A Critical Analysis of Environmental Education Provision in Five Private Preschools in Malaysia, Using Palmer's Model of Environmental Education

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HIGHLIGHTS

- Preschool environmental education (EE) delivery relied on teacher initiative amid gaps in training and resources.
- COVID-19 disrupted experiential EE; teachers used creative indoor alternatives.
- Misalignment noted between EE curriculum goals and teachers' practical delivery.
- Palmer's model revealed imbalances across cognitive, aesthetic, ethical, and environmental action domains of EE.
- Study urges systematic support for immersive EE in early childhood setting.

ABSTRACT

This study explores the holistic implementation and practice of Environmental Education (EE) in five private preschools in Malaysia. A qualitative research approach was employed, utilising semi-structured interviews and document analysis. Data were collected from 16 teachers across the five preschools through purposive sampling of both participants and institutions. Thematic analysis, supported by NVivo software, was conducted using both within-case and cross-case analysis methods. The findings indicate that EE was delivered through a combination of theoretical instruction and practical activities, with teachers demonstrating strong commitment despite various challenges. However, factors such as limited access to outdoor spaces, inadequate resources, and the shift to online learning during the Movement Control Order (MCO) significantly hindered experiential learning and the comprehensive integration of EE. The study underscores the need for Malaysian policymakers to adopt strategies in line with Palmer's model for holistic Environmental Education to strengthen the effective implementation of EE in private preschools. The findings offer valuable insights for educators and students in the participating institutions, as well as for researchers, educational bodies, and policymakers—particularly in relation to teacher training and the broader incorporation of EE into school curricula.

KEYWORDS

Environmental Education (EE)
Holistic Implementation
Practice
Experiential Learning
Policy Making

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INTRODUCTION

Malaysia, like other nations, dealt with the challenge of balancing population growth and heightened demand amidst the ongoing degradation of its natural environment (Begum et al., 2020). Environmental issues such as deforestation, pollution, greenhouse gas emissions, ozone depletion, erosion, and species extinction continue to persist due to insufficient environmental awareness and engagement by the public or policymakers. A study by Rosmadi et al. (2023) attributes the recent flooding in the southern Malay Peninsula to climate change, an improper drainage system, and the accumulation of greenhouse gases in the atmosphere. Malaysia's socio-economic development plans emphasise both societal development and the preservation of the environment as important aspects of national development. Sustainable development strategies addressing climate change and natural disasters necessitate socio-economic development plans to incorporate public environmental awareness, agency, and active engagement in protecting and preserving the natural environment. Priority should be accorded to environmental preservation to foster green growth through foundational and regulatory frameworks, development of exemplary role models, investment in green technology, and implementation of financial instruments, according to the Economic Planning Unit (2015, p. 6-2; WEF, 2023).

In 2001, Malaysia initiated Local Agenda 21 under the Ministry of Housing and Local Government, emphasising the involvement of schools and communities in the pursuit of sustainable development (Yusof & Ariffin, 2020). Recognising the significance of Environmental Education (EE), in 1998, the Malaysian Ministry of Education began to cultivate a society sensitive to environmental issues, equipped with knowledge, skills, values, and commitment to addressing environmental problems. As a result, the official teacher's guidebook on EE introduced in 1998 was integrated into primary and secondary curricula (Abdullah et al., 2018). EE in Malaysia is integrated into subjects such as Moral Education, Geography, Language, Islamic Studies, and Civic and Citizenship Education, while informal education occurs through activities like nature clubs, the Green Project, quiz competitions, recycling campaigns, talks, and visits (Begum et al., 2022; NPSC, 2017; Rahim et al., 2020). This comprehensive approach encompasses knowledge, understanding, environmental awareness, and learning about human interaction with the environment. The emphasis on EE has been in place since the 1980s, with further developments during the Eleventh Malaysia Plan 2016–2020 (Kamaruddin et al., 2019).

However, studies have consistently highlighted significant inadequacies in the implementation and practice of EE among teachers, creating notable challenges in the effective delivery of EE programmes in schools (Ardoin et al., 2023; Mustam & Daniel, 2016). Despite the recognised importance of EE in fostering environmentally conscious individuals and promoting sustainable resource management, Malaysian preschools continue to face considerable barriers to successful EE implementation (Muslim et al., 2017). Research has identified deficiencies in teacher training, experience, and preparedness as major obstacles, hindering the integration of environmental concepts into daily teaching practices (Muslim et al., 2017). These challenges are further compounded by personal and logistical factors such as lack of motivation, insufficient resources, limited funding, and time constraints caused by curriculum overload (Abd Rahman et al., 2018; Kamaruddin et al., 2019). Systemic constraints, including the absence of a dedicated environmental subject in the standardised preschool curriculum (Karim et al., 2022; Kamaruddin et al., 2019), the unclear structure of EE in teacher education programmes (Damoah & Omodan, 2023), and logistical barriers such as workload pressures (Sern et al., 2022), further exacerbate the problem. Additionally, individual factors like limited awareness and readiness among teachers highlight the urgent need for continuous professional development (Kamaruddin et al., 2019).

