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THE ELEMENTARY SCHOOL TEACHERS' AND STUDENTS' UNDERSTANDINGS TOWARDS MITIGATIONS AND CLIMATE CHANGE ISSUES

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ABSTRACT
Climate change is a global challenge that threatens the world today. To deal with the problem of climate change, it is necessary to understand its issues. The purpose of this study was to know the elementary school teachers' and students' understanding about the issue of climate change. Data were obtained through open and closed questionnaires. Data were analyzed qualitatively. The subjects of this study were 45 elementary school teachers and 25 elementary students. The results of the study showed that 1) all respondents of the elementary school teachers and students considered it important to find solutions and understandings to overcome climate change; 2) the students assumed that climate change was a simple problem, this was shown from their response data, namely 52% of them knew that an increase in greenhouse gases can cause climate change. In addition, they had difficulties in reducing the impact of climate change such as using motorized vehicles when going to school. The elementary school teachers' and students' understanding on the issue of climate change was still lacking, so there needs to be awareness within each of them to encourage them to take climate change mitigation actions.

Kata kunci: Understandings, Elementary School, Mitigation, Climate Change Issue.

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INTRODUCTION

Indonesia, which is a maritime country with a very large population, has an impact on the availability of Natural Resources (SDA). This is because the more the population, the more land will be used to meet their daily needs, for example for housing, schools, industry, roads, offices, hospitals, and others. In addition, the increase in population does not only result in reduced natural resources, but also causes various other problems such as social problems, economic problems, environmental problems and other problems. These various problems must be addressed immediately so that the impact does not get bigger and more complex.

Climate change is one of the problems faced by people around the world related to

the preservation of natural resources. Unfortunately, in the process of learning science about global warming and the greenhouse effect, elementary schools have not been taught optimally. Learning in elementary schools is still traditional. Students only act as listeners in the learning process. They must understand how global warming and the greenhouse effect can occur and what actions they must take.

Climate change begins with the release of large amounts of greenhouse gases and trapped in the atmosphere, causing changes in the average temperature of the earth's surface. According to (Flores, 2017), anthropogenic is the biggest cause of climate change, which is the activity of modifying the chemical composition of the atmosphere through excessive deforestation, large amounts of water pollution which can then cause an increase in the earth's temperature, and the use of fossil fuels. Emissions of greenhouse gases such as methane, carbon dioxide, nitrogen oxides, and others resulting from human activities have become a concern at this time, and various efforts have been made to reduce these greenhouse gases. According to (Mustangin, 2017), Environmental management that aims to reduce the impact of climate change is one of the efforts to overcome the problem of climate change. This goal will be achieved if there is cooperation from all parties in society.

The young generation who will have to make effective decisions, really need to know and understand about climate change (Agustini et al., 2022). According to (Ratinen, 2021), to date, relatively little research has been done on the desire of young people to adapt to changes caused by climate change. Environmental issues such as climate change have become part of the science curriculum. Based on the research result of (Carman et al., n.d.) Science educators can increase students' knowledge about climate change by integrating the topic into their daily lives and involving them in efforts to reduce the impact of climate change. A study by (Kagawa, 2007) found that students can contribute by doing environmentally friendly activities (such as saving water, recycling, saving energy, using public transportation, and participating in buying healthy organic products, and being traded well) which shows a small change in lifestyle.

According to (Plutzer et al., 2016), in his research into how climate change is taught in US public schools, he finds that many teachers are unaware of the overwhelming scientific consensus on this subject to anthropogenic causes. Another study in the US examined teachers' understanding of basic concepts of climate change

and reported similar misconceptions about the causes and consequences of climate change. Researchers argue that effective teaching about climate change will be hampered by such misunderstandings. According to (Özden, 2008), environmental education can be seen as a bridge between science education and social responsibility and is considered as one of the most important factors to prevent such problems. The challenge for elementary school teachers is in understanding climate change mitigation and the difficulty in incorporating mitigation and adaptation strategies into teaching in schools (Ratinen, 2021). Globally, elementary school teachers' knowledge of the ozone layer and climate change has received considerable attention in an effort to improve scientific literacy. Previous research documented accurate and inaccurate ideas about ozone formation, function, and depletion among pre-service teachers (Shepardson et al., 2012).

