A 21st Century pedagogy approach to environmental education in the early years

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ABSTRACT
In early childhood education there is growing interest in curriculum that recognizes and values environmental education as a prominent area of study for young children. There is also interest in approaches to teaching and learning that integrate the principles of 21st Century Pedagogy, in particular the recognition of the social construction of knowledge, real-life experiences and the role of the intentional and purposeful teacher to stimulate collaboration, critical thinking, creativity and communication. This paper reports on a qualitative case study that investigated a ‘Learning in Nature Program (LNP)’ designed for 4-year-old children and its impact on their learning. Diverse data were collected, including teacher’s documentation, children’s drawing-tellings and ‘See, Think, Wonder’ thinking routines and photographs. The analysis uncovered the nature of the program, shedding light on the centrality of the intentional teacher in planning, implementing and evaluating a program that enabled experiential learning in the local natural environment. The findings revealed that the LNP stimulated deep engagement with the natural world and supported children’s creative and critical thinking processes. As such, the value of an ecocentric curriculum was identified as highly effective in equipping young children with the knowledge, skills, attitudes and values necessary for the development of a respectful and sustainable relationship with the earth.

INTRODUCTION
In the 21st century humanity is challenged to co-exist within the boundaries of the earth’s natural systems. At this time, it is widely understood that many of the earth’s environments, cycles and processes have been severely altered by human activity (Glaser et al., 2012) and the relationship humans have with the earth is considered by many to be unsustainable (Davis, 2015; Taylor, 2017; Whitehouse, 2012). There is also evidence that 21st Century children are experiencing a significant disconnect with nature, which is impacting on their overall health and well-being (Louv, 2005; Sobel, 1996). This identified increasing divide between young children and their relationship with the natural world beckons change for the future, calling for a paradigm shift in thinking about how young children can be supported to be more environmentally connected, sensitive and in turn responsible.

As way of a response to this call, Australian national and state early childhood curriculum guidelines (DEEWR, 2009; DEECD, 2009; DET, 2016) have endorsed environmental education (EE) as a key priority. The recommendation is that learning in, about, for and from the environment (Palmer, 1998) is integrated into mainstream curriculum. For early childhood education (ECE), this means transforming teaching and learning practices to create an ‘ecocentric curriculum’ where the emphasis is placed on supporting children to develop a closer human-environment relationship. To this end, nature-based preschools (Elliot, 2008; Elliott and Chancellor, 2014; Knight, 2011; O’Brien, 2009; Warden, 2014) provide an enriched context for children to engage in experiential learning opportunities in a natural environment.
have grown in popularity, with evidence highlighting that such programs are needed to heal the broken bond between children and nature. These programs, which are inspired by a belief in natural spaces and materials as being stimuli for creativity and inventiveness, mostly advocate for open-ended, unstructured immersion of children in the environment. As noted by Davis (2015) “Play experiences in nature provide the opportunity for diverse activities that challenge, engage, inspire and provoke” (p. 45), hence environmental education provides foundational experiences for children to make strong authentic connections with the earth.

EE in the early years encompasses raising awareness, acquiring values, knowledge and skills, and engagement in both formal and informal interrelated processes which lead to a deeper understanding of the natural world (Davis and Elliot, 2014; Davis, 2015; Palmer, 1998). It also incorporates the notion of collectively involving children and teachers in the identification of environmental issues by focusing on care and concern for the environment and taking action for a sustainable future. This draws into relief the value of EE in supporting young children’s developing agency, especially in relation to forming and holding views about human-environment interactions and identifying and enacting responses to environmental issues.

EE represents a holistic opportunity for children’s learning with many outcomes including critical thinking which is facilitated through a range of processes that include reflective observation, focused concentration, sorting, classifying, experimenting, describing, recording, encoding and building connections. Also, individual and collaborative creative processing unfolds in an environment where open-ended play provokes inquiry and exploration, self-reliance and responsibility to others and the environment. It is here that EE and the notion of 21st Century Pedagogy merge, prompting teachers to think about what to teach, how to teach and how to assess learning in the natural environment.

