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Climate Change Education For Children Using E-Klim

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Abstract

The worsening waste crisis poses a serious challenge to environmental sustainability. **Objective**: This study introduces E-Klim, an innovative climate education model that combines waste management with child-based environmental learning through participatory visual methods. **Novelty**: This model offers a unique approach by integrating visual education for children, waste-based philanthropic actions, and community empowerment in one integrated framework. **Methods**: Using Participatory Action Research (PAR), this study actively involved children, communities, religious institutions, NGOs, and local governments in developing interactive tools such as the 'Match Cause and Effect' game and the 'Green Challenge' activity. **Results**: The research findings show: (1) a significant increase in children's understanding of climate change through a visual approach, (2) the transformation of the recycling system into a community philanthropic movement, and (3) the implementation of real actions such as tree planting. **Conclusion**: E-Klim has proven to be an effective framework that not only solves the waste problem but also creates a circular economy based on local values, while strengthening environmental education for the younger generation through innovative participatory methods.

Keywords: Climate Change, Environmental Education, Children, E-Klim.

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INTRODUCTION

Climate change is one of the most urgent global challenges in this modern era, affecting various aspects of life, from ecosystems to the economy (Mardani and Muhamad Zainul Abidin 2024; Mardani, Masuroh, and Ali 2023). Mitigation efforts to overcome climate change need to involve innovation and new approaches, one of which is through waste management. E-Klim, a concept that links waste collection and management with altruistic actions, is beginning to be seen as a sustainable alternative to reducing waste and its negative impact on the environment (Mardani 2023). Although this idea is growing in popularity, systematic research on the implementation of the 3 R (Reduce, Reuse, Recycle) and one E (Empowerment) principles in the context of E-Klim is still rare.

In this context, discussing waste management, several researchers, such as (Olivo, Prietto, and Korf 2021) noted that the success of waste management programs is greatly influenced by community participation. He argued that while a technical approach to waste management is essential, without community involvement, any initiative would face major obstacles. (Khomsyi et al. 2024). In another study, (Sathabhornwong 2020) emphasized the need for a structured approach that integrates social and educational aspects to create a deeper awareness of the impact of waste. Meanwhile, according to the development of programs that combine social values with waste management, such as E-Klim, can provide more significant results in reducing waste volume (Dwiningsih and Harahap 2022). Although various studies have addressed the importance of community participation in waste management, understanding of how the integration of the 3 R and 1 E principles in the E-Klim model can contribute significantly to climate change mitigation is still limited (Dwiningsih and Harahap 2022).

The researcher sees a gap that lies in his unique approach by combining the theory of sustainable waste management with the practice of almsgiving. This research not only focuses on the technical aspects of waste management but also emphasizes the importance of education in building public awareness about the impact of waste/waste on the environment. By educating the E-Klim community, it is hoped that behavior changes will be created that can reduce waste accumulation while having a positive impact on climate change (Mardani 2023; Suyanto et al. 2015).

The practical implementation of this model is expected to provide concrete evidence that E-Klim activities can contribute to the achievement of broader environmental and social targets. The study will include case studies from several regions that have implemented the E-Klim program and assess their impact on waste reduction and increased public awareness. With this approach, it is hoped that this research can make a significant contribution to both academic literature and practice in the field. The purpose of this research is not only to enrich the academic discourse on climate change mitigation obtained from its E-Klim, but also to be a reference for policymakers in designing community-based programs to manage waste sustainably. By utilizing E-Klim, it is hoped that synergy can be achieved between environmental protection, social development, and improving the quality of life of the community.

In the context of waste management and E-Klim, several important theories can guide our understanding of the effects and contributions of these practices to climate change mitigation. One of the relevant theories is the Theory of Planned Behavior (TPB), which

Wang put forward (Wang and Tan 2022)This theory explains that individual behavior is influenced by their intentions, which in turn is influenced by attitudes towards behavior, subjective norms, and behavioral control. The application of TPB in the context of waste management shows that community empowerment can increase people's intentions and behaviors to participate in waste reduction programs.