If GHG emissions cannot be reduced and stabilized, then the impact of climate change will continue to worsen, for example in the increase in air temperature, changes in the magnitude and distribution of rainfall as a feature of climate change. The vulnerability of a system can affect the impact of climate change. The ability of a system, which includes ecosystems, socio-economics, and institutions, to cope with the impacts of climate change is what is called *vulnerability*. Small impact, especially if the changes that occur are very varied will not be able to be overcome if the system is vulnerable. The risks due to climate change can be classified into simple extreme risks and complex extreme risks, while changes that occur from climate change can be beneficial or detrimental.

According to several research results that have been carried out, human vulnerability to various indicators of climate change such as tropical cyclones, sea level rise, drought, flooding, and health problems are caused by climate change. Indonesia is very vulnerable to climate change given the size and low economic capacity of its people. People living in coastal areas will face the problem of rising sea levels as high as one meter. In addition, people have lost their homes and resources due to coastal abrasion and the retreat of several kilometers of coastline.

As having been explained by (Harmoni, 2005), millions of Indonesians living in coastal areas are directly affected by the 60 cm sea level rise. Indonesia as an archipelagic country which has more than 80,000 km long coastline causes it to have a high concentration of population and socio-economic activities of the community,

including coastal cities and ports. Likewise, natural ecosystems such as mangroves will experience many disturbances, for example, with increasingly high mudflow and inundation. The Bappeda KMNLH report in 1999 reported that due to global warming in 1990-2100, sea levels rose by 5-10 mmlth or an average of 6 mmltabun. The impact of rising sea levels is increasing the risk of flooding, coastal abrasion, salt water intrusion into estuaries and aquifers, loss of natural and artificial coastal structures and disruption of coastal ecology which includes reduced biodiversity, destruction of mangrove forests, damage to coral reefs, and changes in nature, bio-physics and biochemistry of the coastal zone.

RESULTS AND DISCUSSIONS

After the data was obtained, the researchers analyzed the results of the questionnaire on climate change issues that had been given to the elementary school teachers. As a result, 98% of teacher respondents stated that they knew about climate change and its causes and impacts. In fact, all respondents stated that they felt the impact of climate change. But unfortunately only 27% of teachers always associate science material with climate change, the rest often, rarely or never. Whereas as many as 42% of teacher respondents stated strongly agree and 58% agreed to relate the material to the issue of climate change. Most of them stated that climate change must be addressed by one way of understanding more about the process of its occurrence, the causes and impacts of climate change on humans and the environment. By learning more about climate change, we can plan efforts to adapt and prevent climate change. In research students have misconceptions about the causes of climate change.

And the study by Arslan (2012) also pointed out that the majority of Turkish pre-service teachers have common misunderstandings and poor understanding of environmental issues related to the atmosphere. Global warming is caused by increased penetration of solar radiation, global warming associated with holes in the ozone layer is an example of misunderstanding (Agustini et al., 2022).

Indeed, knowledge about climate change issues as well as having confidence in their own knowledge should be owned by every individual. Climate change is generally recognized as a global problem. It just needs to be emphasized that every human being has the ability to make a difference in the face of climate change. For example, through

behavioral changes in everyday life without affecting the quality of life, starting with small things such as contributing to reducing GHG emissions (Agustini et al., 2022). The efforts to deal with climate change begins in the field of environmental education which specifically links the current global warming with human actions, discusses the impact of climate change on humans and the biosphere, and raises awareness of possible mitigation actions in dealing with the problem. (Higde et al., 2017).

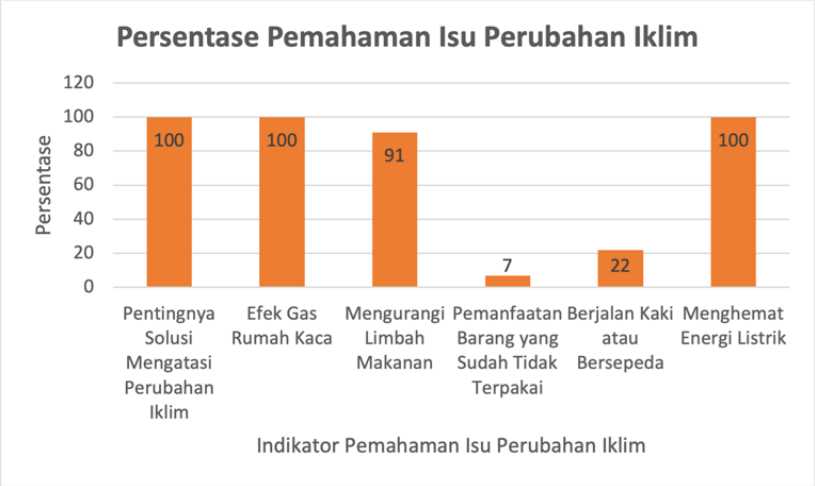

Figure 1. Diagram of the Elementary School Teachers' towards the Climate Change Issues

