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ARTICLE

Connecting children to nature through the integration of Indigenous Ecological Knowledge into Early Childhood Environmental Education

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Abstract

In this paper, we draw on the ontology and epistemology of the local Kasena ethnic group in Northern Ghana to explore Early Childhood Environmental Education. The study, taking place in Boania Primary School, drew on the concept of two-eyed seeing, where both western and Indigenous epistemologies and ontologies were taught. In this way, Indigenous Ecological Knowledge was integrated into the Early Childhood Environmental Education programme for the Kindergarten two classroom environmental studies topics. Two Indigenous Elders led the integration of local knowledge into environmental studies topics by visiting the school to teach the children through taking them outdoors for learning activities. After this, in-depth interviews were held with the teacher, Indigenous Elders, and nine children regarding their experiences. The purpose of the study was to explore how Indigenous Ecological Knowledges can help instil in children positive environmental attitudes and values, while also connecting them to nature and offering them a more relational understanding of human to nature relationships. Based on the Indigenous cultural framework of respect, reciprocity, and responsibility towards nature, the findings show that the integration of Indigenous Ecological Knowledge into environmental education has the potential to improve our relationships with the environment.

Keywords: early childhood; environmental education; Indigenous knowledge; qualitative

Introduction

Environmental education (EE) in early learning has come under critical scrutiny globally (Born, 2018; Nelson, Pacini-Ketchabaw, & Nxumalo, 2018; Nxumalo & Cedillo, 2017; Nxumalo, 2018; Nxumalo & Villanueva, 2019). Prominent among the issues raised is that the pedagogy and curriculum of Early Childhood Environmental Education (ECEE) are dominated by colonized western epistemology (Nxumalo & Cedillo, 2017). Although western science has much to offer EE, relying on western epistemologies alone in ECEE does not address human relationship to and interconnectedness with the environment. Scholars have observed among other things that western epistemology wrongly promotes anthropocentric and binary ideas of children existing separately from nature or the environment (Nelson, Pacini-Ketchabaw, & Nxumalo, 2018). Nxumalo and Cedillo (2017) for example, observed that colonized western epistemology continuously treats nature and non-humans as separate entities from humans. Thus, children fail to learn the necessary relationships, environmental values, and ethics needed to achieve environmental

sustainability (Nxumalo & Cedillo, 2017; Nxumalo, 2018). Pyle (2003) concluded that people's sense of connection to nature 'has paled, withered, and is finally failing' (p. 206). This, the scholar noted, is manifested in the current levels of environmental destruction seen globally.

As a result, calls have been made to integrate Indigenous Knowledges and world-views into ECEE (Nelson, Pacini-Ketchabaw, & Nxumalo, 2018; Nxumalo & Cedillo, 2017; Ritchie, 2012). The aim is to dismantle the mistaken notion that humans exist separately from the rest of nature (Pacini-Ketchabaw & Nxumalo, 2015). Studies have shown that when EE in early learning highlights the interconnections so valued by Indigenous Peoples, rooting the learning in understandings of that place, children's relationship with the environment improves (Nxumalo & Cedillo, 2017). Indigenous epistemologies, particularly Indigenous Ecological Knowledges (IEKs), emphasize the inseparability of humans from the rest of nature (Marshall et al., 2010).

As Robbins (2018) concluded, IEKs offer a more holistic view of ecosystems which allows us to truly understand the inseparability between humans and non-humans. Therefore, the demands to include Indigenous content in ECEE have been strongest towards IEKs (see Ritchie, 2012). IEKs have the cultural framework of love, respect, reciprocity, and responsibility towards nature (Kimmerer, 1998, 2002; Reid, Teamey, & Dillon, 2002), and so are best suited to develop in children deeper relationships and respect towards nature. Wilson (1994 as cited in NAAEE, 2010) concluded ECEE aims to foster in children 'positive attitudes and values about the world of nature and a sense of responsibility toward the natural environment' (p. 23). Nelson et al. (2018) referred to this connection as living in relational reciprocity with humans and non-humans.