The participants and the context

The participants included six early childhood teachers and twenty-nine 4-year-old children attending a long day preschool in inner-city Melbourne, Australia. The early childhood centre was located close to the city of Melbourne’s iconic Yarra River, extensive parkland, an historic and architecturally significant convent precinct and a working children’s farm. The LNP was undertaken as part of the mainstream program and was offered on one morning per week 9:30–11:30 am regardless of weather conditions, for 21 weeks (over three school terms). Prior to departure the children and teachers met in the classroom to discuss the LNP location, learning intentions for the day and matters of safety including a review of risk assessment documentation and first aid
box. The children independently packed their backpacks (spare clothing, snack food, water bottle) and found partners for the walk. The walk to the LNP location varied in distance, from approximately 1 to 4 km (return) per session, with the children managing their backpacks independently. Resources such as clip boards, pens, paper, clip boards, ipads, magnifying glasses, binoculars, hand wipes and small tools were loaded in an all-terrain trolley that was pushed by teachers and children.

One of the teachers was also one of the researchers and as such the research was categorized within the practitioner research domain where teachers have an opportunity, through research processes, to understand more fully the multi-layered conditions under which they practice and the impact of their practice (Kemmis, 2009).

There has been much written about the value of practitioner research (Clarke and Erickson, 2003; Mills, 2003; Stremmel, 2002) with findings indicating that there are many benefits for the teacher including:

- An increased commitment to developing and understanding teaching practice;
- Keeping up to date with contemporary research literature;
- The development of analytical skills that enable critical reflection on personal values and beliefs as they relate to teaching practice;
- An increased capacity to reason, deliberate and make ethical-practical judgments;
- Becoming more open to their work as a professional and finally providing validation of the professional contribution of the individual (Kemmis and McTaggart, 2000).

Ethical considerations

Consistent with formal research protocol, ethics approval was sought from the affiliated university (MGSE, HEAG, Id. 1646280). Parents/guardians of the children and the teachers were provided with detailed plain language statements that fully described the LNP and the research process. This document ensured that informed consent was obtained from all participants.

At the outset of the study the research ethos was carefully considered to reflect the principles presented in the United Nations Convention of the Rights of the Child (UNCRC) (1989) and the powerful ideas emerging from the new sociology of childhood that recognize “children’s agency and competency and the primacy of children’s lived experience” (Smith, 2007, p. 1).

Boileau (2013) notes that children’s voices are rarely heard in research that matters to them. Therefore, in line with UNCRC Article 12 [United Nations Convention of the Rights of the Child (UNCRC), 1989] which recognizes the right of children to be heard and consulted on all matters that affect them, the participating children were also given an opportunity to give formal consent (Conroy and Harcourt, 2009) by completing a: "Would you like to draw and talk with your teachers about the Learning in Nature Program? Would you like to be photographed by your teachers while you are playing during the Learning in Nature Program?" (Figure 1). It was made clear to the children that non-participation was also a choice. The

Figure 1. Child Consent.
consent form was discussed in a group time with the teachers explaining the research to the children and making time to respond to any questions or comments that the children had. Such an approach responds to rights-based literature (Cameron, 2005; Mayall, 2000a, b) that proposes that children are provided with information about research in which they might participate and give individual consent.

Data collection

As qualitative data analysis is essentially about detection (Ritchie and Spencer, 2002) a number of data sources were selected to not only foster authentic involvement of the children in the research but to ensure that the complete data set would ensure that the voices of the children were located centrally in the research and also support a comprehensive and triangulated analysis (O'Donoghue and Punch, 2003). The range of data collection methods included:

- Teacher program plans and evaluations;
- Children's drawing-tellings (Wright, 2007a, b) (n= 240), which were completed during the LNP with the children being asked to draw on A4 paper, something they found interesting during the LNP. The teachers recorded the individual children’s verbatim responses at the completion of the drawing;
- 'See, Think, Wonder' thinking routines (Ritchhart et al., 2011) (n=60) which were completed three times throughout the course of the program;
- Digital photographs recording highlights of the program.

Analysis

As noted by Ritchie and Spencer (2002), qualitative data analysis involves integrated, woven and overlapping processes of “defining, categorizing, theorizing, explaining, exploring and mapping the data” (p. 305). As such, data were systematically filed with all sources being subjected to an ongoing content analysis. In order to ensure methodological congruence between the qualitative research tradition and a detailed and rigorous understanding of the design and scope of the LNP and the children’s experience of learning in nature, the research drew on the analytical approaches of grounded theory. The aim was for the researchers to become over time more and more immersed in the data and develop, through open and selective coding (Creswell, 2003; Neuman, 2006), increasingly richer concepts and models of the nature of the program and what learning was evident (Denzin and Lincoln, 2000).