Given these challenges, the purpose of this study is to examine the current practice and implementation of EE in selected private preschools, focusing on the period from 2020 to 2022. The study seeks to identify and explain the underlying issues and challenges that affect EE practices before COVID-19, during, and post COVID-19 in the selected schools. Recognising the important role of teachers in shaping and executing EE programmes, this research prioritises understanding teachers' perspectives on the barriers they face and how they overcome the challenges they had for effective EE integration into early years education. Correspondingly, the study seeks to answer two research questions:

(1) How is EE currently practised and implemented in selected private preschools from 2019 to 2022?

and

(2) What are the major challenges teachers face in implementing EE in private preschools?

THEORETICAL FRAMEWORK

Palmer's extended tree model of EE in early childhood education—comprising education about, in/through, and for the environment—provides a comprehensive framework for promoting environmental learning in the early years. Education about the environment forms

the foundation by equipping learners with essential knowledge, awareness, and skills related to ecological systems. According to Palmer and Neal (2003), this component emphasises classroom-based instruction enhanced by experiential activities, such as empirical investigations and hands-on exploratory learning.

In the context of the five private preschools, implementing education about the environment would involve introducing young children to basic ecological concepts through stories, songs, visual aids, and simple nature-based experiences, alongside explorative activities such as making potions for feeding plants or animals, exploring the properties of water, investigating the texture of soil, sand and rocks, listening to birdsong, identifying nocturnal animals through sound and movement, and drawing still life. As Wróblewska and Okraszewska (2020) highlight, engaging students in experiential learning promotes critical thinking and a deeper understanding of environmental issues. Fostering environmental literacy at an early age ensures preschoolers form meaningful connections with nature and a sense of belonging to the natural world, thereby laying the foundation for lifelong environmentally responsible behaviour.

The second component, education in/through the environment, emphasises learning experiences that occur directly in natural settings. Palmer (1998) and Palmer and Neal (2003) advocate for outdoor experiences—such as field trips, nature walks, and exploration activities—as essential for building emotional and cognitive connections to the natural world. Integrating this dimension in private preschools would involve organising regular outdoor activities where children can interact with plants and animals in their natural habitats, including ponds, rivers, gardens, trees, under rocks, decaying matter, inside caves, and along the seashore. According to Goldman and Alkaher (2023), direct engagement with nature enhances aesthetic appreciation and fosters a sense of wonder, which is fundamental at the preschool stage. While some natural habitats may not be easily accessible, classrooms can be transformed into three-dimensional role-play spaces such as outer space, the night sky, or the undersea world. Providing young learners with opportunities to explore their environment actively not only enhances their ecological understanding but also instils early emotional bonds with nature, supporting sustained environmental attitudes and behaviours.

The third component, education for the environment, is the action-oriented dimension of Palmer's model, focusing on the development of environmental ethics and responsible citizenship. Palmer and Neal (2003) stress the importance of embedding values such as empathy, compassion, and ethical responsibility within environmental learning. In preschool settings, this can be translated into simple but powerful activities like edible playgrounds, care for chickens, maintenance of nature areas within the school grounds, forest summer schools, nature camps, tree planting and fundraising projects, recycling projects, and participation in community clean-up initiatives—promoting opportunities for students to engage with communities and participate in environmental stewardship. Sunassee et al. (2021) assert that integrating ethical considerations and sustainability practices into education empowers learners to make informed and responsible decisions. By involving preschoolers in small-scale environmental actions, they are encouraged to see themselves as capable of making a positive impact. These early participatory experiences address the gap identified by Nielsen et al. (2016), who found a limited emphasis on active participation in traditional EE approaches.

Teaching EE effectively is essential for promoting positive environmental behaviours in preschool children. Palmer (1998) emphasises the importance of the three key components—education about, in/through, and for the environment—as working together to cultivate environmental stewardship by encouraging actions toward environmental protection and preservation. To achieve this, teachers must be well-equipped with EE content, have access to age-appropriate resources, and create supportive learning environments that foster active participation (Palmer, 1998). Previous studies align closely with Palmer's (1998) framework, highlighting the importance of a comprehensive EE approach that extends beyond theoretical knowledge to include experiential and action-oriented learning. This comprehensive vision is also reflected in the NPSC (2017), which integrates EE across subjects to promote environmental care, conservation, and sustainability, ensuring that young children engage cognitively, socially, and experientially with environmental concepts (Otitoju et al., 2022a, 2022b, 2025).

Moreover, Palmer's emphasis on the need for well-prepared teachers is supported by Ruthanam et al. (2021), who note that teachers' knowledge significantly influences EE instruction. They also observe that resourceful educators can adapt and innovate even when faced with limited resources, supporting Palmer's call for dynamic and participatory learning environments. Furthermore, several scholars—including Mahat et al. (2016), Abdul Halim et al. (2018), and Otitoju et al. (2022a)—argue that a purely cognitive approach to EE is inadequate. They emphasise that fostering genuine environmental responsibility requires emotional engagement and behavioural change, aligning with Palmer's (1998) assertion that EE should move beyond factual learning to nurture an ethic of care for the environment.

