

# Education for Sustainable Development Grounded in Sundanese Local Wisdom: A Case Study of Environmental Awareness in an Indonesian Elementary School

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## ARTICLE INFO

### Keywords:

education for sustainable development;  
sundanese local wisdom;  
whole-school approach;  
environmental awareness;  
primary education

### Article history:

Received 2026-01-11

Revised 2026-02-18

Accepted 2026-06-10

## ABSTRACT

The global environmental crisis requires elementary education to move beyond environmental knowledge toward sustained ecological behavior. However, limited empirical evidence explains how Education for Sustainable Development (ESD) grounded in Sundanese local wisdom shapes students' environmental awareness and practices. This qualitative case study was conducted at SDN Ekologi Kahuripan Padjajaran, Purwakarta, Indonesia. Data were collected over ten weeks through in-depth interviews with 14 informants, including the principal, teachers, extracurricular coaches, an ecological consultant, school committee members, parents, and students. Participant and non-participant observations and document analysis were also conducted. Data were analyzed using the Miles–Huberman model and mapped through an Input–Process–Output–Outcome framework. The findings show that ESD was institutionally embedded through school governance, curriculum planning, ecological facilities, and a whole-school culture rooted in *Panca Waluya* values and the Sundanese philosophy of *silih asah*, *silih asih*, and *silih asuh*. ESD practices were implemented through intracurricular, co-curricular, extracurricular, and school culture activities. These practices produced ecological artifacts, improved environmental literacy, strengthened school cleanliness, and encouraged spontaneous ecological behaviors such as sorting waste, watering plants, saving water, and reminding peers to care for the environment. The study demonstrates that Sundanese local wisdom can function as a contextual mechanism for internalizing ESD values in elementary education. Strengthening green funding, teacher capacity, community partnerships, and outcome-based monitoring is recommended to support replication in other schools.

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## 1. INTRODUCTION

Global environmental crises such as climate change, pollution, and biodiversity degradation continue to be real threats to the sustainability of human life (Lopes & Albuquerque, 2023). This condition requires a collective responsibility from all levels of society, including the world of education, to instill the values of caring for the environment from an early age (Irham, Fachrista, Masyhuri, & Suryantini, 2022). Unfortunately, in many primary education contexts, there is still a gap between students' knowledge of environmental issues and real attitudes and behaviors in protecting the surrounding environment (Mavuso, Khalo, Kafu-Qavane, & Olawumi, 2022). Many students have received thematic environmental learning, but have not shown initiative in sorting waste, saving water, or caring for school plants (Salonen & Sterling, 2023). This gap shows the importance of strengthening the character of caring for the environment through a contextual and meaningful educational approach.

Elementary schools as the foundation of character formation have a strategic role in building environmental awareness and concern in a sustainable manner (Matshikiza & Luggya, 2019). One of the approaches that is considered relevant is *Education for Sustainable Development (ESD)*, which is an educational model that encourages students to understand, reflect, and act for environmental, social, and economic sustainability (Widodo, 2024). In the context of elementary schools, ESD includes indicators such as: integration of sustainability issues in learning, student involvement in environmentally friendly activities, strengthening values and attitudes of responsibility towards nature, and habituation of sustainable behavior in daily life (Nada et al., 2021; Chan et al., 2022; Gunansyah et al., 2021).

This environmental concern can be measured through indicators such as: students' awareness of the cleanliness and sustainability of the school environment (Orbanić & Kovač, 2021), active participation in environmental activities (e.g. recycling, greening, water conservation) (Karacaoğlu, 2024), as well as the emergence of initiatives to protect the environment in their daily lives (Ali, Abduh, Mahmud, & Dunakhir, 2023). Environmental concern for students can be measured through several important indicators that reflect real changes in student behavior. First, their awareness of the cleanliness and sustainability of the school environment, including concern for maintaining classrooms, parks, and public facilities (Orbanić & Kovač, 2021). Second, active participation in various environmental activities such as recycling, greening, waste management, to water conservation, which shows their direct involvement in sustainability actions (Karacaoğlu, 2024). Third, the emergence of student independent initiatives, for example reminding friends not to litter or save energy, which is an indicator of internalizing ecological values in daily life (Ali et al., 2023).

The research gap arises because there are still limited studies that empirically explain how the integration of ESD based on local Sundanese wisdom really shapes students' environmental concerns. Many schools adopt local values only as a symbol without internalization in learning practices or school culture, so that students' ecological behavior has not developed optimally. This research explicitly asks the following questions: (1) How is Sundanese local wisdom integrated in Education for Sustainable Development (ESD) in all dimensions of school curriculum, activities, and culture? (2) What are the mechanisms that link these practices to the growth of students' environmental awareness and behavior? This study uses an ecopedagogical theoretical lens combined with indigenous/local knowledge in ESD, emphasizing cultural-based contextual learning and human-nature relations. Conceptually, this research contributes through a comprehensive mapping of the IPOO model that is integrated with local Sundanese wisdom. Empirically, this study presents detailed case evidence regarding the mechanisms of implementation and internalization of ecological values in elementary schools. The novelty of this research lies in the effort to map the relationship between the values of Panca Waluya, the philosophy of mutual honing - mutual compassion - mutual nurturing, and the indicators of students' environmental concern comprehensively. The urgency is very high because the environmental crisis demands a basic education model that is contextual, based on local culture, and effective in building ecological character from an early age.

