

Analysis of Kinesthetic Students' Creative Thinking Skills on Global Warming Material

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Abstract

The aim of this research was to analyze the creative thinking skills on global warming material of kinesthetic learning style students. The research was a quantitative descriptive study with one shoot case study. Sample of this research use purposive sampling with the consideration of the research respondents are grade XI students who take science subjects thoroughly. Kinesthetic learning style testing was carried out using a learning style questionnaire. Creative thinking skills testing was carried out using multiple choice questions. The creative thinking skills instrument was developed based on Munandar's creative thinking skills indicators, namely: fluent thinking skills, flexible thinking skills, original thinking skills, elaboration skills and assessment skills. This study was conducted on global warming material. Based on the results of the study, as many as 75% of kinesthetic learning style students have creative thinking skills in the very creative category, 8,33% of kinesthetic learning style students have creative thinking skills in the creative category, 8,33% of kinesthetic learning style students have creative thinking skills in the fairly creative category and 8,33% of students have creative thinking skills in the non-creative category. This must still be a concern for teachers to continue to hone the creative thinking skills of kinesthetic learning style students by applying learning methods and media that are in accordance with the characteristics of kinesthetic learning styles.

Keywords: creative thinking skills, kinesthetic students, global warming

1. Introduction

Creative thinking skills are important skills for students in 21st century life. Creative thinking skills are the ability to create different alternative solutions to a problem precisely and there are variations of each solution proposed [1]. Through their creative thinking skills, students hope to be able to create new ideas to solve various problems faced in daily life [2]. Creative thinking skills that are urgently needed in facing the challenges of the times, but in fact based on the results of international studies *Global Creativity Index 2023* shows that Indonesia occupies the 61st position out of 132 countries in the world. This shows that the level of creativity of Indonesian human resources is still quite low. The development of creative thinking skills, especially in the education and technology sectors, needs more attention.

In the field of education, there is a project to strengthen the profile of Pancasila students (P5) which encourages the development of creative competence. The creative profile emerged as one of the efforts to build the character of the Indonesian nation that is superior and able to compete globally [3]. There is a big push to improve creative competence, but in the implementation of creative thinking skills in the educational curriculum still needs to be improved. According to the results Supit *et al.*, (2023) Research shows that creative thinking skills are greatly influenced by students' learning

styles consisting of visual, auditory and kinesthetic learning styles. Although the differentiated learning recommended in the Independent Curriculum seeks to adapt the method to the student's learning style, in reality many students have not been able to optimize their creativity potential because the learning approach does not always consider the best way for students to learn and think creatively [5].

One way to strengthen students' creative thinking skills can be through habituation in every subject, including physics. In physics learning, students are required to carry out creative activities to seek and give opinions so that they can solve problems at school and in the community [6]. Based on several previous studies, it is known that in learning physics, students' creativity has not received attention (Rofiqoh *et al.*, 2020). In research Busyairi & Sinaga (2021) It was found that teachers are still quite difficult in creating questions and assessment rubrics to measure students' creative thinking skills. In addition, the assessment of students' creative thinking skills analyzed based on learning styles is also still rarely carried out in physics subjects.

The research on the analysis of creative thinking skills based on learning styles that has been carried out is still limited only to the junior high school (SMP) level as in the research Fatima *et al.*, (2023) which measures students' creative thinking ability is reviewed from the Visual Auditory Kinesthetic (VAK) learning style on environmental pollution materials and Wardani (2024) conducted research to measure students' creative thinking abilities reviewed from learning styles and movement materials at SMP Negeri 20 Gresik. Based on this, research was conducted to determine creative thinking skills in students with a higher level of education, namely in high school (SMA) students with topics that focus on environmental issues around the world, namely on global warming materials. The characteristics of high school students who already have the ability to think abstractly, accept more complex theoretical concepts and be able to think analytically need to be further researched to find out how education can prepare students to face complex environmental challenges.

This research focuses on one of the learning styles that students do the least, namely kinesthetic learning styles. Kinesthetic learning style is a way of learning by touching and doing it directly. Students who have a kinesthetic learning style can learn best by interacting or experiencing things around them [11]. Students with a kinesthetic learning style like to do things directly and use the body to remember facts [12]. Therefore, the purpose of this study is to analyze the creative thinking skills of global warming materials focused on kinesthetic learning style students at the high school (SMA) level. This research is carried out with a quantitative descriptive method that can explain the results of the research in detail, objectively and can be an initial reference for further action.

