

Child-Friendly Green Transportation Week at Sekolah Alam Lampung: Early Education on Sustainable Mobility

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Abstract: Sustainable and child-friendly transportation is a critical issue in environmentally conscious and inclusive urban development; however, its understanding remains largely limited to adult populations. This community-based research aims to enhance early awareness of sustainable mobility through the implementation of the Green Child-Friendly Transportation Week at Sekolah Alam Lampung. The program was designed using an Education for Sustainable Development (ESD) framework, employing participatory, visual, and experiential learning approaches. The activities included interactive educational sessions, the use of innovative learning media, student mini-projects, and the active involvement of teachers as learning facilitators. Evaluation methods comprised pre-test and post-test assessments, observations, and teacher reflections. The results indicate a notable improvement in students' understanding of green transportation concepts, the relationship between transportation modes and emissions, and the health risks associated with mobility. Student-generated mini-projects, such as educational posters, simple prototypes, and sketches of child-friendly transportation routes were found to enhance critical thinking skills, creativity, and context-based problem-solving abilities. Beyond student outcomes, the program also strengthened teachers' capacity to integrate sustainable mobility themes into thematic school learning. Furthermore, dissemination through social media, video documentation, and online mass media expanded the program's impact beyond the school community to the wider public. Overall, the findings demonstrate that experiential and visual-based educational approaches are effective in fostering sustainable mobility values and environmental awareness among school-aged children.

Keywords: Green Transportation, Child-Friendly Mobility, Education for Sustainable Development, Experiential Learning, Nature-Based School.

Introduction

The peri-urban areas of Bandar Lampung, including Way Huwi, are facing serious challenges related to the provision of safe, healthy, and environmentally friendly transportation. Population growth, increasing commuter activities, and the dominance of private motorized vehicles have contributed significantly to high levels of carbon emissions and air pollution in the area. These conditions have a direct impact on children, who are physiologically more vulnerable to air pollution

exposure, safety risks, and limited access to healthy and inclusive mobility options.

On the other hand, awareness and understanding of sustainable transportation remain relatively limited at the primary and secondary education levels. Formal education rarely places sustainable mobility issues as a central focus, resulting in insufficient knowledge among children regarding the relationship between transportation choices, environmental quality, and public health. In fact, early literacy in green transportation is essential for shaping mindsets, awareness, and responsible mobility behavior in the future.

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Sekolah Alam Lampung (SAL) is an ecology-based school that adopts a contextual, exploratory, and environmentally friendly learning approach. The SAL curriculum is designed to encourage students to understand the interconnected relationship between humans and the environment through sustainability-oriented themes such as organic farming, waste management, nature conservation, and sustainable cities. Accordingly, this community service program aligns well with SAL's curricular direction, which emphasizes holistic environmental education and character development focused on environmental awareness. However, despite SAL's adoption of a sustainability-based curriculum, there has been no thematic program specifically addressing green and child-friendly transportation. Learning materials related to sustainable mobility, visual educational media, and practical activities linking transportation concepts to ecological impacts remain limited. This issue represents a priority concern, given that transportation is one of the largest contributors to emissions and is closely associated with students' daily activities.

Therefore, the Green Child-Friendly Transportation Week program was designed to address these needs through a structured and participatory educational approach. The activities included the delivery of learning materials, demonstrations using teaching aids, interactive discussions, educational games, and mini projects that enabled students to apply sustainable mobility concepts in creative and practical ways. Aligned with SAL's learning characteristics, this program not only enhanced students' literacy in green transportation but also strengthened the school's commitment to fostering a sustainable learning environment.

The main challenges faced by the partner institution, Sekolah Alam Lampung (SAL), include: (1) the absence of structured learning materials on green and child-friendly transportation; (2) limited availability of attractive, age-appropriate visual educational media; (3) the lack of thematic learning activities that link transportation issues with environmental sustainability; and (4) the need to strengthen teachers' capacity to integrate sustainable mobility themes into the SAL curriculum. Based on these challenges, the proposed solutions were systematically formulated along with targeted outputs for each intervention.

