Early Childhood Environmental Education in Tropical and Coastal Areas: A Meta-Analysis

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Early Childhood Environmental Education in Tropical and Coastal Areas: A Meta-Analysis

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Abstract. Early childhood years are the period of the greatest and most significant developments in ones' life, and are generally regarded as the basis upon which the rest of their life is constructed. However, these early years are those that traditionally have received the least attention from environmental education. This paper was aimed to summarize several day-to-day activities that can be conducted to educate children in their early years about environment. Environmental education is an educational process that deals with the human interrelationships with the environment, and that uses an interdisciplinary problem solving approach with value clarification. Environmental education is aimed at producing a community that is knowledgeable about the biophysical environment and its associated problems, aware of how to solve these problems, and enthusiastic to work toward their solution. It highlights the progress of knowledge, understanding, attitudes, skills, and commitment for environmental problems and considerations. Further, environmental education can help children expand their ecological worldview, promote active care to the environment, and explain the relationship between modern life style and current environmental problems. Several types of environmental education have been identified from the literature, such as outdoor activities in natural outdoor setting, school gardening, play-based learning, and drawing activities. Each of these activities has its own characteristics and effects on children's environmental-related attitudes and behaviors. Through these activities, the unique characteristics of tropical and coastal areas can potentially be used to facilitate children to learn about nature and environment. Recommendations for childhood education practitioners and future researchers are discussed.

Keywords: environmental education, children, outdoor activities, play-based learning, classroom activities

1. Early Childhood Years and Environmental Education

The essential objective of environmental education includes individual's active involvement in working toward the ways to cope with environmental-related problems[1]. Environmental education is also conducted to help individuals acquire environmental awareness and sensitivity, and also understand of environmental problems, pro-environmental ideas, values, and concerns. In other words, environmental education helps them learn the skills to identify and resolve the environmental problems, as well as to provide opportunity to be actively involved in environmental-related actions [2].

In early childhood education, environmental education is becoming an increasingly essential learning area to study [3], as there is a strong need to educate children since their early years to learn how to act in a sustainable way [4]. Today, these children are born into a world with major

environmental global issues, such as pollution, climate change, and biological diversity loss. These problems are widely discussed by most of the people on earth such as politicians, academics, and the media throughout the world. These issues are also problems which are articulated and used as educational content in schools. Early childhood education in the United States includes young children within the age range of birth through eight. However, in different countries, this term is more widely used to explain education for young children who have not yet begun kindergarten, generally before they reach five years old [5].

The early childhood years are the phase of the greatest and most significant developments in an individual's life. These years are generally recognized as the foundation upon which the rest of one's life is constructed [6,7]. The role of early childhood education in shaping key academics, social, and cognitive skills that have lifelong consequences for the individual and society has been shown by a significant empirical evidence [5]. Additionally, a large body of literature from different fields such as neuroscience, health, and economics demonstrates that early investments in human capital can offer significant returns both to individuals and to the larger community. Therefore, early childhood environmental education has the potential to make an important impact on young children development as well as on a sustainable world [5].

2. Informal Learning

Environmental education for young children will be more interesting when it is delivered through an informal learning. Informal learning is defined as learning that takes place outside of a classroom environment, such as museums, interactive science centers, forests, botanical gardens, zoos and wildlife parks [8]. Informal learning can improve children's understanding by having the learning process happen in an environment, where children may be unaware that they are learning and that they are naturally motivated by the environment. Compared to a formal classroom environment where information is often delivered orally, or using letters and numbers that need to be decoded, this approach is more exciting to follow [9].

As opposed to formal school, informal learning allows children more to display differing knowledge and understandings. This is because an informal setting is not structured to relate in simple ways to the formal curriculum that children have experienced. Different children have different access to different parts of the knowledge base through, for instance, their different interests, their exposure to different books, CDs, websites, and television, and their different leisure and holiday activities [8]. Additionally, informal learning settings are more likely to provide young children with a variety of free-choice activities to exploring things and construct new knowledge and beliefs [10]. This type of learning can serve as an opportunity to make a topic entertaining and enjoyable, and to forge links with everyday experiences and observations. This can make the learning experience more meaningful and not easy to forget [11]. Several informal learning that can be applied in children in tropical and coastal areas includes outdoor activities in natural outdoor settings, school gardening, play-based learning, and drawing activities.

3. Outdoor Activities in Natural Outdoor Settings

For young children, small-scale actions at the level of the school yard and the local environment might be the most appropriate settings to learn about their environment, as they should not be overwhelmed with indefinite environmental problems. Young children need a direct experience which does not go beyond their intellectual capacity [1].

