

Analysis Critical Thinking Ability and Environmental Care Attitude of Junior High School Students on Global Warming Material

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Abstract: This study aims to determine the critical thinking skills of seventh grade junior high school students on global warming material at SMP Negeri 29 Medan in the 2021/2022 Academic Year, and the attitude of caring for the environment towards global warming material. This type of research is descriptive with mixed research methods. The population in the study consisted of 8 classes and the sample consisted of 2 classes, namely class VII-7 and VII-8 with 62 students. The sampling technique used is random sampling. The research data collection used a HOTS-based essay test instrument totaling 12 items, an interview instrument totaling 7 questions, an environmental care attitude questionnaire totaling 15 statements, and also observation sheets of learning tools. The results showed that students' critical thinking skills could be categorized as low with an average percentage score of 47.50. Factors that influence students' critical thinking skills are situational factors and dispositional factors. The most influential situational factor is the accountable factor, while the most influential dispositional factor is habituation and practice. The caring attitude of students in class VII at SMP Negeri 29 Medan for the 2021/2022 school year can be categorized as not caring with an average percentage score of 49.78.

Keywords: Critical thinking ability, Environmental care attitude, Global warming material

Introduction

Education is important thing to form quality human resources. Education in the 21st century is expected to enhance the talents of each student and train the skills needed to face the challenges of the globalization era. The 21st century learning is a transition from a teacher-centered learning approach to a student-centered learning approach (Munazah et al., 2021).

The 21st century skills that must be mastered by everyone, make education has the responsibility to prepare the next generation in mastering it. The 21st century skills or termed as 4C (Critical thinking, Creativity, Communication, and Collaboration) are the objectives of the 2013 curriculum, namely the skills that students want to achieve. The student who can communicate with their friends dan collaborate with their environment can think critically to overcome new

situations (Bağ et al., 2021). These skill are important for students to solve various problems by using logical reasoning and appropriate solutions (Makhrus et al., 2018). One of the 21st century skills is critical thinking. Critical thinking is a high-level thinking skill that can improve one's analytical power. This skill is needed for students to review the information that has been given based on their experience, so that they can sort the information they receive (Solikhin et al., 2021). According to Teo et al. (2019), the use of HOTS for low-achieving students can make grades better.

Based on the results of the PISA (Program for International Student Assessment) survey in 2018, Indonesia ranked 74th out of 79 countries with a science score of 396, a math score of 379, and a reading score of 371. The questions used in PISA are questions categorized as High Order Thinking (HOTS) that test students' critical thinking and creative thinking skills (OECD, 2019). The result of the TIMSS (Trends in

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International Mathematics and Science Study) survey in 2015, Indonesia was ranked 44 out of 49 countries with an average Indonesian score of 397, while the international average score was 500 (Nizam, 2016). The rank position shows that the problem-solving and critical thinking skills of Indonesian students are still not optimal. Based on these data, the effort that needs to be made by the teacher is to practice problem-based questions so that students can examine and interpret the problem more enthusiastically because they use existing knowledge in students to solve problems in everyday life. Critical thinking is influenced by several things, there are internal and external ones, including personality traits, culture, spiritual and mental development, self-esteem, communication, and interpersonal skills (Mafarja et al., 2022).

The low quality of education in Indonesia, especially in science subjects, must be used as motivation for improvement. Train the critical thinking skills for the younger generation is one of the main goals of the curriculum in Hongkong and it is also very important for society (Lee et al., 2017). In New Zealand, teachers realized that critical thinking is necessary to achieve the high score on exams (Davies et al., 2023). The learning process in the classroom can be used as one of the important things in improving the quality of education. One way to improve the quality of education in Indonesia is to train students' critical thinking skills (Kartika et al., 2020).

Global warming is an environmental problem that has caused environmental damage and has received serious attention in recent years, so critical thinking skills are needed to be able to provide solutions to these problems (Firdayanti et al., 2020). According to Kusmianty et al. (2020), with global warming material in the 2013 curriculum, students are required to be able to understand the phenomenon of global warming, the consequences of global warming, and the right solutions to deal with these problems.

Global warming is one of the phenomena caused by human activities. One of the efforts to reduce the impact of global warming is to carry out activities that preserve the surrounding environment. Every human being has the same obligation to protect the environment. This requires an understanding and knowledge of the environment (Ramadhan et al., 2019). With an understanding of knowledge about the environment, students are expected to be responsible and have a positive attitude towards the environment. Environmental education through school is one way to instill environmental awareness for students (Kamil et al., 2019). Environmental education can be integrated into various educational institutions at all levels of education (Yanti et al., 2020), but awareness of environmental problems needs to be instilled from an

early age in order to form the character of children with concern for the environment (Khozin et al., 2020).

