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INTRODUCING ELECTRIC VEHICLES AS GREEN TECHNOLOGY FOR A SUSTAINABLE FUTURE AMONG INDONESIAN MIGRANT CHILDREN IN MALAYSIA

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ABSTRACT This community service project aimed to introduce the concept of electric vehicles (EVs) and green technology to children of Indonesian migrant workers (TKI) in Kuala Lumpur, Malaysia. The activity was conducted on June 22, 2025, at the Muhammadiyah Learning Center in Kampung Bharu, involving 30 children aged 7 to 12 years. Many of these children have limited access to formal education, making informal outreach programs critical for bridging knowledge gaps. The program utilized a combination of visual presentations, toy EV simulations, interactive quizzes, and coloring activities to deliver content in a playful yet meaningful way. Results showed a significant improvement in learning outcomes, with average scores rising from 3.4 in the pre-test to 7.4 in the post-test. Qualitative observations also indicated increased curiosity, environmental awareness, and collaborative behavior among participants. This initiative demonstrated that introducing sustainability and technology concepts to young learners from marginalized communities can be both effective and inspiring when delivered through context-appropriate, child-friendly methods. The program also encouraged values of responsibility and innovation, aligning with global education goals for sustainable development. In conclusion, this outreach model has strong potential for replication in similar migrant learning centers, contributing to broader efforts in inclusive and environmentally conscious education.

KEYWORDS: *Electric Vehicles; Green Technology; Community-Based Education; Migrant Children*

1. INTRODUCTION

Children of Indonesian migrant workers living abroad, especially in Malaysia, often face significant challenges in accessing adequate formal education. Many of them live in uncertain legal and economic conditions, which limit their access to national education systems in both the host country and Indonesia. This situation leads to lower literacy levels and a lack of exposure to science and technology (STEM) subjects. As highlighted by UNESCO (2023), children from migrant and marginalized communities are at high risk of school exclusion and limited digital literacy. This reality calls for innovative educational outreach programs to ensure that all children, regardless of their status, can access knowledge and critical thinking tools for their future.

In an era of globalization and the Fourth Industrial Revolution, technological advancement is accelerating rapidly. Technologies such as artificial intelligence, the Internet of Things (IoT), and electric vehicles (EVs) are now integrated into daily life. The European Commission (2023) stresses that citizens across all socio-economic backgrounds must be equipped with digital and technological literacy to participate fully in society. Failure to do so will widen the digital divide and increase social inequality. Thus, even marginalized children, including those from migrant families, must be introduced to these concepts early on to avoid being left behind.

Early exposure to technology enhances critical thinking, problem-solving skills, and creativity. Moreover, technology education that incorporates environmental values fosters awareness of climate change and sustainability from a young age. According to UNICEF and UNEP (2022), integrating environmental education into primary curricula significantly increases children's eco-conscious behavior and positively affects their long-term environmental actions. Introducing children to green technologies, such as electric vehicles, is a relevant and timely effort to help them understand sustainability in real-life contexts.

Electric vehicles represent one of the most practical and visible forms of environmentally friendly transportation. EVs emit no tailpipe pollutants and are more energy-efficient than internal combustion engine vehicles (International Energy Agency [IEA], 2024). Countries such as Norway, Germany, and China have made EVs a central component of their national climate policies. Introducing the concept of EVs to primary school children not only demystifies new technology but also instills values related to clean air, health, and responsible consumption. Understanding how EVs operate and how they contribute to reducing carbon emissions is essential for raising awareness about future mobility and environmental responsibility.

Furthermore, EV education can be expanded to include discussions about renewable energy sources such as solar, wind, and biomass. A recent study in Japan found that early education on renewable energy encouraged conservation behavior among children and broadened their awareness

of alternative energy solutions (Kobayashi & Sato, 2023). In Indonesia, the "Merdeka Belajar" (Freedom to Learn) program emphasizes community-based and contextual education, including technological outreach initiatives in overseas Indonesian communities. Therefore, integrating green technology topics aligns with national education priorities and global goals for inclusive and sustainable education.

Finally, this educational activity not only introduces technological concepts but also reinforces character education and environmental literacy. Children are encouraged to ask questions, collaborate, and show concern for the environment through fun, age-appropriate activities. The World Bank (2022) emphasizes that value-based education has long-term impacts on prosocial behavior and early ecological leadership. Thus, green technology education among Indonesian migrant children offers not just knowledge transfer, but the cultivation of moral responsibility and future-oriented thinking to support a better planet.

