



Eco Run (Plogging): Implementing Green Industry Practices In Elementary School Sports

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ABSTRACT

The issue of rising national waste volumes particularly plastic waste poses a serious challenge for Indonesia. Data from the Ministry of Environment and Forestry (KLHK) for 2023 indicates that total national waste generation reached 56.63 million tons, with only 39.01% successfully managed, while plastic waste accounted for nearly 20% of that total volume. This situation underscores the need for early environmental education delivered through activities that are both practical and enjoyable. Plogging an activity combining running with picking up litter offers an integrated solution that merges physical exercise with environmental conservation efforts. This study employs a qualitative descriptive approach to provide an in-depth description of the ECO RUN (plogging) activity conducted at SDN Sukasari 7, which involved 42 student participants. The study's novelty lies in integrating plogging into Physical Education, Sports, and Health (PJOK) lessons as an application of the "green industry" concept, thereby providing a physical activity-based model for implementing the green industry concept. The research aims to describe the implementation of the ECO RUN (plogging) at the elementary school level, analyze its impact on students' environmental awareness, and identify how green industry principles are applied through sports activities. The implementation of the Eco-Run (plogging) as a practical application of the "Green Industry" concept within the Physical Education, Sports, and Health (PJOK) curriculum was successful and received positive responses from both teachers and students. The activity effectively combined physical exercise with environmental education by fostering the habit of running or walking while collecting and sorting waste; consequently, it not only improved physical fitness but also cultivated environmental awareness, responsibility, cooperation, and proper waste-disposal habits. Teachers considered this experiential learning approach more effective than purely theoretical instruction, as it provided students with real-world experience in maintaining environmental cleanliness, while students demonstrated high enthusiasm and positive behavioral changes in both school and home environments. Based on data triangulation, Eco-Run (Plogging) is considered a Green Industry-based innovative learning model suitable for primary schools, as it successfully integrates Physical Education (PJOK) learning objectives with environmental education, fosters an environmentally conscious mindset, and supports Education for Sustainable Development (ESD) goals through active, contextual, and experience-oriented learning.

Keywords: eco run, education for sustainable development (ESD), environmental education, experiential learning, green industry, physical education (PJOK), plogging

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INTRODUCTION

The problem of waste, particularly plastic waste, is one of the biggest environmental challenges facing Indonesia. The increasing consumption of single-use plastics has resulted in a growing volume of non-biodegradable waste, threatening environmental quality, public health, and ecosystem sustainability. Data from the Ministry of Environment and Forestry (KLHK, 2023) reveals that national waste production reaches approximately 56.63 million tons per year, with approximately 20% of this being plastic waste. However, the plastic recycling rate remains relatively low at around 22%, resulting in most plastic waste ending up in landfills or polluting rivers, oceans, and public spaces. This situation demonstrates that waste management requires not only a technical approach but also behavioral changes that must be instilled from an early age.

Elementary schools play a strategic role in shaping students' character and habits, including instilling a concern for the environment. However, various phenomena in schools indicate that numerous students still litter, fail to separate waste by type, and lack a sense of responsibility for the cleanliness of the school environment. This situation indicates that the environmental education currently implemented remains dominated by conceptual delivery, thereby failing to produce sustainable behavioral change. Therefore,

learning strategies are needed to enable students to gain direct experience through real-life activities, so that environmental values can become daily habits.

This demand aligns with the 21st-century educational paradigm that positions schools as vehicles for developing academic competencies, character, and sustainability competencies. Through the Education for Sustainable Development (ESD) approach, UNESCO (2024) emphasizes that environmental issues need to be integrated into the learning process through contextual, collaborative, and action-oriented learning activities. This approach is supported by Kolb's (1984) theory of Experiential Learning, which explains that direct experience is an effective means of building students' knowledge, attitudes, and behavior. Thus, environmental learning will be more meaningful if students are actively involved in activities that connect physical experiences with reflection on environmental issues.

One relevant approach is the Eco Run (Plogging) activity, which involves walking or running while picking up trash in the surrounding environment. This activity not only improves physical fitness but also integrates environmental education, character building, and habituation to sustainable living behavior. In the context of basic education, Eco Run (Plogging) can be a medium for implementing the Green Industry concept, namely the principles of resource efficiency, waste reduction, and environmental responsibility, adapted into the educational process. Through this activity, students learn that protecting the environment is part of everyday life, not just a subject in learning materials.

