answered briefly and did not explain what they described in detail. In this indicator, students have been able to provide appropriate answers, although there are still some of them who have not elaborated in detail. The findings in this study are in line with the results of a study conducted by Haerunisa, which showed a similar trend in students' ability to convey answers in detail (Haerunisa,Prasetyaningsih, 2021).


8. Coba jelaskan dengan bahasamu sendiri,apa itu akar? Menurut kamu,mengapa akar penting bagi tumbuhan?

Jawab: karena akar mati tanaman

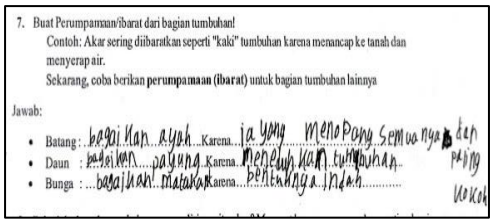
Answer:
because the root plants died

Figure 4. d Elaboration Test Result (Less Creative)

The test results shown in Figure 4.d indicate that students are at a low level of creativity in the elaboration aspect, namely there are 23 students, which can be categorized as less creative. This can be seen from the students' answers which are delivered briefly, less precise, and not fully relevant to the aspects requested in the elaboration question. This condition shows that students still need to develop their understanding and skills in elaborating ideas in more depth, in order to meet the criteria for higher creativity in creative thinking.

Metaphorical Thingking

Based on the description question number 8 represents the aspect of metaphorical thinking or the ability to think through similes, which aims to train students to understand the concept of metaphor to encourage exploration of their imagination. With the test results, it was found that out of 50 student answers, there were four different variations of answers, namely very creative, creative, quite creative, and less creative as follows:

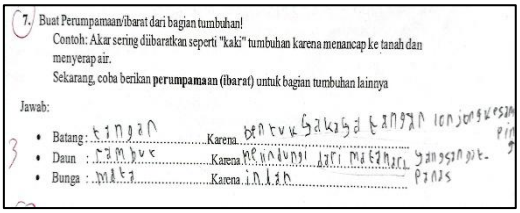

7. Buat Perumpamaan/ibarat dari bagian tumbuhan!
Contoh: Akar sering diibaratkan seperti "kaki" tumbuhan karena menancap ke tanah dan menyerap air.
Sekarang, coba berikan **perumpamaan (ibarat)** untuk bagian tumbuhan lainnya

Jawab:
- Batang : bagaikan ayah Karena ia yang menopang semuanya dan paling kokoh
- Daun : bagaikan payung Karena menjaga dari tumbuhan
- Bunga : bagaikan matahari Karena penting bagi tanaman

Answer:
the trunk is like a father **because** it supports everything and is the strongest
leaves are like umbrellas **because** they provide shade for plants
flowers are like the sun **because** of their beautiful shape

Figure 5. a Metaphorical Thinking Test Result (Very Creative)

Based on the test results shown in Figure 5.a, it is known that some students were able to solve the problem by giving analogies to three parts of the plant body, namely stems, leaves and flowers. The answers given show a basic understanding of the concept of analogy, although it is still conveyed descriptively and does not fully reflect the depth of metaphorical thinking. Nevertheless, this ability can be categorized as very creative compared to the majority of other students. Only 11 students managed to solve the problem with an appropriate analogy approach, which shows their creative thinking potential in connecting biological concepts with symbolic or imaginative representations.

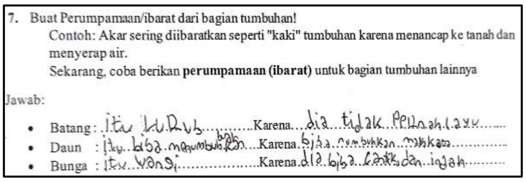

7. Buat Perumpamaan/ibarat dari bagian tumbuhan!
Contoh: Akar sering diibaratkan seperti "kaki" tumbuhan karena menancap ke tanah dan menyerap air.
Sekarang, coba berikan **perumpamaan (ibarat)** untuk bagian tumbuhan lainnya

Jawab:
- Batang : tinggi Karena bentuk seperti tangan
- Daun : rambut Karena menaungi dari matahari
- Bunga : mata Karena indah

Answer:
The stem is like a hand **because** its shape resembles a hand elongated sideways.
The leaves are like an umbrella **because** they protect from the hot sun.
The flowers are like eyes **because** they are beautiful.