The analysis of children’s drawing-tellings (n=290) aimed to classify both the graphic content and the verbatim child narratives. As inter-coder reliability is a critical component of any content analysis, three independent coders undertook the task of trawling through the data. This firstly involved a broad sweep of the entire collection with a view to uncovering the main categories and themes that were representative of the entire sample. Secondly, an additional content analysis was undertaken of individual children’s drawing-tellings, to identify how children were describing their experience. The thinking routine data (n=60) was analysed with a view to identifying categories and themes that were representative of the entire selection. Finally, the photos provided a memory store of children’s engagement in the various aspects of the program. The analysis is diagrammed in Figure 2.

RESULTS AND DISCUSSION

Theory driven curriculum planning

The teacher documentation evidenced comprehensive theory driven planning both on a macro and micro level. Overarching principles developed by the teachers prior to the commencement of the program, referenced an image of the child as strong and capable and well equipped to assess and manage risks in the natural environment (Warden, 2010a). Also, ecocentric sensitive values and environmentally oriented knowledge and skills, including placing Australian Indigenous perspectives centrally in the program were identified. The notion of learning in, about, for and from the environment (Palmer, 1998) as a community of learners (Rogoff, 1994) was articulated under the banner of helping children to build respectful, caring, empathetic attitudes to the natural world. Finally, a range of long-term goals linked to theoretical frameworks were acknowledged as integral to the ecocentric pedagogical platform. These included for the children to:

- Develop an understanding of the significance and importance of the local natural environment for the traditional owners of the land, the Wurundjeri people;
- Engage in experiential, hands-on, open-ended, discovery learning (Dewey, 1938; Bruner, 1966) and play in a wide range of environments, such as parkland, bushland, long grass, river banks, fallen logs and leafy treed spaces;
- Actively participate in multi-disciplinary (mathematics, literacy, science, humanities, the arts, information and communication technologies) learning focusing on linking knowledge schemas (Splitter and Sharp, 1995; Waller, 2007) and supporting individual interests and habits of mind (Costa and Kallick, 2000);
- Engage in individual and collaborative focused observation, problem solving, decision-making and
critical reflection about points of individual and group interest in the environment (Davis, 2015; Scott, 2015);

- Engage in a range of physical experiences to support the building of personal strengths, confidence and resilience in negotiating challenges in the natural world, including uneven terrain, steep inclines and rock formations and logs (Kaplan and Talbot, 1983; Kahn and Kellert, 2002);

- Develop a set of values connected to nature (Kellert, 2002), including enacting respectful and caring behaviours towards the environment, following the ‘Seven Principles of Leave No Trace’ (Wynne and Gorman, 2015) and communicating thoughts and ideas about identifying and problem solving environmental problems (Palmer, 1998; Perkins, 2014).

These long-term goals align with the literature around what constitutes quality teaching in the 21st Century, especially in relation to the values that teachers hold, “their knowledge and their ability to develop strong skills in pedagogy, content and theory in order to plan for the learning of all students” (Moss, 2012, p. 5). Such planning highlights a commitment to constructivism where children make meaning of their world through first hand active engagement with the environment and with people, including a recognition that children’s learning is mediated by prior experience and understandings and that children construct rather than merely absorb knowledge (Vygotsky, 1978). Through the planning documentation the role of the teacher was also brought into relief, with the identification that teachers learn alongside children by facilitating and scaffolding investigations and gathering information. There was also evidence of systematic record keeping that captured the lived experience of the learning during the LNP, making it visible and linking it back to classroom learning (Wynne and Gorman, 2015).

