JPII 13 (2) (2024) 358-366

Jurnal Pendidikan IPA Indonesia

https://journal.unnes.ac.id/journals/jpii

ENVIRONMENTAL EDUCATION IN JUNIOR HIGH SCHOOL SCIENCE: TEACHERS' INTEGRATION PERCEPTIONS THROUGH DISTANCE LEARNING MODALITY

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DOI: 10.15294/jpii.v13i2.570

Accepted: May 16th, 2024. Approved: June 29th, 2024. Published: June 30th 2024

ABSTRACT

In the educational paradigm, it is crucial to consider how education can address the significant environmental and biodiversity changes causing exponential degradation, particularly during the pandemic. This study analyzed junior high school science teachers' perceptions of integrating environmental education (EE) into the curriculum through online distance learning. This research method used survey and case study designs involving thirty-two science teachers from eight schools in Cavite, Philippines. Quantitative data analysis revealed that science teachers incorporated EE during the pandemic. Additionally, qualitative data analysis identified several themes related to science teachers' perceptions: 1) impressions and understanding of EE, 2) benefits of integrating EE into science, and 3) balancing the values and drawbacks. In conclusion, most science teachers agreed with statements regarding their strategies for integrating EE into the science curriculum. Critical issues regarding science teachers' attitudes toward EE integration were identified through interviews and focus groups. This demonstrates how educational technology, mainly when used with remote learning, may facilitate and improve the integration of EE into science instruction. This study offers workable answers for converting these concepts into ecological activities and successful methods for incorporating EE into junior high school science curricula.

Keywords: distance learning; environmental education; perceptions; science education

INTRODUCTION

Achieving sustainable living is challenging due to the Earth's limited capacity and resources, which cannot support a rapidly growing population. However, educational technology can significantly enhance environmental education (EE) by fostering ecological awareness, responsible behaviors, and sustainable practices among students (Sultan et al., 2020). Early integration of sustainable living practices is crucial, relying heavily on EE (Mithen et al., 2021). Also, ESD integration requires student-centered teaching and assessment methods that encourage critical thinking, problem-solving, decision-making, and active participation (Qablan, 2018; UNESCO, 2017, 2018). On a positive note, sustainable development ascertains that people now and in the future can live a sustainable and harmonious life (Owens, 2017; UNESCO, 2017). Education for Sustainable Development by UNESCO (2017) includes teaching biodiversity, climate change, disaster risk mitigation, ecosystem consumption, and poverty reduction. In the early 1950s, the Philippine government and non-government organizations started formally advocating and promoting environmentalism directly linked to sustainable development through education (UNESCO, 2011).

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Environmental education should be affective or emotional, fostering love and respect for nature and humanity. It encourages involvement in enhancing the sustainability of human-nature interactions over time by developing attitudes, values, knowledge, aptitudes, and skills necessary for environmental protection activities (Mastrángelo et al., 2019). Environmental education also involves practicing location-based and behavior-based stewardship, such as engaging with local vegetable fields (Delia & Krasny, 2018). However, students from economically disadvantaged backgrounds or remote areas may face difficulties engaging in technology-based environmental learning due to insufficient access to devices or reliable internet connections (Facer & Selwyn, 2021). Integrating educational technology into EE can enhance these learning experiences, though accessibility challenges must be addressed to be truly effective.

Kilag et al. (2023) found that teachers who considered technology a supplement to traditional teaching methods were more likely to integrate it into EE. Various studies have shown that incorporating EE through multiple sources, such as schools, television, the internet, and awareness campaigns, significantly enhances students' environmental knowledge by connecting them with other environmental institutions. Digital tools increase students' motivation and interest in environmental topics by introducing novelty and engagement. Interactive simulations, multimedia content, and virtual field trips make EE more accessible and engaging for diverse student groups (Katika et al., 2022). Several studies have found that integrating EE through various sources, such as schools, television, the Internet, and environmental awareness campaigns, can significantly enhance students' knowledge by establishing connections with other environmental institutions. This strategy strengthens sustainable development education (Mahat et al., 2020). Additionally, the relationship between students' awareness and practices regarding environmental issues in the Philippines can be improved through better curriculum integration (Medallon & Gallardo, 2014; Labog, 2017; Lopez & Malay, 2019; Punzalan et al., 2019).