Responsible environmental behavior is a learned response or action. For young children, outdoor activities can be a basis for developing an environmental responsibility in early childhood. The purpose of outdoor activities is to give children out-of-classroom educational experiences which includes direct contact with a variety of environment. Previous study showed that increased awareness and knowledge of environmental action strategies contribute to increased motivation to take action. Through personal experiences, diverse environmental education programs such as field trips, hiking, camps, and adventure activities can develop young children's environmental sensitivity, affective

relationship to the natural environment, perform outdoor behavior and exercise their social relationship [12].

Natural outdoor settings are outdoor environments which range from relatively natural to relatively wild. These settings are in contradiction of maintained or built spaces, such as cut grassy areas, landscaped park settings, paved areas, or playgrounds [13,5]. The importance of natural spaces in education is not a new idea, as educational theorists emphasize the role of direct experiences in nature for young children's development and well-being [13, 5]. For example, in tropical areas or in coastal areas, trips to nearby forests or beach make it possible for young children to learn to take responsibility for themselves, their personal belongings, and the environment by not littering and by tiding up. Hiking and walking in the forests makes them learn about the terrain, animals, and plants. Farming can make the students learn about farm life. These trips can make them to take responsibility for their equipment and food [12].

Experiences, often with significant adults, that socialize children to view nature in positive and meaningful ways, were more likely to be beneficial. Nature activities in childhood and youth, as well as examples of parents, teachers, and other role models who show an interest in nature, are key 'entry-level variables' that predispose young children to take an interest in nature themselves and later act for its protection. An authoritative parenting style, combining high standards for behavior and clear rules with encouragement for children to express their thoughts and feelings, is associated with high levels of social responsibility in children[14]. Education programs and membership in environmental clubs and organizations can be seen as arena to gain increased knowledge about environmental issues and learn environmental action skills and capacities[1]. Parents and other family members are critical role models of interest in public issues and prosocial values such as environmental responsibilities. Young children are more likely to participate in community activities if their parents are also active in this way, or give them approval and encouragement to take part[15].

Early childhood educators' beliefs regarding the difficulty of using natural outdoor setting is also a key insight and integral in guiding future research and professional development efforts[5]. Natural outdoor settings hold endless possibilities for learning in all curricular domains. However, early childhood educators may not recognize the potential opportunities for learning in natural outdoor settings nor the alignment between early childhood pedagogy and the opportunities offered by nature experiences. Early childhood educators who were limited in their own childhood exploration of natural outdoor environments may lack the foundational experiences necessary to see the affordances in natural outdoor settings[16,5]. Teachers' beliefs as to benefits of outdoor settings may limit the opportunities that teachers provide for children in the outdoors. For example, early childhood educators tend to associate outdoor settings with physical and social development, as opposed to a wider range of developmental benefits, and view the role of natural elements in outdoor setting as having aesthetics rather than educational value[17,5]. Understanding early childhood educators' beliefs, practices, and perceived barriers in relation to natural outdoor settings can inform efforts to encourage and support the use of natural outdoor settings in early childhood education[5].

4. School Gardening

School gardening covers a range of activities to increase the horticultural complexity of the schoolyard. School gardening can involve having potted plants, raising beds on asphalt, doing indoor composting, and carrying-out in-ground plantings[18,19]. It also includes a systematic approach to redesign the outdoor space around schools into learning landscapes[20]. The purposes of gardening are academic, behavioral, recreational, social, such as to increase children's sense of belonging, self-esteem, and compassion. It can also be political, as the schoolyard can be a visible community asset, and this activity can also serve as an effort for environmental remediation.

Several rationales for school gardening to be an alternative of environmental education for children are that this activity can broaden children's experience of the complexity of the ecosystem and knowledge about the nature and culture continuum. For example, vegetable gardening can teach children about food systems ecology, and exposure to nature and gardening in can shape their attitudes

and environmental values[18]. Gardens cover the principles of biodiversity and organic pest management which contains ponds or recycling streams, trees, and butterfly attractors. This place can be a safe place for a wide variety of flora and fauna beyond the crops, flowers, and bushes purposely grown, and this can also demonstrate ecosystem complexity. Gardens that children help to plan and grow allow a close and personal experience with the environment, repeated sensory contact, and an interaction with the processes of nature. These benefits are believed as necessary for a healthy human development[21].

5. Play-based Learning

Previous studies in the area of play-based learning and pedagogy generally seeks to focus on the ways in which play is related to and/or used in early childhood education as a foundation for pedagogy. It is important for researchers in this area to formulate the way in which "play" is understood, located, or identified in relation to pedagogy[22, 23].