Figure 5. b Metaphorical Thinking Test Result (Creative)

Comparable trends can be found in the test outcomes shown in Figure 5.b, where several students began to demonstrate the ability to associate plant parts with elements of the human body through analogical reasoning. Eleven students responded in a similar manner, utilizing human anatomy as a reference point to describe the function or appearance of plant structures. Although this indicates an initial effort to apply creative thinking, the analogies were generally superficial, lacking in originality and conceptual depth.This suggests that while students are beginning to engage with metaphorical thinking, they still require structured guidance to deepen their understanding of how metaphors work not just as linguistic expressions, but as cognitive tools for linking and reimagining concepts. Their imaginative thinking also needs to be further nurtured so they can construct more meaningful, insightful, and inventive comparisons.



7. Buat Perumpamaan/ibarat dari bagian tumbuhan!
Contoh: Akar sering diibaratkan seperti "kaki" tumbuhan karena menancap ke tanah dan menyerap air.
Sekarang, coba berikan **perumpamaan (ibarat)** untuk bagian tumbuhan lainnya

Jawab:

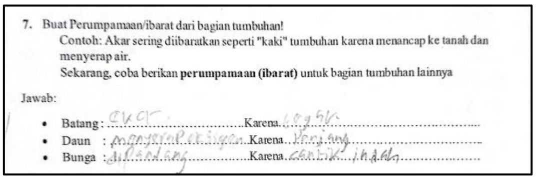
- Batang : .... Karena ....
- Daun : .... Karena ....
- Bunga : .... Karena ....

Answer:
the rod is straight **because** it never withers
The leaf can grow **because** it can grow a crown
the flower is fragrant **because** it can be beautiful and lovely

Figure 5. c Metaphorical Thinking Test Result (Quite Creative)

In the test results presented in Figure 5.c, it is evident that some students are able to identify the characteristics of plant parts with a fair degree of accuracy. However, they still face challenges in creatively linking these parts to other objects through an analogical approach. The analogies provided by students are generally simplistic, lacking depth and only partially relevant to the concept being explored. Notably, seven students gave responses that closely mirrored the example provided, indicating a tendency to rely on conventional or familiar comparisons rather than developing original analogies.

This finding suggests that while students are beginning to develop a basic conceptual understanding of plant parts, their ability to generate creative analogies remains underdeveloped. To foster this skill, there is a need for more engaging learning experiences that encourage students to explore ideas and expand their imaginative capabilities. Educational activities that promote deeper thinking, such as open-ended questions or tasks requiring the application of analogical reasoning, can help strengthen students' ability to make more complex and relevant connections. By supporting students in this way, educators can help enhance their creative thinking and facilitate a more profound understanding of the concepts they are learning.



7. Buat Perumpamaan/ibarat dari bagian tumbuhan!
Contoh: Akar sering diibaratkan seperti "kaki" tumbuhan karena menancap ke tanah dan menyerap air.
Sekarang, coba berikan **perumpamaan (ibarat)** untuk bagian tumbuhan lainnya

Jawab:

- Batang : .... Karena ....
- Daun : .... Karena ....
- Bunga : .... Karena ....

Answer:
rootstock **because** it is upright
leaves absorb water **because** they are long
flowers are seen **because** they are beautiful

Figure 5. d Metaphorical Thinking Test Result (Less Creative)

In the results of figure 5d, it is evident that most students face challenges in recognizing the characteristics of plant parts and struggle to connect these features creatively with other objects using an analogical approach. This suggests that students still require further support in understanding the structure of metaphors and enhancing their imaginative abilities in a more optimal way. Metaphorical thinking, which involves making new relationships through comparison or analogy, plays a crucial role in creative problem-

solving and understanding complex concepts. Metaphors act as cognitive tools, enabling individuals to grasp abstract ideas by drawing parallels between familiar and unfamiliar objects or concepts. This skill is essential for creative thinking because it allows students to develop deeper insights and connect seemingly unrelated ideas in innovative ways.

Moreover, metaphorical thinking not only aids in understanding but also helps students conceptualize abstract concepts more effectively. As Nurhikmayati, (2017).suggests, metaphor is an invaluable tool for conceptualizing abstract ideas and fostering creativity. For students to improve their metaphorical thinking skills, teachers can incorporate activities that encourage the use of metaphors in learning. For instance, using metaphorical language to explain scientific concepts or encouraging students to create their own metaphors for abstract ideas can stimulate their creative thinking processes.