Understanding the motivations behind waste management behaviors is essential for designing effective interventions. Community empowerment by emphasizing social norms and environmental benefits of individual participation can increase the level of community involvement. In this case, by integrating empowerment in the E- Klim program, we can directly build the positive intention of the community to participate, as proposed in the SDGs.

In addition, there is also an Environmental Economic Theory that emphasizes the importance of economic behavior in natural resource management, including waste management (Mardani, 2022; Mardani, Masuroh, Pusrita, et al. 2023). According to Bui, this theory proposes that the actions of individuals or groups get greater benefits from sustainably managed resources (Bui et al. 2020). In the context of E-Klim, the researchers stated that by giving rewards to the community participating in this program, it can increase motivation to be more sustainable. Understanding the economic value of good waste management can touch the psychological aspects of society, thus creating additional incentives to participate in these programs.

In this case (Pollard and Booth 2019) suggests that social resilience theory also emerges as an interesting conceptual framework. Social resilience refers to a community's ability to adapt and rise from challenges, including the impacts of waste and climate change. This study shows that communities that have strong social networks are better able to adapt to environmental changes. He emphasized that a solid social network in a community not only increases capacity to address environmental impacts but also facilitates greater participation in environmental initiatives such as E-Klim. With an understanding of these theories, we can design mechanisms in the E-Klim program that not only reward individual contributions but also strengthen social networks among community members. This is expected to increase the effectiveness of the program in the long term, as well as build collective awareness and responsibility for waste management.

METHODS

In implementing the E-Klim program, the Participatory Action Research (PAR) approach can be an effective method to empower the community and optimize their involvement in waste management (Sugiyono 2020). PAR encourages active participation from the community in every phase of research, including problem identification, solution development, implementation, and evaluation. By using PAR (Rahmat and Mirnawati 2020), this process creates a space for collaboration that allows community members to learn, contribute, and innovate. Through this approach, the community not only plays a role as a research subject but also as an active partner in overcoming waste problems in their environment (Rahmat and Mirnawati 2020).

The implementation of the PAR method in the E-Klim program begins with the initial data collection phase to understand the community's views on waste and its management

practices. This data can be obtained through interviews, focus group discussions, and surveys. Gathering community perspectives is an important first step to identify the real challenges faced. This is in line with the argument by Syahrudin who emphasized the importance of understanding the local context to design the right intervention. The results of this data collection will be the basis for formulating an action plan that involves the community in the design process of the E-Klim program (Syaharuddin, Hidayanti, and Mutiani 2020).

After the problem identification is carried out, the next phase is the phase of designing an intervention that accommodates input from the community. At this stage, the community is invited to collaborate in formulating activities and program mechanisms, as well as the incentive system that will be implemented. By doing this, we not only build social ownership of the program but also increase the likelihood of its sustainability. The partnership between researchers and the community is expected to be able to create relevant and effective community-based solutions, in accordance with the principles expressed by Bagum (Bagum et al. 2024).

Evaluation of the E-Klim program is also an integral part of the PAR approach. The community should engage in an evaluation phase to provide feedback on the effectiveness of the activities and their impact on their waste management behavior. The feedback is not only useful for improving the current program, but also for continuous improvement in the future. This is in line with McNiff's (McNiff 2013) opinion that participatory evaluation not only unearths information about outcomes but also empowers communities for reflection and corrective action, thus creating a continuous learning cycle.

RESULTS AND DISCUSSION

Development of Image-Based EKlim for Climate Change Education

The use of E-Klim as an image-based media can be an interesting and effective educational approach for children to understand climate change. The app is designed to present the cause-and-effect relationship of climate change through simple, interactive, and easy-to-understand visualizations. For example, images of motor vehicle emissions are linked to an illustration of air pollution that continues to increase global temperatures. With this visual approach, children not only learn about the phenomenon of climate change but also the real impact of human activities on the environment. As a first step, EKlim displays images of cause and effect in everyday life. For example, children can see how plastic waste that is thrown carelessly clogs waterways, which then causes flooding. On the other hand, images of mitigation actions such as cleaning waterways or planting trees will provide clear and measurable solutions. This concept helps children understand that their small actions have a huge impact on the environment and can prevent disasters.