Although extensive research on environmental education, Green Industry, and plogging has been conducted, most studies have focused on increasing environmental awareness, pro-environmental behavior, or the benefits of physical activity in isolation. Previous research has primarily focused on the general public, students, or urban communities, while studies on integrating Eco Run (Plogging) as an implementation of the Green Industry concept in Physical Education, Sports, and Health (PJOK) learning in elementary schools remain very limited. Furthermore, research linking physical activity, environmental education, and student character building within an integrated learning framework is scarce. This situation indicates a research gap that still needs further study.

Based on this gap, this study introduces a novel implementation model for Eco Run (Plogging) that integrates Green Industry principles into Physical Education (PJOK) learning in elementary schools as an experiential learning approach and is oriented towards Education for Sustainable Development. Unlike previous studies that focused separately on sports or environmental awareness, this study integrates physical activity, character education, ecological awareness, and sustainability principles into a single structured learning activity. This integration is expected to foster clean living habits, increase environmental awareness, and strengthen students' character traits of responsibility and cooperation.

Based on the description, this study aims to analyze the implementation of Eco Run (Plogging) as a means of implementing the Green Industry concept in Physical Education (PJOK) learning in elementary schools and to examine its contribution to increasing students' environmental awareness and character building. The research results are expected to provide alternative learning models that support the implementation of Education for Sustainable Development in elementary schools and enrich the study of the integration of environmental education, physical activity, and experiential learning.

Scientifically, this research contributes to the development of basic education studies by integrating three fields that tend to be studied separately: physical education, environmental education, and the concept of Green Industry. This research also expands the application of the theory of Experiential Learning and Education for Sustainable Development in the context of physical education learning in elementary schools. Based on a practical perspective, the research results are expected to be a reference for teachers, schools, and policy makers in designing learning that not only improves physical fitness, but also forms a character of environmental care and supports the achievement of Sustainable Development Goals, especially goal 3 (Healthy and Prosperous Lives), goal 4 (Quality Education), goal 12 (Responsible Consumption and Production), and goal 13 (Addressing Climate Change).

LITERATURE REVIEW

Eco Run (Plogging)

Climate change, environmental pollution, and rising waste generation are global challenges prompting the education sector to integrate sustainable development principles into the learning process. Education serves not merely as a means of knowledge transfer but also as a vehicle for shaping character and fostering environmentally responsible behavior. In the context of Education for Sustainable Development (ESD), hands-on learning activities are considered more effective at raising environmental awareness than purely theoretical instruction. A systematic review by Thurm et al. (2024) demonstrates that sports and physical activities hold significant potential to enhance environmental awareness, sustainable behavior, and collaborative skills, while also fostering character development among learners through holistic, experience-based learning (Thurm et al., 2024).

One emerging innovation in the implementation of environmental education is plogging, an activity that combines running or walking with picking up litter along a route. Plogging integrates physical activity with tangible action to maintain environmental cleanliness, thereby offering dual benefits for health and environmental sustainability. According to Martínez-Mirambell et al. (2023), plogging is a relevant educational strategy for fostering an environmentally conscious generation through a simple activity adaptable across various educational levels. This activity not only improves physical fitness but also cultivates ecological awareness, social responsibility, and active student participation in environmental stewardship (Martínez-Mirambell et al., 2023).

In the field of physical education, the implementation of plogging has demonstrated a positive impact on fostering environmentally conscious attitudes. Research by Baena-Morales et al. (2023) confirms that a six-week plogging intervention enhances students' motivation, environmental awareness, and active engagement in physical education lessons. These findings indicate that outdoor-based learning serves as an effective alternative for integrating physical education objectives with environmental education. Beyond improving motor skills and physical fitness, plogging also cultivates pro-environmental behavior through the hands-on experiences students gain during the activity (Baena-Morales et al., 2023).