Data also evidenced rigorous and purposeful planning and decision-making processes that captured the holistic nature of curriculum planning through diagramming where the teaching and learning experience was articulated. Figure 3 provides insight into the
comprehensive, personalized and original nature of this diagramming. Wiggins and McTighe (2011) note that students’ learning is enhanced when teachers think purposefully about curricula planning. In this research there was evidence of focused pedagogical strategizing using conceptual modelling diagrams as a way of capturing the depth and breadth of the LNP. Such an approach is consistent with quality teacher practice where ‘understanding by design’ (Wiggins and McTighe, 2011) guides curriculum planning and involves teachers in decisive thinking processes that support self-organization and the active construction of knowledge for both teachers and learners. It is only when teachers have a clear understanding of the conceptual structures in which their learners operate that they can effectively lead learning.

The teacher documentation also recorded the pre-planned structure of the teaching and learning program. This included:

- Whole of group recited acknowledgement of traditional owners at the meeting place prior to commencement of discovery play;
- Individual and group exploration and experimentation in the natural environment;
- Individual and group interest driven collection and classification of natural found materials;
- Participation in focused observations of and discussions on the landscape, including identification of the features of the river, flora and fauna, geological formations;
- Participation in drawing-telling;
• Participation in ‘See, Think, Wonder’ thinking routine; and
• Use of iPads (children and teachers) to record via photography interesting features of the natural environment and learning experience outcomes.

The program

Data uncovered the participating teachers as active curriculum developers who responded to national and state curricula (DEEWR, 2009; DEECD, 2009; DET, 2016) guidelines. On a week by week basis the teachers purposefully planned learning objectives as a way of identifying ‘big ideas’ (Perkins, 2014) or generative topics that had the features expected for those teachers who would be ‘teaching for understanding’ (Blythe, 1997). The diverse content included but was not limited to:

• Indigenous perspectives: involvement of indigenous elders, smoking ceremony, storytelling, song, dance, indigenous symbols for meeting place, waterhole, running water, people sitting, campfire, rain, animal tracks, shelter;
• Trees: identification of native and non-native species, characteristics, trees as habitat, trees for climbing, protection of trees;
• The river: colour, flow, reflections, currents, patterns, river and river bank as habitat, river from mountain to the sea, waterfall, rock faces, protection of river;
• Fungi: species, characteristics, growth, location, life span;
• Seasonal changes: air temperature, sun, wind, rain, cloud, puddles, mist, fog, rainbow;
• Animals, insects, bugs, creepy crawlies, worms: species, characteristics, habitats;
• Leaves, sticks, stones, feathers, tree bark: collections, classification, ordering, patterns, textures, mandalas;
• Shelters and nests: sticks for building shelters and nests, campfire, nest as habitat;
• Environmental problem seeking and solving: litter, environmental degradation, human impact.

There was evidence that teachers facilitated multi-disciplinary inquiries that supported an integrated approach to teaching and learning that was inclusive of both pre-planned and spontaneous experiences that were real, meaningful, creative and responsive to the surrounding environment. For example, the integration of maths through the creation of a mandalas using found materials, science through classification of insects, engineering through shelter building, language through identification and use of new vocabulary.

Finally, the teacher planning and evaluations were evidenced to align with the SOLO Taxonomy (Biggs and Collis, 1982) that was used to systematically support the development of the children’s thinking to move from ‘surface to deep knowledge’. For example, the learning goals were initially based on learning where the children had limited knowledge of the topics. The teacher’s planning demonstrated that a systematic progression of learning was catered for with the children being involved in describing, performing several different skills and comparing and contrasting observations, ideas and opinions. The programming also provided extensive evidence of teachers adopting multiple flexible teaching strategies to achieve surface to deep understanding (Hattie, 2012). These included the setting of learning goals with the children themselves. Also, open-ended free exploration and direct instruction worked alongside each other to ensure that the children were given “multiple opportunities to learn new ideas and to engage in deliberate practice in an environment where they could concentrate on their learning” (Hattie, 2012, p. 108). These, along with other strategies such as open-ended questioning, drawing-telling and thinking routines, established a model of teaching and learning which aimed to place each child in the centre of the learning and to support individual learning styles (Gardner, 1983; Tomlinson, 1999, 2003).