The following table presents the results of an exploratory analysis of elementary school students' creative thinking levels, assessed across five key indicators: fluency, flexibility, originality, elaboration, and metaphorical thinking. The data were obtained from students' responses to tasks specifically designed to measure various dimensions of creativity within the context of science learning. These results offer a deeper insight into the diversity of students' creative abilities, ranging from very creative to less creative categories, along with the characteristics of their answers for each indicator.

Table 2. Summary Table of Students' Creative Thinking Ability Test Results

Aspect	Category	Number of Students	Answer Characteristics
Fluency	Very Creative	8 students	Provided more than one correct, complete, and relevant answer.
	Creative	12 students	Provided multiple answers, but some lacked completeness or accuracy.
	Moderately Creative	19 students	Mentioned two plant parts with general explanations.
	Less Creative	11 students	Mentioned only one part with very basic explanation.
Flexibility	Creative	21 students	Provided relevant alternatives with logical reasoning.
	Less Creative	29 students	Correct answers but reasoning was too simple or incomplete.
Originality	Very Creative	8 students	Generated unique plant concepts, e.g., predatory plants.
	Creative	6 students	Created imaginative plants like "Random Leaf" with unusual shapes.
	Moderately Creative	13 students	Ideas close to real plant forms, lacked imagination.
	Less Creative	23 students	Common plant choices with no novel or unique elements.
Elaboration	Very Creative	5 students	Detailed answers with strong logical reasons in own words.

	Creative	9 students	Explained reasons like "to absorb minerals" in sufficient detail.
	Moderately Creative	14 students	Appropriate answers, but lacked deep elaboration.
	Less Creative	22 students	Brief, imprecise, or irrelevant answers.
Metaphorical Thinking	Very Creative	11 students	Used analogies for stem, leaf, flower creatively.
	Creative	11 students	Used human body analogies with limited depth.
	Moderately Creative	7 students	Recognized plant parts but lacked creative analogies.
	Less Creative	21 students	Struggled to provide appropriate or imaginative analogies.

CONCLUSION

This study involved 50 fourth grade elementary school students with the aim of evaluating creative thinking skills in the context of Science learning. The results of data analysis show that students' creative thinking skills vary in each indicator measured. In the aspects of fluency and flexibility, most students are classified in the medium category. However, achievements in the indicators of originality, elaboration, and metaphorical thinking tended to be low. Many students showed a limited level of creativity, especially when working on problems that required higher order thinking skills. These findings reflect that students' creative thinking skills have not been optimally developed, which can be attributed to the lack of implementation of learning strategies that encourage divergent thinking and the use of analogies in understanding science concepts. As a follow-up, this study recommends the utilization of innovative learning models, such as inquiry-based learning and problem-based learning, to encourage students' creativity. Teachers are also advised to develop and use open-ended questions that can provoke critical and unconventional thinking, as well as attend training to design and implement valid and reliable creativity assessment instruments. The limitations of this study lie in the relatively small sample size, which only includes five primary schools, as well as the qualitative approach that limits the generalizability of the findings. Therefore, future research is expected to involve more educational institutions with diverse backgrounds and integrate a mixed methods approach to obtain a more comprehensive picture of the factors that influence students' creative thinking skills in science learning. This research involved 50 fourth-grade elementary students to assess their creative thinking skills in science lessons. The findings reveal that the students' abilities varied across different indicators. Regarding fluency and flexibility, most students were categorized as having moderate skills. However, their performance in areas such as originality, elaboration, and metaphorical thinking remained relatively low. A significant portion of students fell into the categories of somewhat creative or lacking creativity, especially on tasks requiring higher-order thinking skills. This indicates that the students' creative thinking capabilities are not yet fully developed, and the current instructional methods are not sufficiently fostering divergent thinking or the use of analogies to grasp concepts. The study highlights the importance of adopting more innovative and creative teaching strategies. It suggests implementing exploratory teaching models like inquiry-based learning and problem-based learning to boost student creativity. Teachers should also focus on creating open-ended questions that encourage students to think beyond conventional ideas and should receive training on how to design effective creativity

assessment tools. Given the limited scope of the study, future research should include a larger number of schools and take into account factors such as student backgrounds, teaching methods, and the support provided by the learning environment.

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