Thus, studies collectively reinforce Palmer's holistic

vision for EE, while underscoring the critical roles of teacher preparation, curriculum integration, and supportive classroom environments to cultivate and enhance EE practice among preschoolers. This will ensure that EE in these settings is not only informative but also experiential and transformative. By combining knowledge acquisition, direct engagement, and action-based learning, preschools can nurture environmentally literate, emotionally connected, and ethically responsible young citizens—perfectly aligning with the goals of comprehensive EE.

Furthermore, the inclusion of learning materials, adequate facilities, and child-centred pedagogies within the model mirrors Palmer's (1998) emphasis on providing meaningful, hands-on experiences that cultivate environmental awareness from an early age. Importantly, Palmer's extended tree model incorporates elements of moral education and community engagement, as supported by contemporary research. For instance, Parra et al. (2020) argue that EE should promote ethical values and a sense of moral responsibility toward the environment—an aspect addressed through the integration of value-driven programmes.

In addition, the model's emphasis on a conducive school environment—featuring EE facilities and resources—resonates with the findings of Mashaba et al. (2022), who highlight the role of experiential learning in fostering positive environmental attitudes and actions. This component is consistent with Palmer's vision of empowering learners to become active environmental stewards.

METHODOLOGY

This study employed an exploratory qualitative approach to examine the implementation, practice, and challenges of EE in private preschools in Malaysia, focusing on the period from 2019 to 2022—covering the time before the COVID-19 pandemic, during the Movement Control Order (MCO), and after the enforcement of Standard Operating Procedures (SOPs). This approach enabled the researchers to gain insight into EE practices and the challenges faced, as well as how these challenges were addressed during and immediately following the pandemic. In addition to interviews with teachers, document analysis—including curriculum materials, workbooks, and teachers' notes—was conducted to deepen understanding of EE implementation (Creswell, 2014).

Five private preschools were selected through convenience sampling, due to difficulties in accessing public preschools, which are subject to more stringent regulations. The COVID-19 pandemic further constrained data collection in public institutions. While this limitation affects the generalisability of the findings, private preschools provided valuable insights into EE implementation across the different phases of the pandemic. Given that EE is integrated across all subjects in Malaysian preschools (National Malaysian Preschool Curriculum, 2017), interviews with teachers offered a broad range of perspectives on its application. Future research could explore comparative analyses between public and private preschool settings to expand understanding of EE practices across diverse institutional contexts.

In-depth, semi-structured interviews were conducted with sixteen teachers from the selected preschools to explore their perspectives on EE, including their conceptual understanding, implementation strategies, and the challenges they encountered. Each interview lasted between 40 and 90 minutes, allowing for flexible and in-depth exploration while maintaining a semi-structured format (Adams, 2015; Creswell, 2012). An interview protocol aligned with the National Preschool Curriculum (2016) was developed to ensure consistency, covering key areas such as EE conceptualisation, integration, teaching methods, and perceived challenges. Interviews were conducted in English to ensure clarity and were recorded using an MP3 device for accurate transcription and analysis.

To ensure participant confidentiality, teachers were anonymised using the code "T" followed by a number, while preschools were identified as Case 1 through Case 5. Transcribed interviews were analysed using emergent coding and thematic analysis within each case, allowing for detailed exploration of individual experiences while also identifying patterns across cases. Palmer's Tree Model of Environmental Education (Palmer, 1998) and the implementation guidelines from Palmer and Neal (2003) were used to guide the content analysis of the NPSC, teachers' notes, and workbooks. The analysis focused on narrative content to explore how EE is operationalised in preschools. Data were categorised under the three core dimensions of Palmer's model: education about, in/through, and for the environment (Palmer, 1998). Figure 1 presents the frequency of each code as it appeared in the interview data.

Name	Files	References	Created on
EE Implementation	5	52	18/04/2025 18:
About the Environment	5	17	18/04/2025 18:
Blended Learning	5	10	18/04/2025 18:
For the Environment	4	12	18/04/2025 18:
In the enironment	3	12	18/04/2025 18:
EE Implementation Challenges	5	38	18/04/2025 18:
EE Implementation Practice	9	140	18/04/2025 18:
EE TOPIC	9	105	18/04/2025 18:
EE Importance	1	1	18/04/2025 18:

Figure 1: Coding sample based on Teacher's Responses

This approach enabled a holistic examination of preschool teachers' instructional practices. The integration of document analysis with teacher interviews enriched the findings by providing deeper insights into both the challenges and strategies associated with EE integration. Ultimately, the study contributes to the broader discourse on advancing EE in early childhood settings by emphasising structured pedagogical approaches that foster environmental awareness and promote sustainability (Palmer & Neal, 2003).

RESULTS

This study provides a qualitative evaluation of the content knowledge, practices, and challenges of EE from the perspectives of preschool teachers and supporting documents. It examines teachers' ability to identify EE topics in workbooks, their understanding of age-appropriate EE content, and their use of teaching aids. The analysis of five selected preschools reveals three key themes: (1) teachers' EE content knowledge, (2) EE implementation practices, and (3) challenges in implementing EE. The examination of EE implementation practices is grounded in a conceptual framework informed by Palmer's EE model, which includes: teaching EE based on acquired knowledge; education about the environment; creating a conducive learning environment to foster connections with nature; education in/through the environment; and exposing students to sustainable EE activities that promote a positive attitude towards nature and the environment, i.e., education for the environment.