Teachers as critically reflective nature educators

The extensive collection of teacher-guided child-focused group discussions and curriculum evaluations provided additional evidence of a model of responsive EE teaching and critical reflection that was integral to the LNP. The teachers systematically recorded the children’s verbal reflections and used these as a starting point for their personal reflections and future planning. Schön’s (1983) term ‘reflection-in-action and reflection-on-action’, became central to the documentation process with teachers continuously examining both their teaching and the children’s responses to it. As noted by Schön (1983), such an approach is a rigorous professional process that leads to a “legitimate form of professional knowing” (p. 69). This enables teachers to shape the teaching and learning to target the development of 21st Century skills and abilities, including resilience, problem solving, decision making, creativity, reflection, self-awareness and independence.

The teacher critical reflection data provided a summary of the learning experiences and teaching strategies particularly in relation to the important role that open-ended questioning played in stimulating recall, identification, interpretation, drawing conclusions and determining evidence within the LNP. The reflections were evidenced to support teachers to move beyond collecting and observing data, to analyse what learning occurred and how it could be changed, refined or
improved. This process supported the teachers to ‘drill down’ to uncover the social, political and ethical implications related to teaching in the natural environment.

**Teachers identifying children’s learning**

**Drawing-tellings**

As this research aimed to uncover the nature of the LNP and its impact on children’s learning, the week by week data collection of children’s drawing-tellings provided direct insight into the efficacy of the LNP to support each participating child’s knowledge building, critical thinking and environmental stewardship. Piaget (1962) commented that a child’s art represents a replica of his/her thinking; hence the visual record created by each participating child captured the immediate identification and re-visitation of thoughts, feelings, images and actions experienced during the program. Drawing has also been identified as one of the preferred modes of expression for children in the early childhood years (Athey, 2007; Docket and Perry, 2005) and as such, is recognized to offer teachers an opportunity to authentically integrate the voices of children in the program and to provide insight into how children make meaning of their lived experience (Wright, 2007a, b). As language is attached to lived experience and words, in effect, are socially fashioned mediatory devices that are an end product of thinking (Vygotsky, 1978), the extensive records of children’s verbal descriptions of their drawings added a further dimension to assessing children’s learning during the program.

As noted earlier, the drawing-tellings (n=240) were subjected to a content analysis with results highlighting children’s learning corresponding to the generative topics that had been identified in the teachers planning including the Yarra River, trees, fungi, sticks, nests, shelters, seeds, water, earth elements friendships/family, imaginative and Indigenous perspectives. In Figure 4, evidence is provided to demonstrate the diversity of children’s
responses.
The analysis of the drawing-tellings also uncovered the use of complex language and a high level of scientific, mathematical and cultural knowledge. For example:

- The Wattles grow near the Yarra River. They grow Wattle flowers; the leaves feel smooth. They are longer leaves.
- The Yarra River is flowing. The rain is coming and the Yarra River is going fast, fast, fast. There are circles from the ripples of the rain.
- The Yarra River and the big stick. It was lying in the grass. The Yarra River was flowing very slowly and I saw reflections in the brown water.
- It has branches and leaves. Because it is very old. Some trees are not old. If we didn't have old trees the possums and koalas and animals that live in the trees would have no place to have a nest.
- That’s the stem, those are the branches. Those are the blossoms and those are the little gum leaves.
- The Wattle Gum Tree. There’s leaves, it smells nice. It’s growing in the earth, on the Wurundjeri land.
- A mushroom above a high tree. The mushroom was growing and it was a big mushroom and it was drinking water after the storm.
- The shelter, we went inside. We were inside. We wanted to build a shelter and somebody went inside and we built it, with sticks, leaves and flowers.
- A mandala. Bark, gumnuts and leaves. It’s a circle shape.
- I was running, I was Bunjil the Eagle flying and I was in the nest and I was in the grass.

- I drew me and my friends walking and seeing rubbish along the Yarra River. We saw something we needed to put in the rubbish.
- We need a grabber that collects rubbish. The rubbish is in the Yarra River – I think the wind blew it there.
- I saw that it looks like the trees were growing down in the Yarra River. A reflection!

This data provides a clear indication of the power of this program to stimulate deep and abstract thinking, creative use of language, critical thinking, problem solving and personal agency. Importantly the data demonstrates the children’s capacity to connect with the natural world and to show care and concern for environmental protection. Ernst (2015) argues that experience in the natural world during the early years is important in facilitating respect and care for the natural environment, and it is evident through the many examples provided that the children participating in this program developed a strong sense of place (Orr, 2013; MacQuarrie et al., 2015) especially connection to the river as an iconic feature of the landscape.