The successful implementation of Eco-Run (Plogging) is also supported by an experiential learning approach, which positions experience as the foundation for knowledge acquisition and behavioral change. A systematic review by Varman et al. (2023) demonstrates that experiential learning positively impacts children's knowledge, attitudes, and physical activity behaviors. Activities that are enjoyable, challenging, and hands-on have been shown to boost motivation to learn while fostering positive habits. Consequently, Eco-Run (Plogging) rests on a solid pedagogical foundation by integrating physical activity, reflection, and tangible environmental action into a meaningful learning process (Varman et al., 2023).

Based on these research findings, Eco-Run (Plogging) is highly relevant to the implementation of the "Green Industry" concept in educational settings. Although the Green Industry concept originated in the industrial sector to enhance resource efficiency and mitigate environmental impact, its core values can be internalized through school-based learning—for example, by encouraging students to reduce and sort waste, maintain environmental cleanliness, and cultivate a sense of responsibility for environmental sustainability. Furthermore, research on plogging participation indicates that pro-environmental attitudes and intrinsic motivation are key drivers of sustained eco-friendly behavior. Thus, Eco-Run (Plogging) holds the potential to serve as an innovative learning model that fosters environmentally conscious character while advancing the goals of Education for Sustainable Development (Kim et al., 2023; Thurm et al., 2024).

Green Industry

The Green Industry concept initially emerged in the industrial sector to enhance resource efficiency, reduce waste, minimize pollution, and achieve sustainable development. Over time, this concept has been adopted in education as part of the implementation of Education for Sustainable Development (ESD). Applying Green Industry principles in an educational setting involves not only managing eco-friendly facilities

and infrastructure but also integrating sustainability values into the curriculum, learning processes, school governance, and community engagement. Through this approach, schools serve as learning environments that shape students' knowledge, skills, attitudes, and behaviors, enabling them to contribute to environmental sustainability (UNESCO, 2024). UNESCO emphasizes that "Green Schools" adopt a holistic approach that encompasses governance, facilities, and operations, learning, and community partnerships as integral parts of education for sustainable development.

Implementing Green Industry principles in education also aims to foster an environmentally conscious school culture by encouraging eco-friendly habits in daily life. Students not only gain knowledge about environmental issues but are also actively encouraged to participate in tangible activities such as waste management, energy conservation, water conservation, school greening initiatives, and project-based learning focused on the environment. This approach is considered highly effective as it provides students with hands-on experience, thereby enhancing their ecological awareness, sense of social responsibility, and critical thinking skills in addressing environmental challenges. Consequently, the implementation of Green Industry principles in education focuses not merely on cognitive aspects but also on character building and fostering lasting behavioral change (UNESCO, 2024).

In the context of primary school education, Green Industry principles can be integrated into various subjects, including Physical Education, Sports, and Health (PJOK), through activities that combine physical exercise with environmental conservation efforts, such as "Eco-Runs" (plogging). This learning model aligns with Green Industry principles by instilling habits of waste reduction, environmental cleanliness, and responsible resource use, while fostering an awareness of environmental sustainability from an early age. Consequently, the school serves not merely as a venue for knowledge transfer but also as an agent of change, cultivating a culture of sustainable living and producing a generation equipped to support future green development (UNESCO, 2024).

METHODS

Research Design

A systematic scientific activity is conducted to ascertain and verify the truth about a phenomenon using reliable data. The present study employs a descriptive qualitative approach. A descriptive approach was selected because, while the researcher already possessed a general overview of the subject under study, a more in-depth analysis of the phenomenon was still required. The focus of this research is to describe the conditions, symptoms, or characteristics of the research subject exactly as they exist, without manipulating the variables under investigation (Supriharyono, 2023, p. 46). Consistent with this view, descriptive research aims to systematically portray the various symptoms, events, or circumstances occurring at the time of the study (Arifuddin et al., 2020, p. 106). Consequently, the researcher acts directly in the field as the primary instrument, observing phenomena, identifying behavioral categories, and objectively documenting all findings in field notes without imposing specific treatments on the research subjects (Wekke, 2019, p. 35). Given these characteristics, this study is classified as descriptive research utilizing a qualitative approach.