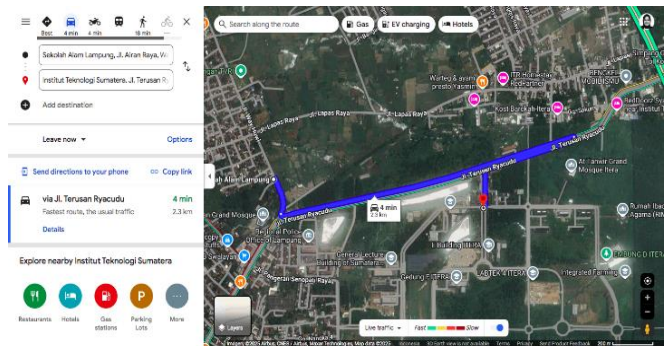


Figure 1. Location of Community Service Program Implementation

The community service activities were conducted at Sekolah Alam Lampung (SAL), which is located approximately 2.3 kilometers from the Institut Teknologi Sumatera (ITERA) campus. This close proximity enabled efficient coordination, team mobilization, and transportation of teaching aids and logistical materials. In addition, the short distance facilitated direct on-site monitoring of the activities and ensured continuous communication between the implementation team and the partner institution, both during and after the execution of the Community Service program.

Development of Green Transportation Learning Materials

The learning materials were designed in the form of presentation slides covering fundamental concepts of green transportation, the environmental impacts of transportation mode choices, mobility-related risks for children, and principles of sustainable cities. The materials were developed using an educational and contextual approach, aligned with the SAL curriculum that emphasizes ecological understanding and experiential learning. Target output: learning materials used during the activities.

Development of Visual Educational Media and Teaching Aids

To support an engaging learning process, the team developed various educational media, including thematic posters, vehicle stickers, and simple teaching aids to help students classify environmentally friendly transportation modes and understand issues such as vehicle-generated air pollution. The media were designed to be child-friendly, easy to read, and aligned with visual and kinesthetic learning styles. Target outputs:

- Green transportation educational posters displayed within the SAL environment
- Stickers and posters used during game-based and simulation sessions

Implementation of the Green Child-Friendly Transportation Week (Core Activities)

The core activities were conducted over three days (13–15 October 2025), including material delivery, discussions, educational games, demonstrations using teaching aids, and the assignment of mini projects. Students were introduced to child-friendly transportation issues through interactive approaches tailored to SAL's learning characteristics. Target outputs:

- Improved student understanding (measured through pre-test and post-test assessments)
- Active participation of teachers as activity facilitators

Mini Project Assignment

The mini project served as an exploratory platform for students to express ideas related to child-friendly transportation solutions and sustainable cities. Student works were presented at the end of the program, with three outstanding projects selected. This activity aimed to strengthen students' understanding, creativity, and confidence in communicating their ideas. Target outputs:

- Mini project outputs in the form of posters and group presentations
- Activity documentation in the form of videos and photographs

Method

The implementation method of this Community Service (PkM) program was designed using a participatory, contextual, and experiential learning approach, aligned with the characteristics of the Sekolah Alam Lampung (SAL) curriculum. This approach is grounded in the principles of Education for Sustainable Development (ESD) promoted by UNESCO (Tilbury, 2011), which emphasize active, collaborative, critical, and application-oriented learning. The following section presents a detailed description of the stages of the program implementation.

Coordination and Curriculum Integration Stage

The initial stage involved intensive coordination with SAL teachers and school management to ensure that the program aligned with the ongoing learning theme, namely Sustainable City/Transport. The activities conducted at this stage included:

- Coordination meetings to agree on the activity schedule.
- Curriculum discussions to adjust the learning materials to students' characteristics and developmental levels (Grade 5–6 of SAL Primary School and Grade 7–8 of SAL Junior High School).

- Adaptation of instructional delivery approaches to match SAL's ecology-based and experiential learning model.
- Integration of sustainability values into the activities in accordance with the whole-school sustainability approach (UNICEF, 2021), which emphasizes that environmental education should be supported by all components of the school.

This stage ensured that the Community Service (PkM) program was not implemented as a stand-alone activity but became an integral part of the school's thematic learning process.

Development of Learning Media and Logistics Preparation Stage

This stage focused on the development of learning tools and technical preparation for program implementation. The activities included:

- Preparation of concise learning materials introducing green transportation concepts.
- Design of presentation slides featuring engaging and child-friendly visual communication.
- Development of visual educational media, such as posters and stickers depicting environmentally friendly vehicles.
- Provision of teaching aids for simulations related to transportation modes, air pollution, and safety risks.
- Preparation of logistical needs, including documentation tools, stationery, and healthy refreshments in accordance with SAL standards.

