Edukasiana: Jurnal Inovasi Pendidikan
ISSN 2809-6770
Volume 4, Issue 1, 2025, pp. 50-59
DOI: https://doi.org/10.56916/ejip.v4i1.971

Exploring Kindergarten Learners' Environmental Consciousness through Drawings: Towards Instructional Materials Development

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Article History:
Received 2024-09-28
Accepted 2024-12-11

Keywords:
Education for sustainable development
Early childhood environmental education
Draw-and-tell technique
Green instructional resources

ABSTRACT

Global environmental crises pose significant challenges to achieving sustainable development, making it imperative to integrate environmental awareness into education at all levels. Early childhood, particularly the kindergarten stage, is a crucial period for cultivating environmental consciousness and instilling lifelong sustainable values. Despite its importance, research on early childhood environmental education (ECEE) in the Philippines remains limited, leaving a gap in understanding how young learners perceive and engage with their environment. This study sought to address this gap by exploring the environmental consciousness of 39 kindergarten pupils at a laboratory school in Central Luzon, Philippines. Using the draw-and-tell technique, combined with semiotic analysis, it examined both the visual and verbal expressions of these young learners. Pupils' drawings featured natural elements (flowers, trees, clouds, and the sun), representations of biodiversity (birds and animals), and the built environment (houses). Imaginative features, such as balloons and rainbows, showcased their creative interpretations of the environment. Oral narratives complemented the drawings, offering deeper insights into their perspectives on environmental issues. The findings underscore the potential of ECEE to nurture environmentally responsible behavior from an early age and inform the creation of green instructional resources, including storybooks designed specifically for kindergarten learners.

1. INTRODUCTION

With barely six years remaining until the United Nations (UN) 2030 deadline for achieving the 17 Sustainable Development Goals (SDGs), the world faces significant challenges in meeting these ambitious targets. A recent report from the UN Secretary-General, shared by the International Institute for Sustainable Development (IISD, 2023), reveals that only approximately 12% of the 140 targets with available data are on track and achievable by 2030.

Among the SDGs, *SDG 4: Quality Education* is seen as the key driver of progress for all other goals. By investing in quality education, learners develop an understanding of the SDGs and are empowered to critically assess problems in their contexts, actively contributing to solutions. For SDG 4 to be realized, educational systems must adopt participative, experiential-learning pedagogies that address the cognitive, socio-emotional, and behavioral dimensions of learning (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2020).

Environmental concerns remain one of the foremost issues globally. While some nations, notably major contributors to global emissions, have committed to reducing carbon footprints by 45% by 2030, the 2024 Global Risks Report (World Economic Forum [WEF], 2024) highlights environmental risks—such as extreme weather, climate action failure, and biodiversity loss—still topping the global risk landscape. Failing to address these issues will disproportionately impact vulnerable communities, exacerbating economic and social inequities. Environmental education (EE) plays a crucial role in addressing these challenges, helping individuals develop critical thinking, communication, problem-solving skills, and resilience to environmental risks (Fletcher, 2023; United States Environmental Protection Agency [EPA], 2023; United Nations Environmental Programme [UNEP], 2024).

The growing interest in environmental education research (Yadav et al., 2022), reflects the increasing need to explore effective methods for raising environmental awareness. However, debates persist about the scope, purpose, and outcomes of EE, driven by methodological differences and inconsistent findings. While many studies report moderate to high levels of environmental awareness, others suggest significant gaps in knowledge among various demographic groups (Uddin, 2023). Scholars advocate for reframing EE to better align with the urgent need for sustainability by teaching environmental concepts, skills, and values using Education for Sustainable Development (ESD) as a guiding framework (McPhee, 2023; Suárez, 2023; Yadav et al., 2022).

Although the Philippines is rich in natural resources, it faces severe environmental issues, many of which are driven by human activity. Its Environmental Performance Index (EPI) rankings have steadily declined: 82nd in 2016, 111th in 2018, and 158th in 2022 (Wolf et al., 2022; Wendling et al., 2016, 2018). To address these challenges, the Philippine government has implemented the National Environmental Education Action Plan (NEEAP) 2018–2040, which outlines strategies for achieving SDGs through environmental education. The plan includes the development of curricula for environmental education at elementary, secondary, and tertiary levels. However, it notably lacks provisions for early childhood education, particularly at the kindergarten level, which is crucial for nurturing eco-consciousness from an early age.

