Critical Thinking Skills Toward Ecological Problems of Climate Change in Basic Schools through The Application of Radec Learning Models

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Abstract: Currently the planet earth is experiencing climate change, which is caused by the way of life of humans which is against the preservation of nature. Education must form humans who are aware of the problems that are happening so that students can be involved in solving these problems. This study aims to determine the extent to which the RADEC learning model is effective for critical skills on the problem of climate change in elementary schools. The number of participants in this study was 22 students. Data using tests and assessments based on critical assessment and problem management. The research method used in this research is quasi-experimental. The results showed that the students 'critical thinking skills training scores were 40.1 and the students' scores were 79.8. Then from the results of the critical and critical skills test it is known that p = 0.00<0.05. So, it can be denied that students' critical thinking skills regarding climate change issues have increased significantly after learning through the RADEC learning model.

Keywords: Climate Change Problems, Critical Thinking Skills, And RADEC Learning Model.

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INTRODUCTION

Currently, the entire hemisphere is experiencing an increase in temperature caused by uncontrolled climate change. Uncontrolled climate change results from human behavior that is not in harmony with nature conservation, this wrong behavior has been going on for a long time. Until now, public awareness of the current climate crisis is still very minimal. Whereas humans need necessities such as clean water, healthy food, and fresh air to survive, if climate change is not immediately addressed, these basic needs will be threatened.

Climate change is already threatening human health, causing human injury as a result of more extreme weather events such as heatwaves, floods, and droughts. Climate change has also caused about 150 thousand deaths each year (World Health Organization, 2002). The cause of climate change is excessive greenhouse gases in the earth's atmosphere. These greenhouse gases consist of carbon dioxide, nitrogen oxides, and methane gas. The sun produces light hitting the earth's surface, then the earth absorbs some of the energy, while the rest is returned to its origin. Greenhouse gases such as carbon dioxide, nitrogen oxides, and methane gas capture this energy and send it back to the earth's surface so that the earth is getting warmer, this event is known as the greenhouse effect.

The excess greenhouse effect is caused by the human way of life, including burning fossil fuels, deforestation, waste, pollution, and livestock. Currently, almost all adults have motorized vehicles and are used for daily activities, these motorized vehicles produce smoke from burning fossil fuels. The largest pollutant from carbon emissions in the world is currently produced from burning fossil fuels such as gasoline, diesel, coal, natural gas, and the like (Global Carbon Report, 2019).

Meanwhile, the sink for pollution from carbon emissions, namely plants, is decreasing every day, and uncontrolled forest conversion is one of the causes. Logging, drought, and burning for oil palm expansion are the causes of the decreasing number of peat swamp forests in Indonesia. This condition is exacerbated by cases of forest fires which always occur every year, in

2019 here there were 1,592,010.00 ha of burned forest areas (Kementerian Lingkungan Hidup Indonesia, 2019)

Modern humans today mostly consume ready-to-eat food made of meat; this condition has led to many animal farms to meet these needs. Meanwhile, livestock manure produces poisonous gases such as hydrogen sulfide, anomia, and methane into the air. This methane gas traps more heat than carbon dioxide in greenhouse gases (Humane Society International, 2011). Not only ready-to-eat food but modern humans today are also tremendous waste producers. In 2018 the State of Indonesia was recorded as producing around 66 million tons of waste to landfills, with the dominance of organic waste (60%) and plastic waste (15%), this condition makes TPA the largest producer of methane gas in Indonesia. Furthermore, Indonesia is also the 2nd country that produces waste into the ocean after China (World Bank Group, 2018).

This condition should be of concern to the world of education, the solution to the ecological problems of climate change is to provide meaningful cognitive understanding to students, so that in the end students have a caring character for environmental sustainability. The same thing was conveyed by Yuliyanto, that education has the goal of forming a student's personality so that he has a responsible character (Yuliyanto et al., 2018). One of the efforts to provide meaningful understanding to students is by improving students' critical thinking skills.

Critical thinking is a basic thinking process for analyzing an opinion to produce a more meaningful insight (Costa, 1985). Critical thinking is a complex process, critical thinking will help us in studying complex ideas systematically, to understand the problem better. A person who can think critically about a problem will not be satisfied with a clear or concrete solution, but he will suspend his judgment while looking for all relevant arguments, facts, and reasoning so that they can support decision making better.

Critical thinking is an important ability to have from an early age because it will prevent them from making inappropriate decisions and help them solve a problem. A person with the ability to think critically has the following characteristics; (1) solving a problem with a specific purpose; (2) analyzing, generalizing, and organizing ideas based on existing facts or information; (3) conclude solving problems systematically accompanied by proper arguments (Cahyono, 2016). Critical thinking can prepare students to think in various disciplines and can be used to meet intellectual needs and solve daily life problems experienced by students and even problems of students in the future. Furthermore, pursuing Fadel and Trilling's critical thinking skills are considered as the basis for 21st-century learning (Trilling & Fadel, 2010).