**Thinking routines**

Further insight of children’s learning whilst engaged in the LNP was evidenced through the collection of ‘thinking routines’ (Ritchhart, 2012) which were undertaken in the natural environment (Figure 5). Teachers engaged one-
Table 1. See, Think, Wonder Thinking Routine Responses.

<table>
<thead>
<tr>
<th>I see…</th>
<th>I think…</th>
<th>I wonder…</th>
</tr>
</thead>
<tbody>
<tr>
<td>A dry waterfall with grass growing in it. I see ripples</td>
<td>The wind makes the ripples. Rainbow Lorikeets lives in the Mountain Ash trees</td>
<td>Why the Yarra River starts in Mt Baw Baw</td>
</tr>
<tr>
<td>The Yarra. It's just quiet. There are trees high in the sky</td>
<td>Gum Nut trees are around the Yarra. It's making shapes but you can't really see it</td>
<td>If the river has rubbish the creatures will be sick</td>
</tr>
<tr>
<td>The Yarra is flowing down to the sea</td>
<td>Fish in the water, in the fresh water</td>
<td>Can you drink it?</td>
</tr>
<tr>
<td>Trees, green trees. The colour green</td>
<td>I think there’s going to be a flood because remember how the clouds are filled with lots and lots of rain</td>
<td>If it will flood – all over the city</td>
</tr>
<tr>
<td>Rubbish down there on the mud</td>
<td>The Yarra is sick because of the rubbish</td>
<td>I wonder if I got a grabber if I could clean it</td>
</tr>
<tr>
<td>The reflections on the other side, trees and the ground, steps and the rocks</td>
<td>Tall trees in the earth need water, helps them grow bigger and bigger. Birds will be in the trees. Koala’s might live in the trees</td>
<td>If the Yarra will shine.</td>
</tr>
<tr>
<td>Rubbish floating</td>
<td>It's going to a waterfall. The birds are making noise</td>
<td>If the birds don’t like rubbish, it makes it dirty</td>
</tr>
<tr>
<td>I can see clouds, sky and water and flowers and I can see the Yarra with ripples</td>
<td>I think about the rubbish.</td>
<td>If the Yarra has feet. Why is the Yarra a muddy colour?</td>
</tr>
<tr>
<td>Some yukky rubbish because someone threwed it in there. I see a stick near the rubbish and I can see shadows of trees on the Yarra</td>
<td>You know, the Yarra goes all the way to our house. When we see the YR there is lots and lots of rubbish</td>
<td>How the Yarra was made. I think it was made by a tap and rain</td>
</tr>
<tr>
<td>I can see in the water some pictures of the ground. I can see rubbish it sitting right there. Rocks and leaves and flowers</td>
<td>About the pictures in the water. Sand because water has sand under the YR</td>
<td>I wish I could be big and go in the Yarra with a boat and hear all of the birds</td>
</tr>
<tr>
<td>Grey and green and some rocks. The trees are standing there next to it. The water is going around</td>
<td>Some patterns and some good sounds. All of the patterns and all of those shapes that are basically shells</td>
<td>If you have good luck next to the Yarra</td>
</tr>
<tr>
<td>A mandala, sticks and leaves. I see cliffs, grass, trees. I see something, circles, coming out. Birds are flying, I heard the noise of the birds</td>
<td>I just saw the Yarra. It is too dangerous to go down to the river. The leaves have dropped. They are slippery. There is mud and shoes are dirty</td>
<td>Look, look, circles. Look what is happening to the Yarra. the branches are tall but I can’t find a big stick</td>
</tr>
</tbody>
</table>

on-one with individual children guiding them through the ‘See-Think-Wonder’ routine as a way of capturing and stimulating thinking by noticing and naming (Johnston, 2004). When teachers scaffold learning in this way children are encouraged to look closely, notice details, describe, explain, make interpretations and ponder.

Ritchhart et al. (2011) argue that thinking routines are an effective teaching strategy to help learners explore their learning more deeply and to make learning visible for both teacher and learner. Table 1 exemplifies the breadth of responses elicited from engagement in this teaching and learning strategy.

