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# Climate Cards: Interactive Educational Media on Climate Change for Elementary School Students

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|---|---|---|

***Abstrak:*** *Sebuah keniscayaan aktivitas manusia selaras dengan perubahan iklim. Hal demikian harus ditanamkan pada kesadaran generasi yang akan menghuni kehidupan planet ini betapa pentingnya sisi positif menjaga kelestarian lingkungan. Tujuan studi penelitian ini mengeksplorasi penerapan dan mendeskripsikan implementasi kartu iklim bagi anak. Serta mengetahui aksi nyata tindakan kreatif yang membawa dampak penyadaran terhadap efek perubahan iklim bagi kehidupan. Penelitian pada riset ini menggunakan metode kualitatif-deskriptif pada pengumpulannya melalui Focus Group Discussion. Data yang telah di dapat akan dianalisis setiap pertemuannya dan ditarik kesimpulan di akhir pertemuan. Hasil penelitian memaparkan edukasi atraktif menggunakan kartu iklim anak di SDN Jetis 2 Saptosari belum banyak yang tahu. Penerapan kartu iklim dilakukan tidak hanya pada pembelajaran ceramah, melainkan memantik peserta didik untuk menjadi subjek belajar yang kolaboratif, kritis, dan komunikatif yang sangat mendukung daya kognitif, afeksi, dan psikomotoriknya. Kemudian, temuan lain dari implementasi ini mampu menggerakkan minat siswa belajar terhadap isu perubahan iklim dan mengelaborasikannya melalui aksi kreatif anak dengan membuat poster sampah.*

***Kata Kunci: Edukasi, Kartu iklim, Perubahan iklim***

**Abstract:** Human activities are inevitably in harmony with climate change. Thus, the importance of preserving the environment must be instilled in the minds of future generations. This research aims to explore and describe the use of climate cards for elementary school children. This research also tries to identify creative actions that can increase awareness of climate change. This research used a qualitative-descriptive method. Data were collected by conducting a Focus Group Discussion. Data were then analyzed in each meeting to conclude. The results of the analysis showed that interactive educational media on climate change have not been widely used in SDN Jetis 2 Saptosari. The climate cards were not only used during the lecturing session. They encouraged students to be more collaborative, critical, and communicative in learning to support their cognitive, affective, and psychomotor abilities. The use of the climate cards could increase students' interest in learning about climate change issues, especially when they are assigned to create a poster about waste issues.

**Keywords: Education, Climate cards, Climate changes**

## INTRODUCTION

Climate change threatens the survival and sustainability of human livelihoods (Schaik, 2023; Susilawati, 2021). An example of the consequences of the current unpredictable weather is crop failure which indicates the agricultural sector's high vulnerability to climate change (Borlu & Glenna, 2021). Considering the global temperatures, the Intergovernmental Panel on Climate Change recorded a drastic increase of geothermal heat intensity, doubling at an average of 0.18 degrees Celsius per decade since 1981 (Retnoutami, 2022). This increase causes the polar ice caps to continue melting, which also affects humidity and sea level rise (Lailia et al., 2023). Prolonged droughts and fires also indicate the increase in global temperature (Zukmadini & Rohman, 2023). However, human actions also increase the burden on the earth by accumulating residues from their activities (Mareta et al., 2023), for example, the use of single-use plastic materials, the use of non-renewable energy in industry and transportation, and deforestation for residential areas. This also results in an increase in household waste (Gharagozloo & Ghazizade, 2023). This condition increases greenhouse gas emissions which ultimately increase global temperatures (Rozci, 2024). Thus, it can be said that waste also contributes to climate change.

Indonesia is one of the world's most significant waste contributors. Data collected from the Environment and Forestry Service indicates that 2024 there will be 34 million tons of national waste, however this figure is not as high as in 2023, which reached 43 million tons of garbage (SIPSN, 2024). The Special Region of Yogyakarta Province is part of the region that produces the most waste, with waste accumulation per 2024 reaching more than 708 thousand tons, or only a 0.53% decrease from the previous year's 712 thousand tons. This province influenced the trend of increasing national waste from 2020 to 2023, and also experienced a decline in 2024 (SIPSN, 2024).