Early Childhood Environmental Education in the Ghanaian context

Faced with an increasing population and numerous environmental challenges, Ghana recognizes the value of Environmental Education (EE), especially at the earlier stages of children's lives. Most of the population depends directly on the environment for survival (Ganaa, 2011). Hence it is acknowledged that EE holds the key to the sustainable use of these environmental gifts. As the Ghana National Environmental Policy (2012) stated, 'conservation and sustainable use of these environmental resources and their protection depends on attitudinal and behavioural change by all individuals, households, private, and public sector institutions' (p. 1). Additionally, several educational reviews (in 2002 and 2007) in the country have highlighted the need to integrate EE into school programmes (Atuguba, 2018). Based on these reviews, EE has been added to the Early Childhood Care and Development (ECCD) curriculum in Ghana as a learning area alongside traditional areas such as numeracy and literacy (see Ministry of Education, 2006, 2019). Thematic Unit 6 of the new Kindergarten curriculum (All Around Us) deals with EE topics (Ministry of Education, 2019). Specifically, the following topics are taught: living and non-living things (living things: animals, domestic and wild), water, air, plants, gardening (types of soil and gardening, making the soil fertile for gardening), light — day and night (natural and technological sources of light), and changing weather conditions (positive and negative effects of weather conditions). The aim is to inculcate in children 'a strong sense of environmental, social, and economic awareness, with emphasis on protecting the environment' (Ministry of Education, 2019, p. vii).

Despite the benefits that Ghana stands to gain from Early Childhood Environmental Education (ECEE), the EE programme (under which ECEE falls) has been introduced as an integrated programme focusing on western science and epistemology to the neglect of Indigenous Knowledges (IKs), particularly IEKs. According to the Global Environmental Education Partnership (2019), the Ministry of Education through the Ghana Education Service (the agency in charge of education) incorporates EE into formal education through the Integrated Science curriculum for all levels of education (Global Environmental Education Partnership, 2019). The implication of this is that EE in early childhood education has been reduced to learning abstract concepts about the environment without genuinely building in children a stronger relationship with the environment. Nxumalo (2018) refers to this act of learning in ECEE as the accumulation of facts. The adoption

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of science as an approach to integrating EE into classroom topics has resulted in too much focus on western science/epistemology to the neglect of IKs. Evidence suggests that relying on western science alone to deliver EE is not the best approach to achieving sustainability and EE must find ways to incorporate Indigenous world-views (Agyeman, 2002; Fien, 1995; Marouli, 2002; Martusewicz et al., 2011; Sauvé, 1997; Taylor, 1996). This paper investigates the integration of IEK into ECEE in one developing world context — Ghana. Ethics approval for the research project was received from the University of Saskatchewan ethics office and the Ghana Education Service.