The development of learning media was guided by multimedia-based learning principles (Heinich et al., 2002), which emphasize that visualization and interaction can enhance students' understanding and motivation.

Core Activity Implementation Stage

The core activities were conducted from 13 to 15 October 2025 and constituted the main phase of educational delivery. The methods applied included:

- Interactive presentations introducing fundamental concepts of green transportation, child-related mobility risks, and the relationship between transportation and environmental quality.
- Educational games and simulations aimed at identifying transportation modes based on emission levels.
- Demonstrations using teaching aids to explain transportation mode classification, emission differences, and the effects of air pollution.
- Group discussions encouraging students to explore real-life issues encountered in their daily environments and express them through worksheets.

- Mini projects in which students worked collaboratively to design child-friendly transportation solutions, thereby strengthening creativity, critical thinking, and presentation skills.

Evaluation and Program Sustainability Stage

This stage aimed to assess the effectiveness of the activities and ensure the sustainability of program benefits. Evaluation methods included:

- Pre-test and post-test assessments to measure improvements in students' knowledge.
- Observation of student engagement throughout the activities.
- Brief interviews and feedback from teachers to assess the relevance of the materials to the SAL curriculum.
- Photo and video documentation as evidence of program implementation.

Beyond evaluation, program sustainability was ensured through the handover of learning materials, teaching aids, and posters to SAL for continued use in subsequent learning activities. In addition, SAL received recommendations for integrating green transportation themes into its annual curriculum.

Result and Discussion

Result

The Community Service (PkM) activities were implemented through a series of well-planned stages, beginning with initial coordination with the school, followed by the development of learning materials and educational media, and the finalization of participant schedules. The core implementation, conducted on 13 October 2025, included the delivery of learning materials, mini projects, educational games, green transportation simulations, as well as pre-test and post-test assessments for both primary and junior secondary school students. Following the activities, program dissemination was carried out through social media platforms, video documentation, and mass media publications, along with the preparation of a draft journal manuscript as an additional output.

Pre-test and post-test assessments served as the primary evaluation instruments to measure changes in students' knowledge before and after the learning intervention. For both primary and junior secondary students, the pre-test functioned to capture baseline understanding of green transportation topics prior to the implementation of the PkM activities. This initial evaluation was essential for identifying students' prior knowledge readiness and their existing level of environmental literacy. Conversely, the post-test was administered after the completion of the learning activities to assess the extent of knowledge

improvement. In the context of environmental education, particularly green transportation topics, pre-test and post-test instruments help identify the effectiveness of instructional methods as well as the pedagogical impact across different age groups. According to Bloom (1976), the use of pre-test and post-test assessments is a standard method for objectively measuring cognitive changes in the teaching and learning process.

At the primary school level, the pre-test and post-test questions were designed to be concrete and simple, emphasizing the recognition of basic concepts in accordance with students' concrete operational developmental stage (Zakiyah, 2024). In contrast, at the junior secondary school level, the evaluation instruments were designed to measure more abstract thinking skills, including an understanding of cause-and-effect relationships, individual roles in environmental sustainability, and creative ideas for environmental preservation (UNESCO, 2017). Thus, the differences in test formats between primary and junior secondary levels reflect variations in cognitive development stages and the expected depth of subject mastery among students.

A five-point Likert scale was employed to categorize students' levels of understanding based on specific score ranges. This scale is widely used in educational research to systematically map competency levels. In the context of primary and secondary education, the Likert scale facilitates educators' ability to observe gradual improvements in understanding, ranging from the "Very Poor" to the "Very Good" category. According to Boone & Boone (2012), the use of Likert scales in learning evaluation helps transform quantitative data (scores) into qualitative information regarding students' mastery levels. The categories used are as follows.

Table 1. Student Assessment Section, Sekolah Alam Lampung

Score Range	Categories	Description
81 - 100	Very Good	Mastered the material very well; able to apply concepts without significant errors.
61 - 80	Good	Understood most of the material and was able to answer questions correctly.
41 - 60	Fair	Basic understanding was present, but there were still some errors.
21 - 40	Poor	Understanding of the material was still weak; reinforcement and assistance were needed.
0 - 20	Very Poor	Did not understand the material; needed to relearn everything.