Environmental care attitude is a form of a person's feelings that must be formed to be able to manage the environment for the better in a sustainable way (Istiqomah et al., 2020). Low environmental care attitude is certainly very influential for the school environment because it can cause various damage to the environment (Fitriati et al., 2021). One of the things that causes environmental damage is not embedding the character of environmental care and responsibility well enough (Jeramat et al., 2019). The implementation of environmental care attitudes in schools at every level is an obligation. All school community members must have an attitude of caring for the environment by preserving the surrounding environment, raising awareness of others about the importance of caring for the environment, and having initiatives to prevent environmental damage (Desvika, 2015). Environmental education is increasingly important in the attempt to change the world for the better. it is a growing concern in curriculums around the world (Arslan, 2012).

Based on an interview with a science teacher at SMP Negeri 29 Medan, the questions that are usually used during learning do not lead to indicators of critical thinking skills. During Face-to-Face Learning, the interaction between teachers and students is limited, students are only required to understand basic concepts. During the observation, the researcher gave questions that instructed students to analyze a science phenomenon. The results obtained, students have answered correctly but have not been accompanied by appropriate scientific explanations. Researchers also discussed with one of the teachers, he said that the teachers at the school had tried to implement student-centered learning, but most teachers at the school were still accustomed to teaching with teacher-centered implementation. According to (Maslakhatunni'mah et al., 2019), one of the factors that cause low critical thinking skills of students is that the learning methods are still conventional (teacher-centered) and students tend to memorize, so that students' explanations are not good enough when they instructed to analyze a phenomenon.

This study aims to analyze critical thinking skills of grade VII junior high school students on global warming, factors that influence critical thinking skills, and students' environmental care attitudes.

Method

The type of research used in this research is descriptive research with mixed research methods. Data collection techniques used in this study were written

tests, questionnaires, and interviews. The research location was at SMPN 29 Medan, with a population of 8 classes and a sample of 2 classes totaling 62 students. Quantitative data was obtained through students' critical thinking ability test scores given at the end of learning and environmental care attitude questionnaire scores. Meanwhile, qualitative data was obtained through interviews related to students' responses in solving critical thinking skills questions.

The written test given to students is an essay test with 12 items that have referred to the indicators of Facione (2013). The following are the indicators that will be used in the study.

Table 1. Indicators of critical thinking skill by Facione (2013)

Indicator	Description
Interpretation	Elaborate the problem based on the information obtained.
Analysis	Analyze the relationship between the information acquired and the concepts learned.
Evaluation	Assess the quality of others' statements or opinions based on existing data.
Inference	Make a rational conclusion based on the existing data.
Explanation	Make arguments about the justification of existing data
Self-regulation	Self-awareness to review the results of previous reasoning.

After students take the written test, students' answers will be checked using predetermined score guidelines, namely giving an initial score to each answer based on the assessment rubric, then determining the value of critical thinking skills with the formula (Riduwan, 2013).

$$NP = \frac{R}{SM} \times 100\% \tag{1}$$

Information:

- NP = Percentage value
- R = Scores of students from each indicator
- BC = Maximum score for each indicator

Based on the results of the written test scores, students were categorized by their level of critical thinking ability and randomly selected to become interviewees. Interviews are used to analyze the factors that influence critical thinking skills which contain 7 questions.

The questionnaire is used to measure the attitude of caring for the environment towards global warming material. There are 15 statement that have referred to the indicators of Dewi (2015), which are 1) have an awareness and gratitude for the role of the Earth's

atmosphere as God's creation; 2) be curious, critical, and care about the environment in identifying the impact of global warming; and 3) use materials that produce greenhouse gases wisely and maintain the balance of ecosystems in the surrounding environment.

This questionnaire is open and direct so that respondents can choose answers that are already available. As a guideline, this questionnaire uses a Likert scale for scoring. After giving a score based on the Likert scale, the percentage value of students' environmental care attitude can be determined using the formula (Prabawati, 2021).

$$P = \frac{f}{N} \times 100\% \tag{2}$$

Information:

- P = Percentage of each answer
- f = Frequency of each answer from the respondent
- N = Number of respondents

Result and Discussion

From the data on students' critical thinking skills test results on global warming material obtained from 62 students, the average score obtained was 47.50 in the low category. The following is the percentage of students' critical thinking ability test results on global warming material which can be seen in Figure 1.