A qualitative approach is employed because it enables a deeper understanding of a phenomenon based on natural conditions. Qualitative data possess distinct characteristics: the meaning of the information is not always explicitly apparent, but is often implicit across various data sources. Data sources in qualitative research may include observational findings, in-depth interview transcripts, and supporting documents such as writings, photographs, or images related to the research focus (Mawardi). Thus, qualitative research enables the researcher to obtain comprehensive information by interpreting various forms of data gathered in the field.

Qualitative research is recognized as an approach grounded in the post-positivist paradigm; consequently, it places greater emphasis on understanding meaning rather than on quantitative measurement. This approach is often referred to as an interpretive method because the research process places greater emphasis on the researcher's ability to understand phenomena in depth, in accordance with the context of the situation in the field (Arifuddin et al., 2020). Furthermore, qualitative research yields findings that cannot be

obtained through statistical analysis or other quantification procedures (Djoko Sunarti, 2023). According to Strauss and Corbin (as cited in Djoko Sunarti, 2023), qualitative research is highly suitable for examining various aspects of social life, history, individual behavior, organizational functions, social movements, and interpersonal relationships that require an in-depth understanding.

Data collection in qualitative research takes place in natural settings, using primary data sources. Common data collection techniques include participant observation, in-depth interviews, and documentation (Arifuddin et al., 2020). These three techniques are combined through triangulation to ensure the data obtained is comprehensive and credible (Wekke, 2019). Observation is employed to obtain data directly by monitoring activities as they unfold during the research. It is a data collection technique that involves the systematic observation of activities within the research subject (Sudaryono, 2016). In this study, the researcher acts as a neutral and objective observer, ensuring that all data reflects actual conditions without researcher intervention (Supriharyono, 2023).

In addition to observation, this study utilizes in-depth interviews as a primary method of data collection. An interview is a communication process between the researcher and an informant aimed at gathering information relevant to the research focus (Mawardi, 2023). Herdiansyah (as cited in Wekke, 2019, p. 50) explains that an interview is an interactive process involving at least two people in a natural setting, in which mutual trust serves as the foundation for gaining a deep understanding of a phenomenon. Consequently, interviews in this study are conducted openly, allowing informants to share information based on their own experiences and perspectives regarding the implementation of Eco-Run (Plogging).

The subsequent technique is documentation. Documentation serves as supporting data to reinforce the results of observations and interviews, thereby enhancing the validity of the research findings. Documentation consists of records of past events, such as writings, images, photographs, and other documents related to the research focus (Arifuddin et al., 2020). According to Djoko Sunarti (2023), documentation involves examining relevant documents to serve as sources of information for the research. In this study, documentation includes photographs of activities, instructional materials, observation records, and other documents related to the implementation of the Eco-Run (Plogging) event.

To ensure data validity, this study employs triangulation. Triangulation is a data collection method that combines multiple approaches or data sources to yield more accurate, credible information (Lafau et al., 2023). Triangulation is implemented by integrating findings from observations, interviews, and documentation, thereby providing a comprehensive overview of the Eco-Run (Plogging) implementation among students at SDN Sukasari 7.

Data analysis is conducted using the Miles and Huberman interactive model, which encompasses data reduction, data display, and conclusion drawing or verification (Mawardi, 2023). The data reduction stage involves selecting, focusing, and simplifying data to ensure that only information relevant to the research objectives is utilized. Subsequently, the data is presented through descriptive narratives, tables, and visual documentation to facilitate understanding. The final stage, conclusion drawing and verification, is carried out continuously throughout the research process to ensure that the findings align with empirical data from the field. Data condensation involves summarizing relevant data, while data display aims to organize information systematically, thereby facilitating interpretation prior to verification and the drawing of conclusions.

Research Site and Period

The research activities were carried out in stages, from December 2025 to May 2026. The first phase was conducted in December 2025 and included research preparation activities, instrument development and validation, and coordination with the schools serving as research locations. This phase aimed to ensure all administrative, technical, and instrument aspects of the research were ready before fieldwork began. The second phase, implemented in February 2026, involved the Eco Run (Plogging) program, a means of implementing the Green Industry concept in elementary school learning. In this phase, students participated in running or walking activities while picking up trash as part of a learning process that integrated physical

activity with environmental education. Furthermore, in March 2026, observations and interviews were conducted to obtain data on the program implementation process, student and teacher responses, and various findings that emerged during the Eco Run (Plogging) implementation. The data obtained during this phase served as the basis for evaluating the program's effectiveness and for supporting the analysis of the research findings. The final phase, data analysis, took place from April to May 2026. All data collected through observation, interviews, and documentation were systematically analyzed in accordance with the research methodology. The results of this analysis subsequently served as the basis for compiling research findings and discussions, and for drawing conclusions regarding the implementation of Eco Run (Plogging) as an application of the Green Industry concept in sports in elementary schools.

