Cek Akhir Artikel 3

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Profile of Student's Creative Thinking Ability in Senior High School on Climate Change Materials

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Abstrak

Climate change is a global problem that is happening right now. An increase in the temperature of the earth's surface causes an ecosystem imbalance because it endangers living thing. This study aims to analyze the profile of students' creati thinking abilities at SMAN 3 Jombang on climate change material. The method of research is quantitative descriptive. The sample used in this study was class XI students at SMA Negeri 3 Jombang, totaling 66 students. The instruments used in this study were 4 essay questions which had been lidated by three expert lecturers and declared valid. The instrument used includes indicators of creative thinking, name fluency, flexibility, elaboration, and originality. Based on the results of the analysis of creative thinking abilities, the fluency indicator obtained a rcentage of 29%, flexibility of 20%, elaboration of 31%, and originality of 29%. It can be concluded, overall, the percentage of creative thinking ability is 27.46%. This shows that the students' creative thinking abilities at SMA Negeri 3 Jombang are still relatively low, so there is a need for learning that can improve creative thinking abilities.

Keywords: Creative Thinking Ability, Global Warming, Climate Change

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INTRODUCTION

Climate change is a global problem that is happening right now. Climate change occurs due to an increase in the temperature of the earth's atmosphere which is known as global warming. An increase in the temperature of the earth's temperature causes an ecosystem imbalance because it endangers living things (Imran et al., 2019). Human activity is one of the causes of climate change. Without realizing it, the result of human activity will have an impact on life. Climate change triggers impacts such as poor air quality, floods, erosion, and water pollution (Islam *et al*., 2020).

Along with the increasingly advanced industrial development, environmental problems will increase due to pollution originating from the industrial sector. This is supported by the Ministry of Environment in research from (Nikensari *et al*., 2019) which states that development activities have created changes in the environmental order that are detrimental to society such as environmental pollution. Therefore the need for creative thinking from the younger generation to increase development while maintaining environmental sustainability.

The younger generation is considered a generation that has creative thinking and is full of innovation. The younger generation has a high curiosity to gain new experiences, so they will think more deeply so they can create brilliant ideas (Kadarisman, 2019). In addition, by involving the thoughts of the younger generation, it will create a new mindset and culture to pay more attention to environmental sustainability (Priyansah, 2023).

Creativity comes from the ability to think creatively. The ability to think creatively is very important to develop. This is because the ability to think creatively can be a provision for students to face the era of globalization requires high creativity (Damayanti et al., 2020).

Based on research from Samudra (2023), creative thinking ability is still relatively low (Samudera et al., 2023). In addition, Sari & Hariastuti (2022) in his research also obtained results that students' creative

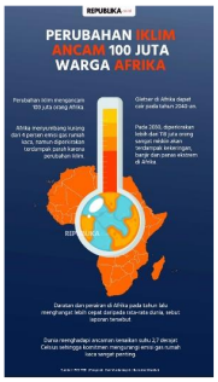
thinking abilitys were in the medium category (Sari & Hariastuti, 2022). This shows the need for special attention to identify and improve students' creative thinking abilitys. Therefore, this research was conducted to analyze the creative thinking ability profile of students at senior high school on climate change materials.

METHOD

The method of research is quantitative descriptive. Quantitative descriptive research is research conducted to find information related to existing phenomena by using numbers as data (Jayusman & Shavab, 2020). The sample used in this study was class XI students at SMA Negeri 3 Jombang, totaling 66 students.

The instruments used in this study were 4 essay questions which had been validated by three expert lecturers and declared valid. The instrument used includes indicators of creative thinking, namely fluency, flexibility, elaboration, and originality. The instruments used in data collection can be shown in **Table 1**.