The interactive features in EKlim are designed to engage children directly. One of them is the game "Match Cause and Effect," where they have to match images of human behavior, such as deforestation, with their impacts, such as landslides. In addition, children can also choose specific actions and see how their decisions affect the environment through dynamically changing visualizations. This feature provides a fun and educational learning experience. Not only that, EKlim can also function as a gallery of disaster mitigation solutions. Images such as the construction of flood-resistant houses, the use of solar energy,

and greening actions show concrete steps to reduce the impact of climate change. Children can also see the positive impact of the action through illustrations of a greener and more beautiful environment. This teaches children to focus on solutions, not just understanding problems. EKlim is not only an educational medium but also a tool to build sustainable environmental awareness. Engaging and relevant visualizations will help children understand the complexities of climate change in a simple and fun way. More than just an application, EKlim can be a catalyst to form a young generation who cares about the environment and is ready to take an active role in disaster mitigation. Through EKlim, children's visual literacy can be improved by connecting abstract concepts of climate change with concrete illustrations. For example, children can understand that global warming is not just a scientific term, but rather a real phenomenon that causes polar ice to melt, threatening the habitats of animals such as polar bears. With attractive and colorful images, the app is able to explain complex concepts in a simple way so that it is easier for children to internalize their impact.

In addition, conveying information through images has a strong emotional impact. For example, illustrations of deforested forests or animals losing their habitat can provoke children's empathy. This is important to build emotional awareness of environmental issues. With this approach, children not only learn to understand climate change logically but are also moved to take care of the environment because they feel emotionally connected to its impacts.

E-Klim can also be used to encourage children's involvement in environmental activities in their communities. One of the features that can be developed is the "Green Challenge," where children are invited to take part in environmental actions based on inspirational images, such as planting trees, cleaning up garbage, or composting from organic waste. After completing the challenge, children can upload photos of their actions into the app, which are then rewarded with a digital badge. This feature not only motivates children to take action but also creates a small, environmentally conscious community.

E-Klim is also designed to help children understand how disaster mitigation can be done practically. For example, through illustrations of evacuation measures during floods or earthquakes, children can learn what to do in an emergency situation. Images showing the environment before and after mitigation actions, such as a smooth flow of water after a channel cleaning, provide a concrete picture of the positive impact of the action. Thus, children not only understand the importance of disaster mitigation, but also feel able to contribute.

EKlim not only serves to educate individuals, but also encourages collective awareness among children, families, and schools. With image-based features such as disaster risk maps, the app allows children and communities to understand their region better. For example, children can see illustrations of flood-prone areas on their local maps, so they can be more vigilant and prepare for mitigation measures with their families. By building this collective awareness, EKlim has the potential to become a medium that strengthens community readiness to face the impacts of climate change.

Through the development of innovative and relevant features, image-based EKlim becomes a medium that not only provides environmental education, but also inspires real action for disaster mitigation. In the long term, this application can help create a generation that is more responsive to climate change and better prepared to face the challenges of

disasters. With an accessible visual approach, EKlim can be an inclusive educational solution that reaches children from different backgrounds.

With a simple and visual approach, EKlim has the potential to be an inclusive educational tool, especially for children who live in remote areas or have limited access to conventional teaching materials. Informative pictures can help explain concepts that may be difficult to understand through text alone. For example, children can see how carbon emissions from motor vehicles and factories can create a greenhouse effect that exacerbates global warming. Thus, children can recognize the link between human actions and their impact on the environment. To expand the impact of education, EKlim can also integrate local cultural elements in its visualization. Illustrations can show how traditional communities take care of the environment, such as the subak system in Bali or the tradition of planting trees in some indigenous communities. This approach provides local relevance and allows children to feel more connected to the material they are learning. By understanding how their own culture contributes to sustainability, children can appreciate local values and make them part of mitigation measures.