The Philippine Department of Education (2016) emphasizes the importance of EE in teaching science topics, asserting that the curriculum aims to develop scientifically, technologically, and environmentally literate Filipinos. Teachers are expected to be responsible, environmentally conscious role models for their students, imparting science education with a focus on sustainability (Celades et al., 2021; Sönmez & Hastürk, 2023). Proper academic education can mitigate environmental issues and encourage student involvement in environmental protection activities (Altin et al., 2014; Rahman et al., 2014; Sontay et al., 2015; Chikati & Okendo, 2018; Boca & Saraçlı, 2019). Integrating educational technology into science education can further enhance students' understanding of environmental concepts and motivate them to participate in environmental protection efforts.

In the educational landscape, it is crucial to recognize the role of education in addressing significant environmental and biodiversity changes that lead to rapid degradation. Environmental education is widely recognized for its pivotal role in nurturing environmentally conscious individuals (Sarıbaş et al., 2016). The COVID-19 pandemic, while posing significant challenges to education, has also spurred increased environmental awareness and sustainable consumption. Studies by Cohen (2020) and Sarkis et al. (2020) suggest that the pandemic has marked the beginning of a transition towards sustainable consumption and reduced air pollution.

From the conducted literature review, the researcher found that limited studies have explored the integration of EE into the science curriculum in the Philippines and internationally. This literature gap existed predominantly during the pandemic when online distance learning modality was implemented. Hence, this study analyzed junior high school teachers' perceptions of integrating EE into the science curriculum in Cavite, Philippines. Adapting the Most Essential Learning Competencies (MELCs) during the pandemic has emphasized environment-related topics in the online distance learning modality, one of the primary education methods used during the pandemic.

METHODS

This research employed survey and case study methodologies to investigate science teachers' perspectives on integrating EE into the science curriculum, aided by educational technologies. The quantitative aspect utilized a survey approach, gathering data through a questionnaire designed for the research subjects. Conversely, the qualitative component employed a case study approach. Yin (2018) defines a case study as an empirical inquiry technique that helps determine the "how and why" of occurrences and helps comprehend them in a comprehensive, real-world context.

In terms of participants, the study selected junior high school science teachers from grade levels 7 to 10 in government primary education schools under one division office in Cavite, Philippines, utilizing purposive sampling. Here, the sample is one whose attributes are specified to be pertinent to the research (Andrade, 2021). Eight science teachers from each grade level were chosen, totaling thirty-two participants. Participants represented various age groups, with half aged 30 to 40; a majority were female (72%) in terms of gender and with less than ten years of teaching experience (44%). Each grade level was equally represented, comprising 25% of the participants. Despite being primary education teachers, some had master's degrees in pure science or science education (16%), demonstrating the application of advanced knowledge in teaching science. These graduate degree holders contributed to addressing challenges, particularly in implementing virtual distance learning.

Regarding data collection and tools, this study gathered the data through a combination of methods, including a survey, semi-structured questionnaire, and focus group discussions, to address the research inquiries comprehensively. These data collection tools were designed to ensure inclusivity and eliminate biases related to participants' gender, socioeconomic status, ethnicity, and cultural background. To gather quantitative responses, a questionnaire adapted from relevant literature underwent validation by academic experts in EE. Semi-structured interviews were conducted using the questionnaire to delve deeper into teachers' perspectives on integrating EE into the science curriculum. Additionally, focus group discussions were employed to facilitate extensive exploration of the research problem and encourage participants to share their insights and experiences regarding integrating EE into science teaching.

The data analysis involved quantitative and qualitative participant responses through three data collection methods. Bazeley (2018) described complementary analysis as integrating concepts and data from different approaches to reinforce conclusions. Quantitative data from the survey questionnaire was statistically analyzed to summarize science teachers' perceptions regarding integrating EE into science lessons. Qualitative data from transcriptions of semi-structured interviews and focus group discussions underwent thematic analysis to identify common themes among participants' responses. Analysis in qualitative descriptive research must be kept simple enough for individuals to grasp and apply the findings to science education practice (Chafe, 2017). Each participant's semi-structured interview and focus group discussion were analyzed separately to assess their perspectives on the research topic. The researcher examined text transcriptions to identify similarities and differences in participants' perceptions and experiences.