Based on Figure 1, it can be seen that 100% of primary school teacher responses stated that it is important for us to seek and find solutions to overcome climate change. The global issue that is being widely discussed and is being discussed is environmental issues (Pratiwi et al., 2019). The increase in greenhouse gases, the loss of biodiversity, climate change, lack of clean water and air pollution are environmental problems that currently occur and need to be addressed immediately. Understanding of climate change that is still not widely and correctly spread is one of the challenges (Reviali, 2018). According to (Dal et al., 2015), currently, various parts of the world are starting to feel the impact of global warming, as well as Indonesia is accepting the impact of global warming and climate change which geographically Indonesia is very vulnerable to this. One of the tangible evidences that we can feel is the increasingly intensive rainy season and the longer dry season. Meanwhile, 100% of primary school teacher respondents know that the increase in greenhouse gases can cause an increase in the average temperature of the earth's surface and global warming.

Increasing concentrations of greenhouse gases such as carbon dioxide CO_2, CH_4 and nitrous oxide N_2O and global warming lead to climate change. Reducing food waste can minimize the impact of climate change. As many as 61% of elementary school teachers already know and understand that climate change and the production of methane gas can be triggered from food waste. In addition, methane gas that comes out of organic waste into the atmosphere can cause the greenhouse effect. Their lack of knowledge and understanding about food waste, which can actually cause climate change, underlies some elementary school teachers also have a habit of sometimes leaving and throwing away food. (Wohl et al., 2006) argued that a person's behavior related to climate change is not solely dependent on the person, collective psychological processes also come into play. Group guilt, for example, can be experienced when people feel that their group is responsible for harmful actions.

The respondents' results also showed that only 22% of elementary school teachers carry out their daily activities by walking or cycling to go to work, which means that most of the respondents still use motorized vehicles or private vehicles. This can cause climate change due to air pollution from motor vehicles and cars as a producer of greenhouse gases. Gasoline contains many chemical pollutants, including CO2. At the beginning of the Industrial Revolution, a lot of carbon was released into the atmosphere each year, but unfortunately the ability of the oceans and other natural processes to reduce carbon dioxide in the atmosphere will take a long time. Respondents' results also show that they save 100% of electrical energy. In addition to saving electrical energy, the elementary school teachers also assumed that the electricity bill would decrease if they turned off the lights. (Williamson et al., 2018) viewed that the problem of climate change is inseparable from the increase in the number of high gas emissions in this century. Whether we realize it or not, it is human behavior itself that causes the high amount of gas emissions.

In overcoming the impact of climate change, it is necessary to understand the cognitive and caring behavior of the elementary school teachers; therefore, their understanding to the issue of climate change is very important. To prepare and empower future citizens such as school children to take mitigation and adaptation actions in terms of climate change can be assisted through teacher education (Boon, 2016). Another study showed that although pre-service science teachers in Turkey thought climate change was a serious problem, research respondents reported that

they did not regularly take action because they were worried about the problem (Higde et al., 2017). While they carry out daily activities that reduce energy consumption such as walking, cycling or recycling, it is questionable whether these simple actions were taken to tackle climate change or for other reasons. In education, they are less skeptical of the seriousness of climate change, they are those who support high pro-environmental values, while those who express low environmental values tend to be unsure about the reality and severity of the impact of the problem (Agustini et al., 2022). However, this study shows that eco-centric values do not contribute significantly to skepticism about the reality of climate change.

As for the results of the questionnaire on the issue of climate change, 40% of respondents knew the issue of climate change, 8% knew the causes of climate change, 24% knew the impact of climate change, and 40% felt the impact of climate change. The percentage of indicators for understanding climate change issues is shown in the following figure.