Table 1. Waste Accumulation Trends in Indonesia

| Date | 2021 | 2022 | 2023 | 2024 |
|---|---|---|---|---|
| National | 28,591,323.10 | 38,570,232.62 | 43,260,356.89 | 34,797,274.68 |
| Yogyakarta Province | 452,637.63 | 691,435.17 | 712,086.32 | 708,359.03 |

Environmental activists and communities are highly concerned about the waste issue in this province. The culture of proper waste disposal seems inappropriate to be reiterated at this time because waste often ends up re-mixed in landfills. Therefore, the paradigm of proper waste disposal is better suited to a shift towards waste management. Waste management transforms waste into valuable products, which leads to an environmentally friendly economic cycle in the community (Andriyanto et al., 2023; Holmberg & Ideland, 2021).

However, currently, the public is reluctant to practice waste management. This can be caused by ignorance and reluctance factors (Gharagozloo & Ghazizade, 2023). If this continues, the effects of waste will accelerate climate change. This can be prevented by educating the next generation to adapt and not follow the bad practice. This means preventative measures to mitigate the impacts of ongoing climate change are needed. If the population is aware of this issue, the golden Indonesia in 2045 can be achieved. Yogyakarta Province has started to improve its response to the climate and waste crisis. Education sectors can utilize climate cards that are easy to understand the causes, impacts, and ways to reduce climate change.

Climate Cards are learning media developed by the Plan International Foundation using a direct-action approach through some game missions designed specifically for children to inspire them to take climate action (INEE, 2024). However, these educational media have not been widely used in Yogyakarta. This educational game offers a positive impact and can be adopted to teach children. These climate cards were applied in SDN Jetis 1 Saptosari in Gunungkidul and provided positive results.

Yoshiko Okada and Toshiki Matsuda (2019) used card games in elementary school children's learning. Social Skills Education (SSE) cards were developed to emphasize not only social skills such as greeting, listening, and politely declining requests, but also to increase children's motivation to participate in problem-solving or building consensus with others (Okada & Matsuda, 2019). It is in line with Fitriyani, Eliyanti, and Hermawati (2021) that problem-solving through creative thinking involves developing a risk board game designed to train students' skills in answering the missions presented on the board (Fitriyani et al., 2021). Sexcio (2022) also found that card learning media positively influences student learning outcomes by facilitating understanding and creating an engaging, non-boring learning atmosphere that increases students' enthusiasm (Sexcio & Dafit, 2022).

Another study by Nurlia (2022) explained four learning models that can enhance learning activities, namely preparation, presentation, practice, and performance (Nurlia, 2022). The finding is similar to Fitriyani et al. (2022) and Hadi, Rahmadhani, and Putra (2024), who found that group investigation or group learning can also enhance students' collaborative learning activities in the classroom (Hadi et al., 2024). Another study displayed climate change banners in the Sungai Siring Village (Mareta et al., 2023). Zukmadini and Rohman (2023) reported that climate change awareness was built using PowerPoint and documentary films (Zukmadini & Rohman, 2023).

The existing studies have not focused on teaching school-age children about the effects of climate change using climate cards. Thus, this study focuses on the use of climate cards as a unique learning model and the actions taken by students. This will provide an alternative

learning support system in order to facilitate students' exploration of climate change and adaptation in a more engaging way.

## METHOD

This qualitative study used a descriptive approach. This means that this study provides a more in-depth description of the research object, namely, the implementation of climate cards for elementary school children. It also explains how children can understand climate change material through games. Researchers collected data to design customized activity materials based on the needs and capacity to implement the climate cards. This was accomplished through discussions with school teachers, students as potential implementation facilitators, and students who would be the learning subjects. Documentation was also gathered from secondary data from previous research and relevant archival documents as supporting sources. Data were collected by conducting Focus Group Discussions (FGDs), where all information, opinions, and attitudes expressed by the participants were then used as research data. Next, the material delivery domains were mapped and divided into oral and play-based models. This was done considering the limited meeting time. Furthermore, the more dominant codification for determining the call to action in the climate card implementation series was creating posters from waste within the school environment. This was supported by the still-frequently discussed issue of waste in Yogyakarta province.

This research was conducted at SDN Jetis 1 Saptosari, Gunungkidul, Yogyakarta, from July to August 2024, with meetings held weekly, with a total of three meetings. Each meeting required 1 to 2 hours, depending on the achievement indicators of a pre-developed work matrix. The FGDs consisted of three groups of 6-7 students. The target group for implementing the climate card was 21 students in grades 5 and 6. The selection of the students is more capable of thinking and responding than those who are younger, although the climate card can be used by children aged 7 to 12. The facilitators of the climate card implementation were students from UIN Sunan Kalijaga Yogyakarta who were conducting community service. A total of 10 students were involved, with each group assisted by three facilitators and one student acting as a facilitator coordinator to oversee the activity.