## 2. METHODS

This study uses a qualitative approach with a case study design to deeply understand the practice of Education for Sustainable Development (ESD) based on Sundanese local wisdom in the natural context of elementary schools. This design allows researchers to comprehensively capture the dynamics of curriculum, activities, school culture, and actors' experiences (Ratnasari & Sudradjat, 2023; Salimi, Dardiri, & Sujarwo, 2021). The Kahuripan Padjajaran Purwakarta Ecological School was chosen as a case study because it is distinctive/unique: the school places the environment as a living laboratory (greenhouse, talun pambibitan, ecological laboratory, Pawon Corner, wine garden) and integrates ESD into formal governance (RKJM, RKT, RKAS), curriculum, and school culture based on Panca Waluya values and the philosophy of mutual hoarding. These characteristics make the case critical to explain the mechanism of how local values do not stop as symbols, but work as continuing education practices that influence students' ecological behaviors (Yani, Roro, Setyowati, Jatmiko, & Ridlwan, 2025; Yani et al., 2025).

Fieldwork was carried out for 10 weeks through regular visits to schools on study days and ecology program days. Data were collected through: (1) in-depth interviews with the principal, two class/subject teachers, two extracurricular coaches, ecological consultants, two committee members, three parents, and three students; (2) participant/non-participant observation as many as [write number of sessions] on intracurricular, co-curricular, extracurricular, and school cultural activities (e.g. garden practices, waste management, water conservation, healthy food projects, hygiene pickets); and (3) document analysis including the medium-term work plan, annual work plan, budget plan, teaching tools/modules, environmental program SOPs, activity schedules, student planting portfolios, ecological product gallery documentation, and meeting/partnership minutes. All data was recorded through interview guidelines, observation sheets, field notes, and document analysis matrices.

Participants were selected by purposive sampling based on criteria: (a) having a direct role in ESD planning/implementation (principal, teacher, program coordinator), (b) involved as supporters of the school ecosystem (parents/committees/partners), and (c) students who are active in ESD practices across activities and represent class/gender variations. Sampling is gradual until the data reaches saturation. Research ethics emphasizes the protection of participants, especially children. Researchers obtained written permission from the school and relevant authorities, and applied informed consent for adults. For students, the parent/guardian consent procedure and child assent are used, with the simple explanation that participation is voluntary and can be terminated at any time. Identities are disguised using pseudonyms, and data is stored securely (password-protected folders, restricted access). Student interviews are conducted in a safe/open space, without pressure, short duration, and avoiding questions that have the potential to cause discomfort.

The data analysis follows the Miles & Huberman model (reduction–display–verification), combined with the *Input–Process–Output–Outcome* (IPOO) framework (Mez & Mez, 2014). The coding process is deductive by building the initial codebook from the IPOO component. Inputs include facilities/policies/curriculum; the process includes intracurricular/cocurricular/extracurricular / cultural; product outputs include ecological/literacy/hygiene; and outcome includes *cageur-bageur-bener-pinter-singer*) and inductive (opening new codes from field data, e.g. the role of partnerships, mutual cooperation, climate response). The codes were then grouped into categories and themes through constant comparison, analytical memo writing, and tracing of "mechanisms" that linked ESD practices to student behavior.

Credibility is strengthened through triangulation of methods (interviews–observations–documents), triangulation of sources (principals, teachers, students, parents, consultants), and time triangulation (routine activities vs program activities) (Benaziria & Murdiono, 2019; Khasanah, Riyanto, & Setyowati, 2023). The researcher conducts member checking by delivering a summary of the initial findings to key informants to test the accuracy of interpretation, peer discussion/peer debriefing to challenge analysis bias, and keeping audit trails (coding decision records, category changes, and data matrices) so that the analysis process can be traced and accounted for.

### 3. FINDINGS AND DISCUSSION

#### 3.1 Findings

##### 3.1.1 Input

Continuing education at SDN Ekologi Kahuripan Padjajaran Purwakarta is developed through a strategic program "Program Dharma Atikan SDN Ekologi Kahuripan Padjajaran" which has become a continuous learning ecosystem that places the environment as the main learning space. Facilities such as the Dharma Atikan Laboratory, Greenhouse, Talun Pambibitan, Pawon Corner, and Wine Garden are designed as living laboratories that allow students to practice the concepts of food security, water conservation, waste management, and horticultural plant cultivation. Students' daily activities consistently reflect the integration of ESD in real-world practice.

The results of observations show that SDN Ekologi Kahuripan Padjajaran has a learning environment that is deliberately designed to support *Education for Sustainable Development* (ESD). Facilities such as the Dharma Education Laboratory, Greenhouse/Talun Pambibitan, Dira Utama Wine Park, Pamanan Rasa Pawon Corner, and Forsita Membumi area serve as living laboratories that allow students to learn directly from nature. Each ecological space provides an authentic experience from planting, caring for and harvesting, to processing agricultural products. The principal emphasized the importance of this approach by stating, "Children should grow up close to nature. The environment is their first teacher." The learning environment is not only a place of practice, but also a vehicle for building the character of caring for the environment through daily interactions. Habits such as watering plants, maintaining gardens, and utilizing organic waste into compost show that this ecological infrastructure plays a strong foundation in internalizing the value of sustainability from an early age.