Table 1. Creative Thinking Ability Test Instrument

Indicator	Instrument
Fluency	Consider the following infographic:  The infographic above contains about climate change in the Africa region. In your opinion, based on the facts on the African Continent and the information in this infographic, what is causing Africa to experience a severe impact due to climate change?
Flexibility	The greenhouse effect is an increase in the earth's temperature caused by the trapping of long-wave (infra-red) sunlight by greenhouse gases such as CO_2, CH_4, NO_2, O_3, CFC. Analyze where the gases are produced, and how are the efforts to reduce emissions from each of these gases?
Elaboration	In this modern era, the agricultural sector has abandoned traditional culture, namely the use of organic fertilizers. At this time the farmers are already using chemical fertilizers. Without realizing it, the use of chemical fertilizers is also a factor causing global warming. What is the link between the use of chemical fertilizers and global warming? Give a detailed explanation.
Originality	Earth's ozone, is a layer that protects the earth from solar radiation. As a result of the covid 19 virus, and the enactment of lockdowns in a number of countries in the world, it was able to close the ozone hole that was once open again. Scientists confirm that the ozone layer, which was once a hole of up to 1 million kilometers, is now closing again due to a decrease in activity that could invite damage to the earth. Based on the explanation above, give your opinion and propose a solution idea for the restoration of the earth's ozone due to global warming.

Further, the answers from the students are scored using the evaluation rubric as shown in **Table 2**.

Table 2. Creative Thinking Ability Test Assessment Rubric

No			Assessment Rubric
1	10	:	Students explain climate change in Africa by associating all the information in the infographic and the state of the African environment.
	5	:	Students explain climate change in Africa by writing all the information in infographics only.
	2	:	Students explain that climate change in Africa is not related to African environmental conditions and infographics/write 1-2 information on the infographic
2	10	:	Students explain the origins and efforts to reduce 4-5 greenhouse gases
	5	:	Students explain the origins and efforts to reduce less than 4 greenhouse gases
	2	:	Students explain the origins or efforts to reduce greenhouse gases
3	10	:	Students provide answers by linking the use of chemical fertilizers and global warming as well as a detailed explanation of the mechanism
	5	:	Students provide answers by linking the use of chemical fertilizers and global warming without a detailed explanation of the mechanism
	2	:	Students give answers without linking the use of chemical fertilizers and global warming
4	10	:	Students provide relevant opinions accompanied by appropriate and unique ideas
	5	:	Students provide relevant opinions accompanied by appropriate and general solutions
	2	:	Students only give opinions or (general) ideas

The profile of students' creative thinking ability was analyzed using the scoring method adapted from (Qomariyah et al., 2021)

$$final\ score = \frac{the\ score\ obtained}{maximal\ score}\ x\ 100\%$$

Furthermore, students' creative thinking abilities are grouped based on categorization as shown in **Table 3** (Wijaya et al., 2022).

Table 3. Creative Thinking Abilitys Category

Persentase	Kategori
81%-100%	Very creative
61%-80%	Creative
41%-60%	Enough creative
21%-40%	Less creative
0%-20%	Not creative

The research was conducted based on the flowchart shown in **Figure 1.**

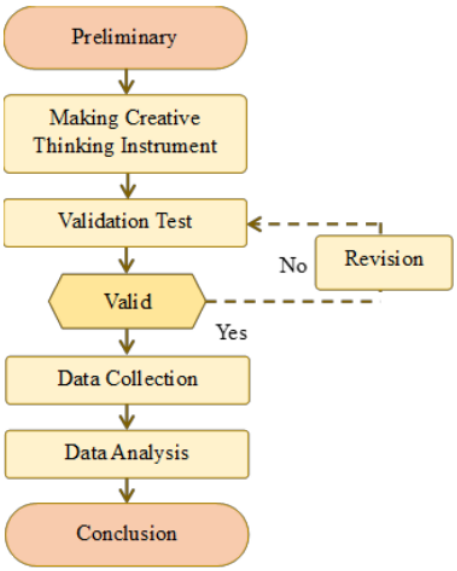


Figure 1. Research Flow Chart

RESULTS AND DISCUSSION

This research was conducted on 66 students of class XI SMA Negeri 3 Jombang on global warming. The instrument used in this study was obtained from a test of creative thinking skills in order to obtain data in the form of numbers. The instrument consists of 4 questions which contain indicators of creative thinking skills. The score for the ability to think creatively from several samples for each indicator can be shown in **Table 4**.

Table 4. Acquiring Creative Thinking Ability Test Scores

Name	Indicator				Final Score	Kategori
	A	B	C	D		
ANH	5	2	2	5	35	Less creative
IR	2	2	5	2	27,5	Less creative
MN	2	2	2	2	20	Not creative
NAP	2	5	2	2	30	Less creative
FRA	2	2	5	5	35	Less creative

Based on **Table 4**, it can be seen that the sample has low creative thinking skills. The first question is with fluency indicators, students give lots of answers by writing 1-2 facts related to infographics only. Students don't provide answers that contain a fact in the infographic and are associated with the African situation which is very at risk of climate change due to its barren condition. Examples of answers from students can be shown in **Figure 2**.