Across Case Analysis on Content Analysis of Documents

Table 1: Cross-case analysis on Content Analysis of Documents across the Five Cases and the NPSC Curriculum via Matrix coding query. *See Table 2 for detailed description of codes.*

	A: Education about the environment	B: Through the environment	C: Education for the environment	D: Unrelated to EE
1: Case 1 Doc	30	6	5	0
2: Case 2 Doc	39	35	2	24
3: Case 3, 4 & 5 Doc	72	14	28	0
4: NPSC Curriculum	308	149	84	0

The content analysis summarised in Table 1 reveals a clear emphasis on the empirical dimension of EE in the case documents, with progressively richer and more balanced coverage found in the NPSC. In the first case document, references coded as education about the environment dominate, accounting for 30 of the coded items. By contrast, education in the environment appears only six times, and education for the environment a mere five times. No passages in this document were deemed unrelated to EE, indicating that while the content remained focused on environmental topics, it was primarily framed in an empirical, knowledge-transmission mode rather than through hands-on or action-oriented forms of EE.

A similar pattern emerges in the second case document, though with a slightly stronger experiential component. Of the 76 coded items, 39 are classified as education about the environment and 35 as education in the environment, reflecting some attention to learning through direct engagement with nature. Only two coded items fall under education for the environment, while 24 items were judged unrelated to EE. This suggests that although the document begins to incorporate experiential learning, it still places primary emphasis on factual or conceptual instruction.

The third, fourth, and fifth case documents display a more substantial engagement with all three EE dimensions, yet they remain heavily skewed towards the empirical. In these documents, 72 items are coded as about the environment, 14 as in the environment, and 28 as for the environment. The rise in for the environment coding indicates a growing inclusion of ethical or action-oriented content that encourages learners to take responsibility for environmental stewardship. Nevertheless, education in the environment remains under-represented.

By contrast, the NPSC demonstrates a holistic integration of EE concepts. It allocates 308 coded items to education about the environment, 149 to education in the environment, and 84 to education for the environment. This balanced distribution illustrates that the curriculum not only imparts environmental knowledge but also embeds learning through direct experience and promotes ethical commitments and environmental action. In summary, whereas the individual case documents lean heavily towards an empirical approach, the NPSC provides a more comprehensive treatment of EE's cognitive, experiential, and ethical dimensions.

The analysis of EE content and pedagogical knowledge among teachers across the five cases highlights both strengths and gaps in the implementation of EE, particularly when comparing teachers' perceptions of what they taught with the topics reflected in their documents (Table 2).

In Case One, the teacher's notes and workbook encompass all three components of EE: education about, in/through, and for the environment. Teachers in Case 1—particularly T1 and T3—demonstrate a clear understanding of EE content and curriculum knowledge, as they actively engage students in outdoor activities, including visits to gardens and hands-on experiences with nature. T1 states: *"I encourage students to establish a personal connection with nature through visiting gardens and participating in outdoor activities. Such hands-on experience allows them to interact with the natural environment"* (Interview T1, Case 1). Similarly, T3 reinforces this approach with an emphasis on experiential learning: *"We bring students closer to nature through active learning experiences, promoting understanding of animals and plants and visits to museums"* (Interview T3, Case 1). Their teaching practices align closely with the EE topics documented in their teaching materials, demonstrating a comprehensive and effective application of EE principles.

In Case Two, however, teachers exhibit a more varied approach to EE content knowledge. T4, for

Table 2: Detailed Description of Content Analysis of Documents, such as analysis of workbooks and teachers' notes from five private preschools, as well as the NPSC Curriculum. (modified from Palmer, 1998:145 by Reibelt, 2018) through a matrix coding query.