Indigenous Ecological Knowledge and environmental protection in Ghana

There is a saying in Ghana that to protect any species of animal or plant you must give it a spiritual or godly status. Indigenous Ecological Knowledges (IEKs) play a key role in the conservation of the environment in Ghana and several studies have empirically demonstrated how IEK is helping solve real-world environmental problems. IEK as used in this paper refers to a way of life with a cultural ethos of love, respect, responsibility, and reciprocity towards nature (see McGregor, 2005, 2008). In the traditional Ghanaian context, some of these are in the form of Indigenous cultural practices, totems, and taboos instituted to protect the environment (Atuguba, 2018). In the community of Boania and Paga, paramount among these are the people living in harmony with their sacred crocodiles with neither hunting the other (Arhin, 2008). The people of Boania have a strong historical relationship with crocodiles, which they worship and hold as totems. Additionally, the community has sacred groves regarded as a habitat for the gods, certain species of trees like the baobab trees are considered family members, and there are taboos, and other cultural practices to define the relationship between the people and their non-human relations. In addition, the people of Boania see nature and non-humans as teachers, who teach how to live on the earth sustainably. These are all pedagogical practices that can be employed in ECEE to highlight the relationship between humans and non-humans. Similar practices exist in other remote communities across Ghana. Importantly, these IEKs have been found to still be effective in adapting to climate change and protecting the environment. For example, Boafo et al. (2016) observed that in the face of no early warning systems from climatologists, rural communities still rely heavily on IEK to prepare for floods and droughts in Northern Ghana. Likewise, Adom (2018) concluded that natural resource conservation in the Bomfobiri Wildlife Sanctuary was successful due to the people's IEK. McPherson et al. (2016) showed how IEK even helped in the discovery of the 'sitatunga (*Tragelaphus spekii gratus*), a species familiar to locals, but not previously scientifically recorded in Ghana and regionally assumed extinct' (n.p). Based on this, scholars (Arhin, 2008; Attuquayefio & Gyampoh, 2010) have concluded that the introduction of western-style conservation systems in Ghana must consider cultural practices including IEKs of the local communities. Kimmerer (2002) observed in the United States context that IEK has 'an ethic of reciprocal respect and obligations between humans and the nonhuman world' (p. 434). This ethic is necessary given the level of environmental destruction that is happening globally. As Pyle (2003, p. 206) argued, 'there is no longer any doubt that a strong individual sense of connection to nature and natural processes is utterly essential to the healthy coexistence of humans with their biological neighbours and physical setting'.

Methods

The research project adopted a community-based participatory design approach and an Indigenous methodology in the form of a two-eyed seeing to guide the research. Two-eyed seeing is a methodology in which both western science and Indigenous knowledge is valued for their explanatory power. In the case of this study in Ghana the Indigenous eye was highlighted on one hand (represented by the Elders' teachings) and the western eye on the other (represented by the curriculum and the teacher). A Community Research Advisory Committee (CRAC), comprising community members, Elders, Knowledge Keepers, and education experts from the

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community of Boania was formed to guide the research process. Data were collected using in-depth interviews with 12 co-researchers. The co-researchers consisted of two Elders (man and woman), one teacher, and nine pupils. We used the term co-researchers instead of research participants because they played active roles in the research beyond research participants (Bourassa et al., 2020; Pope, 2020). The interview questions were co-developed, reviewed, and approved by the CRAC representing the community. As well, the CRAC was involved in deciding the methods to be used in collecting data. In-depth interviews were adopted because they allowed for deeper and open discussions on the issue under investigation (Bessarab & Ng'andu, 2010) being the community's IEK in this case. Two rounds of interviews were held with the Elders and teacher while one set of interviews was held with the pupils. The first set of interviews occurred at the beginning of the research to find out what IEK was and how it could be integrated into classroom lessons. After this, we decided on the methodology to use in integrating this knowledge into classroom lessons. Collaboratively, we adopted a two-eyed seeing methodology to integrate the community's IEK into classroom environmental studies lessons. The Elders took turns visiting the school every week to engage the children on the community's IEKs. They did this by taking the children on outdoor land-based learning while the teacher taught what existed in the children's curriculum in the classroom.

Data analysis

The data analysis was a collaborative process done with overarching guidance from the Community Research Advisory Committee. A qualitative data analysis approach in the form of thematic analysis was adopted to analyse data. Thematic analysis is a form of pattern recognition within data, with emerging themes becoming the categories for analysis (Fereday & Muir-Cochrane, 2006). The thematic analysis approach is a more flexible approach that can be modified for the needs of many studies, providing a rich and detailed, yet complex account of data (Braun & Clarke, 2006). The process began with transcribing interviews, coding, and categorizing codes into themes. Themes were deductively selected based on how they helped answer the research questions of the study (Braun & Clarke, 2006). This was done by using NVivo 12 Plus, computer software that facilitated the coding of data and organizing it into themes. The transcripts were sent back to the co-researchers to be verified. Also, identified themes were discussed with the co-researchers to ensure the themes truly represented their views. After, the themes were presented to the CRAC for their review and overall approval.