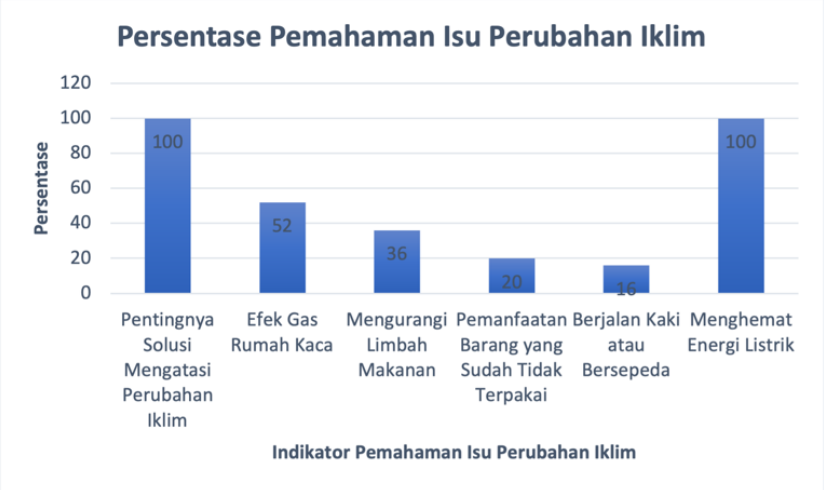

Figure 2. Diagram of the Elementary School Students' Questionnaire Results towards Climate Change Issues

Based on Figure 2, it can be seen that 100% of primary school students' responses stated that it was important to find solutions to overcome climate change. For the addition of greenhouse gases that have an impact on climate change, 52% of respondents already knew it. In terms of reducing food waste, the impact of climate change can be minimized. As many as 36% of elementary school students already knew and understood that food waste could actually trigger climate change and produce methane gas.

Respondents' results also showed that only 16% of elementary school students walk or cycle to go to school, which means that most of the respondents still use motorized vehicles or private vehicles. Respondents' results also showed that they save 100% of electrical energy. In addition to saving electrical energy, they also assumed that turning off the lights can reduce their electricity bill.

Understanding the issues of climate change had an impact on the action plans that would be carried out for climate change adaptation and mitigation. The researchers collected data for the students' action plans for climate change through an open questionnaire. In the open questionnaire there are 5 options for formulating problems related to climate change, namely ways to make people prefer to use public transportation to reduce air pollution, ways to make people prefer to use used goods, ways to make people more happy to plant crops, ways to make people happier make compost instead of burning garbage. From the choice of problems, 80% of respondents chose the formulation of the problem that must be addressed immediately, namely how to make people prefer to use public transportation to reduce air pollution. However, for the action plan questionnaire, 48% of respondents could write only one action plan.

As for the low students' action plan was in accordance with previous research, including the research by (Marhamah, 2020) which conducted an interview on Friday, November 3, 2017 with a teacher in the field of Natural Sciences at SMP Negeri 12 Tasikmalaya, obtained several problems. It was revealed in learning activities that students still had difficulties when teachers used the 2013 curriculum-based learning model. The learning process had not run optimally even though it had involved students for discussion and presentation, but so the learning process tended to be teacher-centered. This causes the test scores of students to have a low average score of 77, while the KKM (minimum completeness criteria) has a value of 78. In addition, in science subjects there have never been measurements of problem solving skills in the school.

Observation by (Pinilih et al., 2016) at SMA Negeri 1 Sukoharjo showed that the delivery of physics subject matter was done by using Powerpoint-assisted lecture method. A total of 64 out of 72 students thought that physics learning carried out using power-point presentation media did not involve the active role of students. The same pattern in each subject matter causes physics learning which is felt by the students to

be monotonous and boring. Learning that takes place with the lecture method, so that it is less memorable in the students' memories. They learn by memorizing the material that has been recorded, but a few days later forget the material that has been learned. According to them, learning with the lecture method does not support their ability to remember, so the learning outcomes obtained are relatively moderate.