In developing critical thinking skills, support for innovative learning models is needed. The learning model that is considered to have the potential in developing these skills is the RADEC learning model. RADEC learning model is an acronym for reading, Answer, Discuss, Explain, and Create. The RADEC learning model can encourage students to develop 21st-century skills (Setiawan et al., 2019). The basic principle of this RADEC model is that all students can learn independently and learn more about knowledge and skills (Sopandi, 2017). RADEC learning has steps that direct students to carry out various meaningful activities such as reading, discussing, explaining, exploring, solving problems, and making works. The learning process using the RADEC model has been shown to improve students' mastery of cognitive concepts (Sopandi & Handayani, 2019). However, it is still necessary to test how to improve critical thinking skills related to the ecological problems of climate change through the RADEC learning model.

METHOD

The purpose of this study was to determine critical thinking skills on the ecological problems of climate change in elementary school students through the implementation

of the RADEC learning model. The method used in this research is a quasi-experimental method with the design of the matching pretest-posttest control group design. The number of participants in this study was 22 students. The instruments in this study used tests and assessment rubrics that measure students' critical thinking skills. This study aims to determine the results of the learning treatment using the RADEC learning model.

The indicators used in this study are indicators proposed by Glaser which only use five indicators, namely: 1) recognizing the problem; 2) analyze the problem; 3) collect and compile the necessary information; 4) finding ways to deal with problems; 5) conclude. The result of this validation test is that this instrument is declared fit for use to measure students' critical thinking skills on climate change issues (Fisher, 2009).

RESULTS AND DISCUSSION

Based on the results of research that have been carried out at SD IT Alamy, Subang District, Subang Regency, it is known that the critical thinking skills of students in the 5 indicators have increased significantly.

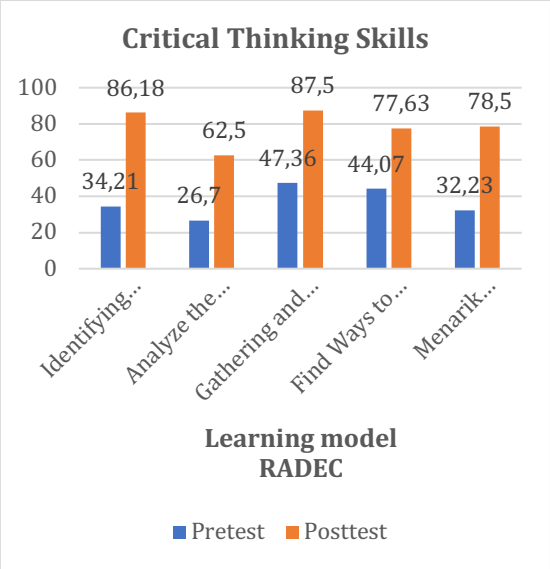

Figure. 1. Improvement of students' critical thinking skills

This figure shows that overall, the critical thinking skills of students have increased from each indicator. The indicator that has increased the most is the indicator of knowing, namely recognizing the problem. The ability of students to analyze, which was initially included in the poor category, after being given learning using the RADEC model, has increased dramatically compared to the indicators of critical thinking skills.

In the pre-test data, the indicators of collecting and compiling the necessary information are the indicators most mastered by students, but after being given treatment, the increase that occurs in the indicators of collecting and compiling the necessary information is not as big as the increase in the indicators of recognizing problems. In the pre-test data, the students' concept mastery ability in analyzing problems was the lowest indicator compared to other indicators, but after being given learning the improvements that occurred in the indicators of analyzing the problem were not as big as the improvements that occurred in other indicators of critical thinking skills. From this explanation, it is an interesting finding that overall, the critical thinking skills of students have increased from each indicator and are included in the good category.

The results showed that the average pre-test score of students was 40.1. After doing the normality test using the Kolmogorov-Smirnov test, it was found that the pre-test data for students' critical thinking skills came from a normally distributed population (p (0.05). Likewise, the post-test data with an average score of 79.8 came from a population that was normally distributed (p>0.05). Because the two data were normally distributed, the next statistical analysis was used by the researcher using the parametric test with the t-test. From the results of the t-test, it is found that the significance value is 0.00, which means 0.00<0.05. Thus, it can be concluded that there are significant differences in critical thinking skills on ecological problems of climate change using the RADEC learning model.

CONCLUSION

The results showed that students' critical thinking skills increased significantly after being given learning using the RADEC model. This means that the stages of the RADEC learning model are effective in improving critical thinking skills on ecological problems of climate change in primary schools. The RADEC learning model has implications for the learning process, which can encourage students to be more active in the learning process, improve students 'reading habits, train students to work together, develop students' explaining skills, and train students in making works.

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