Table 2 outlines the Climate Card Implementation Meeting Plan, which is organized over three days. On Day 1, participants engage in a 60 minute session focused on introducing and socializing the concept of climate change and the Climate Card. On Day 2, they proceed to the implementation stage, spending 90 minutes applying the Climate Card in practical or interactive activities. Finally, on Day 3, the program concludes with a 120 minute session

dedicated to the Appeal of Creative Action, where participants are encouraged to present, reflect on, and promote innovative actions for addressing climate issues.

Table 2. Climate Card Implementation Meeting Plan

| Meeting | Activity | Duration |
|---|---|---|
| Day 1 | Climate Change and Climate Card Socialization | 60 minutes |
| Day 2 | Climate Card Implementation | 90 minutes |
| Day 3 | Appeal of Creative Action | 120 minutes |

All data collected from observations and FGDs were then analysed and selected according to research needs. These results are presented in tables and narrative descriptions to draw conclusions. To validate the data, researchers used source triangulation techniques to ensure the validity of the research data. This triangulation examined school teacher's responses, student understanding, and direct observations during implementation. This response was evident in the school's support for displaying the work on the bulletin board. Furthermore, it demonstrated the children's courage to express their opinions, ask questions, listen to explanations and instructions, and their willingness to think creatively and prioritize teamwork. Therefore, the application of climate cards for children supports climate awareness campaigns and learning, which creates make a generation aware of environmental issues.

## RESULTS AND DISCUSSION

### Results

### Climate Change and Climate Card Socialization

Before introducing the Climate Cards, the children were taught about climate change and its current impacts. For example, they learned that natural events can contribute to climate change and lead to disasters. The facilitator also provided insight into hazard mitigation using the example of earthquakes. To create a non-monotonous atmosphere, the facilitator also used singing and body movement techniques in the middle of the presentation. This stimulated children's imaginations during an earthquake. The reason for selecting an example of an earthquake is due to its frequent occurrence and high casualty rates in Yogyakarta.

In the first meeting, the facilitator approached the children to build a good bond. This is important to encourage children to follow the desired direction. Children's natural tendency to imitate the adults around them contributes to this process (Razi et al., 2018). This stage serves as an introduction between the facilitator team and the students.

Socialization is the first step in gaining an understanding of interactions, thinking patterns, and adaptations. Facilitators also assessed the children's ability to respond to the extent to which they have acquired cognitive capacity on the topic of climate change.

Climate cards are an attractive educational learning medium that introduce children to deeper learning about disasters, weather, and climate, including their causes, impacts, and management (Setiadi, 2024). The climate card guide and map as shown at figure 1, can be freely accessed and downloaded online from the Plan International website. This climate card has not been widely used. This research involved children for the implementation of the climate cards because they can absorb learning easily and can be an excellent channel for transferring information to their parents (Çoban & Göktaş, 2023; Setiadi, 2024). Furthermore, this game is designed for children aged 7-12 (Plan International, 2021).


Figure 1. Climate Craft Mission Map

**Implementation of Children's Climate Cards**

Learning is not only about creating a fun, comfortable, and interactive world but also a challenging process (Fithrotuzzahroh et al., 2023). In the climate card game, each group was encouraged to understand the material by playing according to the assigned mission. The climate cards were implemented in the second meeting at SDN Jetis 2 after establishing 3 groups in the socialization meeting. These groups became the participants of the Focus Group Discussion for climate card implementation.

This game is likened to pirates seeking treasure but facing many obstacles. It covered 14 missions, each innovatively packaged during its implementation. However, the facilitator did not use a game method for all fourteen missions. Children used games for missions 1, 2,

3, 4, 5, and 7 with the activity of making, drawing, coloring, and playing with seasonal costumes. Playing with costumes is the third mission, which is intended to encourage students to prepare costumes according to the season, which is secretly conveyed to each group by the facilitator. This means that only the group knows the season chosen. This game involves guessing the other group's season. The displayed costumes stimulate children to think about which season best suits the costumes. Meanwhile, in missions 6, 8, 9, 10, and 11, the facilitator directly explains the purpose of each mission to the children. Missions 12, 13, and 14 encourage children to express their opinions regarding climate change responses. This method fosters children's motivation (Mangione et al., 2013). This has the positive impact of encouraging children to be brave and take the initiative to take good actions. However, in the last three missions, only one of the three groups dared to voice their opinion. Summary of mission and achievement is shown in Table 3, while the documentation of the mission implementation is shown in Figure 2.