Population and Participants

This study was conducted at SDN Sukasari 7 in Tangerang, with fourth and fifth-grade students serving as the research subjects. Purposive sampling was used to select subjects, aiming to gather diverse information regarding the implementation of Eco-Run (Plogging) within Physical Education, Sports, and Health (PJOK) instruction. Through this selection, the study seeks to obtain a comprehensive picture of the execution, student responses, and overall effectiveness of the Eco-Run (Plogging) initiative as a practical application of the "Green Industry" concept at the elementary school level.

Research Instruments

Instruments

Instruments used in the present study consist of:

1. Plogging Implementation Observation Sheet: Student Participation, Compliance with Instructions, Amount of Waste Collected, Environmental Caring Attitude.
2. Teacher Interview Guidelines: Teacher's Perception of the Activity, Impact of Activities on Students, Feasibility of Integrating Plogging Into Pjok.
3. Student Interview Guidelines: Experience following Plogging, Changes in environmental awareness, Impression, and motivation

Instrument Blueprint

The Research Instrument Grid is illustrated in Table 1 below.

Table 1. Research Instrument Grid

No.	Activities	Research Focuses
1.	Observation	Observing the Eco-Run implementation process and changes in students' real behavior in the field with the following indicators: 1. Implementation Process 2. Plogging Techniques 3. Waste Sorting 4. Ecological Behavior 5. Participation and Fitness
2.	Interview	Exploring educational perspectives on the feasibility and impact of integrating Plogging into the curriculum and measuring the depth of students' understanding and emotional impressions of environmental conservation through sports, with the following indicators: 1. Relevance of Green Industry 2. Educational Impact 3. Integration of Physical Education Curriculum

3. Documentation	4. Obstacles & Solutions
	5. Hands-on Experience
	6. Ecological Understanding
	7. Internalization of Values
	8. Continuous Motivation
	Collecting authentic evidence of implementation and supporting data for analysis with the following indicators:
	1. Activity Documentation
	2. Waste Data Documentation (Records of volume/weight of waste collected)
	3. School Administration Documentation (Research permit, activity schedule, and profile of SDN Sukasari 7)

RESULTS AND DISCUSSION

Observations on the Implementation of Eco-Run (Plogging)

Research observation results are displayed in Table 2 and Figure 1. Both describe the implementation of Eco-Run (Plogging).

Table 2. Research Observation Sheet Results

No	Observation Aspects	Rating Scales				Observation Notes
		1	2	3	4	
A	Dimension: Eco-Run (Plogging) Implementation					
1.	Students wear protective equipment (gloves) before starting the activity			√		Several students did not wear gloves
2.	Students follow the predetermined running route in a disciplined manner			√		However, not all students were disciplined
3.	Students consistently run or briskly walk throughout the activity			√		Several students did not run during the activity
4.	Students demonstrate high enthusiasm while collecting litter along the route				√	The students were very enthusiastic about participating
5.	Students promptly collect any litter they encounter without skipping designated areas				√	Students followed the instructions independently
6.	Students place the collected litter neatly into trash bags, leaving no scattered waste				√	Students carried out this task well
B	Dimension: Impact on Environmental Awareness					
7.	Students are able to distinguish between plastic and organic				√	Students were able to differentiate plastic waste from leaf waste
8.	Students dispose of waste in the appropriate final-disposal containers according to their category				√	Students sorted the waste according to the given instructions
9.	Students show initiative in picking up litter voluntarily without repeated instructions				√	Students had already understood the instructions
10.	Students remind their peers not to litter during the activity				√	Students encouraged their peers to dispose of waste properly
11.	Students perform personal hygiene procedures (handwashing) after completing the activity.				√	Students understood the importance of washing their hands after the community clean-up activity