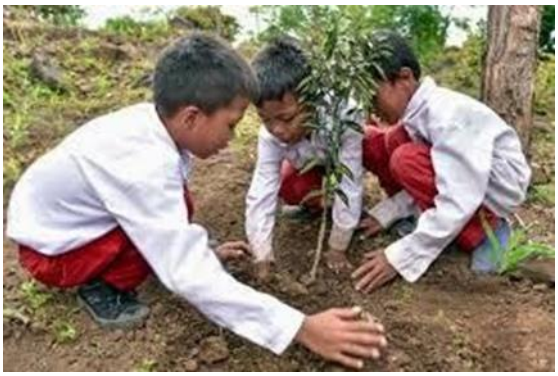

Figure 1
Tree planting to prevent floods and nature sustainability

The personalization feature in EKlim can be an added attraction. Kids can be given the option to choose an avatar or character in the app that represents them. Every mitigation or education activity they complete will make a positive change to the virtual environment displayed on the screen. For example, after completing challenges such as planting trees virtually, children can see the forest around their avatars become greener. This feature provides an immediate sense of satisfaction and encourages children to continue learning and participating. Another advantage of image-based media like EKlim is its ability to cross language barriers. Visual images are universally understandable, even by children with limited literacy. This is important to reach children in different regions of Indonesia, including those living in areas with low levels of education. By relying on intuitive illustrations, EKlim can be an inclusive educational tool for all levels of society.

The Importance of Protecting the Environment from Plastic and Littering

One of the most pressing environmental problems today is pollution due to plastic waste and the habit of littering. Plastic, which takes hundreds of years to decompose, has become a major threat to ecosystems, especially the ocean. Plastic waste that is littered often

ends up in rivers and oceans, damaging the habitat of living things such as fish, turtles, and birds. Children need to be taught from an early age about the dangers of plastics to the environment and their impact on human life, including health risks due to microplastics entering the food chain.

EKlim can help children understand the adverse effects of plastics through interactive illustrations. For example, the app can show images of plastic clogging waterways, causing flooding in cities, or images of marine animals trapped by plastic waste. By seeing the immediate impact of these bad habits, children will more easily understand the importance of reducing the use of single-use plastics and putting waste in its place. This illustration can also be followed by simple information about eco-friendly alternatives, such as the use of cloth bags or reusable drinking bottles.

The habit of littering not only pollutes the environment but also increases the risk of disasters such as floods. When waterways are clogged with garbage, the flow of water stops and causes puddles that eventually turn into major floods, especially in urban areas. EKlim can visualize this process through simple animations. Children can see the difference between clean and clogged waterways, as well as their impact on the surrounding community. In this way, they are invited to take an active role in maintaining the cleanliness of the environment. Through image-based education and interactive games, EKlim can be an effective tool to instill awareness about the importance of protecting the environment from plastic waste and littering behavior. By getting children used to caring about this issue from an early age, it is hoped that they can grow up to be a generation that is more responsible for the environment. These good habits, if done collectively, can have a significant impact in reducing pollution and protecting ecosystems for the future.

Environmental Conservation and Impact of Plastic Use

The widespread use of plastics in daily life has posed a serious challenge to the environment. Plastics, which are difficult to decompose, often end up in garbage heaps or the natural environment, contaminating soil, rivers, and oceans. Plastic waste can damage ecosystems, harm animal life, and even disrupt the food chain. In addition, plastic products that are thrown away carelessly have the potential to produce microplastics, small particles that can seep into soil and water sources, as well as enter the human body through food and drink. Therefore, protecting the environment from the use of plastic and littering is very important to maintain the health of the ecosystem and humans themselves. It is important to understand that plastic waste also contributes to climate change through its emissions in its production and disposal processes. The process of making plastics requires significant energy, which in turn contributes to greenhouse gas emissions. By reducing our reliance on plastics, we are not only protecting environmental sustainability, but also contributing to climate change mitigation. Therefore, awareness and collective action in reducing the use of plastics is urgently needed, especially among the younger generation, who are the pioneers of future change.