This data highlights the centrality of thinking routines in the LNP to support children’s knowledge and understandings, in particular their capacity to identify environmental issues and concerns and to problem-solve solutions. Such an approach is in line with 21st Century teaching and learning where making time for focused thinking and problem-solving shows respect for and acknowledgement of each child’s contribution.

Photographs

Throughout the LNP, the teachers and children used iPads as a visual method of data collection to document the learning experiences and use as a reference library after the event. In early childhood education photography has become one of the main means by which teachers of young children capture evidence of individual and group learning in action (Fagan and Coutts, 2012; Verenikina and Kervin, 2011). It has been used for many years now by children themselves (Einarsdóttir, 2005) as a tool through which they can express their perceptions of their lived experience, share their funds of knowledge (González et al., 2005) and have their contributions
valued by their peers and teachers. Children’s photographs also provided a basis for further learning, exploration and discussion with individual children “being empowered to share and contribute to their peers’ learning in a reciprocal manner, thus mutually enriching each other’s learning and awareness about the world around them” (Khoo et al., 2013, p. 17).

In this research, the teacher’s documentation noted that when the children were given the opportunity to photograph their interests the children invested more fully in their learning, taking ownership and displaying personalized agency to act in the moment to contribute to the documentation of the learning during the LNP. For the teachers the photographic records were used as a memory boost for evaluation and assessment purposes.

Through the use of the iPad the teachers were able to capture individual children playing in a variety of environments and to document the qualitatively different forms of play and discovery. The data evidenced children connecting with the natural world and expressing a sense of wonder and curiosity about the natural world, engaging with peers in collaborative inquiries and merely ‘being’ in the environment (Figure 6). Finally, there was extensive photographic evidence to support the efficacy and value of the LNP. Children were captured:

- Actively participating in the LNP showing enthusiasm and curiosity for focused observations of the natural environment;
- Engaging in open-ended discovery-learning individually.
and with peers;
- Engaging in imaginative and dramatic play individually and with peers;
- Engaging in collaborative inquiry partnerships with peers and teachers;
- Demonstrating interest in living and non-living things;
- Engaging in dirt, mud and water play;
- Demonstrating resilience and perseverance when challenged (for example, coping with changing weather conditions, climbing trees, balancing on stepping stones);
- Problem solving in a variety of real life situations.

Conclusion

Robinson (2006) and Leadbeater (2010) both note that learning beyond the classroom has a powerful impact on children’s motivation and attention, hence the major recommendation from this study is to encourage teachers of young children to embrace an ecocentric curriculum that enables, deep, wide and rich hands on learning for children in open local community spaces. The notion of the 'wall-less classroom' challenges teachers to step out, find out and help children speak out about the world in which they live. Such an approach supports children to invest in their learning, cultivate greater learner autonomy and reinforce their capacities for focused observation and personal reflection. Finally, this research has added to the growing body of literature that has identified the benefits of personalized, participatory and productive learning in the real-world (McLoughlin and Lee, 2008; Scott, 2015). It has also demonstrated that young children readily embrace their responsibilities as environmental stewards to care and respect the earth and willingly invest in taking action to protect and care for it.

RECOMMENDATIONS

Although this was a small-scale study undertaken in a unique setting, the results highlight the efficacy of a thoughtfully designed, implemented and evaluated EE program for four-year-old children. What the study has shown is that when teachers bring intentionality and purpose to their planning and use a range of focused teaching strategies, a transformational ecocentric curriculum can be developed and implemented to support the acquisition of twenty-first century thinking skills and child agency. Importantly this research has demonstrated how providing children with extensive opportunities to connect with the natural world beyond the confines of the classroom, supports environmental stewardship and the opportunity to build an authentic relationship with nature, acquire new knowledge and understandings and develop a deeper awareness of the complexity of the natural world.

This study was context bound and not intended to result in generalizations to the wider educational community, nevertheless the research argues for accessibility and transferability of the pedagogical approach investigated, with the findings having broad implications for early childhood curriculum and pedagogy as well as teachers professional practice. Readers are provided with a rich case study that provides insight into a unique ecocentric curriculum that responded to and was strongly influenced by a wide range of educational literature that wove together environmental education and twenty first century pedagogies to produce a unique environmental education program for four-year old children.

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