2. Methodology

This research is a descriptive research with a quantitative approach and a *one-shoot case study* research design. The subjects in this study are grade XI students of SMAN 1 Semarang who have studied global warming material. The samples in the study were determined through *purposive sampling techniques*. The criteria for the sample of respondents were students who studied science subjects as a whole with a total of 62 students. The data collection technique is carried out through 3 stages. The first stage is the distribution of learning style questionnaires to find out students who are included in the kinesthetic learning style. The second stage is a test of creative thinking skills on global warming materials. The third stage is interviews as supporting data to find out more details of creative thinking skills on global warming materials.

The learning style questionnaire used to find out the student's learning style amounted to 30 statements. The questionnaire was developed based on learning style theory according to Deporter & Hernacki (2013). The questionnaire developed was carried out a feasibility test using validation of opinions from experts (*judgment experts*). The results of the questionnaire feasibility test by 3 experts as validators obtained a percentage of 91.1% which is in the very feasible category. Creative thinking skills on global warming materials were measured using multiple-choice questions totaling 15 questions. Questions on creative thinking skills of global warming material were developed based on the indicators of creative thinking skills Munandar (2014). The indicators of creative thinking skills are fluent thinking skills, flexible thinking skills, original thinking skills, detailing skills and assessment skills. The questions for the creative thinking skills test before being used to measure students' creative thinking skills were carried out by experts who obtained a feasibility percentage of 99% and were in the very feasible category. In addition, the questions for the creative thinking skills test have also been carried out which include the validity test of the question item with the results of the validity test of the item obtained 15 questions used are valid questions, the reliability test with the test results obtained a reliability value of 0.884 which is at very high criteria, the difficulty level test of the question obtained 3 questions in the medium category and 12 questions in the easy category, The differentiating power test of the questions was obtained 1 question had very good discriminating power, 4 questions had good discriminating power, 7 questions had sufficient discriminating power and 3 questions had bad discriminating power. After the test students' creative thinking skills, scoring is carried out with a correct answer with a value of 1 and a wrong answer with a value of 0 which is then calculated using the percentage formula [14]:

$$P = \frac{f}{N} \times 100\%$$

Where is the percentage number of scores obtained, is the number of scores obtained and is the maximum score. The creative thinking skill score is then converted in the creative thinking skill criteria to find out the level of creative thinking skills based on the percentage of the test score obtained. These criteria describe students' creative thinking skills. The criteria for creative thinking skills are shown in Table 1 *PfN*[15].

Table 1. Criteria for Creative Thinking Skills

Percentage of Score (%)	Category
81 – 100	Very Creative
61 – 80	Creative
41 – 60	Quite Creative
21 – 40	Less Creative
≤ 20	Not Creative

3. Results and Discussion

The results of the distribution of student learning style questionnaires were obtained by 12 grade XI students of SMAN 1 Semarang who are students with kinesthetic learning styles. Furthermore, an analysis of the creative thinking skills of kinesthetic students on global warming materials was carried out, the results of which are presented in Table 2.

Table 2. Description of Kinesthetic Students' Creative Thinking Skills

Students' Creative Thinking Skill Level	Number of Students	Percentage (%)
Very Creative	9	75
Creative	1	8,33
Quite Creative	1	8,33
Less Creative	0	0
Not Creative	1	8,33

The results showed that 75% of kinesthetic students were in the very creative category. The highly creative category shows that the kinesthetic student has met all the indicators of creative thinking skills which include fluent thinking skills, flexible thinking skills, original thinking skills, detailing skills and grading skills [16]. Kinesthetic students are mostly able to solve problems with creative thinking skills on global warming materials. Creative thinking skills in global warming materials of kinesthetic students were also analyzed based on the achievement of each indicator of creative thinking skills. The percentage of the results of the analysis of the achievement of each indicator of creative thinking skills of kinesthetic students is presented in Table 3.

Table 3. Percentage of Achievement of each Indicator of Creative Thinking Skills of Kinesthetic Students

Indicators of Creative Thinking Skills	Achievement Percentage (%)
Think Fluently	87,50
Think Flexibly	75,00
Original Thinking	86,11
Detailing Skills	70,83
Assessing Skills	89,58

The results of the analysis of kinesthetic student achievement on each creative thinking skill indicator are known that more than 70% of kinesthetic students have met each of the creative thinking skill indicators. This shows that an average of 8 out of 12 kinesthetic students have been able to solve problems on each indicator of creative thinking skills correctly.

