Creative Thinking Skills of Elementary Students in Science: A Case Study at SD Lawangan Daya 2

1st Bagus Rahmad Wijaya[1], 2nd Andika Adinanda Siswoyo[2], 3nd Eka Maya Kusuma[3]

{bagus.rahmadwijaya@trunojoyo.ac.id[1], andika.siswoyo@trunojoyo.ac.id[2], 210611100149@trunojoyo.ac.id[3]}

Universitas Trunojoyo Madura, Jl. Raya Telang,PO BOX 02 Kecamatan Kamal, Bangkalan Jawa Timur 69162 Indonesia[1,2,3]

Abstract. The ability to think creatively is very important for students in today's development. The ability of students in Indonesia to think creatively is currently still relatively low. To improve this skill, teachers must be able to identify which indicators of creative thinking skills have been mastered and which have not been mastered by the students. Therefore, this research aims to describe the profile of elementary school students' creative thinking skills in science learning at SD Lawangan Daya 2. Creative thinking is an important 21st-century skill, especially in science education, to encourage innovation and problem-solving abilities. The method used in this research is a quantitative descriptive method. This study focuses on indicators of creative thinking skills, including fluency, flexibility, originality, and elaboration. The instrument used in this study is a validated test. Next, the research results were analyzed using descriptive statistics to identify indicators that require special attention to be improved by teachers. This research can provide important recommendations for teachers to encourage the development of students' creative thinking skills to be more effective according to the potential that students currently possess. Based on the test results, it is known that students' creative thinking abilities fall into the moderate category.

Keywords: creative thinking skills, science education, elementary students

1 Introduction

The current digital era is one consequence of the development of existing technology. Technology that continues to develop today has become a part of life. The existence of technology today has become the most essential part of human life. This can no longer be avoided in everyday life, almost all human activities are digital. In this era of technological development, education also faces challenges in adapting to existing developments [1].

Education today is also developing by utilizing all existing technologies in the learning process. Learning that occurs due to technological developments is called 21st-century learning. According to [2], the 21st century is characterized by easy access to information that can be done anywhere and anytime. Therefore, 21st-century skills must be honed and

ICHSS 2024, December 11, Surakarta, Indonesia

DOI 10.4108/eai.11-12-2024.2360417

improved, especially in education. This is because, in 21st-century learning, learning must include the knowledge, skills, and abilities students need to face the future. The skills mentioned in the 21st century are usually called 4C skills (communication, collaboration, critical thinking, creative thinking) [3]. Every student must possess these four skills. Based on the issues that discuss technological developments, the ability to think creatively is the main foundation so that we can participate in technological developments in the era of the Industrial Revolution 4.0 (Munandar in [3]. This aligns with the opinion of [4], which states that the ability to innovate is the basis for mastering other skills. The era of the Industrial Revolution 4.0 is a challenging problem to face if you cannot think creatively. This opinion is supported by [5], which states that the ability to think creatively is significant in driving human progress, especially in discoveries in technology, science, and others. This statement proves that thinking creatively is very important and necessary in dealing with existing technological developments.

Creative thinking skills are essential in education, especially in science learning. This ability can encourage innovation in new ideas for solving problems. However, this contradicts the condition of students in Indonesia who have a low level of creative thinking skills. Indonesian society is ranked 61st out of 132 countries based on the 2023 Global Innovation Index published by the World Intellectual Property Organization (WIPO). This condition is a significant challenge for the world of education in Indonesia [6].

The ability to think creatively is one of the unlimited human abilities, the ability to think creatively itself is included in one of the abilities that requires someone to think out of the box or think outside of reason, which thoughts are sometimes not thought of by other people [7]. Another opinion states that the ability to think creatively is an ability that someone has to create something new that can be used to solve problems or see new correlations between previously existing elements (Munandar in [8]. The ability to think creatively is a thought that should not be given limits because if given limits, the person's thinking will stop there according to the existing limits and only be guided by the existing rules and limitations.

Creative thinking skills have four indicators: fluency, flexibility, originality, and elaboration. Fluency shows a person's ability to produce many ideas, concepts, solutions, or opinions to a problem. Flexibility is a person's thinking skill in creating ideas, concepts, opinions, and answers that vary from various points of view. Originality is the skill to produce unique and distinctive ideas, opinions, or answers. While elaboration is a person's ability to produce detailed ideas accompanied by logical explanations for each part of the idea he created [9].