Type of Document	Education about the environment (empirical)	Education in/through the environment(aesthetical)	Education for the environment (ethical)	Unrelated to EE
Notes and Workbook Case 1	Scientific processing skills, classification of objects, communicating the result, scientific attitude and pure value are based on keeping the environment clean.	Drawing a tree by tracing the palm of the hand, observation, and using the 5 senses	Taking care of the trees	Not relevant
Notes Case 2	Bring flowers to class and ask the students, what objects is held? The teacher shows flowers and trees, she asks the students to count. Draw trees and count. Count the number of flowers on each tree along with singing.	Brings flowers to class, teacher shows flowers and trees, teacher draws or colours trees using bright colour and ask the student to paste flowers on, the drawn trees. Paint a tree attach flowers on them.	Not relevant	My friend. Teachers ask the name of the students; students introduce themselves to each other to get familiar with each other. Develop speaking skills
Workbook Case 3, 4, & 5	Picture showing a boy cleaning the toilet, water cycle, water absorbed in the air. Cloudy clouds become heavier and water droplet after the rain. Water droplets fall into the ground as rain. Different part of plants, different stages of tree development, chicken development stages. Natural habitat of animal's domestic animals, wild animals, aquatic animals, life in the ocean and fresh waters. 4 different season winter, summer, autumn, and spring. Love our environment.	Plant growth, flowers, birds, butterfly, and practically teaching the kids how to make water bobbles.	Recycling: blue waste bin for paper, books, new papers, magazines, and anything made from paper. Preserve the beauty of our environment. Do not destroy the environment greedily. Deforestation	Not relevant
NPSC	Hearing, Compare and differentiate objects using one characteristic: (i) colour (ii) shape (iii) size (iv) texture (v) weight. Compare and differentiate objects which have two similar characteristics. Acquire basic knowledge on body parts and senses. Identify characteristics of living and non- living things. Name animals. Name body parts of animals. State functions of body parts. Identify and state functions of sensory organs. Identify habitats of animals. Compare and differentiate animals according to their diet: (i) Animals that consume meat, Animals that consume plants. Animals that consume meat and plants. Observe and talk about life cycle of animals. Identify parts of plants: (i) leaf (ii) stem (iii) roots (iv) flower (v) fruit. Classify plants based on specified characteristics. Observe and record germination and growth of seeds. Investigate attributes of materials. Investigate objects which sink or float. Describe the changes of water: (i) from water to ice and vice versa (ii) from water to steam and vice versa. State various sources of light. Investigate materials that dissolve in water. Investigate materials that can absorb water. Investigate reactions of magnet on various objects, Investigate the uses of sun light in one's daily life. Observe and talk about changes in weather. Describe the beauty of the environment. Describe the importance of the environment to mankind. Discuss ways to overcome problems and issues related to the environment. living components such as animals and plants and non-living things such as soil, landscape, and the weather. The negative effects of the forces of nature such as floods, earthquakes, typhoons, volcanic eruptions and droughts, and human activities. Pollution (air, water, and land); the extinction of flora and fauna; disposal of waste and thinning of the ozone layer. Traditions and practices that are handed down or inherited from generation to generation such as folklores, folk songs, games, food, costumes, handicrafts, and traditional musical instruments.	Carry out observation using five senses: sight, touch, smell, taste. Observe the environment using a combination of two senses. Observe the environment using a combination of three or more senses. Group objects according to identified characteristics. Identify living and non-living things. Differentiate living and non-living things. Carry out exploration on animals. Identify body parts. Observe and imitate movements of animals. Carry out exploration on plants. Observe and talk about the life cycle of animals. Compare parts of plants based on the following characteristics: (i) colour (ii) size (iii) shape. Observe and name common vegetables and fruits. Observe and group parts of plants based on the following characteristics: (i) colour (ii) size (iii) shape (iv) texture. Observe and record germination and growth of seeds. State needs of plants through observation. Explore the physical world in one's daily life. Record observations on shadows. Observe and talk about changes in weather. Understand the beauty of the environment. Talk about the beauty of the environment. Understand the relationship between mankind and the environment.	Participate in activities to sustain the beauty of the environment. Sustain and conserve the environment. Practise environmental sustainability and conservation. Reforestation. Gazettement of forest reserves. Practice of the 3Rs (Reduce, Reuse & Recycle). Cleaning of rivers and seas and law enforcement. A group of people who protect and save, such as the Fire & Rescue Department. Actions to protect the natural resources of the earth to maintain them in their original state. Ways of using, handling, and managing natural resources to avoid loss, damage, and wastage.	Not relevant

example, places considerable emphasis on environmental conservation through tree planting, stating: *"I teach about tree planting to emphasize the importance of environmental conservation in science. By planting trees, we contribute to saving the environment and ensuring a sustainable oxygen supply"* (Interview T4, Case 2). This reflects a strong grasp of EE principles, particularly in linking ecological understanding to practical actions. T4 also integrates broader environmental and health-related themes such as responding to flu outbreaks and floods, underscoring the role of leadership during environmental crises. As she notes: *"I teach the students about handling flu and other emergencies like floods, instilling leadership qualities in them to respond in times of crisis"* (Interview T4, Case 2).

However, despite these strengths, the document analysis reveals that some of the topics identified in teachers' notes do not fully align with core EE concepts, particularly when compared to the broader range of environmental topics presented in the workbooks. For instance, T5 focuses on personal hygiene, cleanliness, and social-emotional development while also covering EE topics such as tree planting and environmental stewardship. T5 integrates the ethical dimension of EE, stating: *"I also teach tree planting, how to understand nature, and how to maintain good social and emotional skill among peers"* (Interview T5, Case 2). While these themes are relevant to EE, a discrepancy emerges in the breadth of content: her teaching does not fully reflect the more extensive topics covered in the workbook, particularly regarding habitat preservation and combating deforestation.

In Case Three, teachers such as T7, T9, and T10 demonstrate an integrated approach to EE by blending environmental content with other subject areas like mathematics, science, and language arts. T7 incorporates EE into mathematics using recycled materials for creative projects: *"In mathematics, children learn measurements and apply them to creative activities using recycled materials"* (Interview T7, Case 3). T9 also introduces EE themes in language instruction, stating: *"I teach Arabic, Bahasa Melayu, and also Jawi writing that uses Arabic letters. I introduce EE topics such as various plants, clouds, rivers"* (Interview T9, Case 3). Despite these integrative efforts, a misalignment exists between the teachers' instructional focus and the content represented in the workbook. While teaching efforts centre on specific EE topics like plant growth, recycling, and animal habitats, the workbook includes broader subjects such as the water cycle and deforestation. This suggests a gap between teachers' personalised approaches and the standardised EE curriculum, indicating the need for improved alignment.