RESULTS AND DISCUSSION

Science teachers were surveyed using a modified structured questionnaire to assess their practices of integrating EE using various educational technologies. Results in Table 1 show that 17 (53%) of the teachers strongly agreed on the importance of educating students about the environment, with only 1 (3%) strongly disagreeing. Teachers' responses indicated agreement on average, with a mean score of 3.47. This indicates a positive acknowledgment of EE's significance and teachers' role in raising students' awareness. Additionally, most teachers (17 or 53%) agreed on using environmental themes in the learning process, considering them essential for students. These themes are integrated into selected science topics, often reflecting the local community's context.

In this study, a significant majority (66%) of science teachers strongly agreed that they prepare appropriate teaching materials about the environment, enhancing engagement and interactivity in their virtual classes. To enhance preparedness for distance education and improve efficiency, teachers should develop contingency plans for modifying lesson plans related to environmental topics as part of their annual course preparation process (Kocabaş & Yücel, 2022). The study also revealed that most respondents (53%) introduce environmental themes or topics encountered in real-life scenarios, while 66% prepare teaching materials on environmental topics. Additionally, 63% integrate EE using various learning methods, and 59% believe they play a significant role in imparting environmental knowledge through classroom teaching. Science teachers are encouraged to utilize diverse instructional strategies incorporating real-world experiences and engaging with the environment and society to promote EE (Asri et al., 2020; Sulaeman et al., 2020; Sholahuddin et al., 2021). Furthermore, research by Katika et al. (2022) demonstrates that augmented reality effectively enhances engagement and improves learning outcomes across various educational domains, including EE.

Table 1. Science Teachers' Integration of Environmental Education in Online Distance Learning Modality

Statement	SA (4)		A (3)		D (2)		SD (1)		M	DI	SD
	n	%	n	%	n	%	n	%			
1. I educate the students about the environment because it is important.	17	53%	14	44%	0	0%	1	3%	3.47	A	0.67
2. I use environmental themes in the learning process as they are important for students.	12	38%	17	53%	3	9%	0	0%	3.28	A	0.63
3. I prepare appropriate teaching materials about the environment for the students I will teach.	8	25%	21	66%	3	9%	0	0%	3.16	A	0.57
4. I make an important contribution to introducing environmental knowledge through classroom teaching.	10	31%	19	59%	3	9%	0	0%	3.22	A	0.61
5. I agree that there is enough time in the curriculum to integrate environmental education into the learning process.	13	41%	15	47%	3	9%	1	3%	3.25	A	0.76
6. I integrate environmental education into the learning process using various learning methods.	7	22%	20	63%	5	16%	0	0%	3.06	A	0.62
7. I have enough ability to integrate EE into learning activities.	5	16%	23	72%	4	13%	0	0%	3.03	A	0.54
8. I take part in activities related to the environment in my school.	11	34%	17	53%	4	13%	0	0%	3.22	A	0.66
9. I use teaching materials about EE that can be found in various media.	5	16%	22	69%	4	13%	1	3%	2.97	A	0.65
10. I integrate EE into the learning process to provide solutions to some environmental problems.	9	28%	20	63%	2	6%	1	3%	3.16	A	0.68
11. I review the curriculum and I believe that it must be reorganized to include more about environmental education for various levels of education.	6	19%	21	66%	4	13%	1	3%	3.00	A	0.67
12. I undergo special training to be able to integrate environmental education into the learning process.	3	9%	18	56%	9	28%	2	6%	2.69	A	0.74

Due to the pandemic, the educational system shifted from traditional to distance learning, and one of these is the online option. Among the participants, 13 (41%) strongly agreed, and 15 (47%) agreed that there is enough time in the curriculum to integrate EE into the learning process, while others disagreed. From a different perspective, the majority (63%) of science teachers agreed to integrate EE into the learning process using various learning methods.

According to reports from science teachers regarding their preparation of teaching materials related to the environment, a majority (69%) agreed that they possess such materials accessible through various media. Meilinda et al. (2017) found that science teachers believe the media can be more effective than education in influencing human behavior in response to global climate phenomena. This indicates their ability to cater to students' interests, even in a virtual setting. Furt-

hermore, a significant portion (63%) of science teachers personally integrate EE into the learning process to address environmental issues, aligning with educating students about the environment. Suryawati et al. (2020) recommended using problem-based learning to enhance students' understanding of science and ecology, enabling them to apply problem-solving skills to environmental challenges.