In the first indicator of creative thinking skills, namely fluent thinking skills, kinesthetic students were tested for their ability to give many answers or ideas. Questions to test indicators of fluent thinking skills were applied to question numbers 1 and 6. Question number 1 hones fluent thinking skills by being given questions that test students' ability to relate the impact of global warming to human survival. In the question, a narrative about the impact of global warming is presented followed by the question of how the long-term impact of global warming on human life is. Furthermore, in question number 6, a picture of some of the equipment that produces *Chloro Fluoro Carbon* (CFC) students are tested for their ability to formulate things that can be done to reduce the number of *Chloro Fluoro Carbon* (CFC) produced by some of these equipment. Of the two questions, the indicators of fluent thinking skills of kinesthetic students answered correctly on question number 1. This is because in question number 1 there are many words that contain actions so that it will make it easier for kinesthetic students to think fluently. One of the characteristics of kinesthetic students according to Deporter & Hernacki (2013) that is, they tend to use more words that contain action.

The second indicator of creative thinking skills is flexible thinking skills. In the indicator of flexible thinking skills of kinesthetic students was tested with 2 sub-indicators. The first sub-indicator of flexible thinking skills is the ability to apply a concept in other different contexts. The first sub-indicator is manifested in question number 3 by presenting a question to solve information on the amount of exhaust gases produced by a motor vehicle and relate it to the cause of

global warming, namely the number of motor vehicles in very large numbers. Furthermore, the second sub-indicator of flexible thinking skills is the ability to interpret a phenomenon presented. The sub-indicator is outlined in question number 4 which contains a narrative about the La Nina and El Nino events, then the questions in the question test students to diagnose the impact of La Nina and El Nino phenomena in Indonesia. Students with the third learning style, namely kinesthetic students on the questions with indicators of flexible thinking skills, the number of students who answered 49 was the same on both numbers. It is known that 9 out of 12 kinesthetic students were able to answer correctly on both sub-indicators of flexible thinking skills. This shows that 75% of kinesthetic student profiles have flexible thinking skills in sub-indicators, the ability to apply a concept in a different way, and the ability to interpret a phenomenon presented. This ability is possessed by kinesthetic students because kinesthetic students tend to like learning with hands-on experience so that they are better able to understand how a concept can be applied in different contexts [17]. Kinesthetic students also tend to do learning that focuses on processes and not just outcomes so that they are used to developing the ability to think in different ways and be able to interpret phenomena with a broader perspective [18].

In the third indicator of creative thinking skills, namely the original thinking skills of kinesthetic students, it was tested with 2 sub-indicators. The sub-indicators are the ability to create combinations of parts and the ability to think of new ways. In the sub-indicator of the ability to make combinations of parts is outlined in questions number 2 and 14. Question number 2 tests students' ability to generalize the impact of forest burning in an area on global warming in the world. Question number 14 tests students' ability to be able to generalize the influence of an action on global warming events. Furthermore, the sub-indicator of the ability to think of new ways is tested in question number 5. Question number 5 tests students' ability to be able to design the right steps so that global warming does not occur, so that after being able to design the right steps, students will find the wrong steps so that global warming does not occur. In the indicator of original thinking skills, kinesthetic students answered the most correctly on questions with sub-indicators finding new ways. This is because the activity of finding new ways is influenced by the senses used to capture information. In visual students, the best sense to use 51 for learning is the eye senses and in kinesthetic students learn best with direct practical actions (Priyatna, 2013).

Furthermore, the fourth indicator of creative thinking skills, namely the skill of detailing students' kinesthetic learning style, was tested with 2 sub-indicators. The first sub-indicator is the ability to enrich and develop an idea. This sub-indicator is applied to questions 7 and 13. Question number 7 tests students' ability to detail foreign terms about global warming precisely. Question number 13 tests students' ability to detect the most widely used keywords as a global warming campaign effort. After students are able to detect the most used keywords as the right global warming campaign effort, then students can choose the inappropriate campaign slogan. Furthermore, the second sub-indicator of detailing skills is the ability to test detailed things to see the picture of the direction to be taken. The sub-indicators are applied to questions number 8 and 12. Question number 8 tests students' ability to be able to choose the most impactful international agreements to overcome global warming. Question number 12 tests students' ability to choose the right follow-up efforts to address global warming. After choosing the right follow-up effort to address global warming, students can choose the inappropriate follow-up effort. Furthermore, of the four questions presented for detailing skills, kinesthetic students answered more correctly about question number 13. This is because question number 13 is directly related to actions that contain actions so that it is easier for kinesthetic students to be able to answer the questions correctly. The ability to perform actions that contain action according to the characteristics of kinesthetic students (Deporter & Hernacki, 2013).