12. Students properly organize and return the equipment (trash bags/gloves) after use

✓ Students understood the tasks they had completed and cleaned up the equipment accordingly



Figure 1. Implementation of Eco-Run (Plogging) as a practical application of the "Green Industry" concept within Physical Education, Sports, and Health (PJOK) lessons

Based on observations of the Eco-Run (Plogging) activity, the implementation generally went well. All stages of the activity, from preparation to implementation to closing, were carried out according to the lesson plan. Students demonstrated active engagement throughout the activity, although several aspects still needed improvement.

Regarding the implementation dimension of the Eco-Run (Plogging), most students wore protective equipment, including gloves, before the activity began, although several students did not use them consistently. Students were also able to follow the teacher-determined running route, although discipline varied among participants. Throughout the activity, most students consistently ran or walked briskly while picking up trash found along the track.

The aspect that received the highest response is student enthusiasm for picking up trash. Observations reveal that almost all students appeared enthusiastic about participating in the activity and independently picked up trash without repeated instructions. The collected trash was subsequently neatly placed in trash bags to prevent it from scattering during the activity.

Regarding environmental awareness, observations indicate an improvement in students' ability to distinguish between organic and inorganic waste. Most students have been able to sort plastic and leaf waste into the categories explained by the teacher. Furthermore, students began showing initiative by voluntarily picking up trash, reminding one another not to litter, washing their hands after activities, and returning used equipment to its proper place.

Overall, observations indicate that the Eco-Run (Plogging) activity not only increased students' physical activity but also fostered environmentally conscious behavior by instilling habits of maintaining cleanliness, sorting waste, and taking responsibility for the school environment. Interviews with two Physical Education (PE) teachers reveal a very positive response to the implementation of the Eco-Run (Plogging). Both teachers considered the activity a creative instructional innovation, as it successfully integrated physical exercise with environmental education.

Teacher Interview Results

According to the teachers, the "Green Industry" concept was exemplified through the waste collection and sorting activities performed during the lesson. They also noted that practical activities like the Eco-Run were far more effective than theoretical lessons on environmental cleanliness, as students could learn directly through real-world experience. One teacher estimated the activity's effectiveness at around 80%, while the other noted that elementary students find it easier to grasp concepts through hands-on practice than through classroom-based instruction.

Regarding physical fitness, the teachers stated that the PE learning objectives were still met, as students engaged in running, walking, bending, and lifting trash throughout the activity. Beyond physical benefits, the activity also boosted the spirit of mutual cooperation and heightened the students' concern for the environment. In addition, the teachers observed that student enthusiasm was significantly higher than in conventional PE lessons. They noted that the activity offered a novel experience, thereby increasing students' motivation to learn.

However, several challenges remained, such as students running without regard for their groups, a lack of discipline in following instructions, and the need for greater teacher supervision. Consequently, the teachers suggested involving more educators in future Eco-Runs and beginning with clearer demonstrations to ensure all students fully understood the procedures.

Student Interview Results

Theme 1. Eco-Run as a Contextual Learning Innovation

Physical Education teachers view Eco-Run (Plogging) as providing a more meaningful learning experience than conventional sports learning.

"The children are more enthusiastic because they are not only running, but also feel a sense of responsibility for maintaining the school environment. They learn by doing." (PJOK Teacher 1)

Other teachers also said that practice-based learning is easier for students to understand than delivering material in a purely theoretical way.

"If it is only explained in class, children quickly forget. When they actually pick up trash while exercising, they better understand the importance of maintaining cleanliness." (PJOK Teacher 2)

These two quotes reveal that Eco-Run fosters contextual, experience-based learning so that students gain knowledge through real-world activities.

Theme 2. Increasing Environmental Awareness

The second theme emerged from the consistency of students' answers regarding changes in behavior after participating in the activity.

"Now, if I see trash at school, I immediately pick it up and throw it in the trash." (Student 3)

"I now know that plastic waste and leaves must be separated." (Student 1)

The quote presents that the Eco-Run activity not only increases knowledge of waste management but also encourages environmentally conscious behavior through concrete actions.