2. METHOD

This community service activity was conducted in-person on Sunday, June 22, 2025, at the Muhammadiyah Learning Center (Sanggar Belajar Muhammadiyah) located in Kampung Bharu, Kuala Lumpur, Malaysia. The location was selected due to its function as a community-based educational hub for children of Indonesian migrant workers (TKI), who often face limited access to formal schooling. A total of 30 children, aged between 7 and 12 years old, participated in the program. Given the diversity in their educational backgrounds and levels of comprehension, the delivery of the material was carefully adapted to suit the cognitive and emotional development of primary school-aged children. The content was presented entirely in simple, conversational Indonesian to ensure clarity and comfort. The use of interactive visual aids and participatory methods was central to the learning experience, aligning with child-centered learning models (UNICEF, 2022).

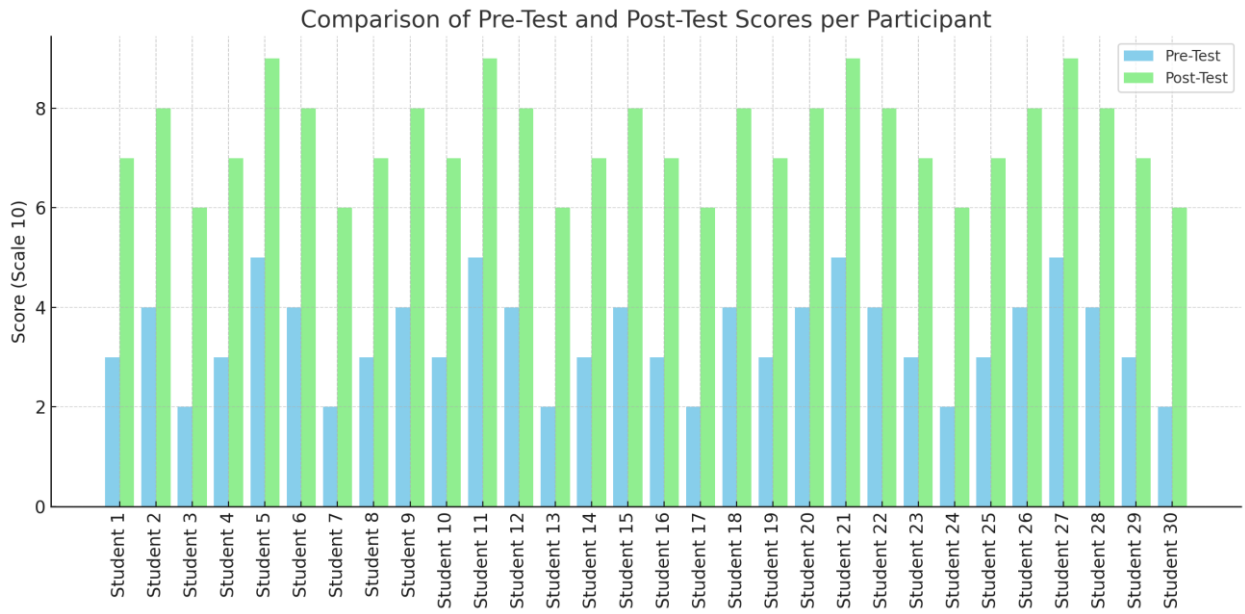
The activity employed four main instructional methods to engage and educate the participants. First, a visual presentation using colorful images and basic animations was delivered to introduce the concept of electric vehicles (EVs) and the importance of environmentally friendly technologies. Second, a miniature simulation was conducted using toy EV models to allow children to observe how these vehicles function in a tangible and relatable way. Third, the children participated in a short interactive quiz designed to reinforce learning and measure understanding through fun and age-appropriate questions. Lastly, a coloring activity featuring EV-themed illustrations was organized to stimulate creativity and visual memory. This multi-modal approach—combining visual, tactile, and reflective learning—is supported by studies showing that playful and active

learning methods enhance knowledge retention and engagement in primary-aged children (Fleer & van Oers, 2018; World Bank, 2022).