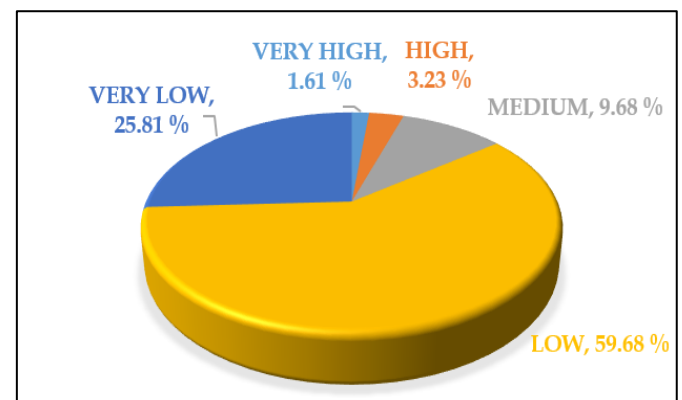


Figure 1. Percentage number of students on critical thinking ability

The data on students' critical thinking abilities in each indicators are in Table 2. Table 2 shows that the interpretation indicator, students are expected to be able to elaborate the problem based on the information obtained. The average value obtained for this indicator is 68.87. It can be seen from the answers given by students who are able to understand the comparison of the two pictures regarding the differences in natural global warming and global warming that occurs due to human activities and then describe the problem properly.

Table 2. Critical Thinking Ability Based on Indicators

Indicator	Average value	Category
Interpretation	68.87	Medium
Analysis	44.84	Low
Evaluation	35.32	Very low
Inferences	37.58	Very low
Explanation	50.65	Low
Self-regulation	47.74	Low

In indicator analysis, students are expected to be able to analyze the relationship between the information obtained and the concepts learned. The average value obtained for this indicator is 44.84. In this indicator, students have not been able to analyze the relationship between forest fires due to drought and the climate crisis.

In the evaluation indicator, students are expected to be able to assess the quality of other people's statements or opinions based on existing data. The average value obtained for this indicator is 35.32. In this indicator students have not been able to understand the questions, this is indicated by students' answers that are not in accordance with the questions.

In the inference indicator, students are expected to be able to make rational conclusions based on existing data. The average value obtained for this indicator is 37.58. In this indicator, students have not been able to analyze the graph regarding the achievement of reducing CO₂ gas emissions which are increasing.

In the explanation indicator, students are expected to be able to make arguments about the justification of existing data. The average value obtained for this indicator is 50.65. On this indicator, students are able to answer correctly, but are not supported by concepts that can build their arguments.

On the self-regulation indicator, students are expected to be able to review the results of reasoning that was done before. The average value obtained for this indicator is 47.74. In this indicator, most students are confident in their answers, even though the answers to the previous questions are still not correct.

The ability to think critically is a skill that must be owned by everyone in the era of the industrial revolution 4.0. Through education, the next generation of the Nation is trained to develop critical thinking skills which aim to be a provision in dealing with technological developments and also the influence of globalization in this era (Novianti, 2020). Constructivist theory states that students need to learn by building their own knowledge through experience and interaction with their surroundings (Miri et al., 2007). The ability to think critically is a capability that must continue to be developed, especially in the next generation of the Nation as an effort to achieve success

in order to be able to compete in the 4.0 revolution era. Critical thinking skills are one of the higher order thinking skills (HOTS) that students need to develop as candidates for society through education in schools (Novianti, 2020).

The critical thinking skills of students at SMP Negeri 29 Medan are still relatively low because in the learning process, students tend to be still in the memorization stage. It can be seen from the answers of students who tend to still explain concepts, even though the questions presented have different meanings. This means that the questions presented do not instruct to explain the concept. This is in line with research Maslakhattunni'mah et al. (2019), students' critical thinking skills are low because in the learning process students tend to learn by remembering and understanding and still often memorize. Agnafia (2019), also said that students' low critical thinking skills were also caused because students were not used to being trained to use critical thinking indicators.

Based on interviews with students, the low ability to think critically is also caused by students not being used to working on questions that require critical thinking. The science teacher gave practice questions from the school book. After doing the analysis, there are 3 out of 10 questions that contain indicators of critical thinking. This should be improved again so that students are accustomed to working on critical thinking questions. This is in line with research Solikhin et al. (2021), the lack of critical thinking skills is caused because students have never worked on science questions which aim to train critical thinking skills. Therefore teachers should be able to choose the right learning model to be able to train students' critical thinking skills. Spector et al. (2019), explained that critical thinking skills can make it easier for students to achieve the desired results in learning. The support from the teacher is very meaningful in the development of student learning, especially students' critical thinking (Darling-Hammond et al., 2020).