Creative thinking ability is a high-level thinking skill [10]. This is closely related to the quality of conceptual understanding which is a prerequisite for generating new quality ideas. Based on the results of interviews with class teachers, students in grade 4 have a good understanding of concepts related to the chapter on heat, changes in the state of matter, and energy. However, teachers never measure students' creative thinking abilities and do not train them systematically. So, the level of creative thinking skills has yet to be well known even though students' conceptual understanding is good. Measurement of students' creative thinking abilities is essential. This is useful for developing indicators of creative thinking skills that students have mastered and improving indicators that have yet to be learned well by students. So that the learning design can optimize students' skills effectively. Therefore, analysis of students' creative thinking abilities is essential.

2 Research Method

This study uses a quantitative approach with a descriptive method. Descriptive quantitative research was conducted to describe and measure the level of students' creative thinking skills in science learning in students, especially grade 4 students of SDN Lawangan Daya 2. Data collection in this study used interview sheets, observations, and test instruments, and each question covered several aspects of creative thinking skills.

This study's subjects were 4th-grade students, with a population of 29 students, all of whom were used as samples, which can be called a saturated sampling technique. The data collected from the test instrument results are then processed to determine the percentage of values obtained by students. Determination of students' creative thinking abilities can be classified based on the average and standard deviation [11], which are listed in the table below in 3 categories, namely high, medium, and low.

Table 1. Categories of creative thinking skills levels

Criteria	Categories
$s \geq (\bar{x}+SD)$	High
$(\bar{x}-SD) < s < (\bar{x}+SD)$	Medium
$s \leq (\bar{x}-SD)$	Low

SD = Standard deviation

$\bar{x}$ = mean of students

Calculating the results of students' answers and analyzing the percentage of average values obtained on each indicator of creative thinking ability can reveal the percentage of students' creative thinking skills. Interpreting indicators of students' creative thinking ability [12] is divided into good, good, sufficient, bad, and very bad.

Table 2. Interpretation of creative thinking skills levels

Criteria	Categories
81-100	Very good
61-80	Good
41-60	Sufficient
21-40	Bad
0-20	Very Bad

3 Result And Discussion

Based on the results of the test instruments that have been given and analyzed by the researcher, the following data was obtained:

Table 3. Creative thinking skills test result

Number of students	29
Maximum score	32
The highest score	24
The lowest score	11
Mean	15,931
Standard deviation	4,053

Using the formula mentioned previously, the results of the creative thinking test instrument completed by students yielded the following data:

Table 4. Many students, based on their level

Criteria	Categories	Number of students	Percentage
$s \geq (\bar{x}+SD)$	High	3	10,3%
$(\bar{x}-SD) < s < (\bar{x}+SD)$	Medium	16	55,5%
$s \leq (\bar{x}-SD)$	Low	10	34,5%

Based on the data above, it can be seen that the number of students who get the high category is less than the number of students who get the low and medium categories. The number of students who get the high category is 3 out of 29. Students who get the medium category are more than 50%, which shows that student's ability to think creatively, although already in the sufficient category, still needs training to improve it.

The test instrument created is an essay test instrument where each question item includes one or more indicators of creative thinking ability. The indicators used in creating questions are the four indicators of creative thinking ability: fluency, flexibility, elaboration, and originality. Questions are designed to give students a little reasoning to answer. Questions are arranged based on IPA material, which is based on the material of changes in the form of objects and energy and their changes. Here are examples of creative thinking ability questions created by researchers based on validation by several experts, namely as follows.

Table 5. Essay question example

Indicators of creative thinking skills	Question	Answers and scoring
Flexibility (students' ability to answer questions from various angles or variations)	Lately, the weather has been very hot, many sellers sell ice because they take advantage of the existing conditions. However, there are some problems because the weather is very hot, the ice that is sold is sometimes	Alternative answers: 1. Put salt around the ice cubes 2. Buried in a pile of straw or rice husks 3. Placed in a pile 4. Use large ice

	wasted because it melts before being sold to buyers. Create at least four ideas that can help sellers so that the ice they have does not melt quickly!	cubes. Scoring: 5= If they mention four answers correctly. 4= If they mention three answers correctly. 3= If they mention two answers correctly. 2= If they mention one answer correctly. 1= If they do not answer.