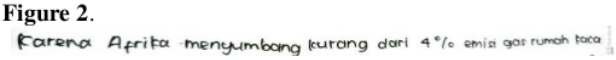


Figure 2. Answers to the Fluency Indicator Question

Then, in the second question with the flexibility indicator, students only gave answers about the origin of greenhouse gases and did not provide any efforts made to suppress these gases. Students are only fixated on answers close to their daily lives. They are not able to mention other broader sectors such as agriculture and animal husbandry that produce CH_4 gas. Examples of answers from students can be shown in **Figure 3**.

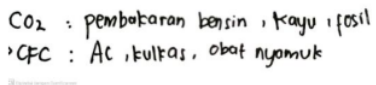


Figure 3. Answers to the Flexibility Indicator

Followed by the third question with an elaboration indicator. In the third question, students gave short answers and there was no visible relationship between the use of fertilizers and global warming. students are unable to explain what actually causes global warming from the use of fertilizers in the agricultural sector. Examples of answers from students can be shown in **Figure 4**.

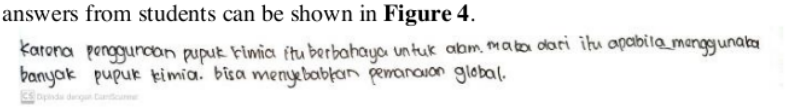


Figure 4. Answers to the Elaboration Indicator

Fourth question with originality indicator. In this question, students provide answers to ideas that are still general in nature related to efforts to close the open ozone layer without giving opinions related to existing phenomena. In addition, the ideas given by students are ideas that are common and many people think about. Many students gave ideas to plant trees, dispose of garbage, and reduce motorized vehicles. In fact, the idea needed is a unique idea such as the procurement of environmental activities that can have a major impact on environmental sustainability. Example of answers from students can be shown in **Figure 5**.

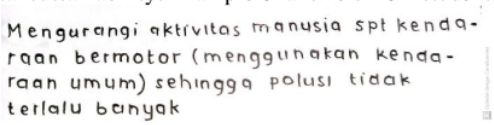


Figure 5. Answers to the Originality Indicator

Based on the overall data, it was obtained an average result of students' creative thinking abilities with a percentage of 27.54% in the less creative category. Overall creative thinking ability can be shown in **Figure 6**.

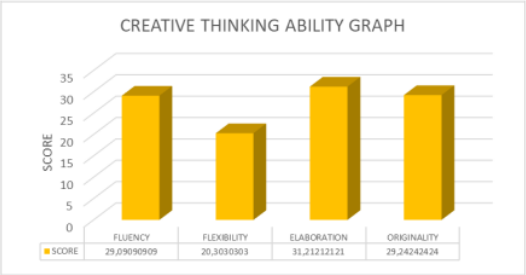


Figure 6. Creative Thinking Ability Graph

Based on **Figure 6**, it can be seen that the fluency indicator has the lowest percentage. Shows that there are still many students who are unable to think from different perspectives and are fixated on just one answer.

Based on the data analysis conducted, students' creative thinking abilities on climate change material obtained different results for each indicator. The climate change material in this study focuses on the greenhouse effect which causes an increase in the temperature of the earth's atmosphere, because the increase in the temperature of the earth's surface due to the greenhouse effect will result in a very extreme climate change on earth (Pratama, 2019).

In this material, students are assessed on the aspects that exist in the ability to think creatively, namely fluency, flexibility, elaboration, and originality. The first indicator is fluency, participants are faced with questions that contain climate change in Africa. Students were asked to provide answers by relating the dry and barren conditions of Africa. In this indicator, students still give a lot of short answers and only take 1-2 facts contained in the infographic. This shows that students are still weak in fluency indicators so they are not able to give many answers. Supported by opinions from Kadir (2022) which states that the indicator of fluency or fluent thinking is the ability to give many answers (Kadir et al., 2022).