This categorization provides a more in-depth interpretation of the level of concept mastery, thereby facilitating analysis of the improvement that occurred after the material was presented. Based on the attached pre-test and post-test score tables, there was a significant improvement in understanding at both levels of education.

(Rohmah, 2025). The post-test scores in this group reflected further refinement and reinforcement of the concepts they had previously acquired.

The substantial gap observed between pre-test and post-test scores indicates the effectiveness of the Community Service (PkM) program in expanding students' knowledge of green transportation. The significant improvement observed among primary school students suggests that the learning materials successfully introduced new concepts in an accessible and effective manner. Meanwhile, the improvement among junior secondary students reflects the strengthening and deepening of pre-existing understanding. Pedagogically, these findings align with constructivist learning theory, which emphasizes that learning outcomes are optimized when students are engaged in relevant and well-structured learning experiences (Rosita, 2024). Furthermore, environmental education literature indicates that short-term educational interventions can significantly enhance environmental literacy among children and adolescents, particularly when learning materials are presented within contexts closely related to everyday life (UNESCO, 2017). Therefore, the PkM activities can be considered effective in improving green transportation literacy across both educational levels.

Results of the Pre-Test and Post-Test at Sekolah Alam Lampung

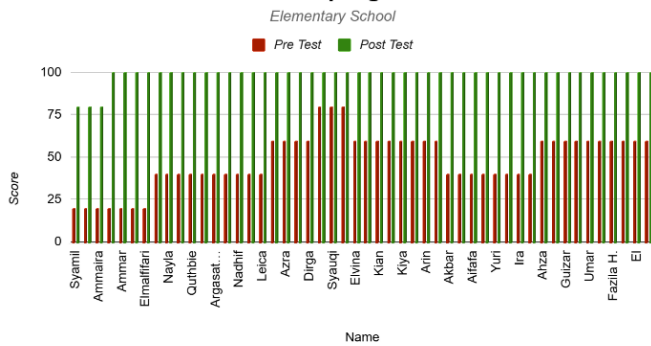


Figure 2. Pre-test and Post-test Graphs for Students at Sekolah Alam Lampung Elementary School

Elementary school students' pre-test scores were in the lower Likert category, indicating that their initial understanding of the concept of green transportation was still limited. The dramatic increase in post-test scores shows that the learning intervention was effective in providing new understanding.

Results of the Pre-Test and Post-Test at Sekolah Alam Lampung

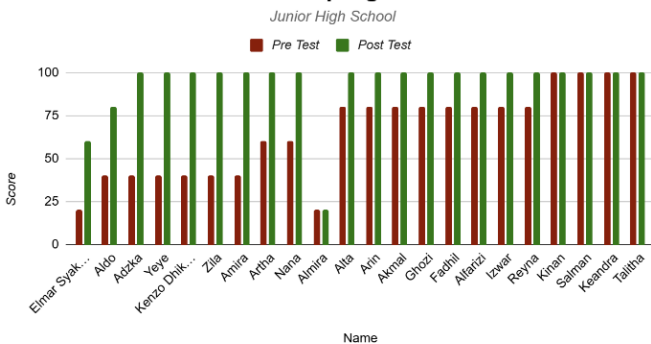


Figure 3. Pre-test and Post-test Graphs for Students at Sekolah Alam Lampung Junior High School

Among junior secondary school students, the pre-test scores were categorized at a relatively higher level, indicating that they already possessed baseline knowledge of green transportation concepts. This finding is consistent with cognitive development literature, which suggests that adolescents have more advanced abstract thinking abilities, enabling them to comprehend sustainability concepts more rapidly

Strengthening Students' Sustainable Mobility Literacy

The pre-test and post-test results indicate a significant improvement in students' sustainable mobility literacy. This improvement is evident in their ability to understand green transportation concepts, recognize mobility-related health risks, and explain the relationship between transportation mode choices and generated emissions. Practically, educational interventions through interactive materials, teaching aid demonstrations, and thematic games proved effective in strengthening students' foundational understanding.