Based on the questions that have been made, several students still need to answer the questions. The data on the distribution of students who answered and did not answer the questions is grouped in the aspect of creative thinking skills.

Table 6. Many students answered and did not answer

Indicator	Number of students did not answer	Percentage	Number of students who answered	Percentage
Fluency	12	41%	17	59%
Flexibility	-	-	29	100%
Elaboration	-	-	29	100%
Originality	9	31%	20	69%

As seen from the table above, from the total number of students, not all students can answer questions that hone creative thinking skills. This is also supported by observations during the observation. During the work on the questions, several students were still confused or had difficulty understanding the meaning of the questions, so the researcher had to explain the meaning. However, the results obtained by students are still not optimal. If seen based on the interpretation table of creative thinking skills, grade 4 students of Lawangan Daya Elementary School (LADA) obtained the following data:

Table 7. Results of interpretation of creative thinking levels

Indicator	Percentage	Interpretation
Fluency	48%	Sufficient
Flexibility	44%	Sufficient
Elaborasi	57%	Sufficient

Originality	49%	Sufficient

Table 7 shows that each indicator of creative thinking ability has not received a good or very good category. Fluency, which was one of the indicators that received the best category in previous studies, only received a sufficient category in this study. Fluency in creative thinking ability requires someone to think in one type or one variation. It is one of the essential aspects that must be possessed by people who have the skills to think creatively.

Elaboration is one of the four indicators of creative thinking ability with the highest percentage. In this case, students can provide details on the images or works they create. This is proven from the results of students' work, which in questions that hone creative thinking skills by asking students to draw and provide details or explain the details of the answers they make (elaboration).

Originality is the ability of students to create or make new or different solutions from others by combining several existing factors to create something new. The originality indicator is slightly higher after elaboration. This is supported by the results of observations, seen when working on questions, students still ask their friends or copy their friends' answers. It can be seen from this behavior, that students are still unable to think for themselves or solve problems themselves, they prefer to see other people's answers.

Flexibility is an indicator that occupies the lowest position of the four existing factors. This is because students cannot think or view a problem from a different perspective. This is evident when working, students are still fixated or answer questions only with answers from books and have not been able to think of ways with other perspectives.

The low creative thinking ability is caused by students not being trained in this skill systematically [13]. This is supported by the teacher's statement that in learning, students are more focused on learning concepts, theories, laws, or products of science alone [14]. The teacher assumes that creative thinking skills are special abilities of each individual that have been embedded since birth [15]. In addition, teachers also did not understand the indicators of creative thinking skills and how to teach them systematically [16]. This is also supported by teachers' learning approach to developing creative thinking skills, which is inappropriate because it only takes the form of general instructions [17].

The approach chosen by the teacher is teacher-centered. This approach supports students' low creative thinking skills. By using this approach, learning tends to run one way, which results in students acting passively. The roles and activities carried out by students need to be more effective in training students' creative thinking skills [18]. This is in contrast to the opinion of other researchers, namely that students' skills will develop well if learning is carried out through exploration, investigation, discovery, and problem-solving [19]. The results of this study show that the learning approach and learning process experienced by students significantly affect students' creative thinking skills [20][21].

4 Conclusion

Creative thinking skills are essential for every individual to keep up with current technological developments. Schools, where students study, need to develop learning that hones creative thinking skills. Learning centered on teachers is one of the learning methods that causes students to only think about it without being able to consider using other perspectives. This

can be seen in grade 4 students of SD Lada 2, who have low creative thinking skills due to learning-centered only on teachers. The study results showed that creative thinking skills were still not visible there. Based on the results of this study, it is hoped that every teacher can provide opportunities for their students to think creatively by allowing them to search for or get information in their own way.

References

[1] Haetami. (2023). *Manajemen Pendidikan Pada Era Perkembangan Teknologi*. CV Jejak. .

[2] Sumarni, Halim, F. A., Fatihah, N. A., Rahmatiani, L., Kardinus, W. N., Al-Anshari, A., & Solang, D. J. (2023). *Pembelajaran Abad 21*. PT. Literasi Nusantara Abadi Grup.