Table 3. Achievement

| Mission | Achievement | | |
|---|---|---|---|
| | Group 1 | Group 2 | Group 3 |
| 1. Learn about where you live | Each group makes an origami ship and imagine what will happen in their home several decades in the future. | | |
| 2. Learn about weather (Each child writes down the weather that occurred in the last morning, afternoon, evening, and morning during the meeting) | Able to recognize the weather in their respective area | Able to recognize the weather in their respective area | Able to recognize the weather in their respective area |
| 3. Learn about climate using costume guessing game | Able to guess 1 climate of another group | Able to correctly guess the climate of another group | Able to guess 1 climate of another group |
| 4. Learn that climate is changing | Able to explain the contents of the colored image | Able to explain the contents of the colored image | Quite capable of explaining the contents of the colored image |
| 5. Learn how climate change affects weather | Quite capable of connecting between weather and its impacts | Capable of connecting between weather and its impacts | Quite capable of connecting between weather and its impacts |
| 6. Learn how climate change impacts people | Children are expected to understand the impact of climate change on people's lives. | | |
| 7. Learn that people, place, and things are connected. (Each child makes a map of their house and the area around their house, such as rice fields, rivers, forests, cow sheds, and so on) | Each child in the group is expected to able to create a map and explain their relationship to the conditions of their respective area. | | |

| Mission | Achievement | | |
|---|---|---|---|
| | Group 1 | Group 2 | Group 3 |
| 8. Learn how nature helps us deal with climate change | Children are expected to understand that nature can prevent climate change from worsening, for example by reforesting bare land. | | |
| 9. Learn about child's rights and climate change | Children are expected to understand that they have rights, for example, to clean water and food, and to feel safe wherever and whenever. | | |
| 10. Learn about global action | Children are expected to understand how to care for the earth and its sustainability, for example by saving electricity, switching to public transportation, and implementing Reduce, Reuse, and Recycle principles. | | |
| 11. Explore actions around the world | Children are expected to learn about the measures taken by various countries to mitigate the effects of climate change, for example in Haiti, where schools have climate awareness clubs that organize school cleanups to reduce flooding and Indonesia, which grows vegetables in school gardens. | | |
| 12. Chose a climate action to take forward | Dare to come forward to mention examples of minimizing climate change effects | No one dared to speak | No one dared to speak |
| 13. Call for climate action | Dare to come forward to mention examples of minimizing climate change effects | No one dared to speak | No one dared to speak |
| 14. Share climate story | Dare to retell the activities that have been done | No one dared to tell a story | No one dared to tell a story |

Figure 2. Groups Completing the Climate Card Mission and Costume Guessing Game

**Climate Cartoon Action: Waste Poster**

The yellow signs do not only represent the message to stop disposing waste in the right place or according to its type, but also to learn how to utilize and manage waste. Nowadays, waste needs to be viewed as a friend. In this case, we should not only constantly produce waste but also recycle it into reusable materials. The climate cards in the 12th, 13th, and 14th missions inspire students to take concrete action in their surroundings, particularly at school. In the implementation of the climate cards in the second meeting, students took the idea of

using waste around the school as a craft material to create posters. It is not simply picking up waste and turning it into a picture, as the goal is to be a model for an educational campaign targeted at the entire school community. Sorting waste is a creative idea in response to the waste crisis in Yogyakarta.

Before the activity, students were invited to identify some types of waste in the surrounding environment and participate in cleaning and disposing of the waste into trash bins. This stage fosters children's behaviour to dispose of waste properly. Then, each group brainstormed ideas for the types of waste needed. The facilitator helped guide the children based on the concepts and ideas discussed.