Several experts in education and environmental pedagogies have recommended revising or reorientating teacher training (McKeown, 2015) in environmental pedagogies teaching (Misiaszek, 2015). It is recognized that for science teachers to effectively integrate EE into the curriculum and ensure future generations are environmentally aware, they require training (Sönmez & Hastürk, 2023). This study examined the science topics and lessons across different grade levels where EE was integrated to understand the rationale behind their selection, particularly regarding their connection to environmental themes. The study found that most integrated topics were related to biology and earth and space sciences, aligning with the spiral progression approach of the science curriculum. As suggested by Mongar (2022), activities involving community engagement and action can enhance the environmental content of science curricula. Furthermore, promoting environmental awareness requires improved curriculum, pedagogy, and formal teacher education on environmentally relevant topics that connect with real-life experiences, as Gray and Colucci-Gray (2018) advocate.

This study also aimed to explore the background and perceptions of science teachers on EE integration aside from how they integrate EE into the curriculum based on their level of agreement and experiences. From the qualitative data analysis, several themes emerged and were narrowed down according to the commonalities of shared knowledge by the participants. The themes related to the science teachers' perceptions of integrating EE in the curriculum include 1) impressions and understanding of EE, 2) benefiting from EE integration in science, and 3) balancing the values and drawbacks of EE integration.

Science teachers' perspectives on science and EE are vital as they recognize the interconnectedness of these fields. They believe that science fosters understanding of the world and its components, leading to awareness of the importance of environmental care and the need to mitigate harmful activities. Integrating EE into the science curriculum stimulates students' awareness of how human actions affect the Earth's systems. Environmental consciousness requires knowledge and comprehension of the natural environment (Kousar et al., 2022). Lastly, promoting sustainable living practices can contribute to environmental protection and conservation efforts.

S1-G9 expressed: "Science subjects and EE hold transformative potential grounded in real-life experiences. I view EE as a process that empowers individuals to explore environmental issues, devise solutions, and act for environmental improvement." Integrating EE into the science curriculum is crucial for addressing environmental challenges. Ergin (2019) suggests that science can be utilized to address human-nature conflicts, while education can raise awareness and provide information, making natural science and EE easily combinable. Also, EE can yield direct environmental benefits and effectively address conservation issues (Ardoin et al., 2020). On the other hand, S2-G8 expressed: "I initially found teaching science and EE to be straightforward, but later, I realized the challenges, particularly in conveying their importance to my students. Integrating EE into the science curriculum is important to foster creative and critical thinking skills using available educational tools, especially in community engagement."

Educational technology addresses environmental challenges by deepening students' understanding of technical and environmental issues through natural science and fostering community engagement through EE. Additionally, involving student organizations like Youth for Environment in School Organization (YES-O) can catalyze the integration of EE into science topics across the school community. Research by Ikhsan et al. (2019) indicates that EE can cultivate students' scientific character and attitudes toward ecosystems. Moreover, incorporating character education into science subjects, as suggested by Dimante et al. (2016) and Vesely et al. (2020), can help students develop valuable traits. S3-G9 emphasized the relevance of integrating EE into science, as it provides practical applications for real-world scenarios and current environmental concerns. As science encompasses various fields, including disaster awareness, educational technology can aid science teachers in effectively conveying the importance of environmental issues to their students.

Several studies have indicated that while environmental literacy and knowledge are beneficial to a certain extent, they may not be sufficient to drive significant changes in overall ecological behavior toward sustainability (Amirshokoohi,

2010; Roczen et al., 2014; Ahi & Alisinanoglu, 2015). S1-G7 emphasized: "EE heightens students' awareness of environmental degradation, health concerns, and the significant impacts of climate change, highlighting the urgent need for sustainable living." Similarly, S1-G10 stressed: "EE equips students with an understanding of how their decisions and behaviors influence the environment, providing them with the knowledge and skills necessary to address complex environmental issues and promote environmental sustainability." Educational technology can address these challenges by providing innovative learning tools and platforms that engage students in real-world environmental issues.