[3] Madyani, I., Yamtinah, S., Utomo, S. B., Saputro, S., & Mahardiani, L. (2020). *Profile of Students' Creative Thinking Skills in Science Learning*.

[4] Fazriyah, N. (2016). Kemampuan Berpikir Kritis Pada Pembelajaran Abad 21 di Sekolah Dasar. *Pengembangan Kemampuan Berpikir Kritis, Kreativitas, Komunikasi, dan Kolaborasi dalam Pembelajaran Abad 21; Inovasi Pembelajaran abad 21*, 207

[5] Ghufron, M. N., & Risnawita, R. (2017). *Teori-teori Psikologi* (2 ed.). Ar-Ruzz Media.

[6] Dutta S, Lanvin B, León LR, Wunsch-Vincent S. *Global Innovation in the face of Innovation Index 2023 uncertainty*. Vol. VIII, World Intellectual Property Organization. Geneva; 2023. 1–19 p

[7] Mansyur, M. Z., Rahmadani, E., Siallagan, T., Astuti, R. N., Purba, S., Kurniullah, Z., Ritnawati, Subakti, H., Nuryanti, A., Pramana, C., Simarmata, J., Khalik, F. M., & Amelia, U. (2024). *Belajar dan Pembelajaran di Abad 21*. Yayasan Kita Menulis.

[8] Sarmiasih, N., Putrayasa, I. B., & Marhaeni, A. (2020). Pengembangan Instrumen Keterampilan Berpikir Kreatif dan Hasil Belajar IPA Siswa Kelas V SD. *Jurnal Pendidikan dan Evaluasi Pendidikan Indonesia*, *10*(2), 70–78.

[9] Hu, W., & Adey, P. (2002). A scientific creativity test for secondary school students. *International Journal of Science Education*, *24*(4), 389–403. https://doi.org/10.1080/09500690110098912

[10] Trianggono, M. M. (2017). Analisis Kausalitas Pemahaman Konsep Dengan Kemampuan Berpikir Kreatif Siswa Pada Pemecahan Masalah Fisika. *Jurnal Pendidikan Fisika Dan Keilmuan (JPFK)*, *3*(1), 1. https://doi.org/10.25273/jpfk.v3i1.874

[11] Arikunto, S. 2015. *Dasar-dasar Evaluasi Pendidikan Edisi kedua Cetakan Keempat*. Jakarta: PT. Bumi Aksara

[12] Riduwan. (2010). *Dasar-dasar Statistika*. Bandung: Alfabeta

[13] Rofi'uddin A 2000 Model Pendidikan Berpikir Kritis Kreatif untuk Siswa Sekolah *Dasar Majalah Bahasa dan Seni* 1 L72-94

[14] Safilu 2010 Hakekat dan Stretegi Pembelajaran Biologi untuk Memberdayakan Keterampilan Berpikir Siswa J. *Pendidikan Biologi*, 2 L1-11

[15] Gomez J G 2007 What Do We Know About Creativity? *J E T* 7 31-43.

[16] Laius A & Rannikmae M 2014 Longitudinal Teacher Training Impact on Students' Attributes of Scientific Literacy *International J. of Humanities and Social Science* 4 L63-72

[17] Cheng V M Y 2010 Teaching Creative Thinking in Regular Science Lessons: Potentials and Obstacles of Three Different approaches in an *Asian context Asia-Pacific Forum on Science Learning and Teaching* 11

[18] Wicaksono I, Wasis, Matlazim 2017 The effectiveness of Virtual Science teaching model (VSTM) to improve students' scientific creativity on senior high mastery on senior high school physics subject J. *Balt. Sci. Educ*. 16 L549-61

[19] Ruseffendi E T 1991 *Pengantar Kepada Membantu Guru Mengembangkan Kompetensinya dalam Pengajaran Matematika untuk Meningkatkan CBSA* Bandung: Tarsito

[20] Kind P M & Kind V 2007 Creativity in science education: perspectives and challenges for developing school science *Stud. Sci. Educ*. 43 L1-37

[21] Junus, I. S., Santoso, H. B., Isal, Y. K., & Utomo, Y. A. (2015). Usability evaluation of the student centered e-learning environment. *Int. Rev. Res. Open Dis*. 16 62-8