Table 4. Post Assessment

| Assessment indicator | Score | | |
|---|---|---|---|
| | Group 1 | Group 2 | Group 3 |
| Climate-Related Poster Ideas | 7 | 7 | 8 |
| Using Waste as Poster Material | 6 | 4 | 8 |
| Design Creativity | 6 | 5 | 6 |
| Total score | 19 | 16 | 22 |

Based on the Table 4, Group 3 is more effective in utilizing dry waste as a substitute for dye on their posters than the other groups, who tended to use dye. Groups 1 and 2 collect waste by cutting living plant parts, such as flowers, leaves, and twigs. Furthermore, the two groups' poster ideas are quite similar, focusing on the state of the earth due to the impact of climate change. Meanwhile, Group 3 focuses more on the current, increasing global temperature. All groups used leaf waste and some plastic. This demonstrates the students' ability to recycle environmental waste in innovative ways. This creative activity provides new perspectives on appropriate ways to recycle waste into unique crafts, for example, the use of environmentally friendly materials, such as poster boards made from cardboard and used paper, and waste materials as substitutes for dyes.

Figure 3. Cleaning Up Trash and Creating a Waste Poster

**Discussion**

Climate cards can be considered a type of learning model using traditional print media. They are like handouts and do not use the internet (Watri et al., 2023). This game-based learning model has been widely adopted, for example, traditional Game-Based Learning (GBL) media in earthquake learning using posters, brochures, or other tools that promote active learning and participation (Çoban & Göktaş, 2023). This means this educational media can be played anywhere and anytime.

The learning process is inseparable from the use of learning resources (Maulida & Syaifuddin, 2024). Talking about games, people tend to conclude that they are the opposite of improving academic performance. On the other hand, games can be an engaging learning method (Martinez et al., 2022). Games indirectly educate students to understand the material. Educational games also offer excitement that keeps children engaged in learning (Hamdaoui et al., 2018).

Overall, the children's willingness to follow instructions and solve problems in each mission is considered successful. It can be seen from the group's ability to achieve its goals, including their responses and attitudes. This encourages children to complement each other's thinking. This is similar to the investigative group model, which enhances student learning activities through analysis, discussion, problem-solving, questioning, and expressing opinions, as well as teamwork (Fitri, 2022; Hadi et al., 2024). Based on a pedagogical theory perspective, learning in the climate card game can be considered a contemporary pedagogy. Hidayat et al. (2024) explain that contemporary pedagogy encourages children to be actively interactive, critical, and collaborative, while the educator acts as a facilitator who encourages them to do so (Hidayat et al., 2024). However, the implementation of these climate cards can sometimes make children bored, even though they are designed to be as engaging and time-efficient as possible. This indicates that learning through digital media, whether applications or e-learning, or contemporary pedagogy that emphasizes the use of technology, is more engaging in motivating children to learn. However, it is important to realize that this teaching model cannot present physical reality to children (Çoban & Göktaş, 2023; Hidayat et al., 2024; Istiq'faroh et al., 2024). Children's lack of interest and motivation to participate in learning activities (Nurlia, 2022) encourages facilitators to provide rewards to students who successfully answer questions or to groups that win games. To add excitement, prizes can be given at each meeting to attract children's interest in learning (Saliyo & Hidayah, 2022).

## CONCLUSIONS

The implementation of the children's climate card in SDN Jetis 1 Saptosari, Gunungkidul, runs smoothly. The students look active and eager to support actions to reduce the effects of climate change. Climate cards can serve as a learning model for recognizing and responding to current climate change issues, but some have not realized the benefits. Despite the simplicity of the concept and method, they can motivate children to learn.

In the socialization stage, children understand climate change and its effects on increased disasters and earthquake safety measures. Besides, they learn more about climate change, including the differences between weather, seasons, and climate, the impacts of each, and how to adapt. In the action stage, concrete actions are taken to reduce the negative impacts of climate change. These three stages demonstrate the significant impact of facilitators in the implementation of climate cards. They help students understand the mission and stimulate their cognitive abilities. As a reward, children are given prizes at each meeting in order to increase their enthusiasm for learning. This learning model can be an alternative to boring classroom learning. The positive value children gain is primarily in understanding weather, seasons, climate, and the potential disasters caused by these conditions. It also stimulates imagination, creativity, and innovation in waste mitigation. This research is expected to increase awareness of the future generation regarding the effects of climate change and encourage all levels of society to begin adapting to climate change.

The researcher realizes that it's still too early to draw general conclusions because not every school in the same class has a unified understanding of climate card implementation. Facilitators here are also university students and not full-time teachers. Therefore, future research needs to compare the use of the climate card with other schools.

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