A literature study of RKJM, RKT, and RKAS shows that the Dharma Atikan Program does not stand as an additional activity, but has been integrated into the school planning system. Alignment of the program with a formal policy structure ensures that the implementation of ESD is systematic, measurable, and sustainable. The school superintendent emphasized the importance of such integration by stating, "*This program is alive because it enters the system, not just a seasonal activity.*" This shows that the sustainability of the program does not depend on a specific figure, but on strong governance. Every activity, from the development of ecological facilities, environmental habituation, to sustainability-themed extracurricular activities, is clearly listed in the annual and medium-term planning documents. The integration of this policy is an important factor that ensures the consistency of ESD implementation from year to year, while opening up space for periodic evaluation and program development.

The integration of a curriculum based on Sundanese local wisdom is a key element in ESD education at SDN Ekologi Kahuripan Padjajaran. The Panca Waluya values: cageur (physically and spiritually healthy), bageur (empathetic and prosocial), bener (honest and responsible), pinter (intelligent and problem solver), and singer (adaptive and innovative)—are consistently applied in intracurricular, co-curricular, and extracurricular learning. The principal emphasized the relevance of this value in building ecological character by saying, "We want children to be not only smart, but also smart, good, true, smart, and singer. This value guides every environmental activity here."

In addition, the philosophy of mutual honing, mutual love, mutual nurture strengthens collaborative learning and empathy in environmental activities. Students are invited to teach each other the skills of caring for plants (*silih asah*), help each other maintain the cleanliness of the environment (*silih asih*), and guide each other friends who have difficulties in ecological practice activities (*silih asuh*). These values make the curriculum not only develop academic competence, but also ecological and social character. The integration of local wisdom into the curriculum makes ESD relevant to students' cultures, making it easier to understand, live, and practice in daily life.

### 3.1.2 Process

Education for Sustainable Development (ESD) is implemented with the values of Pancasila and *tribakti* (*bakti ka diri, bakti ka alam and bakti ka sasama*) in intracurricular, co-curricular, extracurricular and school culture. In intracurricular activities, especially in thematic subjects, science, and PPKn, teachers consistently integrate sustainability issues such as recycling, water conservation, food security, and local ecosystems. Learning does not stop at theory, but is directly related to the condition of the school environment. One teacher explained, "The children don't just hear, they see and touch the process directly." This approach makes students understand ecological concepts through real-life experiences, such as observing the plant cycle in the greenhouse or calculating the water needs for the school garden. The smart value is seen in problem solving activities when students are asked to find solutions to environmental problems, such as rearranging land irrigation systems or designing waste reduction posters. This approach develops critical thinking skills and sustainability-based decision-making skills.

Co-curricular activities through proficiency classes expand students' experience in applying ESD principles through hands-on practice. Students participated in food processing production projects, making handicrafts made from natural materials, and compounding herbal nutrients from school gardens. The person in charge of the program explains, "We always encourage them to look for new ideas from existing materials. The environment provides everything." This activity instills the value of *singers*, namely creativity, innovation, and adaptability. Students are invited to use residual materials as value-added products so that they understand the concept of circular economy concretely. In addition to practicing life skills, this activity strengthens students' relationship with the environment, as well as building sustainability-oriented entrepreneurial skills.

The implementation of extracurriculars at SDN Ekologi Kahuripan Padjajaran functions as a space to strengthen ecological character through real activities. Activities such as Scouting, *pencak silat*, educational eco-tourism, and *talun pambibitan* instill the values of *bener* (discipline), *bageur* (care), and *cageur* (physical and emotional health). The Scout coach explained, "Discipline is not a theory. They learn discipline from caring for the garden and keeping it clean." Regular activities such as gardening, cultivating the land, and cleaning school areas encourage students to understand that discipline and care are not just moral behaviors, but the foundation of environmental sustainability. Thus, extracurricular activities become a vehicle for internalizing the values of Panca Waluya through direct interaction between students and the environment.

School culture strengthens this through the implementation of Sundanese philosophy: *silih asah* (mutual learning), *silih asih* (loving each other), and *silih asuh* (guiding each other). Observations show students helping each other take care of plants, sharing cleaning tasks, and working together in the classroom garden. One teacher said, "Here, taking care of the environment is a joint effort, not a command." Collaboration between students builds collective concern and shared responsibility for the environment. In addition, the involvement of parents and school committees through joint harvesting activities, seed donations, and land maintenance extends the impact of continuing education to the home. One parent admits: "My son often reminds me about saving water. Schools are very influential." This collaboration proves that ESD in schools runs in an ecosystem manner, involving the entire community.

Although the implementation of ESD based on Pancasila values and the *tribakti* philosophy is going strong, the research found a number of challenges that need to be overcome in order to maintain the sustainability of the program. Natural and climatic challenges arise in the form of extreme weather changes that have an impact on the success of crop cultivation, the availability of water for school garden irrigation, and the risk of crop failure in the long dry season. In addition, financial challenges are also an obstacle because the development of ecological facilities, greenhouse maintenance, and the provision of seedlings require a lot of money, while school budget support is very limited. Teachers and program managers mentioned that some activities must be carried out in a cooperative manner to reduce the cost burden. To overcome this, the school actively establishes partnerships with the community, parents, local governments, and private institutions through seed

donations, technical training, and environmental CSR programs. This external support is a key solution in maintaining the continuity of the program while expanding the collaborative network, so that continuing education is not only the responsibility of the school, but also a joint movement between institutions, families, and communities. Thus, climate, financial, and managerial challenges can be minimized through collaborative strategies and community-based adaptations.