Results

From the analysis, the following five themes emerged as they related to enhancing children's relationship with the environment and non-humans: language, ontological and epistemological implications, nature as a teacher, pedagogical disruptions, and engagement with real-world environmental problems. It is also important to note that these themes emerged from the IEK's inherent values of respect, reciprocity, and responsibility.

Language

To enhance children's relationship with the environment and non-humans, the type of language used in the curriculum and pedagogy of Early Childhood Environmental Education (ECEE) is important. We found that the integration of Indigenous Ecological Knowledge (IEK) into ECEE exposed the human-centric language and narrative in Ghana's ECEE programme. The language used in the current ECEE curriculum and pedagogy is anthropocentric where the environment is seen as a resource to satisfy human needs. This has the potential to adversely impact how children view the environment and their relationships with non-humans. Whereas, with the

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Elders, things offered by the land, environment, and non-human relations are viewed as gifts. These gifts are to be received by the community with respect, responsibility, and reciprocity as the guiding principles. As the male Elder commented,

> Basically, the Kasena people are farmers because their livelihood is mostly agriculture. The people farm to sustain themselves. They live off the Land and its gifts which include the vegetation that grows around us, water bodies, the air, and other things. These are the gifts from the land we depend on and in return we must take good care of the land (male Elder interview [1] transcript, January 27, 2020).

The curriculum is based on western science, only, with no IEK, and the language structure represents that influence.

Ontological and epistemological implications

Generally, we found that the ontology and epistemology of Kasena's IEK highlighted human inseparability from the environment and from non-human relatives more profoundly. Hence, the integration of IEK into ECEE allowed children to develop deeper and stronger relationships with nature. For example, the ontology and epistemology of the community's IEK do not dichotomize things as living and non-living. Everything has a spirit including stones which are sometimes considered living things and mediums to communicate with ancestors. Based on the IEK, the Elders showed that the community had a strong and inseparable relationship with nature. As the male Elder commented, 'all ceremonies or activities begin with the pouring of a libation in community' (male Elder interview [1] transcript, January, 27th 2020), which was a way of seeking permission from the land (Acharibasam, 2021).

Nature as a teacher

Another important theme that emerged from the integration of IEK into ECEE was that there is a lot we can learn from the environment and our non-human relatives on how to live sustainably on the earth. Based on this, the Male Elder stated,

> The jackalberry tree (*Diospyros mespiliformis*) grows on termite mounds and develops a symbiotic relationship with the termites. The roots of the tree serve as a habitat for the termites, and they too do not eat the roots of the tree. We can emulate this to live with the environment sustainably (male Elder interview [1] transcript, January, 27th 2020).

These land-based teachings have the potential to enhance sustainable behavioural outcomes in children.

Pedagogical disruption

This was another theme that emerged concerning how environmental topics were taught under ECEE. Due to its holistic nature, the integration of IEK into ECEE allowed the Elders to teach all subject areas in an integrated way. In other words, all forms of knowledge were integrated in the teaching. This challenged the norm where forms of knowledge are divided into different subjects or disciplines and taught separately under western informed ECEE. Under the current ECCD curriculum, forms of knowledge are divided into different subjects including mathematics, environmental studies, religious and moral studies, and so on. But this was not so with the community's IEK which is holistic. As a result, in teaching about the environment, the Elders employed

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spirituality to explain concepts including the use of taboos to conserve the environment and non-humans in the community. The Female Elder, for example, stated

> individual households within the community of Boania have taboos surrounding what species of trees can be used as fuelwood or not and the same taboos apply to some species of animals. Going against these taboos can bring curses to families and the community as a whole (female Elder interview [1] transcript, January 29th, 2020).

This holistic way of seeing nature further highlights our inseparability from the environment and non-humans.