Theme 3. Character Building Through Direct Experience

Teachers assessed that the Eco-Run activity successfully instilled the values of responsibility, cooperation, and mutual assistance.

"During the activity, they helped each other, reminding each other if there was any trash that hadn't been collected." (PJOK Teacher 2)

This statement is reinforced by observational results, which indicate cooperation among students during the implementation of activities.

Theme 4. Implementation Challenges

Despite having a positive impact, teachers identified several obstacles.

"There are still several students who are too enthusiastic to follow their groups; thus, teachers have to supervise more." (PJOK Teacher 1)

These findings indicate that implementing Eco-Run requires effective classroom management, clear safety procedures, and adequate support to achieve learning objectives optimally. Interviews with three students reveal that all respondents reacted positively to the Eco-Run (Plogging) implementation. All students stated that the activity was highly enjoyable and more engaging than standard running. The students expressed that the Eco-Run offered a novel experience, allowing them to exercise while simultaneously helping to keep the school grounds clean. Even though several students admitted to facing minor difficulties while running and picking up trash, they thoroughly enjoyed the entire event from start to finish. Regarding environmental awareness, all students have come to understand the importance of sorting organic and inorganic waste. They also identify plastic waste and fallen leaves as the most common types of waste found in the school environment.

A shift in behavior, furthermore, was evident following the activity. All students expressed a commitment to disposing of trash properly, admonishing peers who litter, and even picking up trash whenever they encounter it whether at home or on the street. Furthermore, the students expressed a desire for the Eco-Run event to be held again, as they found it both enjoyable and beneficial for the school environment.

Research findings indicate that implementing Eco-Run (Plogging) successfully integrates Physical Education (PJOK) learning objectives with environmental education through contextual physical activity. This activity provides hands-on learning experiences, allowing students not only to improve their physical fitness but also to cultivate an environmentally conscious character. These findings align with Kolb's (1984) Experiential Learning theory, which posits that direct experience is an effective medium for building knowledge and modifying student behavior.

Student enthusiasm during the activity demonstrates that learning through real-world actions can boost motivation to learn. Compared to conventional sports instruction, Eco-Run offers a more meaningful experience because students are actively involved in addressing environmental issues they encounter firsthand. In addition, these findings underscore the research of Baena-Morales et al. (2023), which states that plogging can simultaneously enhance students' physical activity, environmental awareness, and social engagement.

The implementation of the "Green Industry" concept in this study is realized by fostering habits such as reducing waste, sorting waste by type, maintaining environmental cleanliness, and instilling a sense of responsibility for the school environment. Although the Green Industry concept is typically applied in the industrial sector, this study demonstrates that Green Industry values can be internalized as early as the elementary school level through simple yet meaningful learning activities. Students not only grasp waste management concepts but also apply them directly in their daily lives.

Data from observations, teacher interviews, and student interviews consistently indicate that Eco-Run

(Plogging) successfully increased students' environmental awareness. Triangulation of the results reveals that students have developed habits of disposing of trash in designated bins, sorting waste, reminding peers to maintain cleanliness, and demonstrating responsibility for the school environment. These behavioral changes demonstrate that experiential learning is more effective at shaping character than instruction focused solely on classroom-based content delivery.

However, the study identified several implementation challenges, such as inconsistent student discipline, irregular use of protective gear, and the need for more intensive supervision during the activity. Consequently, future Eco-Run events require more systematic briefings, more supervisors, and more structured operational procedures to ensure greater effectiveness.

Overall, the findings elucidate that Eco-Run (Plogging) is a viable learning model for Physical Education (PJOK) in elementary schools. This model not only promotes physical fitness but also serves as a vehicle for implementing "Green Industry" concepts by fostering environmental awareness, waste management skills, teamwork, mutual cooperation (*gotong royong*), and social responsibility. Thus, Eco-Run (Plogging) holds potential as an innovative educational approach that supports the goals of Education for Sustainable Development (ESD) within the elementary school setting.