The topic of climate change and students' contributions to this phenomenon are highlighted. S3-G8 emphasized: "EE offers students valuable opportunities to engage with real-world issues and the complex environmental challenges facing our planet." Incorporating EE into the curriculum also fosters positive values regarding maintaining environmentally friendly behavior. S4-G7 stressed: "The significance of integrating EE into science is that it prompts students to recognize the consequences of their actions on the environment." Similarly, S4-G8 pointed out: "EE is crucial because many diseases stem from environmental changes and human activities. It involves studying the environment, its conditions, issues, management, and practices for sustainability." By integrating educational technology into EE, educators can empower students to become informed and proactive agents of change in addressing climate change and other environmental challenges.

S7-G9 views the integration of EE into science as timely and beneficial, as it enhances awareness of environmental issues and promotes better care for one's surroundings. She emphasizes the importance of EE in enabling individuals to explore environmental challenges, solve problems, and take action to improve the environment. This fosters a deeper understanding of environmental issues and equips individuals with the skills to make informed and responsible decisions. According to Zaenuri et al. (2017), EE can also be integrated into habits promoting personal hygiene. Drawing from the findings of Wilujeng et al. (2019), the Education for Environmental Sustainable Development (EESD) method seeks to cultivate environmentally conscious individuals in the next generation. Moreover, Zahra et al. (2024) underscore the significance of incorporating technology with active learning approaches to enhance EE, especially for young students. Educational technology plays a pivotal role in implementing these initiatives.

By integrating EE into science lessons, science teachers have observed numerous benefits in conveying to students the importance of environmental awareness. Osunji (2021) underscored the significant impact of student outcomes from EE on the overall quality of education delivered in schools. Nevertheless, outdoor education offers students opportunities to learn beyond the confines of the classroom, promoting their social development and leisure skills in the process (Larsen et al., 2017). Arik and Yilmaz (2020) supported that outdoor education and problem-based learning methods, which are more effective than other approaches, can better promote students' environmental knowledge and attitudes. By leveraging educational technology, educators can enhance students' environmental literacy and instill a sense of responsibility towards the environment, irrespective of the learning environment.

Participants highlighted various aspects of integrating EE into the curriculum. S3-G7 said: "The absence of hands-on experimentation hindered students' comprehension and engagement." Conversely, S3-G8 emphasized EE's role in nurturing critical thinking and promoting healthy lifestyles. S3-G9 underscored EE's potential to connect classroom learning with real-life situations, aiding in addressing environmental challenges. However, concerns were raised about integrating EE into all subjects and its alignment with curriculum competencies, as mentioned by S3-G10. Despite challenges, integrating EE into subjects like Science can heighten students' awareness of global environmental issues and equip them with preventive measures. This discussion emphasizes the importance of leveraging educational technology to enhance hands-on learning experiences, foster critical thinking, and facilitate the application of knowledge to real-world contexts while ensuring alignment with curriculum objectives. Masalimova et al. (2023) shared that activity-based EE can enhance environmental characteristics.

Incorporating EE into the curriculum poses a challenge due to time constraints, even though the time required is minimal. According to S7-G7: "This integration increases students' awareness of environmental issues and prompts them to consider solutions." However, S7-G8 expressed: "While students become more environmentally aware through EE, there may be limited opportunity for practical application, thus representing a drawback." Teachers face signifi-

cant challenges in integrating EE into the curriculum. More importantly, the study of Corpuz et al. (2022) specified that primary issues related to EE integration include insufficient teachers' knowledge about EE, limited time to conduct activities that could enhance students' environmental literacy and engagement, and a lack of clear guidelines from school management on effectively incorporating EE.

CONCLUSION

Enhancing environmental education integration into science instruction requires understanding science teachers' perspectives, as revealed by a quantitative survey where most teachers frequently incorporated real-world environmental themes into their curriculum. Teachers developed relevant resources and employed diverse strategies despite differing school and grade-level viewpoints. Key themes from interviews and focus groups highlighted the importance of understanding EE, leveraging technology for distance learning, and balancing benefits and challenges in remote environments. The study emphasizes the need for continuous professional development, reoriented curricula, and teacher training programs to integrate EE effectively. It calls for collaboration among stakeholders to address EE comprehensively. It suggests exploring stakeholders' perspectives to fully engage teachers in meaningful EE integration, supported by educational technology for collaborative efforts and resource provision.

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