Engagement with real environmental problems

The integration of IEK into ECEE took environmental studies outdoors. IEK is land-based, experiential, and practical and cannot be taught in the classroom alone. As a result, the teaching of this knowledge was done outdoors and on the land. Being outside, in the community, created the opportunity to engage children in conversation about real environmental problems that the community faced including bush fires, deforestation, too much bark harvesting, and farming practices. For example, the male Elder used this opportunity to talk about illegal logging within the community. He stated, 'the illegal logging of rosewood is something the community can no longer ignore and all community members including children must get involved in the fight against illegal logging in Boania' (male Elder interview [1] transcript, January, 27th 2020).

Discussion

The results of this study provide an insight into the role of Indigenous Ecological Knowledge (IEK) in enhancing children's relationship with non-humans and the environment. This has become key in addressing the current environmental challenges we are facing globally. In this section is a broader presentation of our findings and their implications for Environmental Education (EE) in early learning.

Language and connection to the environment

One major outcome of the integration of Indigenous Ecological Knowledge (IEK) into Early Childhood Environmental Education (ECEE) is that it exposed the anthropocentric language and narrative in Ghana's ECEE programme. Calderon (2014) concluded that when educational concepts are viewed from an Indigenous viewpoint, the problems associated with the one-sided western educational epistemology become more visible. When IEK was integrated into ECEE, the language and narrative of the curriculum and pedagogy became problematic. The language and narrative used in ECEE play a crucial role in how we normalize the human anthropocentric and extractive behaviours. For example, the Ghana National Environmental Policy (2012) observed, 'conservation and sustainable use of these environmental resources and their protection depends on attitudinal and behavioural change by all individuals, households, private, and public sector institutions' (p.1). As well, the Ministry of Education (2019) stated that the aim of ECEE is to inculcate in children 'a strong sense of environmental, social, and economic awareness, with emphasis on protecting the environment' (Ministry of Education, 2019, p. vii).

Using words such as *resources* and *economic* to justify the need for EE stems from an anthropocentric point of view. This means the main reason for environmental protection is to serve the resource needs of humans (Tsing, 2015), and not because humans are inseparable from the environment. Thus, economic interest hinged on natural resource extraction is embedded in ECEE. IEK, on the other hand, uses terms like gifts, respect, reciprocity, responsibility among others to define human relationship with the environment and non-humans. Nelson et al. (2018), also

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cautioned against the language and narratives we use in ECEE else we risk furthering a capitalist agenda of resource extraction. Tsing (2012 cited in Nxumalo, 2018) also concluded pedagogies such as these are 'not enough to unsettle children's inheritances of human-centric practices that privilege human mastery or control over more-than-human others' (p. 151). Therefore, IEK is needed to help connect children more to the environment and our non-human relatives.

Ontological and epistemological

The integration of IEK into ECEE had ontological and epistemological implications as it allowed children to have a different view of nature. Importantly, this further highlights the inseparability between humans and non-humans. The Kasena Indigenous ontology and epistemology from which the two Elders drew to teach environmental topics does not dichotomize things as living and non-living. Even stones, at times, are considered living things. Pedagogically, the Elders demonstrated the community had a strong relationship with nature and they viewed nature through that relationship. There was no clear separation between the people of Boania and nature. Similarly, Marshall et al. (2010) commented in the context of Canada that 'From an Indigenous perspective, humans are inseparable from the rest of creation' (p. 174). This was found in the Boania community's relationship with the sacred crocodiles, stones, trees, and other forms of creation. Harming sacred beings can bring curses to the entire village (Acharibasam, 2021). Stories such as these show the impossibility of maintaining separations between humans and non-humans (Pacini-Ketchabaw & Nxumalo, 2015). These cultural beliefs directly show how the destruction of the environment leads to our own destruction.