In Case Four, a notable variation exists in teachers' approaches to EE. T11 expresses a willingness to teach EE in the future but does not currently include it in her lessons, despite acknowledging the importance of environmental awareness. She notes: *"Yes, I will love to teach EE in the future. Yes, it's important for them to take care of nature; the kids must know about plastic, and how to use it again"* (Interview T11, Case 4). In contrast, T12 actively incorporates EE into her Bahasa Melayu lessons through seed planting and recycling activities: *"I teach planting seeds and recycling while teaching Bahasa Melayu language"* (Interview T12, Case 4). T14 also covers EE topics—particularly recycling and waste disposal—emphasising their relevance to science and social studies: *"Yes, it is important to teach children about EE because they can learn to reduce unimportant things like bottles, paper, and so on. For example, the paper we can use for recycling, and water we can use for recycling too"* (Interview T14, Case 4). However, consistent with Case Two, the document analysis in Table 2 shows that the teachers' notes in Case Four focus predominantly on recycling and basic plant growth. In contrast, the workbook addresses a broader range of EE themes, including the water cycle and environmental preservation. This again highlights a mismatch between the content teachers prioritise and the wider expectations of the curriculum.

Case Five presents another example of discrepancies between teachers' perceptions of EE and the workbook content. While T15 acknowledges the topic of recycling, she confines her instruction to language teaching, stating: *"I only teach languages, nothing related to EE"* (Interview T15, Case 5). This reflects a significant gap in EE content knowledge and integration. By contrast, T16 demonstrates initiative by incorporating EE into mathematics, using recycled materials in counting activities: "We count objects, so it helps us to recycle while doing mathematics. We use bottle caps for counting during math activities" (Interview T16, Case 5). While T16's effort shows an innovative approach to integrating EE with mathematics, her instructional focus still falls short of the full range of topics represented in the workbook, which includes areas such as plant growth, the water cycle, and habitat preservation.

Across the five cases, findings reveal a clear understanding of EE among some teachers, particularly those who adopt hands-on, interdisciplinary approaches. However, evidence also indicates a recurring misalignment between what teachers perceive as essential EE content and the broader, more comprehensive content outlined in the workbooks. This gap in both content and curriculum knowledge suggests that, while teachers demonstrate a strong commitment to integrating EE into their practice, there is a need for targeted training to help them align their instructional activities with national EE curriculum goals and outcomes. Enhancing teachers' capacity to deliver a wider and more coherent range of EE topics would support a more consistent and impactful approach to EE in preschool settings.

EE Implementation and Practice Among the Five Cases

Matrix coding was employed to analyse data across cases in a structured and systematic manner, guided by Palmer's extended model of EE—comprising empirical, aesthetic, and ethical dimensions. The analysis focused on three key components: education about the environment, education in/through the environment, and education for the environment, using a combination of thematic coding and content analysis. This process involved reducing the textual data into categories of words or phrases, which enabled the identification and classification of EE topics based on Palmer's framework. The coding was applied to teachers' responses during interviews regarding their

implementation and practice of EE, facilitating a clear mapping of pedagogical focus across the three dimensions of environmental education.

The implementation of EE across the five selected private preschools reveals a range of pedagogical approaches that align to varying degrees with Palmer's threefold model of EE: *education about the environment, education in the environment, and education for the environment.* As shown in Table 3, each case offers insights into how preschool educators navigated curricular demands and pandemic-related restrictions while striving to engage children with environmental themes.

Table 3: Cross-case analysis of Teacher's Responses on EE Implementation and Practices across the Five Cases via Matrix coding query.

	A: About the environment	B: In the environment	C: For the environment	D: Blended Learning
1: Case 1	4	10	6	5
2: Case 2	8	1	4	2
3: Case 3	1	0	0	1
4: Case 4	2	1	1	1
5: Case 5	2	0	1	1

Education about the environment, which focuses on imparting factual knowledge and understanding of environmental topics, was evident across all five cases, particularly through the use of workbooks, videos, and textbook materials. In Case 1, for instance, both Teacher 1 and Teacher 2 emphasised the integration of EE with science topics such as tree tracing, object classification, and the five senses. This approach reflects a strong *about the environment* component. As Teacher 2 explained, *"I prefer to combine the environmental subject with other subjects like science because they are highly related to EE"* (Interview T2, Case 1). Similarly, in Case 2, EE was embedded in science lessons addressing air pollution, floods, and the classification of natural elements. Teacher 6's focus on *"planting for oxygen production"* (Interview T6, Case 2) further illustrates the knowledge-based nature of this approach.

Education in the environment, which encourages direct interaction with nature, was significantly disrupted by the COVID-19 pandemic and the resulting Movement Control Order (MCO). Nevertheless, some teachers adopted innovative strategies to simulate or modify experiential learning. In Case 1, Teacher 1 adapted by creating "mini flower parks" within classrooms, allowing students to engage with natural elements despite external restrictions. She explained, "We now bring materials such as seeds and flowers into the learning environment, creating mini flower parks for a hands-on experience on a smaller scale" (Interview T1, Case 1). Teacher 2 also encouraged students to bring plants from home and even introduced live animals into the classroom, stating, *"We had to adapt by using books, audios, videos, and flashcards... [and] introduced live animals in the classroom"* (Interview T2, Case 1).