### 3.1.3 Output

The results of the documentation show that the Dharma Atikan Program produces real outputs in the form of various ecological products created directly by students. These products include healthy processed food based on school plants, environmentally friendly handicrafts from recycled materials, organic fertilizers, plant seeds, to planting portfolios that document the learning process of students from the stage of tillage, planting, maintenance, to harvesting. All of these works are exhibited at the Dharma Atikan Gallery as tangible evidence of the internalization of the values of singer (creative and innovative) and smart (ecological intelligent). In addition, the cleanliness of the school environment and the comfort of the classroom emerged as important outputs. Field observations showed an orderly school environment, minimal waste, with small gardens that were cared for directly by students. The classroom looks clean, neat, and has a corner of plants that are taken care of in turn by the students. This shows that ESD practices not only produce physical products, but also create a healthy and ecological learning environment through changes in student behavior.

Furthermore, the results of data triangulation through questionnaires, interviews, and observations showed a significant increase in students' ecological literacy. Students are able to explain concepts such as sustainability, recycling, water conservation, and healthy food in simple language while putting them into practice. One teacher confirmed, "Children can explain recycling while practicing it." Smart value (problem solving) is reflected in students' ability to provide simple solutions to environmental problems, such as making small water channels to prevent inundation or using leftover leaves as compost. The true value is seen in the consistency of behavior such as throwing garbage in its place, maintaining the cleanliness of the classroom, and caring for plants without being asked. Thus, program outputs include increasing cognitive capacity, ecological proficiency, cleanliness of the school environment, and comfortable classrooms, all of which are indicators of the success of ESD based on Sundanese local wisdom.

### 3.1.4 Outcome

The findings of the study show that the internalization of Panca Waluya's character values is really reflected in the daily behavior of students. Interviews with some students show a deep awareness that caring for the environment is part of good character. One student said, "If the plants are not watered, we are not good. We need to be proactive in taking care of the environment." The value of cageur can be seen from the healthy lifestyle of students and their connection to natural activities, such as gardening and caring for animals. The value of bageur is reflected in the ability to work together, help each other take care of the garden, and show empathy for friends and the environment. The true value appears in the discipline of maintaining cleanliness, consistency in watering plants, and maintaining school facilities. Meanwhile, smart grades are seen in students' problem-solving abilities – for example, when they are looking for solutions for simple irrigation or processing organic waste into compost. Finally, the value of singers can be seen from the creativity of students making environmentally friendly products, natural crafts, and small innovations in co-curricular projects. All these values show that ecological character grows in an integrated manner through ESD activities.

The results of the observation show that environmental care behavior is no longer instructive, but has become a spontaneous culture that emerges from the consciousness of students. They sort waste unsolicited, clean classroom areas voluntarily, water plants when they see the soil starting to dry out, and remind friends to conserve water and protect the environment. Parents also feel the impact at home, where children begin to bring these positive habits into family life. The school superintendent

asserted, "ESD here is not only changing the way they learn, but the way they live." This shows the success of integrating Sundanese values of "silih ahon, silih asih, silih asuh" with the ESD framework in forming a stable environmental concern. These three philosophies make students guide each other, care for each other, and take responsibility for each other's environment. These findings show that the ecological character formed is sustainable, deep-rooted, and has the potential to be taken by students to the next level of education.

The following is a summary table (Local wisdom value, school practices, evidence of student behavior) based on the findings of Input–Process–Output–Outcome:

**Table 1.** Summary of Research Findings

No	Local wisdom value	School practices (implementation examples)	Evidence of student behavior
1	<i>Cageur</i> (physically–mentally healthy; close to nature)	Gardening in the greenhouse/ <i>talun</i> , food security practices, outdoor learning as a living laboratory	Students actively garden and care for plants; they appear more connected to nature; students water plants when they notice the soil is dry
2	<i>Bageur</i> (empathy, pro-social care, compassion)	School culture and collaborative activities for garden care and cleanliness; Scouting/eco-activities	Students help one another maintain the garden and cleanliness; awareness emerges that “not watering plants means not being <i>bageur</i> ”
3	<i>Bener</i> (discipline, honesty, responsibility)	Daily routines: cleaning duty roster, ecological behavior SOPs; discipline strengthened through Scouting and maintenance of ecological facilities	Students dispose of waste properly, keep classrooms/school clean, care for plants without being told, and perform duties consistently
4	<i>Pinter</i> (ecological intelligence; problem solver)	ESD integrated into core lessons (Science/Thematic/Civics): recycling, water conservation, local ecosystems; solution tasks (simple irrigation, waste-reduction posters)	Students explain sustainability/recycling/conservation concepts while practicing them; they propose simple solutions (e.g., small drainage channels, composting from leaf litter)
5	<i>Singer</i> (creative, innovative, adaptive)	Skills classes/projects: healthy food processing, eco-friendly crafts, organic fertilizer; using leftovers (circular economy mindset)	Students produce ecological products (organic fertilizer, recycled crafts, healthy food products, seedlings, planting portfolios) and generate new ideas from available materials
6	<i>Silih asah</i> (learning from each other)	Peer teaching on plant care/ecological activities; collaborative learning in class gardens	Students share knowledge and guide peers in plant care and environmental practices independently
7	<i>Silih asih</i> (caring/helping one another)	Working together to maintain cleanliness; mutual cooperation during harvest/class garden activities; peer support during practice	Students help peers, work together to complete environmental tasks, and show collective responsibility for cleanliness
8	<i>Silih asuh</i> (mentoring/guiding one another)	Guiding peers who struggle during ecological practice; culture that “caring for the environment is shared responsibility, not an order”	Students mentor peers, remind others to act environmentally, and correct friends who litter
9	<i>Tribakti</i> (devotion to self–nature–others)	Integrating <i>tribakti</i> across curricular–co-curricular–extra-curricular activities; parent/community/partner involvement (joint harvests, seed donations, land maintenance)	Environmental care carries over to home (children remind parents to save water); community participation strengthens students’ consistency in pro-environmental behavior