The community's inseparability from nature was particularly strong in the Elders' teaching of living and non-living things, where the children learnt that natural characteristics of being able to breathe, grow, reproduce, and respond (traits of being alive) were not the only characteristics for classifying things as living versus non-living (Acharibasam, 2021). The male Elder, for example, stated that the relationship humans have with some trees is sometimes equal to a relationship with a family member (Acharibasam, 2021). For example, the boabab and tamarind trees are regarded as part of a family by the community because of their long-life span (Acharibasam, 2021). Patrut et al. (2007) and Swart (1963) observed that the baobab tree, for example, can live for over 1000 years. Therefore, trees like these are considered sacred and part of the community. According to the male Elder, these trees know the human family's ancestors personally, including their names, and faces (Acharibasam, 2021). As a result, 'they cannot be treated as just trees but rather as part of the family and community' (Acharibasam, 2021, p. 63). Teaching children to view trees as family members and to behave sustainably towards them is completely different from what the ECCD curriculum has on trees (see Ministry of Education, 2019). While outdoors, the students could observe that both Elders emphasized the point that trees are caring and gave gifts (such as fruits, leaves, and herbs) freely to the community. To reciprocate, the community must care for the trees; this had great resonance with the children. This lesson emphasized our reciprocal relationship with nature and our responsibility to the other forms of creation. Through this activity, the Elder and children also engaged in conversations surrounding deforestation, and the general health of the forest. Among these was the illegal logging of rosewood. This way of seeing nature, as a giver of gifts which the community must in turn reciprocate is not present in the ECCD curriculum (see Ministry of Education, 2019). The Elders' teaching provided a more informative understanding of the environment than the ECEE curriculum which focused on the cognitive development of western science concepts. To develop concern for the environment, scholars (see Nxumalo, 2018) emphasized the need for a pedagogical shift from learning facts toward matters of concern. Importantly, Davis (2003) argued that our belief system determines how we relate to nature and our culture determines the environmental footprint we leave behind. By teaching children to view trees as family members in Boania, they may grow to have a different relationship with the environment and other non-humans.

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Nature as teacher enhances children's relationship with the environment

Another important outcome of the integration of IEK into ECEE was the act of viewing nature as our teacher. The Elders emphasized that as humans we must learn from non-humans how to live sustainably. This seems to be a global concept which Indigenous Elders and knowledge keepers have regularly emphasized, how as humans (the youngest of creation) we can learn from our relatives (other creations) how to live on earth sustainably. Consistent with this, Stone and Center for Ecoliteracy (2009) found nature to be an effective teacher on how to live sustainably. According to the Elders, 'mother earth (Katiga) must be treated gently. The chameleon is thought to walk softly on the earth out of respect, and so as not to harm her (Awedoba, 2000). Therefore, humans must learn from the chameleon how to treat mother earth (Acharibasam, 2021). Based on this, the male Elder talked about the honourable harvesting of traditional medicine. During the outdoor learning activities, we realized that the outer bark of most of the trees (Tamarind tree, *Khaya senegalensis*) had been harvested for medicinal purposes. Delvaux et al. (2009) observed that after bark harvesting, different tree species have different recovery rates. According to the scholars, two species, *Khaya senegalensis* and *Lannea kerstingii*, showed complete wound recovery while *Afzelia africana*, *Burkea africana*, and *Maranthes polyandra* have a very poor recovery. Hence, different species are impacted differently. Houde (2007) stated that IEK promotes environmental ethics that prevent overexploitation. It is important, therefore, to include IEK so people learn to harvest honourably, so the trees can recover.