To achieve the goal of more effective environmental education, the Eklim-based learning method (electronic climate change) offers an innovative approach in teaching children about environmental issues, especially regarding plastic waste management. This learning media can be designed using an interesting picture game pattern, where children can

learn while playing. For example, games can focus on recycling, showing children how plastic waste can be processed into new materials, and the importance of sorting waste before throwing it away. Additionally, interactive apps that simulate the consequences of choices related to waste management can improve children's understanding of the impact of their actions on the environment.

In addition to play, creative activities such as making art from recycled waste can encourage children to think innovatively about repurposing materials that should otherwise be thrown away. Through outdoor activities, such as environmental cleanups, children can experience firsthand how their actions can contribute to nature conservation. Direct interaction with the environment will foster a sense of love and responsibility for the earth. Interactive learning methods are highly encouraged, where children are given the task of conducting research on recyclable materials, as well as identifying sources of plastic around them. This can be expanded with direct observation activities, where they can observe locations with plastic waste problems, while discussing solutions. Through active involvement in observation and discussion, children not only acquire knowledge, but also develop critical thinking and analytical skills. Technology also plays an important role in Eklim-based learning. The use of applications and digital platforms that display educational games can invite children's interest and make learning more fun. For example, a simulation app that allows children to manage their own city, where they have to make decisions regarding waste management and resource use. These games can be an effective way to show the consequences of actions taken against the environment.

In addition, social media and digital communication platforms can be used as tools to rally movements among children and the school community. Through collaborative projects, they can plan campaigns to reduce the use of plastic in schools or in everyday life. This approach not only educates, but also builds cooperation and leadership skills. Evaluation of the effectiveness of Eklim-based environmental learning programs is also very important. Teachers and educators need to develop assessment methods that can measure the extent of children's understanding of environmental issues and their ability to apply that knowledge in real action. For example, a final project held in a school can explore eco-friendly initiatives they have created, such as recycling campaigns, art exhibitions from recycled materials, or even the development of school gardens that use eco-friendly materials. Follow-up after the implementation of the program is also important to ensure that children remain involved with environmental issues and continue to educate themselves. Holding regular activities such as "No Plastic Day" or "Healthy Walk Caring for the Environment" can foster good habits in the long run. This not only provides continuous learning, but also strengthens a sense of community and collectivity in an effort to protect the environment.

Climate change is one of the most pressing challenges facing humanity today. In recent decades, rising global temperatures, extreme weather, and changes in rainfall patterns have become increasingly apparent, and various studies have shown that human activities, including aerosol use and air pollution, are significant contributing factors to this phenomenon. Sprays, which are often used in household and beauty products, contain chemicals that can contribute to global warming and create a wider negative impact on air quality and human health. Some of the tools that exist are popular in children's circles:

1. Spray Use and Greenhouse Gas Emissions

Sprays or aerosols contain volatile organic compounds (VOCs) and propellant materials, which contribute to greenhouse gas (GHG) emissions. When aerosols are sprayed, these gases are released into the atmosphere. In many cases, VOCs serve as precursors for the formation of troposphrosphere ozone, which is a greenhouse gas that contributes to the phenomenon of global warming. Ground-level ozone also has a direct impact on human health and ecosystems, increasing the risk of respiratory diseases and damaging crops. Air pollution is generated from a variety of sources, including motor vehicle emissions, industry, and the use of fossil fuels. Pollutants such as fine particles (PM2.5 and PM10), nitrogen oxides (NOx), and sulfur dioxide (SO2) have a significant impact on human health and the environment. Long-term exposure to air pollution can lead to respiratory distress, cardiovascular disease, and an increase in premature mortality. Additionally, air pollution can worsen climate conditions by increasing the greenhouse effect, which impacts global temperatures and weather patterns.