In contrast, Case 2 shifted toward digital platforms, limiting opportunities for direct engagement with nature. Teacher 4 noted, *"I utilised YouTube videos and virtual DVDs as instructional tools to impart knowledge about tree planting and recycling"* (Interview T4, Case 2), signalling a move from *in the environment* to *about the environment.* Similarly, in Case 3, teachers such as T7 and T9 relied heavily on animations and videos due to restrictions on outdoor exploration. As T9 reported, *"EE was not included in teaching and learning activities at all"* due to the pandemic (Interview T9, Case 3). However, efforts to compensate with virtual tours and simulations suggest partial attempts to sustain experiential learning.

Education for the environment, which aims to instil values, attitudes, and behaviours supporting environmental stewardship, was evident in teachers' efforts to model and promote responsible environmental actions. In Case 2, Teacher 4 used storytelling to instil leadership and empathy in real-life contexts such as flood responses: *"Teachers play a crucial role in preparing children for real-life situations... thereby instilling leadership qualities"* (Interview T4, Case 2). Teacher 6 linked personal hygiene and social relationships to environmental care and public health, reflecting a holistic approach to environmental responsibility: *"I am committed to environmental care... educating others about contributing to a healthier environment"* (Interview T6, Case 2).

Case 5 offered additional examples of *for the environment* education through practical activities such as recycling embedded in mathematics lessons. Teacher 15 shared, *"I integrate Environmental Education (EE) by incorporating recycling activities into my lessons, where students engage in counting and sorting"* (Interview T15, Case 5). Such integration not only imparts environmental concepts but also promotes eco-friendly habits. Similarly, Teacher 16's sorting exercises, though limited in scope, encourage responsible waste management behaviours: *"I have introduced practical recycling lessons where students sort plastic bottles into designated bins"* (Interview T16, Case 5).

Across all cases, challenges such as limited access to nature, language barriers (as seen with Teacher 7 in Case 3), and a rigid curriculum (as noted by Teacher 8 in Case 3) affected the depth of EE implementation. Nevertheless, teachers demonstrated strong commitment to Palmer's principles, often adapting creatively under difficult circumstances. Notably, *education for the environment* emerged as the most consistently applied component, even when direct engagement (*in the environment*) was restricted and factual delivery (*about the environment*) had to be adjusted. This commitment is captured in Teacher 2's affirmation: *"EE remains crucial for children... shaping students' behaviour, adaptability, and understanding of the environment"* (Interview T2, Case 1).

Across the five cases, the implementation of EE varied in response to the pandemic, demonstrating teachers' adaptability in navigating restrictions. In line with Palmer's threefold model, all cases demonstrated a focus on education *about the environment* through knowledge-based methods such as the use of workbooks, videos, and textbooks. As Teacher 2 from Case 1 noted: *"I prefer to combine the environmental subject with other subjects like science because they are highly related to EE."* However, *education in the environment* was significantly affected by COVID-19 constraints, prompting creative alternatives such as "mini flower parks" in classrooms (Teacher 1,

Case 1) and virtual resources in Case 2. Despite these challenges, *education for the environment* was consistently promoted. Teachers like Teacher 4 in Case 2 emphasised leadership and empathy: *"Teachers play a crucial role in preparing children for real-life situations... thereby instilling leadership qualities."* Overall, while pandemic-related limitations constrained direct environmental engagement, teachers showed resilience and a shared commitment to cultivating environmental responsibility. As Teacher 2 from Case 1 summarised: *"EE remains crucial for children... shaping students' behaviour, adaptability, and understanding of the environment."*

Challenges of EE Implementation Among the Five Cases

The implementation of EE across the five private preschool cases presented several challenges, particularly regarding the topics taught, teaching methods employed, and availability of instructional materials. One recurring issue was the limited scope or absence of EE topics in some schools' workbooks. Whereas certain teachers successfully integrated EE themes—such as recycling, waste management, and tree planting—others struggled under rigid curriculum guidelines or subject constraints. For example, Teacher 8 in Case 3 admitted, *"I solely focus on teaching mathematics, with minimal incorporation of EE concepts into the subject"* (Interview T8, Case 3), indicating a lack of EE integration in mathematics. Similarly, in Case 5, Teacher 16 reported, *"I did not teach any EE topics due to numerous restrictions"* (Interview T16, Case 5), suggesting EE content was entirely omitted.

Teaching methods posed another significant challenge, especially during and after the COVID-19 pandemic. Educators had to adapt to online or blended learning models, which greatly limited the hands-on and outdoor experiences essential to EE. Teacher 6 in Case 2 noted, *"Children's activities are currently restricted, preventing them from freely roaming and playing as they did before the pandemic"* (Interview T6, Case 2), reflecting the frustration of being unable to offer interactive experiences. Likewise, Teacher 9 in Case 3 lamented, *"Due to the COVID pandemic, practical studies were restricted to home, and EE was not included in teaching and learning activities at all"* (Interview T9, Case 3). Despite these constraints, some teachers devised creative workarounds. For instance, Teacher 1 in Case 1 established "mini flower parks" within the classroom: *"We now bring materials such as seeds and flowers into the learning environment, creating mini flower parks for a hands-on experience on a smaller scale"* (Interview T1, Case 1).