Young children are particularly vulnerable to environmental threats such as climate change. Dost (2021) argues that these challenges undermine children's rights as defined in the United Nations Convention on the Rights of Children (UNCRC). Despite this, research on Early Childhood Environmental Education (ECEE) remains limited both globally and locally, especially compared to studies targeting higher education levels. Tolentino (2019) points to the challenges of conducting research with very young children, specifically regarding data validity and reliability. Yet, young children possess the right and capacity to actively engage with and solve environmental problems (Silo et al., 2024; Tsevrini & Christidou, 2022). Moreover, early childhood is a critical period for shaping attitudes and behaviors, making it an ideal stage to promote pro-environmental values (Lamanauskas, 2023).

The goal of environmental education, including at the early childhood level, is to cultivate an awareness of environmental issues and to encourage eco-friendly behaviors. This is achieved by shaping an ecocentric perspective that enables young learners to recognize the interconnectedness of ecosystems and the importance of protecting the environment (Ignatova, 2023; Kim & Lee, 2023). While ECEE is often associated with nature-based education, Barrable (2019) suggests that its focus should extend beyond nature to actively encourage environmental protection through sustainable development principles.

Republic Act (RA) 10157, or the "Kindergarten Education Act," acknowledges that early childhood is a period of maximum cognitive development. A review of the Department of Education's (DepEd) Kindergarten Curriculum Guide reveals that the developmental domains include familiarity with the natural environment, both living and non-living elements (Department of Education [DepEd], 2016). This

demonstrates the Philippines' intent to equip young learners with a basic understanding of environmental protection—a critical foundation for cultivating pro-environment behavior.

To ensure the effectiveness of ECEE, research and development are vital to keep educational practices aligned with both current needs and future sustainability goals. International studies report that young children can develop environmental consciousness and an understanding of the complex relationships within ecosystems, leading to eco-friendly behaviors (Melis et al., 2023; King, 2022; Melis et al., 2020). In the Philippines, kindergarten learners show potential to perceive and act from an ecocentric perspective, indicating their capacity for environmental protection (Tolentino, 2023). However, the limited focus on ECEE in the local context emphasizes the urgent need for greater attention to how young children learn about the environment and the role they can play in preserving it.

This study explores the concepts of the environment among kindergarten learners, aiming to inform the development of instructional materials that will enhance environmental awareness and encourage pro-environmental behavior. Specifically, the study seeks to:

1. Describe the environmental concepts held by kindergarten learners; and
2. Provide inputs for the development of green instructional resources based on the findings.

2. METHODS

This qualitative research utilizes the scanning model under the umbrella of descriptive research. The study participants were five- to six-year-old children (24 males, 15 females) enrolled in the kindergarten program at the host institution's laboratory school. Informed consent was sought from the parents or legal guardians of 39 participants who were willing to take part.

Data were gathered using the draw-and-tell method, a widely recognized tool for eliciting ideas from young children (Günindi, 2012). Following ethical guidelines, the data collection process was designed to be developmentally appropriate and considerate of the children's well-being. The protocol for the draw-and-tell method was reviewed and validated by experts in child psychology and early childhood education.

To analyze the drawings and verbal explanations, semiotic analysis was applied due to its ability to uncover the meanings children assign to environmental concepts through their representations (Türckan, 2013). Drawing on Charles Sanders Peirce's General Theory of Signs, the analysis categorized the elements in the children's drawings into Peirce's symbol-icon-index triad (see Table 1). Each drawing was analyzed for its iconic qualities (e.g., literal representations like trees or sun), indexical qualities (e.g., raindrops or weather patterns), and symbolic qualities (e.g., abstract representations like a smiling sun).

Table 1. The Symbol-Icon-Index Triad of Peirce's General Theory of Signs

Classification	Description	Example
Icon	Possesses the quality signified; related to the object it denotes	A drawing of a tree with green leaves and a brown trunk physically resembles a tree and, therefore represents the concept of a tree in the environment.
Index	In real reaction with the object denoted, exists in virtue of a real, existential connection with its object.	A drawing of raindrops falling from clouds indicates the presence of rain, establishing an indexical sign related to weather.
Symbol	Determines the interpretant sign	A drawing of a sun with a smiling face and rays extending outward symbolically represents the concept of a sunny day and positive feelings associated with good weather (note that symbols have convention-based relationships with their objects)

Sources: Thornbury, C. (2011). Peirce's General Theory of Signs. In *Finding Meaning, Cultures Across Borders: International Dialogue between Philosophy and Psychology*; Huening, D. (n.d.). *symbol-index-icon*. The University of Chicago.