One of the main consequences of global warming due to air and aerosol pollution is the changing climate patterns that occur around the world. Rising global temperatures are causing melting ice in the Arctic and South Poles as well as ice caps, resulting in rising sea levels. This poses a risk to coastal areas and small islands, which face the threat of drowning, erosion, and habitat loss. Additionally, changes in temperature and rainfall can disrupt ecosystems, causing species displacement and increasing the risk of extinction for some species that cannot adapt quickly.

Climate change caused by aerosols and air pollution is also leading to higher frequency and intensity of extreme weather. Phenomena such as tropical storms, floods, droughts, and heat waves are becoming increasingly common. Research shows that the interaction between atmospheric pollutants and temperature changes can worsen weather conditions. For example, rising temperatures lead to increased evaporation, which contributes to drought conditions, while irregular rainfall patterns can exacerbate flooding. These impacts not only threaten human survival, but also disrupt agriculture, water supply, and biodiversity.

Climate change also has significant implications for human health. Poor air quality, due to aerosol emissions and pollution, is linked to increased rates of respiratory diseases and heart disease. In addition, changes in weather patterns can increase the spread of infectious diseases. For example, malaria and dengue fever may experience wider spread as climate shifts provide more supportive habitats for disease vectors. Therefore, there is a direct link between air pollution, climate change, and its negative impact on public health.

When we spray aerosol products, chemical substances called volatile organic compounds (VOCs) are released into the air. These substances can accumulate and cause air pollution. Air pollution is a mixture of particles and gases that can harm our health. For example, breathing in polluted air can make us cough, shortness of breath, or even a headache. In other words, the products we use daily can have an impact on our health and increase the risk of disease. Air pollution is not only harmful to our health, but it also affects the Earth's temperature. Polluting gases, such as carbon dioxide, contribute to the greenhouse effect. The greenhouse effect is like a blanket that

covers the Earth and keeps the temperature warm. However, if there are too many of these gases, the Earth's temperature will rise, causing climate change. For example, in summer, we can experience hotter and uncomfortable weather than before.

One of the impacts of climate change is weather that has become more extreme. This means we could experience stronger storms, more rain, or even more severe droughts. For example, the weather can get very hot during the summer, or we can experience heavy rains that make the ground landslide. All these changes affect not only animals and plants, but also our daily activities, such as playing outside or going to school.

Children's contribution to climate change mitigation

1. Becoming a Neighborhood Leader in School

One effective way for children to contribute to protecting the environment is to be leaders in schools. Children can invite friends to discuss the importance of reducing the use of aerosol products and choosing more environmentally friendly alternatives, such as natural sprays or non-aerosol products. By making presentations in class, children can share information about the impact of air pollution and raise awareness among their peers. With passion and knowledge, they can motivate others to participate in eco-friendly initiatives.

2. Holding an Awareness Campaign

In addition, children can also hold awareness campaigns at school or in the home environment. For example, they can create posters or brochures explaining the dangers of air pollution and aerosol use, as well as inviting family and friends to reduce their use. In this campaign, they can include information about environmentally friendly ways that can be practiced on a daily basis. With their creativity and skills, children can create positive change that has a far-reaching impact on their communities.

3. Engaging in Environmental Activities

Participating in environmental activities outside of school can also be a fun way for children to contribute. They can join a group of volunteers who clean rivers, parks, or beaches. This activity provides an opportunity to learn first- hand about the importance of maintaining environmental cleanliness and the impact of waste, including plastics and aerosol products. In addition, involvement in activities like this helps children understand the relationship between our actions and the health of the planet, as well as foster a sense of responsibility for the environment.

4. Using Social Media Wisely

In this digital era, children can also use social media to spread environmental messages. By creating engaging content, such as educational videos or eco-friendly challenges, they can inspire friends and family to care more about the environment. Social media is a powerful tool for raising awareness about important issues, including climate change and air pollution. By sharing information and experiences, children can build a community that cares more about sustainability.

5. Introduction of Alternative and Renewable Energy

Alternative and renewable energy is a more environmentally friendly energy source compared to fossil fuels such as oil and coal. Two popular examples are solar panels and wind turbines. Solar panels convert sunlight into electricity, while wind turbines use the power of the wind to generate energy. By using these energy sources, we can reduce air

pollution and the negative impact on climate change. Using clean and sustainable energy is essential for a better future for all living things on Earth.