The Elder also taught on trees as teachers. From the jackalberry tree which grows on termite mounds, he taught the children the concept of living and let live (Acharibasam, 2021). He observed, 'there exists a symbiotic relationship between the jackalberry tree and the termites, neither harming the other' (Acharibasam, 2021, p. 74). The roots of the tree serve as a habitat for the termites and they also do not eat the roots (Acharibasam, 2021). He emphasized 'humans can emulate this to live with nature' (Acharibasam, 2021, p. 74). Furthermore, from the *Faidherbia albida* the Elder indicated that humans must learn to use resources sustainably during bumper harvest. The tree, *Faidherbia albida* has a reversed or inverted phenology, in that 'the species has the unique characteristic of shedding its foliage at the start of the rainy season, and of coming into leaf in the dry season' (Wood, 1992, p. 9). According to the Elder, the tree saves its water during the rainy seasons when there is plenty and uses it during the dry season when there is a shortage. Based on this, the Elder stated that humans should also learn to save food when there is a bumper harvest in the rainy season to cater to food shortages during the dry season.

Acharibasam (2021) observed, 'since agriculture is rain-fed in the community, symbolically, the dry season indicates the lean season (food shortage) in the community of Boania, while the rainy season indicates a time of bumper harvest because that is when farming is done' (p. 75). To botanists, however, the reverse phenology of this tree species makes it ideal for agroforestry since it does not interfere with agricultural activities (Wood, 1992). According to Wood (1992), 'This unexpected inverted phenology means that its presence in farmers' fields does not interfere with agriculture, and, indeed, makes it an ideal agroforestry tree for use in combination with crops' (p. 9). Thus, whereas western science sees the usefulness of the tree to serve human needs, IEK uses the tree as a teacher on how to prepare for drought. The human-centric relationship of western science is what several scholars have argued against in ECEE (Nxumalo & Cedillo, 2017). Accompanying each of the Elder's teachings is also a responsibility. Kimmerer (2012) concluded that 'in indigenous ways of thinking, knowledge is inseparable from the responsibility for that knowledge' (p. 322). These teachings confirm research by others that IEK has a cultural framework of respect, reciprocity, and responsibility towards nature (see Kim, Asghar, & Jordan, 2017; Parrota & Trosper, 2012; Reid et al., 2002). Saint-Orens and Nxumalo (2018) concluded that Indigenous teachings such as these help us 'to live in more relational and less human-centered ways in these environmentally challenging times' (p. 71).

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Pedagogical disruption and relational understanding of nature

Again, the integration of IEK into ECEE led to pedagogical and curricular disruptions. This gave the children a deeper and holistic understanding of the relationship between humans and nature. The knowledge learned from IEK was holistic and did not treat environmental concepts as separate knowledge. Unlike the ECCD curriculum used by the teacher, domains of knowledge are not divided under IEK. While teaching about living and non-living things, the Elders integrated several subjects to explain concepts. They talked about family, taboos, the spiritual dimensions of land and trees, the pouring of libation, and the connection to ancestors, among others. As Haverkort (2009, as cited in Atuguba, 2018) stated, 'the natural, social and spiritual worlds are inseparable and integrated' (p. 35). Environmental knowledge was not separate from spiritual knowledge. Kimmerer (2002) concluded that IEK 'is inseparable from the social and spiritual context of the culture' (p. 434).

Holistic pedagogies such as these are very important for ECEE. They help children understand the interconnected relationships among all species and the intrinsic value of each one (Nadasdy, 1999). The Elders showed the relationship between trees and other forms of creatures including humans. They highlighted how the gifts from trees (medicine, shade, fruits, rain, leaf vegetable, among others) sustained other species including humans. For example, without trees, there would be no water for their sacred crocodiles which would negatively impact the spiritual health of the community. Based on this notion, Chandra (2014) warns IKs should not be compartmentalized like western knowledges. Nsamenang (2005) observed that under the traditional African educational system, domains of knowledge are not divided into different disciplines but knowledges about all aspects. The teacher on the other hand did not employ a holistic approach to teaching living and non-living things. Forms of knowledge exist as separate subjects in the ECCD curriculum. For example, religion and environmental studies exist as separate subjects in the ECCD curriculum. This separation fails to highlight the interconnection between humans and non-humans.