These findings are consistent with Mackett (2013), who emphasized that simple and contextual learning interventions can enhance children's awareness of environmentally friendly transportation while shaping positive mobility preferences. Recent studies further support this conclusion, demonstrating that experiential and gamified learning approaches significantly improve children's understanding and attitudes toward sustainable mobility (Rogelj et al., 2024; Sipone et al., 2025). Teachers' field observations also confirmed students' improved ability to identify low-emission transport modes and basic transportation safety principles. Moreover, the effectiveness of visual-based and activity-oriented methods aligns with Gill (2021) and Monroe et al. (2019), as well as more recent findings showing that interactive and visual learning enhances cognitive engagement and environmental literacy

among school-aged children (Magalhães, 2025). Therefore, the integration of participatory methods and contextual educational content effectively strengthened students' sustainable mobility literacy and ecological awareness from an early age.

Development of Relevant Learning Media

The learning media developed in this program, including posters, mini booklets, pop-up sticks, and thematic teaching aids served as important innovations for Sekolah Alam Lampung, as no prior materials specifically addressed sustainable transportation education. These media not only filled the gap in learning resources but also enriched the educational process through visual and interactive approaches that helped students grasp abstract concepts more concretely.

The effectiveness of visual learning in improving students' retention and comprehension has been widely documented in environmental education literature. Monroe et al. (2019) demonstrated that visual learning strengthens cognitive connections and facilitates the internalization of sustainability concepts among school-aged children. More recent studies have confirmed that visual and interactive media significantly enhance students' engagement and understanding of sustainable transport issues (Caggiani & Prencipe, 2025; Rogelj et al., 2024). During program implementation, the media functioned as core instruments for material delivery, simulations, and discussions, enabling students to actively engage in experiential learning. After the program, all media were handed over to the school for continued use in SAL's thematic learning, ensuring long-term benefits and supporting the school's environment-based curriculum.

Strengthening Teachers' Capacity

Teachers' roles as facilitators became a key element in the capacity-building process for sustainable education, particularly within the framework of Education for Sustainable Development (ESD). Through direct involvement in all stages of the program, teachers gained experience in delivering green transportation issues using contextual and experiential learning methods. They also evaluated the effectiveness of the developed teaching aids, strengthening their competencies in applying visual and interactive educational media.

Teachers' participation in assessing students' mini projects further expanded their understanding of authentic assessment strategies emphasizing creativity, problem-solving, and the application of sustainability concepts. This finding aligns with Tilbury (2011) and is reinforced by recent studies highlighting that teacher engagement is crucial for embedding sustainable

mobility education into school curricula and institutional practices (UNESCO, 2021; Magalhães, 2025). Accordingly, the program not only benefited students but also enhanced the school's institutional capacity to implement sustainability agendas in a systematic and sustainable manner.

Mini Projects as a Medium for Knowledge Transformation

The implementation of mini projects resulted in diverse creative student outputs, including educational posters, simple prototypes, and sketches of child-friendly transportation routes reflecting their understanding of sustainable mobility issues. This project-based approach allowed students to develop critical thinking skills by identifying transportation problems in their surrounding environment and proposing realistic solutions.

The mini projects also encouraged creativity through visualization, modeling, and conceptual narratives, strengthening students' ability to apply knowledge in practical contexts. The project design process trained students in problem-solving by considering safety, emissions, user comfort, and route connectivity. Pedagogically, these findings align with Mochizuki & Bryan (2015) and are further supported by recent literature emphasizing that experiential and project-based learning is a core component of ESD, as it enables students to construct knowledge through hands-on practice and reflection on real-world contexts (Rohmah, 2025; Sarkheyli & Sarkheyli, 2025). Thus, mini projects functioned not only as creative outputs but also as effective media for transforming sustainability knowledge among students from an early age.

Publication and Dissemination

The program also achieved significant outcomes in disseminating its results through various channels, including the social media platforms of the Urban and Regional Planning Study Program at ITERA, activity documentation videos, and online mass media publications (Kompasiana). The diversity of dissemination channels enabled wider public access to information regarding the program's objectives, processes, and outcomes.

Effective dissemination strengthens transparency and accountability while expanding program impacts beyond the Sekolah Alam Lampung community to parents, educators, and stakeholders in transportation and environmental education. Recent studies emphasize that knowledge dissemination and public engagement are critical for scaling sustainable mobility education initiatives and encouraging program replication (Caggiani & Prencipe, 2025; Rogelj et al., 2024). Therefore, dissemination activities served not merely as administrative outputs but as strategic efforts to

promote best practices in sustainability education and child-friendly transportation advocacy.