The second indicator is flexibility, students are given questions about the triggers for greenhouse gases and efforts to reduce gas emissions. Students give a lot of reasons for the presence of greenhouse gases without giving any effort that can be done to suppress these gases. In addition, students are also still fixated on just one answer such as CO_2 is formed due to burning waste. This is because CO_2 is the most abundant greenhouse gas in the environment around students.

Students will give answers according to what they know from the results of exploration in their environment. This is in accordance with the opinion of Wahyuni & Alfiana (2022) which states that students' exploratory abilities are formed from the encouragement of students in digging up information and solving problems around them (Wahyuni & Alfiana, 2022). As a result of the lack of flexibility, the answers given by students are still fixated on one direction. In accordance with the opinion of Kamalia & Ruli (2022) which states that the flexibility indicator relates to the flexibility of the direction of an idea (Kamalia & Ruli, 2022).

The third indicator is elaboration. In this indicator there is a question about the relationship between the use of fertilizers and global warming. Students are asked to explain in detail regarding this relationship and its process. Many students answered that fertilizer causes global warming without any explanation about what causes it. This shows that students are unable to specify an answer so that the answers they give are still in the form of statements without a more in-depth explanation. Pratiwi (2021) also argues that the elaboration indicator encourages students to detail a solution to an existing problem resulting in a complex solution (Pratiwi et al., 2021).

The fourth indicator is originality. In this indicator students are asked to provide ideas, ideas, and thoughts related to a given context. In this indicator students are given a problem with the phenomenon of closing the ozone layer, students are asked to provide opinions and ideas so that the open ozone layer can close completely. The answer given is an idea that is still common and has been thought of by many people. In addition, students also did not include opinions related to this phenomenon. This shows that students are not able to provide the results of their own thoughts regarding a given context. Cahyanu (2022) also argues that students who are unable to convey ideas or personal ideas have low originality abilities (Cahyani et al., 2022).

Based on the results of the analysis of creative thinking abilities as a whole in Figure 5, the percentage of creative thinking skills is 27.46% in the less creative category. This shows that the students' creative thinking abilities at SMA Negeri 3 Jombang are still relatively low, so there is a need for learning that can improve creative thinking skills. The ability to think creatively is very important for students to be able to solve problems flexibly and not be fixated on just one solution. Febrianingsih (2022) also argues that with the ability to think creatively, students become capable of making alternative solutions to a problem (Febrianingsih, 2022). Nurlaela & Ismayati (2015) in his book entitled "Strategi Berpikir Kreatif" argues that the ability to think creatively is needed to face global challenges so that they are not inferior to other nations (Nurlaela & Ismayati, 2015).

Along with the very rapid industrial development, environmental problems will increase due to pollution produced from industrial processes. Thus, it is necessary for the younger generation with high creative thinking skills to suppress environmental damage as a result of industrial development activities. This shows that the ability to think creatively is very important for the younger generation to have so that development can accelerate and the safety of the earth is maintained. In addition, with the creativity of the younger generation, it will form a golden nation (Abbas, 2022).

The low ability of students' creative thinking can be improved through a learning that is centered on students so that they can increase their creativity. Learning must involve students directly so that they do not only receive information and knowledge from the teacher. This learning can be applied through several learning models such as in research from Mokambu (2021) which can improve the ability to think creatively through problem-based learning (Mokambu, 2021), research from Qadafi (2022) which can improve creative thinking skills through STEAM-integrated PjBL learning in physics subjects (Qadafi et al., 2022), research from Aisy & Ismah (2022) which uses the Picture and Picture Type Cooperative learning model to improve students' creative thinking skills in solving algebraic problems (Aisy & Ismah, 2022), and research from Shima & Hadi (2022) which obtained the result that the ability to think creatively increased by applying the guided inquiry model rather than conventional learning (Shima & Hadi, 2022).

Based on the research results associated with existing references, it is necessary to implement student-centered learning that can improve creative thinking skills so that students have the ability to solve problems with various solutions.

CONCLUSION

Based on the data and analysis obtained in this research, it can be concluded that the percentage of creative thinking abilities is in the less creative category. This shows that the student's creative thinking ability in senior high school on climate change materials are still relatively low, so it is necessary to apply

student-centered learning that can improve creative thinking skills so that students have the ability to solve problems with various solutions.

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