Engaged children in real-life environmental problems

In no other way was the notion that children existed separately from nature more evident than in the teaching of ECEE where learning took place mainly indoors. The integration of IEK into ECEE helped take environmental studies outdoors. This gave the children a first-hand experience of the environmental problems caused by the anthropocentric relationship with nature, thus 'helping unsettle the innocent child-in-nature discourses' (Nxumalo, 2018, p. 153). Scholars (Nxumalo, 2015; Nxumalo & Cedillo, 2017; Pacini-Ketchabaw, 2013) have vehemently criticized the continuous promotion of a romanticized or idealized notion of nature and childhood. Commenting on this, Nxumalo and Cedillo (2017) concluded 'There is also a gap in situated and responsive engagements with the specific environmental challenges that young children face in their particular locations' (p. 100). This means children must be presented with the real-world environmental challenges they face in their communities in ECEE. To suit IEK, learning occurred on the land which is the source of the community's IEK.

Kimmerer (2012) concluded, 'in my experience, the classroom is not the most conducive environment for engaging TEK [Traditional Ecological Knowledge] in environmental science, as it is far removed from the sources of traditional knowledge' (p. 320). Through this, the Elders engaged the children in real-life conversations about how selfish human-centric activities such as bad agricultural practices, bush fires, deforestation, climate change (including droughts and floods) and overgrazing were leading to the demise of certain species such as elephant grass, an important species of grass used for making traditional mats and bags. The Elder noted that these mats are traditionally used to bury the dead in the community. Hence, they play an important cultural role. Again, due to increasing global demand, there has been an increase in the illegal felling of

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rosewood trees in the whole of Northern Ghana including Boania. But none of these issues are being taught in ECEE. Therefore, the inclusion of IEK in ECEE allowed the children to engage with real environmental challenges the community faced. These pedagogical encounters are needed in ECEE to help achieve sustainability (Nxumalo, 2018).

Cultural challenges

The integration of IEK into ECEE was not without challenges. For example, we observed some cultural practices such as taboos barring females from climbing trees — this posed challenges to learning about the environment in ECEE and prevented girls from taking part in nature play. Tree climbing plays a key role in ECEE (Gull, Goldstein, & Rosengarten, 2020) but in the community of Boania, the practice is culturally discouraged among girls. When asked how children learnt how to climb trees outdoors, many of the children responded that they learnt the skill from their peers and siblings. Thus, to get around these taboos, children often learnt about nature (tree climbing) more from their peers outside the school environment than from the teacher or parents. However, the girls in particular responded that their mothers would punish them if they ever caught them climbing trees because girls do not climb trees. Culturally, the community of Boania frowns on females climbing trees. As a result, this skill could not be learnt from a teacher, or any other adult, especially for the girls. Although the two Elders did not prevent any of the girls from climbing trees, they confirmed the practice is barred in some homes within the community. They further added that this was more out of safety concerns and the danger that children may hurt themselves. Irrespective of the reasons, we found such cultural practices to impede children, especially girls, engagement with nature.

Conclusion

Addressing our current environmental crises demands a reassessment of the model of ECEE globally practiced. Especially for developing countries like Ghana which are faced with serious environmental challenges, the time has come to integrate Indigenous Knowledges into environmental learning in early childhood education. Currently, environmental education at the early childhood level has been dominated by western epistemology. This tends to reduce environmental learning to the accumulation of scientific facts and knowledge while neglecting IEKs, which among other things, have the potential to forge a stronger relationship between humans and non-humans. Further, we observed the centring of IEK in ECEE, challenged the language used in ECEE provided ontological and epistemological lessons, provided pedagogical disruptions and relational understanding of nature, and engaged children in critical environmental issues. We found that the integration of IEK into ECEE in Boania Primary School generally improved the programme by making it more engaging for children. Based on this, we argue that for ECEE to contribute towards transformation towards sustainability in Ghana, it must find ways to incorporate Indigenous content, especially, IEK, into programmes.

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