### 3.2 Discussion

The implementation of Education for Sustainable Development (ESD) in fostering the character of caring for the environment is basically the most effective, starting from the grassroots level through the internalization of local wisdom values (Firmansyah & Wibowo, 2022). Cultural values such as Panca Waluya (*cageur, bageur, bener, smart, and singer*) accompanied by the implementation of *mutual honing, mutual love, mutual nurture* function as a moral and social foundation that forms ecological awareness from an early age. When local wisdom is integrated into learning practices, daily habituation, and school culture, students not only understand the concept of sustainability, but also live and practice it in real action. With this approach, ESD becomes more contextual, grounded, and able to give birth to consistent and sustainable environmental care behaviors.

The success of ESD implementation is greatly influenced by the quality of *the inner capacities* of school residents, in line with the Inner Development Goals (IDGs) framework (Keshishi, 2025). In this perspective, sustainability is not only supported by means, curricula, or programs, but also by inner capacities such as self-awareness, empathy, responsibility, and willingness to act. When teachers and students have ecological sensitivity and the ability to reflect on the impacts of everyday behavior, ESD practices become more consistent and meaningful. IDGs also emphasizes relating and acting, so that collaborative culture, exemplary leadership, and habits of caring for the environment can grow as stable social norms in schools. The learning environment designed as a living laboratory ranging from greenhouses, farmhouse talun, ecological laboratories, to Pawon Corner (kitchen for cooking crops) encourages the development of the domain of Being and Relating (Sprow, 2025), such as self-awareness, closeness to nature, empathy, and a sense of responsibility. These findings confirm that education for sustainability depends not only on the availability of physical means, but also on the building of inner capacity that grows through direct and meaningful interaction with the environment (Ikeda & Goossens-Ishii, 2024).

The integration of ESD programs in long-term, medium-term, and school budget plans shows that their implementation is not ad hoc, but is systemically embedded in school governance. This is in line with the *Whole-School Approach to Sustainability*, which emphasizes that ecological behavior change can only occur if policies, leadership, curriculum, school culture, and community participation move in harmony. This approach demands the integration of sustainability in learning, school operations, and stakeholder engagement on an ongoing basis (Rumjaun & Atchia, 2024). Thus, SDN Ekologi Kahuripan has managed to get out of the symbolic ESD pattern towards an institution that structurally supports sustainability literacy.

The application of Sundanese local wisdom through the values of Panca Waluya and the philosophy of *mutual honing, mutual compassion, mutual nurturing* are key findings that show the strategic role of *local indigenous knowledge* in strengthening ESD (Rumjaun & Atchia, 2024). This integration of values transforms the orientation of ESD from a mere global concept to a glocal practice that is relevant to the cultural identity of the students. This approach is in line with UNESCO's recommendations that place local culture as the foundation of the transition to continuing education. From a learning theory perspective, ESD practices in schools are consistent with experiential learning (Sibeko, Ezeji, Uleanya, & Adigun, 2025), ecopedagogy (Dickmann & Consorte-McCrea, 2025), and place-based learning (Rønning, Cohen, & Adams, 2018), where students learn from the environment through exploration, observation, and reflection as a form of learning by doing (Martinuzzi, Spörk, & Martinuzzi, 2023).

In intracurricular activities, the integration of ESD themes in science, thematic, and PPKn fosters the Thinking domains (IDGs), especially *critical thinking and sense-making* (Rodríguez-Loinaz, Ametzaga-Arregi, & Palacios-Agundez, 2024). When students are asked to analyze water use, create simple irrigation solutions, or calculate waste degradation, they not only master ecological knowledge, but also build agency to act. The school's concrete context helps them understand global issues through local experiences. Co-curricular through proficiency classes strengthens *civic action and creative*

*competence*, two critical aspects within the framework of ESD (Mróz & Ocekiewicz, 2021). Activities such as making organic fertilizers, processed healthy foods, and recycled crafts stimulate creativity (singer value) and problem-solving skills (smart value). This process is a form of real implementation of the circular economy mindset which is usually difficult for elementary children to understand if not through direct practice.

Extracurriculars such as Scouting, educational eco-tourism, and pencak silat become spaces for internalizing the values of *cageur*, *bageur*, and *bener*, which are related to the domain of Caring and Collaborating in IDGs (Robles, 2025). Through natural activities and group cooperation, discipline, empathy, and concern are built not as normative concepts, but as living social norms. Thus, the development of ecological character arises naturally, not through an instructive approach. Furthermore, a school culture that emphasizes each other, mutual love, and nurturing is conceptually in line with transformative learning theory (Khabanyane, Maimane, & Ramabenyane, 2014). Collective interaction between students creates a *disorienting dilemma* that encourages critical reflection, for example when they see a friend littering or classroom plants being left untreated. This process of transforming students' ecological identities is proof that continuous learning requires a community of practitioners, not just classrooms.