Figure 4. Implementation of Community Service Activities at Sekolah Alam Lampung

Discussion

The findings of this study demonstrate that structured, participatory, and experiential educational interventions can significantly enhance students' literacy on sustainable mobility. Improvements observed in students' understanding of green transportation concepts, mobility-related health risks, and the relationship between transport modes and emissions indicate that sustainability-oriented learning is most effective when delivered through contextual and activity-based approaches. This aligns with UNESCO's framework for Education for Sustainable Development (ESD), which emphasizes active learning, real-world relevance, and learner engagement as core principles in fostering sustainability competencies (UNESCO, 2020; Carney, 2022).

The effectiveness of interactive learning methods, including educational games, simulations, and visual demonstrations, supports previous studies highlighting the importance of experiential learning in sustainability education. Wals & Benavot (2017) argue that sustainability challenges require learning processes that move beyond knowledge transmission toward transformative and participatory experiences. This perspective is further supported by Ardoin et al. (2020), who demonstrate that action-oriented and experiential environmental education interventions significantly improve learners' environmental knowledge, attitudes, and pro-environmental behavior, particularly when learning activities are closely connected to real-life contexts.

The use of visual and multimodal learning media in this program further contributed to students' comprehension of abstract sustainability concepts. Posters, visual tools, and hands-on materials helped translate complex ideas such as emissions, safety, and environmental impacts into concrete and age-

appropriate representations. This finding is consistent with multimedia learning theory, which suggests that learners achieve better understanding when verbal explanations are combined with well-designed visual elements (Mayer, 2005; Mayer, 2021). In the context of environmental education, visual learning has been shown to strengthen cognitive connections and improve long-term retention among school-aged learners (Gill, 2021).

Teacher involvement emerged as another critical factor in ensuring the effectiveness and sustainability of the program. Teachers' roles as facilitators, evaluators of student projects, and integrators of sustainability themes into ongoing curricula reflect the whole-school approach promoted in recent sustainability education literature. Cebrián et al. (2020) emphasize that teachers' competencies in Education for Sustainable Development are central to embedding sustainability values and practices within school curricula through reflective and transformative pedagogy. This view is further supported by UNICEF (2021), which highlights that sustainability initiatives in schools are more effective when supported by strong teacher capacity and institutional commitment.

Moreover, the implementation of mini projects allowed students to actively construct knowledge by identifying local mobility issues and proposing context-specific solutions. Project-based and experiential learning approaches have been widely recognized as effective strategies for developing critical thinking, creativity, and problem-solving skills in sustainability education (Lozano & Barreiro, 2022). By engaging students in designing child-friendly transport solutions, the program facilitated not only cognitive learning but also the development of values and attitudes aligned with sustainable behavior.

Overall, the results support existing literature suggesting that short-term, context-based educational interventions can generate meaningful improvements in sustainability literacy among primary and secondary school students when designed using participatory, visual, and experiential methods (Scott, 2021). Therefore, the Child-Friendly Green Transport Week program demonstrates strong potential as a replicable and context-sensitive model for introducing sustainable mobility education from an early age, particularly within environmentally oriented schools and child-centered learning environments.

Conclusion

The implementation of the Community Service program entitled "Green Child-Friendly Transportation Week" at Sekolah Alam Lampung was successfully

carried out and achieved its intended objectives. Through a series of educational activities, including material delivery, educational games, teaching aid simulations, and mini projects students gained a better understanding of the importance of environmentally friendly transportation in their daily lives. Teachers actively participated as facilitators and mentors, enabling the educational process to be well integrated with the ongoing thematic curriculum. The educational media produced, such as posters, stickers, and teaching aids, were utilized during the activities and subsequently handed over to the school to support sustainable learning. In addition, a documentation video was produced as one of the program outputs.

Several technical challenges emerged during implementation, including scheduling adjustments, the need for curriculum integration, and weather conditions. Nevertheless, all activities were successfully conducted through intensive coordination with the school. Dissemination of the program through social media, mass media, and visual documentation further expanded the program's impact on the broader community.

For future community service activities, it is recommended that time planning be conducted at an earlier stage to better align with the school calendar, along with strengthened initial coordination to ensure more effective curriculum integration. Furthermore, similar programs may be further developed by expanding participant coverage or enriching learning methods to enhance sustainable transportation literacy among students.

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