The authors collaboratively analyzed the data to ensure reliability. A panel of five researchers independently examined the drawings, identifying elements and cross-referencing these with transcripts of each child's oral presentation. Any elements that were particularly challenging to identify were discussed collectively, with the final decision requiring agreement from at least three out of five researchers. This iterative process ensured consistency and minimized subjectivity.

The verbal descriptions were transcribed and categorized by themes corresponding to environmental concepts. This coding process was further validated through intercoder reliability measures, where a subset of the data was independently coded and compared. Additionally, member checking was conducted by inviting the children's parents to review the interpretations of their child's drawings, which enhanced confirmability and reduced researcher bias (Shenton, 2004; Kalu & Bwalya, 2017).

3. RESULTS AND DISCUSSION

Description of Kindergarten Learners' Environmental Consciousness

The participants' drawings were analyzed in two phases. First, all the elements in the drawings were noted by directly observing them vis-à-vis the transcripts of each learner's oral presentation of the drawing. Second, using Peirce's Theory of Signs, semiotics was applied to classify the elements.

As a result of the semiotic analysis, it was found that participants could identify components of the environment as revealed in their illustrations. A total of 202 elements were identified. It could be noted that both biotic and abiotic components are well-represented in the elements the learners have included in their drawings. Though they may lack formal knowledge of this classification system, drawing these components in one picture may suggest the potential for these young learners to develop an awareness of the interaction of living things and non-living things in the context of the environment.

Figure 1. L26's illustration of the environment shows both biotic (e.g., trees, dogs) and abiotic components (house, church, clouds, truck)

Figure 2. L30's drawing shows different environments in one picture. Living things include cactus, fish, human, dog, tree, and horse while non-living things include sea, mountain, and helicopter.

It was noted that though some elements appear to be recurring across the outputs, no two outputs are precisely alike. Hence, kindergarten learners' portrayal of the environment differs from person to person. This could be explained by the varying exposures of these learners to the environment, especially outside of school. Bronfenbrenner's Ecological Systems Theory explains that the physical environmental factors to which a child is exposed form part of the micro-system and have corresponding effects on that child's development (Bagais & Pati, 2023).

The drawings produced by the participants open opportunities to understand how young children perceive and represent environmental concepts. In line with Peirce's triad discussed in the methodology section, icons represent objects directly. Hence, they reveal the participants' direct observations or experiences related to the environment. Indexes, which indicate direct relationships, could reflect how participants establish connections between elements of the environment and specific meanings or impacts. As for symbols that rely on agreed conventions, specific facets of the drawings may unveil cultural or learned associations and a deeper understanding of environmental concepts. Table 2 classifies the identified elements (already grouped based on two broad categories, i.e., biotic and abiotic components) into icons, indexes, and symbols.

Table 2. Result of the Semiotic Analysis of Elements in Participants' Drawings

Drawing Elements	Breakdown based on Peirce's Theory of Signs			Frequency	Percentage
	Icon	Index	Symbol		
Biotic Components					
Humans	16	4	7	27	13.37
Plants	41	1	0	42	20.79
Animals	22	1	0	23	11.39
Sub-total	79	6	7	92	45.55
Abiotic Components					
Natural	51	0	1	52	25.74
Man-made	56	2	0	58	28.71
Sub-total	107	2	1	110	54.45
Total	186	8	8	202	100.00

From the descriptive analysis, participants appeared to have identified more abiotic than biotic elements. The abiotic factors commonly included in the drawings were house and sun, which appeared in more than half of the total number of drawings. For the biotic side, the most recurrent elements were flowers and trees. This confirms the findings of Silo et al. (2024), who reported that kindergarten-aged children have acceptable knowledge about the Earth and generally can manifest awareness of their physical environment. It must be noted, however, that the fact that the participants included diverse biotic and abiotic elements in their drawings does not readily imply that they can classify the items they have drawn as such. A study by Podanyova et al. (2019) reported that their participants were more familiar with animals than plants and were confused about the classification of plants as living organisms. Hence, opportunities must be provided in the curriculum to enhance preschoolers' environmental knowledge in this particular aspect. Nonetheless, this apparent familiarity with the diversity of the components of the environment boosts their likelihood to participate in meaningful activities involving various entities in the environment (Green, 2022).

Semiotic analysis of the elements shows that 92% of all the items included in the drawings are iconized signs, which means they directly represent the objects they intend to represent. For instance, the

trees illustrated by the learners resemble our typical image of a tree and do not mean anything else. Hence, only a tiny percentage of the elements may be construed as indexed or symbolized.