Previous study investigated how teachers can create different types of pedagogical plays. These activities can provide opportunities for young children to develop knowledge through experiences about environmental education[24]. This work suggested three ways of thinking about children's play-based activities when engaging with environmental education as a learning area, including open-ended play, modeled play and purposefully framed play. First, open-ended play which includes play experiences where the teacher provides young children with materials suggestive of an environmental or sustainability concept. In this activity, teachers provide minimal engagement and interaction which allows children to examine and explore the materials as a basis for learning about the concept of environment or sustainability. For example, children are provided with materials and then asked to make dirty water "clean." There is little or no discussion or modeling of the activity, and the children are left to participate in open-ended play with the materials.

Second, modeled play which involves play experiences where the teacher illustrates, explains, and/or demonstrates the use of materials suggestive of an environmental or sustainability concept prior to allowing the children to use these materials with minimal adult interaction as basis for learning about the concept of environment or sustainability. For example, children are shown a model of how the materials could be used to make a filter for cleaning water. Children participate in the play activity following modeling by the teacher. This activity can involve a live demonstration or can also use a video-based model.

Third, purposefully framed play which includes play activities in which the teacher provides children with materials suggestive of the concept of environment or sustainability. The teachers then provide opportunities for the children to be involved in an open-ended play, followed by modeled play and then teacher-child interaction/engagement. For example, children are provided with materials and participate in open-ended play. Following the open-ended play activity, the teacher models how the material could be used, and the teachers engage in discussions with the children about the activity.

Additionally, there are several organizing themes in environmental-education related play which involves social facilitation, play places, spatial play, play content, and intermittent play[25]. First, social facilitation recognized that supportive parents or other immediate others or peers made play experiences possible in wild environments. Parents can guide the activity by choosing to live near nature, experiencing it directly and through discussion with their children. They can send their children to camp, and traveling with their children to wild places. Parents can also facilitate the play activity by saving items to use in collecting or allowing their children to come home dirty. Parents can provide books and magazines in their homes devoted to the scientific aspects of nature.

Second, play places which include the use of many types of play areas. Participants reported using many interstitial spaces, including wooded areas and ponds along golf course fairways, watersheds through urban areas, unfinished houses in construction sites, bridges, and traditional rural and wild landscapes.

The third organizing theme is spatial play, which distinguished exploration of large-scale environments from stationary play in one area. These environments included time spent away from

home on vacation or with relatives, exploring by following creeks and ditches, and using forts or tree houses that were near-distant, that is, close to home but far enough away to require some travel and provide privacy from parents. The participants can spend several weeks away from home, either traveling or staying with relatives. During these activities, their relatives can provide access to new play areas.

Fourth, both play places and spatial play led to the broadest and most complex organizing theme, play content. The content of play describes in detail regarding activities occurred during childhood. One cluster of activities consisted of fantasy play based around story lines in movies and books. A second content cluster involved creative acts with clay and plants. A third grouping consisted of searching for, catching, trapping, or collecting animals, insects, and fossils. There were also games such as hide-and-seek and dam wars. By climbing trees, crossing creeks, and swinging on vines, participants demonstrated physical prowess. Last, many responses included creating structures such as forts and shelters. Play content can be child–child play in nature and child–nature play. Child–child play involved activities dominated by interactions between children in which they used natural objects as barriers, weapons, or tools. For example, throwing walnuts at each other during war games would be child–child play. In child–nature play, either solitary or with others, the focus was on observing, catching, exploring, or creating with natural objects.

Finally, another organizing theme was intermittent play through chore-like rehabilitation of wildlife, gardening, caring for pets, and picking berries. Although these activities resembled work, they sometimes provided novel and enjoyable experiences. Many respondents cared for a variety of pets during their childhood. Others mentioned finding sick or injured wildlife and having the opportunity to rehabilitate wild animals. Other responses included mowing the lawn, feeding animals, and spending time outside as a family.

The global theme that covers all the themes was environmental pleasures, acknowledging the strong perceptual and affect component of recalled experiences of playing outdoors. The difference that we identified as child–child and child–nature play merits further investigation. The style of interaction during play in and with nature may predict a generative interest in natural history. Young children whose play tended to involve interacting with nature (e.g., catching frogs in a creek) as opposed to interacting with each other (e.g., war games with walnuts) may be more likely to have pleasurable, overt, and implicit learning experiences with and about natural objects and creatures. That possibility may explain why many adults may recall play experiences in nature as a child are not interested in natural history or biodiversity issues as an adult. Childhood play provides opportunities for developing layers of skill sets: physical coordination, ancillary skills (e.g., tolerance for dirtiness, heat, and cold; wayfinding), social interactions, and creative acts, including art and construction. Most children develop these outcomes by playing outdoors. Children who engaged in child–nature play probably experienced an additional dimension of nature that they continued to value into adulthood.

Parents and peers played a role in access to wild and interstitial places through choosing home location and granting freedom to play and explore. Both access to natural areas and the content of childhood play in nature probably reflect to some extent the values of parents and peers. Parents appear to play a significant although indirect role in experientially preparing their young children to benefit from structured environmental education through unstructured, self-directed experiences in nature. Environmental educators should help parents to provide unstructured and child-directed experiences with natural environments.