The last indicator of creative thinking skills measured was assessing skills. In this indicator, kinesthetic learning style students were tested on 3 sub-indicators of assessment skills. The first sub-indicator is the ability to make decisions which are applied to question number 9. This question tests students' ability to decide on correct statements regarding actions to reduce global warming. Furthermore, the sub-indicator of assessing skills tested is the ability to determine an opinion about something that is applied to questions number 10 and 15. Question number 10 tests students' ability to conclude the effectiveness of a sustainable lifestyle against global warming. Question number 15 tests students' ability to deduce the effectiveness of the 3R concept to reduce global warming. The last skill sub-indicator is the ability to design a work plan from the ideas that are sparked which are applied to question number 11. Question number 11 tests students' ability to be able to design ideas that can be done to reduce global warming. After choosing the right idea design, students can determine the wrong idea design. Of the four skill indicator questions, kinesthetic students answered the most correctly on question number 11. This is because question number 11 invites students to be able to assess the efforts that can be made to reduce global warming in the field of Education. These actions are very relevant to the activities they are currently undergoing, namely as a student, making it easier for students to be able to assess well. Based on the results of the analysis, it is known that assessing skills can be done well if the subject who assesses is directly involved. Research Salmah *et al.*, (2025) also states that direct involvement can make the subject more aware of the real circumstances that are happening. Kinesthetic students in general already have good grading skills. This is strengthened by the results of interviews that show that visual students are able to give assessments well. Kinesthetic students are able to assess the quality of the questions presented and are able to express the reasons for the assessments given.

Among the five indicators of creative thinking skills achieved by kinesthetic students, assessing skills are the highest skills possessed by kinesthetic students and detailing skills are the lowest skills possessed by kinesthetic students. This can also be further known based on the results of interviews which stated that in the skills of assessing kinesthetic students they are able to give assessments quite well and are able to provide assessments based on their understanding. In the question of assessment skills, it is also a question that is relevant to the conditions that students are experiencing so that students are able to assess more deeply. Furthermore, the skill of detailing kinesthetic students is still quite low, which is known based on the results of interviews that kinesthetic students still need to be trained in their ability to enrich and develop ideas by increasing knowledge. Kinesthetic students are not able to detail the ability to develop ideas because they do not know what is being asked, so it is necessary to improve their knowledge to be able to detail well. In addition, the tendency of kinesthetic students to learn in a practical way also affects the ability of kinesthetic students to think theoretically or abstractly [20].

Based on the results of the analysis on the creative thinking skills of kinesthetic learning style students, it is known that the right stimulus can help kinesthetic students to think more creatively. The stimulus can be a direct practical activity that suits the student's kinesthetic learning style. Therefore, in the learning process, teachers are expected to facilitate kinesthetic students by applying learning methods and media that are in accordance with the characteristics of kinesthetic learning style students.

4. Conclusion

The analysis of creative thinking skills of global warming materials in visual learning style students resulted in the finding that 75% of kinesthetic students were in the very creative category, 8.33% of kinesthetic learning style students were in the creative category, 8.33% of kinesthetic learning style students were in the fairly creative category and 8.33% of kinesthetic learning style students were in the uncreative category. The achievement of each indicator of creative thinking skills of kinesthetic learning style students was obtained 87.50% of kinesthetic students met fluent thinking skills, 75% of kinesthetic students met flexible thinking skills, 86.11% of kinesthetic students met original thinking skills, 70.83% of kinesthetic students met detailed skills and 89.58% of kinesthetic students met assessment skills. The creative thinking skills of kinesthetic students are the highest on the assessment skill indicator and the creative thinking skills of kinesthetic students are the lowest on the flexible thinking skills indicator. The creative thinking skills of kinesthetic learning style students must continue to be improved by providing the right stimulus in learning according to their learning style.