Factors that greatly affect students' critical thinking skills are the accountable factor and the factor of habituation and practice. Accountability factor, namely students must be able to account for the decisions they take. In this factor, students are said to have high critical thinking skills when deciding to invite others to preserve the surrounding environment. This is in line with research Sakdiah (2021) who said that the decisions taken and implemented by students in everyday life, indicate students' high critical thinking skills. While the factors of habituation and practice, namely students must do habituation and practice in improving critical thinking skills. This can be done by getting used to working on practice questions that contain indicators of critical thinking. This is in line with Agnafia's research

(2019) which says that one way to improve students' critical thinking skills is to practice questions that contain indicators of critical thinking.

From the questionnaire that has been analyzed, the attitude of caring for the environment on global warming material obtained from 62 class VII students, the average result obtained is 49.78 in the less care category. The following is a diagram of students' environmental care attitudes on global warming material which can be seen in Figure 2.

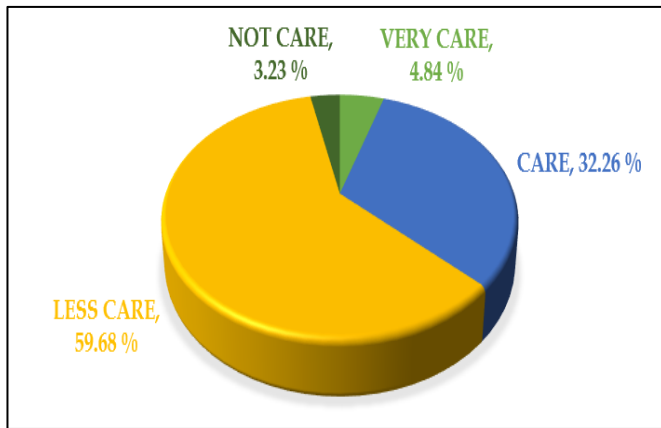


Figure 2. Diagram of class VII students' environmental care attitudes on global warming material

Based on Figure 2 above, the data on students' environmental care attitudes for the first indicator can be seen in Table 3. Table 3 shows that the acquisition of an average value indicates the care category. This is marked by students who reduce littering because this action can have a bad impact on the atmosphere (statement 5). Students also bring drinking bottles from home to reduce the purchase of plastic-packaged mineral water while at school (statement 4). Furthermore, students are already concerned about admonishing other people who burn garbage because the smoke can cause environmental pollution (statement 3). On the other hand, students are less concerned about giving thanks to God Almighty for the atmosphere created to protect living things from solar radiation (statement 1). Students are also less concerned with the existence of an atmosphere that protects the earth from the sun's heat (statement 2). According to research Rahmawati & Bakhtiar (2018), the atmosphere is one of the layers of the earth that functions to filter harmful rays from the sun, can protect living things on earth from extinction. Therefore, it is very important for students to care about being grateful for the existence of an atmosphere that can prevent global warming. The data on students' environmental care attitudes for second indikator can be seen in Table 4.

Table 3. Have an Awareness and Gratitude for the Role of the Earth's Atmosphere as God's Creation Indicator

No	Statement	Average	Category
1	When I pray, I give thanks that the atmosphere was created by God to protect living things from solar radiation.	41.29	Less care
2	As the Earth's temperature increases, I feel that the existence of the atmosphere is not important to protect the Earth from the sun's heat.	42.90	Less care
3	Although I know that the smoke from burning garbage can damage the atmosphere, when I see other people burning garbage, I prefer to leave it alone rather than confronting them, because it's not polite.	56.77	Care
4	I use a water bottle brought from home so that when I'm at school, I don't buy plastic bottled water.	59.68	Care
5	When I feel the weather getting hotter, I still litter because it has no effect on the weather.	62.26	Very care
Average Score		52.58	Care

Table 4. Be Curious, Critical, and Care about the Environment in Identifying the Impact of Global Warming Indicator

No	Statement	Average	Category
6	When I feel the weather getting hotter, I try to find out the cause, even though it can be solved directly by using a fan or Air Conditioner.	45.48	Less care
7	When I see people littering in Medan City, I don't care and prefer not to reprimand them because I feel it's rude.	48.71	Less care
8	When I saw the piles of garbage on the roadside of Medan City, I tried to find out what could be done to stop the piles of garbage from getting worse.	45.81	Less care
9	When I learned that Medan City is the dirtiest city in Indonesia, I still littered, because I was used to it.	47.74	Less care
10	After consuming the candy, I keep the trash when I can't find a trash can nearby.	50.32	Less care
Average Score		47.61	Less care

Table 4 shows that the average score indicates a less care category. This is indicated by students who tend to use fan or AC (Air Conditioner) when the weather is hot, without trying to find out what caused it (statement 6).