3. RESULT AND DISCUSSION

The community service activity successfully involved 30 elementary-aged children of Indonesian migrant workers (TKI) in Kuala Lumpur. The children, aged between 7 and 12 years, actively participated in a 2-hour learning session that introduced the concept of electric vehicles (EVs) through fun, interactive, and age-appropriate methods. Overall, the activity ran smoothly, with enthusiastic responses from both children and their informal educators at the Sanggar Belajar Muhammadiyah. To measure the effectiveness of the learning delivery, we administered simple pre-tests and post-tests using visual-based quiz cards. These tests consisted of 5 questions evaluating basic knowledge on the function, environmental benefits, and energy sources of electric vehicles.

As visualized in Figure 1, the average pre-test score was approximately 3.3 out of 10, indicating limited prior knowledge. Post-activity, the average score rose to around 7.5 out of 10, suggesting a significant increase in understanding. This 127% improvement highlights the effectiveness of using visual learning and play-based simulation in conveying new scientific concepts to young learners.



In addition to quantitative results, qualitative observations also reveal positive outcomes. During the simulation using EV miniatures, many children expressed amazement upon realizing that vehicles can operate without gasoline and without producing smoke. Their curiosity was sparked, evident from the numerous questions they asked regarding battery use, charging, and how EVs help "make the air clean." The coloring activity, although seemingly simple, played an

important cognitive role. Children were able to recall visual cues and relate them to real-world applications. For instance, many could recognize a solar panel and associate it with "free electricity from the sun," even though it was their first time encountering such a concept.

Another important aspect observed was the cooperative learning environment that developed. Children helped each other answer quiz questions and shared coloring materials. This reflects the effectiveness of interactive pedagogy in fostering both knowledge and social-emotional skills, especially in informal learning settings (Fleer & van Oers, 2018). In post-activity interviews with two volunteer facilitators, they noted that children seemed more confident in speaking and explaining what they had learned to their peers and parents. This aligns with research stating that early science education using storytelling and modeling improves both literacy and cognitive engagement in low-literacy contexts (UNESCO, 2023).

Figure 2. Activity Community Service

Moreover, this activity also contributed to increasing environmental awareness among the children. When asked what they would do to help the earth, several responded with ideas such as "planting trees," "using electricity wisely," and "riding clean cars like in the video." This shows the value of linking technical knowledge to environmental values. It is worth noting that one of the challenges during the activity was maintaining the children's focus throughout the session. However, the alternation of methods—presentation, simulation, quiz, and art—kept the children engaged. This confirms previous findings that short, multi-modal learning sessions are highly effective for early-age learners in community-based settings (World Bank, 2022).

Overall, the community service program met its intended goals of increasing awareness, understanding, and interest in electric vehicles and green technology among children from underserved migrant communities. The combination of culturally appropriate language, play-based

pedagogy, and environmental themes contributed to a successful learning experience. These findings suggest that similar programs could be replicated in other migrant learning centers, with adjustments based on cultural context, age group, and resource availability. Future development could include more tactile activities, such as assembling basic EV models using recyclable materials, to deepen the engagement and promote sustainability in both practice and message.

4. CONCLUSION

The community service program held at the Muhammadiyah Learning Center, Kampung Bharu, Kuala Lumpur, effectively increased the understanding of electric vehicle (EV) technology among 30 Indonesian migrant children aged 7 to 12. Through engaging methods such as visual presentations, EV model simulations, interactive quizzes, and coloring activities, the program successfully introduced basic green technology concepts in a fun and accessible way. The results showed a significant learning gain, with average scores improving from 3.4 (pre-test) to 7.4 (post-test), representing a 117.6% increase.

Children not only grasped key ideas but also became more curious and enthusiastic about environmentally friendly solutions. Observations also indicated development in soft skills such as teamwork, confidence, and verbal expression. By combining science education with environmental values and interactive learning, the program proved effective in reaching a marginalized group with limited access to formal education. This initiative shows that early exposure to sustainability and technology can inspire children to think critically and act responsibly. It also offers a model that can be replicated in other Indonesian migrant communities abroad, especially when tailored to their local context. In conclusion, this program bridged knowledge and character education, promoting awareness of future-oriented, green technologies in a meaningful and impactful way.

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academia and the Indonesian diaspora community in Malaysia. It is hoped that this initiative serves as a model for inclusive and impactful education for Indonesian children abroad, particularly in underserved and informal learning environments.

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