References

- [1] U. Munandar, *Development of Creativity of Talented Children*. Jakarta: Rineka Cipta, 2014.
- [2] Y. D. Haryanti and D. S. Saputra, "Publication Media in the Field of Basic Education," *J. Pendas Horizon*, vol. 5, no. 1, pp. 1–7, 2019.
- [3] D. Irawati, A. M. Iqbal, A. Hasanah, and B. S. Arifin, "Pancasila Student Profiles as an Effort to Realize the Nation's Character," vol. 6, no. 1, pp. 1224–1238, 2022.
- [4] D. Supit, M. Melianti, E. M. M. Lasut, and N. J. Tumbel, "Visual, Auditory, Kinesthetic Learning Styles on Student Learning Outcomes," *J. Educ.*, vol. 5, no. 3, pp. 6994–7003, 2023, doi: 10.31004/joe.v5i3.1487.
- [5] K. Analisa and A. Muhid, "Literature Review : Improving Creative Thinking Skills through Treffinger Learning," *J. Stud. Teachers and Learning*, vol. 7, no. 2, pp. 648–659, 2024.
- [6] R. K. Hidayat, B. A. Novianti, and S. Subki, "Improving the Creative Thinking Ability of Physics Students Based on the Independent Curriculum," *J. Ilm. Educator Profession.*, vol. 8, no. 2, pp. 1143–1151, 2023, doi: 10.29303/jipp.v8i2.1412.
- [7] I. F. Rofiqoh, S. Subiki, and A. S. Budiarto, "Identification of Students' Creative Thinking Skills with the Mind Mapping Method in Physics Learning Topics of Optics in High School," *J. Pembelajaran Fis.*, vol. 9, no. 4, p. 139, 2020, doi: 10.19184/jpf.v9i4.18359.
- [8] A. Busyairi and P. Sinaga, "Test Instruments Development Of Ideation-Explanation Model To Measure," *J. Mathematics and Natural Sciences Incandescent*, vol. 16, no. 1, pp. 57–63, 2021, doi: 10.29303/jpm.v16i1.1700.
- [9] S. Fatima, B. Tamam, W. P. Hadi, M. Ahied, and I. Rosidi, "Analysis of Students' Creative Thinking Ability Reviewed from VAK Learning Style on Environmental Pollution Material," *J. Nat. Sci. Educ. Res.*, vol. 6, no. 1, pp. 44–49, 2023, doi: 10.55719/jrpm.v3i2.290.
- [10] N. S. K. Wardani, "Analysis of Students' Creative Thinking Ability Reviewed from Learning Styles on Style and Motion Materials at SMP Negeri 20 Gresik," Sunan Ampel State Islamic University Surabaya, 2024.
- [11] A. Priyatna, *The Importance of Children's Learning Styles! Maximizing Children's Potential by Modifying Learning Styles*. Jakarta: Elex Media Komputindo, 2013.
- [12] P. Wiedarti, *GLS Manual Series The Importance of Understanding Learning Styles*. Jakarta: Directorate General of Primary and Secondary Education, Ministry of Education and Culture, 2018.
- [13] B. Deporter and M. Hernacki, *Quantum Learning Makes Learning Comfortable and Fun*. Bandung: Kaifa, 2013.
- [14] A. Sudijonas, *Introduction to Education Statistics*. Jakarta: Raja Grafindo Persada, 2011.
- [15] Riduwan, *Measurement Scale of Research Variables*. Bandung: Alfabeta, 2010.

- [16] N. A. Sihani, Suhar, and Rosdiana, "Analysis of Mathematical Thinking Ability of High School Students Reviewed from Learning Style," *J. Researcher. Educators. Matt.*, vol. 10, no. 1, pp. 43–55, 2022, doi: DOI: <http://dx.doi.org/10.36709/jppm.v10i1.23885>.
- [17] R. Amelia and M. A. Hikmah, "Understanding Student Learning Styles: The Key to Successful Learning Personalization," *J. Ilm. Nusantara*, vol. 2, no. 1, 2025.
- [18] Baihaqi, F. Umasangadji, S. Siburian, E. Nurmala, and F. Muhammad, "The Influence of Learning Styles and Student Creativity on Learning Outcomes," *J. Sos. and Bid. Educators.*, vol. 2, no. 1, pp. 17–25, 2025.
- [19] Salmah, I. Siregar, I. S. Nola, and T. Hartati, "Procedures for Implementing Class Action Research (PTK) Turning Class Challenges into Solutions," *Ta'limuna J. Pendidik.*, vol. 3, no. 1, pp. 63–73, 2025.
- [20] Syafruddin, S. Ramadani, D. Elnafisah, N. Sari, and M. Rifan, "Innovation and Adaptation of Social Studies Learning in Curriculum Development," *J. Elem.*, vol. 7, no. 2, pp. 65–70, 2024.