As expected, most of the elements drawn by the learners fall under the icon classification. These illustrations reflect the learners' direct and literal representation of objects. Considering the stages of development, a child's kindergarten years are characterized by a concrete understanding of the environment, with the drawings serving as means to capture and present their immediate experiences and perceptions. This supports Turkcan's (2013) findings, which found that participants' drawings were mostly under the icon category, followed only by those with symbolic meaning.

Regardless of the educational level to which it is delivered, the long-term goals of environmental education remain the same. Environmental education only differs in terms of how it is delivered and who is involved. It is a characteristic of ECEE to bank on rich experiences with nature towards promoting holistic development among young children (Merrick, n.d.). Considering their level of development, it is normal for children to interpret natural phenomena differently from adults. Through enrichment and restructuring, conceptual change may occur, and children's understanding of these same phenomena may eventually become closer to what is factually and conceptually accepted by the scientific community (Govindaswamy, 2004).

As the absorptive capacity of the mind is finest during the early childhood years (Republic of the Philippines, 2012), young learners must be afforded opportunities to be exposed more to the natural environment. With the positive effects of exposure to nature supported by several studies and literature (Barrable, 2019; North American Association for Environmental Education [NAAEE], 2019; Meier & Sisk-Hilton, 2017; Merrick, n.d.), it is unfortunate that children of the present tend to have fewer opportunities for outdoor activities and limited contact with the environment. According to White (2004), a culture of fear has developed among parents and eventually fueled the preference for indoor over outdoor exposure for learners. As King (2022) mentions, the natural experiences of these young children may have corresponding effects on how they understand nature and environmental stewardship.

Development of Green Instructional Resources

There is no fixed definition of what a green instructional resource is. In this paper, a green instructional resource may be viewed as any educational material or tool that promotes environmental consciousness, sustainable living, and eco-friendly behavior among learners. Green instructional resources aim to promote critical thinking, problem-solving skills, and ethical decision-making in the context of environmental issues. As planned, this study may be among the early attempts to cover the sustainable development triad: environment, economy, and society – in the context of early childhood education. As pointed out in the introduction, ECEE is a relatively underexplored field, especially in the Philippines. Furthermore, local studies have yet to produce instructional materials that foster environmental consciousness and promote pro-environment behavior.

A story book may be produced as part of the succeeding phases of the study. Erpestad (2013) found that the storytelling strategy may be effectively applied in EE as it can establish connections between people and the natural world and inspire people to act on nature's behalf. In addition, stories effectively hook learners' interests when teaching environmental concepts. Key findings from the analyzed data were extracted and transformed into inputs to inform the crafting of the EE story book for kindergarten learners.

Since the end-users of the target instructional resource are kindergarten pupils under the watch of the Department of Education, inputs from the department's publicly available documents were also identified and considered as additional inputs. These key findings have been summarized in Table 3. The material may also be designed in such a way that it responds to DepEd's call for localization and

contextualization. For instance, since the locale is in a province known to celebrate the Pawikan (sea turtle) festival annually, to celebrate the important role that sea turtles play in the environment, the material may consider setting the story in the province to make the story more contextualized and relatable to the learners. Implications for the target development of the book have been reflected in table 3.

Table 3. Contextualized inputs towards the crafting of a Green Instructional Resource

Key Findings	Contextualized Inputs for the Green Instructional Resource
Learners can describe the components of the environment, both living and non-living.	The story to be written and featured in the book may highlight the interactions between nature's biotic and abiotic components.
Learners can identify several types of plants and animals.	The book may feature the main character's encounters with species found in the locality or a nearby locality.
The majority of the elements drawn by the learners fall under the icon classification based on Peirce's Theory of Signs.	Illustrations in the story book may reflect the iconic classification of signs, depicting objects and characters in a way that closely resembles their real-world counterparts.

4. CONCLUSION

This study revealed that kindergarten learners possess an early understanding of their environment, including its living and nonliving components. They also show what is possibly an early understanding of biodiversity. These findings highlight the potential of the kindergarten level as a fertile ground for building ecological literacy through teaching materials and approaches, anchored on sustainable development. The study suggests that a green instructional resource, such as a story book, should be developed using its key findings, aligned with DepEd's call for contextualization and localization. However, given the study's limited sample size, future research should involve larger groups for greater generalizability. Further research is also encouraged to create a framework that integrates the sustainability triad—environment, economy, and society—to guide the development of green instructional materials. Once developed and approved, the resource could be piloted in the institution's laboratory school, with classroom-based research conducted to assess its effectiveness as an Early Childhood Environmental Education (ECEE) material.

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