1. Solar Energy for Families and Schools

Kids can learn about how solar panels work and their benefits for the environment. At school, they can do small projects, such as creating a simple model of solar panels to see how solar energy can be harnessed. In addition, if their school has a solar panel system, children can be involved in a program to monitor the energy generated. In this way, they can understand firsthand how clean energy can be used to reduce electricity costs and carbon emissions, as well as help keep the air clean.

2. Wind Energy and Its Impact

Similar to solar energy, wind energy is also a very important source of renewable energy. Children can learn about how wind turbines work and how energy from the wind can be converted into electricity. They can do simple experiments, such as making windmills from recycled materials, and observe how the wind can move the windmills. By understanding the importance of wind energy, children will appreciate more efforts to use this inexhaustible natural resource, while reducing dependence on fossil fuels that pollute the environment.

3. Inviting Families to Switch to Renewable Energy

Children can also play a role in inviting family and friends to consider using renewable energy at home. They can talk about the benefits of installing solar panels or using an electrical service that provides energy from renewable sources. In the process, children can learn about how this energy affects electricity bills and the environment, as well as the challenges faced in switching to renewable energy. By sharing this knowledge, children can help make small steps toward greener decisions in everyday life at home.

4. Electric Vehicles: Solutions to Pollution

Electric vehicles are one of the promising solutions to reduce air pollution and the impact of climate change. Unlike cars that use fossil fuels such as gasoline or diesel, electric vehicles use batteries that are charged with energy from renewable sources, such as solar panels or wind turbines. Because electric vehicles do not emit harmful fumes or gases into the air, they help to make our environment cleaner and healthier. By switching to electric vehicles, we can reduce greenhouse gas emissions which are the main cause of global warming. Children can learn that conventional motor vehicles emit carbon dioxide (CO2) emissions every time they walk. These emissions contribute to the greenhouse effect that makes the Earth even hotter. Electric vehicles, on the other hand, do not produce these emissions while operating. By using electric vehicles, we are helping to reduce air pollution, which in turn can reduce health problems, such as asthma and respiratory diseases in humans. This is an important step in maintaining public health and the environment.

Children can be taught how electric vehicles work and how this technology works. A simple science project could involve making an electric car model using recycled materials and a small motor. Through experiments like this, they were able to understand how energy is stored in batteries and how they are used to power vehicles. This knowledge can foster their curiosity about technological innovations and how we can solve environmental problems in creative ways.

Children can play an important role in influencing their families to consider using electric vehicles. By explaining the environmental and health benefits of electric vehicles, as well as sharing information about government incentive programs that support the purchase of electric vehicles, they can help their parents make more environmentally friendly decisions. In addition, children can ask families to take part in community events that introduce electric vehicles, so they can see firsthand the benefits.

CONCLUSION

This study proves that E-Klim has successfully answered the challenges of climate change education for children through an innovative visual approach. Interactive image-based media such as the "Match Cause and Effect" and "Green Challenge" features have proven effective in increasing children's understanding of the causal relationship between climate change while encouraging active participation in environmental action. The transformation of the recycling concept into a philanthropic activity through a waste donation system adds to the appeal of this program for children and the community.

The success of E-Klim cannot be separated from the implementation of the Participatory Action Research (PAR) method which directly involves children and stakeholders in program development. This participatory approach produces an educational model that is adaptive to local needs while building a strong collaborative network between schools, communities, and the government. The results are seen in the adoption of the concept of a circular economy based on community participation and increasing environmental awareness of the younger generation.

The findings of this study recommend the integration of the E-Klim model into the basic education curriculum as a national strategy for environmental education. The development of advanced modules and replication of programs with contextual adjustments in various regions are important next steps. E-Klim is not only real evidence of the effectiveness of visual education, but also offers a sustainable solution to form a generation that is responsive to climate change and environmental issues.

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