The involvement of parents and school committees extends the implementation of ESD into the realm of community-based learning, which is the key to the sustainability of environmental education. CBL is a learning model that challenges learners to identify authentic issues, formulate essential questions, develop research-based solutions, and take concrete action to address these challenges (Andrade, Workman, & Westover, 2022). Changes in student behavior that are carried home show a *spillover effect* (Kotíková, 2023; Li, Wang, Du, & Dong, 2019), that sustainability values have become part of identity and not just a response to school instruction.

Outputs in the form of ecological products such as organic fertilizers, planting portfolios, recycled handicrafts, and processed foods show that the implementation of ESD in schools produces *tangible learning artifacts* that reflect the success of the Acting domain within the framework of *Inner Development Goals* (IDGs). In addition to physical products, changes in the school environment to be cleaner, greener, and more organized reflect the ecological behavior of students that are increasingly consistent. Comfortable classrooms, minimal waste, and the presence of a corner of plants that are taken care of in turn by students show the internalization of the value of sustainability in their daily lives. The literature confirms that a clean school environment is an important proxy variable for the success of ecological culture and continuing education.

The most significant outcome is the formation of *ecological habitus*, which is an ecological disposition that arises spontaneously and stably (Kirby, 2017). The findings show that ecological behavior no longer depends on teacher instruction, but is emerging as a natural habit: students water plants unasked, reprimand friends who litter, maintain classroom cleanliness, and conserve water in daily activities. This pattern indicates that ESD has moved beyond the cognitive realm to the affective and conative realms, where knowledge develops into value, and value is realized into a consistent action that reflects true ecological character.

Critically, the success of ESD integration based on Sundanese local wisdom shows that the most effective sustainable education model is one that combines *inner transformation, ecopedagogy, and local wisdom*. This approach can serve as a model for other schools in Indonesia because it is able to address two global ESD challenges: the gap between knowledge and behavior, and the failure of ESD narratives that are too abstract. By being rooted in local culture, ESD at SDN Ekologi Kahuripan becomes relevant, grounded, and sustainable.

#### 4. CONCLUSION

The implementation of Education for Sustainable Development (ESD) based on Sundanese local wisdom at SDN Ekologi Kahuripan Padjajaran shows that sustainable education can effectively shape students' environmental concerns when supported by a complete school ecosystem. The main findings

show that what works well is a combination of inputs (living laboratories such as greenhouses, pamnurse talun, ecological laboratories, Pawon Corners; as well as policy support in RKJM-RKT-RKAS and Panca Waluya-based curriculum), processes (integration of ESD in intracurricular, cocurricular, extracurricular, and school culture), as well as strengthening the values of mutual honing – mutual love – mutual care and *tribakti*. Key mechanisms that explain the success of the program are daily practice-based learning, collaboration between students, role models and school governance, and parent/community involvement that extends impact to the home. The outcomes that can be seen are an increase in ecological literacy, the birth of students' ecological products, a cleaner and greener school environment, and the formation of spontaneous ecological behaviors (sorting garbage, watering plants without being asked, reminding friends to save water) that reflect the character of cageur, bageur, bener, smart, singer. The implications: (1) Policies need to encourage green funding and partnership/CSR schemes so that ecological facilities and programs do not depend on the school's regular budget. (2) Teacher development needs to be focused on contextual ESD pedagogy (ecopedagogy, experiential learning) and the ability to design ecological behavior/character assessments. (3) School governance needs to ensure that ESD is "entered the system" through planning, SOPs, and periodic monitoring-evaluations so that consistency across years is maintained. The limitations of this study include a single-case design so that generalizations are limited, the peculiarities of the ecological school context that may not be fully equivalent to other schools, the potential for observer bias in participant observations, and the absence of longitudinal behavioral tracking to see the durability of behavior change in the long term. Further research is recommended to conduct multi-case comparative studies (ecological schools vs regular schools), longitudinal tracking of students' ecological behavior (in schools and homes), as well as mixed-method approaches to measure environmental awareness (e.g. attitude scales, behavior logs, and hygiene/garbage footprint indicators) so that the mechanisms and impacts of ESD based on local wisdom can be tested more robustly and broadly.

**Acknowledgments:** The author expresses his deep gratitude to the Rector, Chairman, and Team of the Institute for Research and Community Service (LPPM) Universitas Singaperbangsa Karawang for the opportunity provided through the Community Service Competitive Grant program. The support provided is a very important basis in the implementation of this activity. Thank you are also conveyed to all parties who have provided assistance, cooperation, and commitment during the implementation process. The cooperation that is established not only ensures the smooth running of the program, but also has a significant positive impact on educators, students, and partner institutions. Hopefully this contribution can continue and provide long-term benefits for the development of science and technology.

**Conflicts of Interest:** This study confirms that there are no conflicts of interest related to the implementation and publication of the results of this study. All authors state that they have no financial, professional, or other relationships that could affect the objectivity and integrity of this research.