Students choose not to reprimand other people who litter with impolite reasons if they are rebuked directly (statement 7). Students do not try to find out what efforts can be made to stop the pile of garbage from increasing

(statement 8). Students continue to litter even though they already know the environment in Medan City which is already dirty because they are used to it (statement 9). Students are less caring if they throw

candy wrappers carelessly when they do not find the nearest trash can (statement 10). The data on students' environmental care attitudes for third indikator can be seen in Table 5.

Table 5. Use Materials that Produce Greenhouse Gases Wisely and Maintain the Balance of Ecosystems in the Surrounding Environment Indicator

No	Statement	Average	Category
11	I prefer to use a bicycle instead of a motorcycle to go to school as a form of reducing CO ₂ gas levels.	38.39	Less care
12	When shopping at a minimarket, I prefer to bring my own shopping bag rather than using a plastic bag from the minimarket.	42.26	Less care
13	When it is daytime, I prefer to turn on the lights to make it brighter, rather than turn them off to save energy.	53.87	Care
14	When there is a gotong royong activity to clean the school environment, I prefer to go to the canteen for snacks.	56.77	Care
15	During breaks at school, I like to encourage others to throw garbage in its place.	54.52	Care
Average Score		49.16	Less care

Table 5 shows that the average score indicates a less care category. This is indicated by students who tend to choose to use motorized vehicles as vehicles to school by being picked up and picked up by their parents rather than having to use bicycles to prevent an increase in CO₂ gas levels (statement 11). Students prefer to use plastic bags from the mini market rather than bringing their own shopping bags from home, this shows that students do not reduce their use of plastic (statement 12). However, many students choose to save energy by using lights only as needed (statement 13). Furthermore, only a few students prefer to have snacks in the school canteen rather than having to take part in mutual cooperation activities to clean up the school environment (statement 14). Then, students who invite their peers to throw garbage in their place during breaks (statement 15).

The attitude of caring for the environment is one of the character education in schools that aims to teach students about the obligation to protect the surrounding environment. With an understanding of knowledge about the environment, students are expected to be responsible for the environment around them. Concern for the environment is not entirely a talent or an instinct, but rather the result of an educational process (Prabawati, 2021).

The attitude of caring for the environment of students at SMP Negeri 29 Medan is still relatively uncaring because of a lack of knowledge of common deviant behavior, such as burning trash; lack of knowledge about reducing plastic waste, for example students prefer to spend money to pay for plastic bags at minimarkets rather than having to carry bags made of cloth; and a lack of courage to reprimand others for engaging in deviant behavior that could damage the environment. This is similar to research conducted by

Prabawati (2021), that the sensitivity of students to the environment is still lacking.

There are various manifestations of the cultivation of environmental education in schools, one of them is the "Sekolah Peduli dan Berbudaya Lingkungan (SPBL)" program, known as the Adiwiyata program (Afrianda et al., 2019). The purpose of the Adiwiyata Program is to create good conditions for school to become a place of learning and awareness of the school community, so that that in the future the school community can responsible for efforts to efforts to save the environment and sustainable development (Muhartati et al., 2019). Various activities that have been carried out to support the Adiwiyata program, including Implementing the 8R program (reduce, reuse, recycle, replant, rethink, respase, refuse, repair), and Implementing a healthy canteen program (Istiqomah, 2019).

Conclusion

Based on research that has been done, the critical thinking ability of students in grade VII at SMP Negeri 29 Medan for the 2021/2022 academic year, can be categorized as low with an average percentage score of 47.50. Factors that influence students' critical thinking skills are accountable factors and habituation and training factors. The environmental care attitude of students can be categorized as less care with an average percentage score of 49.78. Critical thinking skills must be trained more frequently and accompanied by good knowledge of the surrounding environment, so that students can be responsible for preserving the surrounding environment.

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Author Contributions

In this study, conceptualization was conducted by Gracia Hillary and Ely Djulia; methodology by Gracia Hillary; validation by Ely Djulia; formal analysis by Gracia Hillary; investigation was conducted by Gracia Hillary and Ridha Harni Hasibuan; resources were provided by Ridha Harni Hasibuan, who provided lesson plans and syllabus; data curation was conducted by Gracia Hillary; writing-original draft preparation by Gracia Hillary; writing-review and editing was conducted by Gracia Hillary and Ely Djulia; visualization by Gracia Hillary and Ely Djulia; supervision was Ely Djulia; project administration was conducted by Gracia Hillary and Ely Djulia; and funding acquisition was provided by Ely Djulia and Gracia Hillary.

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Conflicts of Interest

The authors declare no conflict of interest.

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