Child play activities in nature are either child–child (e.g., playing war) or child–nature (e.g., exploring a creek) focused activities. Child–nature interactions are more developmentally important than child–child interactions. Parents, environmental educators, and nature centers can stimulate child–nature interactions that encourage exploring for animals by providing equipment ranging from empty mayonnaise jars to insect nets. Many parks loan fishing equipment and could also loan nature-study equipment. Environmental learning centers could offer programs for parents on how to purchase quality nature-study equipment, microscopes, and telescopes for their children. To help their children

start effectively to use their new gift, the video-game generation of parents would also need instruction on what in nature their children can observe with these nature study gadgets.

6. Drawing Activities

Children's drawings may provide us with insights into their cognitive, affective and social development because they are unique, and have complex thoughts and feelings. Psychotherapists and clinical counsellors have analyzed children's drawings as projections of their personality traits. These experts are likely to use children's art as a powerful tool in communication[26].

For young children, drawings are believed to reflect their mental representations and conceptual knowledge about the objects they draw. When children's mental models of the world become more extensive and differentiated, their drawings become more precise and comprehensive[27]. Using drawings to probe understandings was a useful approach in researching children's learning. Drawings enabled them to visualize and reveal to the child and teacher 'qualities of understanding' that can be hidden through other research procedures such as interview, observation, or traditional cognitive paper-and-pencil tests. This is because individuals are more ready to think about images long before thinking in words and they expand upon this noting how humans tend to feel more satisfied if they can translate words into images. In science, 'complex notions are often represented by familiar, everyday images[28]. Previous research showed that drawings to be an effective method for analyzing 7 to 9 years old English and Mexican children's environmental perceptions[29]. Empirical material consisting of drawings can be used to visualize the way in which children think about the environment.[30]

Previous study also demonstrated that drawing activities can facilitate children to learn about tropical rainforest[30,31]. Drawing activity is one of the unique strategies to evaluate children's perceptions regarding the environment, and also their major expectations and concerns for the future in relation to environment[29]. Drawing techniques provide a relatively easy way to gather social information from and about children[32]. The use of drawings for evaluation purposes is a powerful tool, since most children tend to enjoy drawing activity without showing any sign of pressure.

For children who do not like answering questions, drawing tests can be completed quickly, easily and in an enjoyable way.[33] Drawings avoid linguistic and oral communication barriers. These fun activities also enable comparisons between groups of different languages and abilities.[34] The content of children's drawings may provide insight into their feelings and thoughts about the world.[35] Children's drawings provide a 'window' into their thoughts and feelings, mainly because they reflect an image of his/her own mind.[36] For example, a previous study used drawings from children to discover the variety and kinds of concerns children might have about the environmental crisis. Children were asked to draw a picture about what it means to them when someone says, 'You have to save the planet'. Findings showed that 87% of the children were very much aware of the environmental crisis. Nearly half (47%) described themselves or others taking personal action for positive social/environmental changes.[32]

Other study demonstrated that before and after the children visited the project and took part in a workshop, they were each asked to draw a picture of a 'tropical rainforest'—drawing[31]. At the first stage, young children were encouraged to express their knowledge about tropical rainforests. This was supervised by teachers in their school and the children were given the task in as relaxed an atmosphere as possible. They had as much time as they needed to complete their drawing and it was emphasized that it had to be their own work from their existing knowledge. No secondary sources of information or discussion were permitted. At the second stage, they were asked to do the same thing. However, before they entered the second stage, they visited the tropical rainforest.

One of the key differences between the set of children's first drawings i.e., before they went to see the rainforest and second drawings after they visited the rainforest, was the extent and depth of the trees and plants drawn. In the first drawing, they drew fewer trees and plants. Additionally, the trees were drawn very much in a stylized fashion such as they have lollipop shaped trees, or sometimes they have fruits such as apples or oranges or bananas. These things did not happen anymore after they

visited the real rainforest. In their second drawings, children drew many more recognizably different species of tropical rainforest trees and plants. The accuracy and details of their drawings had significantly improved. They drew more accurate and architecturally shaped rainforest trees and plant shapes. The shapes of the leaves were accurately drawn with details such as leaf veins and drip points included.

7. Conclusion

Scientists have started to be aware of the importance of children to learn about environment since their early years, especially through informal learning. Informal learning is identified as an appropriate method for children in their early years to learn about their environment. This includes outdoor activities in natural outdoor settings, school gardening, play-based learning, and drawing activities. Parents and educators are encouraged to use these range of activities to educate children about environment. Future researchers are encouraged to investigate a variety of methods to develop environmental education strategies for early childhood education in tropical and coastal areas.

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