## REFERENCES

- Alexander, S. M., Beck, G. L., Michele, D., Kelly, B., Smith, L., Howard, N., & Shenvi, C. L. (2022). What Makes a Near - Peer Learning and Tutoring Program Effective in Undergraduate Medical Education: a Qualitative Analysis. *Medical Science Educator*, 1495–1502. <https://doi.org/10.1007/s40670-022-01680-0>
- Ali, M. I., Abduh, A., Mahmud, R., & Dunakhir, S. (2023). Raising Students' Awareness on Environmental Education Issues. *Indonesian Journal of Educational Research and Review*, 6(1), 1–8. <https://doi.org/10.23887/ijerr.v6i1.59146>
- Andrade, M. S., Workman, L., & Westover, J. H. (2022). Current practices for community-based learning in schools of business. *International Journal of Management Education*, 20(1). <https://doi.org/10.1016/j.ijme.2021.100597>
- Benaziria, B., & Murdiono, M. (2019). Civic teacher strategy in the integration of nationalism and tolerance character in school based on pesantren in Yogyakarta city. *Journal of Social Studies (JSS)*, 15(1), 13–34. <https://doi.org/10.21831/jss.v15i1.25227>
- Chan, C. L., Tan, P. Y., & Gong, Y. Y. (2022). Evaluating the Impacts of School Garden-Based

- Programmes on Diet and Nutrition-Related Knowledge, Attitudes and Practices Among the School Children: A Systematic Review. *BMC Public Health*, 22(1). <https://doi.org/10.1186/s12889-022-13587-x>
- Coudeyre, E., Richard, E., Eschaliere, B., & Dupeyron, A. (2013). Qualitative study of barriers to physical activity in population of low back pain patients. *Annals of Physical and Rehabilitation Medicine*, 56, e311. <https://doi.org/10.1016/j.rehab.2013.07.825>
- Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches*. Singapore, London, New aDekhi, Los Angeles, Washington DC: SAGE.
- Creswell, J. W., & Guetterman, T. C. (2019). *RESEARCH EDUCATIONAL PLANNING, CONDUCTING, AND EVALUATING QUANTITATIVE AND QUALITATIVE RESEARCH*. New York: Pearson.
- Dickmann, I., & Consorte-McCrea, A. (2025). The Role of Ecopedagogy in the Development of Sustainability Responsible Students. In *World Sustainability Series: Vol. Part F128* (pp. 379–398). [https://doi.org/10.1007/978-3-031-80380-2\\_18](https://doi.org/10.1007/978-3-031-80380-2_18)
- Firmansyah, M. S., & Wibowo, A. (2022). Konsep Ecopedagogy Dalam Pelestarian Kearifan Lokal Di Min 10 Blitar. *Muallimuna Jurnal Madrasah Ibtidaiyah*, 8(1), 96. <https://doi.org/10.31602/muallimuna.v8i1.7943>
- Grissom, J. A., & Loeb, S. (2015). Triangulating principal effectiveness: How perspectives of parents, teachers, and assistant principals identify the central importance of managerial skills. In *American Educational Research Journal* (Vol. 48). <https://doi.org/10.3102/0002831211402663>
- Gunansyah, G., Zuhdi, U., Suprayitno, S., & Aisy, M. R. (2021). Sustainable Development Education Practices in Elementary Schools. *Journal of Education and Learning (Edulearn)*, 15(2), 178–187. <https://doi.org/10.11591/edulearn.v15i2.17091>
- Ikeda, A., & Goossens-Ishii, A. (2024). A Value-Creating Approach to Education for Sustainable Development: Inner Transformation. In *Value-Creating Education: Teachers' Perceptions and Practice* (pp. 31–48). <https://doi.org/10.4324/9781003307037-6>
- Irham, I., Fachrista, I. A., Masyhuri, M., & Suryantini, A. (2022). Climate Change Adaptation Strategies by Indonesian Vegetable Farmers: Comparative Study of Organic and Conventional Farmers. *The Scientific World Journal*, 2022, 1–13. <https://doi.org/10.1155/2022/3590769>
- Karacaoğlu, Ö. C. (2024). *Environmental Awareness of Students in a Elementary school With Zero Waste Policy*. 2(6), 3–28. [https://doi.org/10.59324/ejceel.2024.2\(6\).01](https://doi.org/10.59324/ejceel.2024.2(6).01)
- Keshishi, N. (2025). Unlocking a new generation of leaders: How universities can support students' inner development goals. In *Stories of Hope: Reimagining Education* (pp. 399–414). <https://doi.org/10.11647/obp.0462.33>
- Khabanyane, K. E., Maimane, J. R., & Ramabenyane, M. J. (2014). A critical reflection on transformative learning as experienced by student-teachers during school-based learning. *Mediterranean Journal of Social Sciences*, 5(27), 452–459. <https://doi.org/10.5901/mjss.2014.v5n27p452>
- Kirby, J. (2017). Fleshing out an ecological habitus: Field and capitals of radical environmental movements. *Nature and Culture*, 12(2), 89–114. <https://doi.org/10.3167/nc.2017.120201>
- Kotíková, S. (2023). Spillover effects: A challenging public interest to measure. *National Accounting Review*, 5(4), 373–404. <https://doi.org/10.3934/NAR.2023022>
- Li, C., Wang, W., Du, S., & Dong, M. (2019). Spillover effect of cross-regional direct investment in resource industries in China. *Resources Science*, 41(4), 613–626. <https://doi.org/10.18402/resci.2019.04.01>
- Lopes, A. C. C. G., & Albuquerque, A. A. de. (2023). Climate Financing: Institutional Effectiveness of the National Fund on Climate Change. *Revista De Administração Pública*, 57(3). <https://doi.org/10.1590/0034-761220220318x>
- Martinuzzi, A., Spörk, A., & Martinuzzi, S. (2023). Experiential learning about sustainable development and the SDGs: Features, challenges, and experiences of a modular course in business education. In *Higher Education for the Sustainable Development Goals: Bridging the Global North and South* (pp. 165–180). <https://doi.org/10.1108/978-1-80382-525-020231009>