Availability of EE-specific teaching materials was also a major challenge. Teachers often lacked dedicated EE resources and instead relied on standard science or social studies textbooks, which contained limited environmental content. Teacher 11 in Case 4 explained, *"I don't have a specific Environmental Education (EE) handbook, but I cover EE topics within the science and social studies curriculum, which has limited EE content"* (Interview T11, Case 4). This issue was exacerbated during the pandemic, as physical teaching aids and outdoor materials became less accessible. Although teachers turned to digital platforms, these too had limitations. Teacher 4 in Case 2 reported, *"I utilised YouTube videos and virtual DVDs as instructional tools to impart knowledge about tree planting and recycling"* (Interview T4, Case 2), yet acknowledged that such tools could not fully replicate real-world environmental experiences.

Additional barriers included language constraints and insufficient teacher preparedness in EE pedagogy. Teacher 7 in Case 3, who taught Arabic and Jawi, highlighted the difficulty of conveying environmental concepts in those languages: *"Since I teach Arabic and Jawi, I encounter difficulties. The curriculum covers various topics like plants, clouds, and rivers, but the language barrier makes it hard for students to fully grasp and apply the content"* (Interview T7, Case 3). This points to a broader need for targeted EE training and better alignment of subject matter in multilingual contexts.

Overall, the challenges to EE implementation in these five preschools were multifaceted. While some educators demonstrated creativity and commitment to embedding environmental concepts, systemic constraints—from curricular gaps and resource shortages to pandemic-related restrictions—limited the depth and consistency of EE across all cases.

THEORETICAL IMPLICATIONS

Theoretically, our analysis—guided by Palmer's (1998) concept of EE, which comprises learning about, *in/through*, and for the environment—suggests that robust content knowledge and curriculum coherence are essential prerequisites for advancing beyond surface-level instruction. In Cases 1 and 2, instruction was largely confined to teaching *about the environment.* In contrast, authentic experiential learning *in/through* the environment—such as pre-pandemic outdoor garden activities—and sustained actions *for the environment*, including recycling projects and tree planting, were more apparent when these foundational elements were firmly in place. However, the shift to virtual modalities during the pandemic (as observed in Cases 3 to 5) exposed a critical shortcoming. In the absence of explicit pedagogical guidance and adequate resources, many teachers reverted to fact-based instruction or excluded EE altogether. This regression significantly undermined the holistic and participatory engagement central to Palmer's model, highlighting the vulnerability of EE implementation when structural and professional supports are lacking.

PRACTICAL IMPLICATIONS

Teachers in the study—particularly those in Cases 4 and 5—demonstrated significant gaps in content knowledge and curriculum alignment, which impeded their ability to deliver comprehensive EE. To address the evident lack of teacher preparedness in implementing a holistic EE curriculum within early childhood education, educational institutions and policymakers must prioritise the development of clear, cohesive frameworks that equip teachers with both theoretical foundations and practical strategies. This may include the creation of detailed curriculum guides, the provision of specialised training

programmes, and access to teaching resources that empower educators to integrate environmental themes confidently into their daily instruction. Furthermore, addressing disparities in access to essential resources—such as digital tools, teaching aids, and safe outdoor learning spaces—is critical to ensuring EE practices are both equitable and inclusive. Sustained support through mentoring, professional coaching, and capacity-building initiatives at the school level is essential to foster a culture of environmental engagement. These measures will help ensure that EE provision is balanced, contextually relevant, and capable of promoting long-term environmental stewardship among young learners.

LIMITATIONS AND RECOMMENDATION FOR FUTURE STUDY

The resources, curricula, and academic cultures of private preschools often differ significantly from those of public institutions. Consequently, future research should incorporate public preschools to enable a more holistic examination of EE practices across diverse educational settings. Additionally, reliance on teacher self-reports may introduce bias, as responses may reflect teachers' intentions more than actual practices. Similarly, the documents provided may not capture the full scope of EE implementation within preschool environments. To address these limitations, future studies could incorporate observational methods or utilise multiple data sources to triangulate findings and provide a more comprehensive understanding. Moreover, while this study focused on EE implementation before and during the COVID-19 pandemic, it also explored the immediate challenges experienced in the pre-pandemic, pandemic, and post-pandemic phases. Further longitudinal studies may help capture the long-term effects of these disruptions on EE practice in early childhood education.

FUNDING/ACKNOWLEDGEMENT

This research received no external funding.

INSTITUTIONAL REVIEW BOARD STATEMENT

The study was conducted in accordance with the ethical guidelines of Universiti Sains Islam Malaysia regulations for research involving human participants. Approval was obtained from the appropriate authorities as of November 2023.

DATA AVAILABILITY STATEMENT

The data presented in this study are available on request from the corresponding author due to privacy and institutional restrictions.

DISCLOSURE STATEMENT

The authors declare no conflict of interest.

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