CONCLUSION AND RECOMMENDATIONS

The research results underscore that Eco-Run (Plogging) is a learning strategy that integrates physical activity with environmental education through direct experience. This finding aligns with research by Martínez-Mirambell et al. (2023), which states that plogging increases environmental awareness because students are actively involved in concrete actions to maintain environmental cleanliness. In addition, the study reveals that physical activity, combined with environmental action, can increase students' motivation to learn and social participation.

The research findings elucidate the research by Baena-Morales et al. (2023), who found that plogging is an innovative approach to physical education that can develop physical fitness while fostering pro-environmental behavior. In line with the present study, students demonstrate increased environmental awareness, proper waste-disposal habits, and waste-sorting skills after participating in the Eco-Run activity.

Based on a learning-theory perspective, the research findings support Kolb's (1984) Experiential Learning Theory. According to this theory, knowledge is built through concrete experience, reflection, conceptualization, and application in real-life situations. Eco-Run provides students with the opportunity to directly experience environmental preservation, so that knowledge and attitudes form not only in the cognitive realm but also translate into concrete behavior. Therefore, the behavioral changes observed in this study result from an experiential learning process.

Furthermore, the research findings underscore the Education for Sustainable Development (ESD) concept developed by UNESCO (2024). ESD emphasizes the importance of learning that fosters sustainability competencies through concrete actions, collaboration, and student involvement in solving environmental problems. Eco-Run exemplifies this principle by integrating sports activities with the practice of maintaining a clean environment and responsible waste management.

Theoretical and Practical Implications

This research expands on the integration of Green Industry concepts into Physical Education (PJOK) instruction in elementary schools. While Green Industry has been primarily studied in the context of industry and resource management, this study demonstrates that Green Industry values can be internalized through experiential learning activities. These findings also underscore the theories of Experiential Learning and Education for Sustainable Development, which argue that direct experience is an effective approach to fostering environmentally conscious behavior from an early age.

In practice, this study demonstrates that Eco-Run (Plogging) can serve as an innovative learning model for physical education teachers to integrate the goals of improving physical fitness with those of

environmental education. In addition, this model can be one of the school programs supporting the implementation of a green school culture (Green School) and sustainable development policies. For local governments and the Department of Education, the research results can serve as a basis for designing environment-based learning programs that integrate physical activity, character education, and sustainable environmental management in elementary schools.

Limitations

The present study has several limitations that should be considered when interpreting the findings. First, the research was conducted exclusively at SDN Sukasari 7 in Tangerang, involving only fourth- and fifth-grade students and Physical Education (PE) teachers. Consequently, the characteristics of the participants and the school setting may not represent those of other elementary schools with different demographic, cultural, or environmental contexts. Therefore, the findings of this study cannot be generalized to all elementary schools, but should instead be understood as context-specific evidence regarding the implementation of the Eco-Run (Plogging) program in the selected research setting. Second, this study employed a descriptive qualitative approach, focusing on the implementation process, participants' experiences, and perceptions, rather than examining causal relationships or statistically testing the program's effectiveness. Third, data were collected through observations, interviews, and documentation within a relatively short period, implying that the identified improvements in students' environmental awareness and pro-environmental behaviors primarily reflect short-term outcomes rather than long-term behavioral sustainability. Fourth, the implementation of the Eco-Run (Plogging) program was influenced by contextual factors, including school culture, teacher support, the availability of facilities and equipment, environmental conditions, and weather during the activity. All of which may affect the transferability of the findings to other educational settings. Therefore, future studies are recommended to involve a larger number of schools with diverse characteristics, employ experimental or mixed-methods designs to evaluate the effectiveness of the Eco-Run (Plogging) model more rigorously, and conduct longitudinal investigations to provide stronger evidence regarding its long-term impact on students' physical fitness, environmental character, environmental literacy, sustainable behavior, and the integration of Green Industry principles in elementary education.

Credit Authorship Contribution Statement

First, second, and third authors: Initial draft writing, methodology, conceptualization, observation, visualization, and investigation. Fourth and fifth authors: Supervision and validation.

Declaration Of Competing Interest

The authors declare no conflict of interest regarding the research, writing, or publication of this article.

Ethical Declaration

All informants participated voluntarily, providing their consent after receiving adequate information. The confidentiality of their identities was maintained throughout the study in accordance with the ethical guidelines of Universitas Muhammadiyah Tangerang.

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