- Matshikiza, S., & Luggya, S. K. (2019). Implementation of Multicultural Education in South Africa. *ICERI2019 Proceedings*, 1(3), 7207–7212. <https://doi.org/10.21125/iceri.2019.1712>
- Mavuso, M. P., Khalo, X., Kafu-Qavane, B. P., & Olawumi, K. B. (2022). Climate Change Education as a Means to Protect the Planet: A Review of the Relevant Literature. *E-Bangi Journal of Social Science and Humanities*, 19(3). <https://doi.org/10.17576/ebangi.2022.1903.10>
- Mróz, A., & Ocetkiewicz, I. (2021). Creativity for sustainability: How do polish teachers develop students' creativity competence? analysis of research results. *Sustainability (Switzerland)*, 13(2), 1–22. <https://doi.org/10.3390/su13020571>
- Nada, H. N., Fajarningsih, R. U., & Astirin, O. P. (2021). Environmental Education to Build School Members' Character. *Jpbi (Jurnal Pendidikan Biologi Indonesia)*, 7(1), 43–52. <https://doi.org/10.22219/jpbi.v7i1.14283>
- Orbanić, N. D., & Kovač, N. (2021). Environmental Awareness, Attitudes, and Behaviour of Preservice Preschool and Elementary school Teachers. *Journal of Baltic Science Education*, 20(3), 373–388. <https://doi.org/10.33225/jbse/21.20.373>
- Perbawasari, S., Dida, S., Nugraha, A., & Adi, A. (2020). *Communication of Character Education through Special Purwakarta 7 Days of Education (7 Poe Atikan) (Qualitative Descriptive Study on Character Education in Purwakarta Regency)*. <https://doi.org/10.4108/eai.5-11-2019.2292522>
- Robles, S. (2025). Toward sustainable futures: Enhancing inclusive transdisciplinary skills and inner development goals in sustainable entrepreneurship education. *Journal of the International Council for Small Business*, 6(3), 539–551. <https://doi.org/10.1080/26437015.2024.2412827>
- Rodríguez-Loinaz, G., Ametzaga-Arregi, I., & Palacios-Agundez, I. (2024). ICT tools and citizen science: a pathway to promote science learning and Education for Sustainable Development in schools. *Journal of Biological Education*, 58(3), 609–625. <https://doi.org/10.1080/00219266.2022.2092192>
- Rønning, W., Cohen, B. J., & Adams, J. W. (2018). Education as a community project: Understanding place-based learning. In *Global Perspectives on Education Research* (pp. 103–124). <https://doi.org/10.4324/9781351128421>
- Rumjaun, A., & Atchia, S. M. C. (2024). Whole-School Project-Based Approach to Promote Education for Sustainability: A Mauritian Experience. In *Sustainable Development Goals Series: Vol. Part F3104* (pp. 291–301). [https://doi.org/10.1007/978-3-031-56172-6\\_21](https://doi.org/10.1007/978-3-031-56172-6_21)
- Rusyadi, A., Syamsudin, A., Wasliman, I., & Anwar, M. (2019). Training Management in Improving Teacher Performance. *International Journal of Nusantara Islam*, 7(2), 353–365. <https://doi.org/10.15575/ijni.v7i2.12586>
- Salonen, A. O., & Sterling, S. (2023). Education as a Way toward a Sustainable Future There is a growing pessimism about the future . Human-induced climate. *Wiley*, 73(4), 615–637. <https://doi.org/10.1111/edth.12588>
- Sibeko, N., Ezeji, I. N., Uleanya, C., & Adigun, M. (2025). Reflections on Leading and Managing Computer Science Final Year Projects in a South African Rural University Using Gibb's Framework. *Communications in Computer and Information Science*, 2397 CCIS, 67–82. [https://doi.org/10.1007/978-3-031-82478-4\\_5](https://doi.org/10.1007/978-3-031-82478-4_5)
- Sitika, A. J., Kejora, M. T. B., & Syahid, A. (2021). Strengthening humanistic based character education through local values and Islamic education values in basic education units in purwakarta regency. *İlköğretim Online*, 20(2), 22–32. <https://doi.org/10.17051/ilkonline.2021.02.06>
- Sprow, A. H. (2025). Higher Education Institutions' Role in Developing Future Leaders for Sustainability: Incorporating the Inner Development Goals. *International Journal of Sustainability in Economic, Social, and Cultural Context*, 20(1), 117–132. <https://doi.org/10.18848/2325-1115/CGP/v20i01/117-132>
- Sun, Z., & Li, J. (2020). The effects of performance of public sector health system on quality of life in China: Evidence from the CGSS2015. *International Journal of Environmental Research and Public Health*, 17(8). <https://doi.org/10.3390/ijerph17082896>
- Tanjung, S. (2022). an Analysis of Teacher Pedagogical Competence in Teaching English for Senior High

School Learners. *Vision*, 18(1), 75. <https://doi.org/10.30829/vis.v18i1.1394>

Wang, J. C., Hsieh, C. Y., & Kung, S. H. (2022). The impact of smartphone use on learning effectiveness: A case study of elementary school students. In *Education and Information Technologies*. Springer US. <https://doi.org/10.1007/s10639-022-11430-9>

Widodo, W. (2024). Strong Madrasah Education Management Strategy To Improve The Quality of Education In MTsn 2 Malang City. *Asian Journal of Social and Humanities*, 2, 1013–1020.