Other same type researches, such as the one conducted by Simbolon (2012) In Indramayu District; the results showed that the level of awareness and understanding of climate change issues is still low, as evidenced by the lack of planning patterns that directly contribute to climate change adaptation efforts and steps, the lack of cooperation between institutions in the internal scope and support and collaboration with external institutions and the lack of the existence of special responsibilities from formal institutions (Mukhlis, 2017). As for some of the literature related to improving student action plans, including a study by (Syahriani et al., 2018) which aims to describe the planning, implementation, and evaluation of the cultivation of environmental care attitudes towards waste in grade I students at SDN 09 Bengkulu City. This research is a qualitative research that is a case study. The subjects in this study were school principals, first grade teachers, first grade students, and education staff (administrative staff and school guards). Data collection techniques used observation, interviews, and documentation. Data analysis was carried out by means of data reduction (Data Reduction), data presentation (Data Display) and drawing conclusions (Verification Data). Increased persistence, source triangulation, and technique triangulation were used to test the validity of the data. Based on the results of the study, it can be concluded that the inculcation of environmental care attitudes carried out at SDN 09 Bengkulu City, namely through (1) habituation (planning which includes an Action Plan for the Implementation of a School Environment Care Culture and picket schedule; implementation is exemplary habituation, spontaneous habituation, and routine habituation). ; evaluation of the cleanliness of the school environment, the environmental care attitude of class I students towards waste, and the achievement of the cleanliness of the school environment), and (2) conditioning (planning which includes the provision of facilities and infrastructure, teacher training; implementation in the use and maintenance of facilities and infrastructure; evaluation regarding the supporting and inhibiting factors). (3) Law no. 26 of 2007 concerning spatial planning emphasizes that spatial

planning based on disaster mitigation is needed as an effort to improve the safety and comfort of life and livelihood. To further strengthen the role and function of spatial planning in reducing disaster risk due to climate change, it is necessary to have policies and strategies for climate change mitigation and adaptation in the field of adaptive and responsive spatial planning.

Based on the results of the initial analysis, there are 7 (seven) cities in Indonesia that are included in the 136 (one hundred and thirty-six) priority locations for Disaster Risk Reduction (DRR) in the 2015-2019 Medium Term Development Plan (RPJMN), and at the same time included in the category 50 (fifty) areas vulnerable to climate change in the 2014 National Action Plan – Adaptation to Climate Change (RAN-API). The cities are: Bandung, Surabaya, Bogor, Depok, Tangerang, Malang, and Balikpapan. These seven cities can be considered as priority cities in Indonesia to be encouraged to become disaster-resilient and climate change-resistant cities (Resilient City). In Fiscal Year 2016 the Directorate General of Spatial Planning, Directorate of Regional Planning carried out Spatial Planning Quality Improvement Activities to Realize Disaster-Resilient and Climate Change-Resilient Cities, starting with an assessment of these priority cities in terms of disaster resilience and climate change resilience. The results of the assessment carried out will be one of the bases in the preparation and/or refinement of an action plan to realize a Resilient City, which then needs to be integrated into the city's spatial plan. Among the various factors causing the lack of student action plans for climate change, the most dominant factor is the lack of effective learning in the classroom. The reality in the field is that students are still listening, recording and memorizing or in other words, the learning that is carried out is still conventional and teacher-centered, so that the growth of awareness and action plans of students is still low because in the learning process students are less involved. Likewise, the availability of inadequate learning media is a factor causing the low understanding of the concept of climate change.

If the problem of the students' lack of action plans is left unchecked, it is the same as letting students not have concern for the environment and allowing the low problem-solving abilities of the nation's next generation. This is because climate change also has a negative impact on the environment so that it becomes a global problem, not only in Indonesia. If the next generation of the nation does not have concern for the global problems that are being faced, in the future environmental

damage will be allowed because of the low problem solving ability and low concern for students.

CONCLUSIONS AND SUGGESTIONS

Based on the description of the research results, it can be concluded that most elementary school teachers know that global warming occurs due to the presence of greenhouse gases and can cause climate change. As for reducing food waste, a small number of teachers and elementary school students know that leftover food can actually trigger climate change. Climate change is unknown to most elementary school students. Most teachers and elementary school students are also aware that the behavior they do can have an impact on climate change, but this behavior is still carried out because it is very difficult for them to leave the habits that are often done such as saving electricity use, disposing of waste in its proper place (organic and inorganic), and reuse items that are no longer used, walking or cycling. Therefore, knowledge of climate change in elementary school teachers and students is very necessary. Understanding of climate change must be instilled and taught to students who are the younger generation and must be ready to take mitigation actions related to climate change whose impacts are getting worse.

Based on the result of the study, the researchers have the following suggestions:

a. Curriculum developers are expected to integrate climate change issues into learning.
b. . As for the teachers, they are expected to be able to use their creativity in learning to convey climate change mitigation issues to their students.
c. For other researchers, research on climate change is very important because climate change is a global problem faced today.

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