

TECHNOLOGY GOES BUSH: USING MOBILE TECHNOLOGIES TO SUPPORT LEARNING IN A BUSH KINDER PROGRAM

Jennifer Masters¹ and Leanne Grogan²

¹*University of Tasmania, Launceston, Tasmania, Australia*

²*La Trobe University, Bendigo, Victoria, Australia*

ABSTRACT

A 'bush kinder' is the Australian equivalent of a European forest kindergarten. Although it is not usual for technology to be used in the type of program, the authors suggest that mobile technologies can be used creatively and sensitively to support learning in the bush kinder context. This paper describes an ethnographical case study where two early childhood researchers participated in a bush kinder program in "active participant-observer" roles and used a mini-iPad with cellular data access to extend investigations with the children. The advantages of this approach are that information about the natural environment can be accessed 'just in time' and experiences can be captured for future reflection and presentation to a wider audience.

KEYWORDS

Mobile technologies, kindergarten, nature education, bush kinder

1. INTRODUCTION

In his book, 'Last Child in the Woods', Richard Louv (2005) coined the term 'Nature Deficit Disorder' to describe how human beings, particularly children, are losing touch with nature because they spend progressively less time outdoors in natural spaces. The consequence of this disconnection is that children lose the capacity to restore their own health and wellbeing through relaxing in the natural world. Further, these children are likely to have a reduced capacity to develop an affinity with nature and therefore do not acquire responsible behaviours that are essential for ongoing environmental care and management.

A common assumption of the 'getting back to nature' movement is that children should forgo their fascination with modern technologies, such as computer games and television, in order to interact with the environment in a pure state. In this paper, however, we question the premise that technology and nature are diametrically opposed. Rather, we see technology as a tool that, when used creatively, can actually help young children to make connections in the bush kinder nature setting and then be used as a medium for sharing their understanding and ideas about the bush when they return to their lives in a urban context.

2. THEORETICAL FRAMEWORK

2.1 The Nature Education Movement

A renewed interest in connecting children to nature is being felt across the early childhood educational sector around the world. As far back as Froebel, the "Grandfather of Kindergarten", in the early nineteenth hundreds (Ebbeck and Waniganayake, 2010), preschool was seen as the child's gateway to nature. This connection, however, faded during the corporatisation of early childhood environments in the nineteen eighties and nineties, when cement, artificial grass and synthetic ground cover became the dominate surfaces of play in

early childhood settings. As the first decade of the new century approached, it was noticed that children were losing important affiliations with the natural world around them.

While children usually oscillate between indoor and outdoor play activity, it was noticed that children were spending progressively more time indoors and less time outside (Clements, 2004). This shift from active outdoor play towards a passive and inactive lifestyle generated concerns about the health of children. It was identified that childhood obesity was an increasing issue (Ellaway et al, 2007) and the physical fitness of children and the development of motor skills were in decline (Fjortoft, 2001). Another concern was that children were engaging less in creative, imaginative and make believe games (Clements, 2004; Fjortoft, 2001). It was also noted that when children did participate in outdoor activity, it was more likely to be in an organized sport that was heavily managed by adults rather than freeform outdoor play (Clements, 2004). This meant that rules and structure were imposed on children rather than being child-initiated and negotiated.

The benefits of outdoor play for contemporary children have been well documented. Davis et al (2010) identify that health and wellbeing goals for young children can be clearly linked to “green” outdoor play. This play gives children the opportunity to develop physical skills, such as strength and flexibility, and physical self-awareness (Clements, 2004). Additionally, risk-taking in a natural space allows children to extend both physical and mental boundaries (Sandseter, 2009). Kellert (2005) also identified that play in a natural space supports the development of self-esteem and helps to build resilience against stress and adversity. This was reinforced by Maller and Townsend (2006) who suggested that hands-on contact with nature could benefit the mental health and wellbeing of children.

It has also been suggested that interactions with nature are beneficial for cognitive and social development (Strife & Downey, 2009). Sustained play in a natural setting is said help to improve concentration and facilitate the process of learning (Wilson, 2012). Further, unstructured play with improvised materials supports the development of imagination, creativity and cognitive development in general (Wilson, 2012). Playing with other children in an outdoor, natural setting offers further opportunities. Dowdell et al (2011) suggested that unstructured imaginative play in nature supports the development of positive relationships, provides a platform for social negotiation and helps children to learn skills and strategies for cooperation.

A key premise for nature play is that a meaningful and connected understanding of the natural environment is an essential precursor for young children to develop a “stewardship of the planet” perspective. Davis et al (2010) identified that sustainability education is fundamental in order to engage future adults with the rising issues of climate change and environment degradation. This was reinforced by Ernst and Theimer (2011), who made tangible links between a child’s early engagement with nature and later life environmentalism. Sustainability education can lead to short-term activism where children ensure that they don’t waste water, recycle rubbish etc. but it is also likely to have more far reaching outcomes (Lester and Maudsley, 2007). Logically, it seems to make sense that children who experience and develop an affinity with nature are more likely to develop long-term responsible environmental behavior that will protect the environment for future generations.

2.2 Technology and Nature

About the same time as outdoor and nature play went in to decline, the use of technology by children for entertainment rose to prominence. This phenomenon is seen as a direct connection in the literature. For example, McCurdy et al (2010) reported that the health and fitness of children declined as they spent more time indoors using electronic media and less time engaged in outdoor unstructured play. Larson et al (2011) identified that electronic media consumption, including internet use and texting, was the most common reason children gave for not spending time outside. This disposition is embodied in a well-known Richard Louv quote attributed to a 4th Grader: “*I like to play indoors better ‘cause that’s where all the electrical outlets are*” (Louv, 2005).

While it is likely that time spent inside using computer games and entertainment technology does encroach on time that could be used by children to engage in outdoor and nature play, it is important that the focus remains on the actual activity rather than the technology per se. Computer games and other electronic entertainment technologies such as Wii, Nintendo and iPad apps can be incredibly captivating and, while this activity arguably can have merit in regards to skill development, persistence and problem-solving, concerns relating to the time consuming and addictive nature of these pastimes are also valid (Plowman et al, 2010). It

does, however, needs to be recognised that research in the area of the use of technology by young children identifies that this sort of activity is only one in a spectrum of applications.

Digital technology has revolutionized how children learn and interact with their world and there are plenty of instances where technology is used to extend learning opportunities and facilitate new ways to engage, create and communicate (Plowman et al, 2010). Di Blas et al (2013), for example, described a digital storytelling project in Italy where kindergarten children collectively author digital stories to communicate ideas about a shared experience. In a similar approach, Leinonen and Sintonen (2014) identified that media technology is a considered an everyday resource in the Finnish kindergarten where they supported children to use technologies such as digital cameras and audio recording devices for media production.

Typically the ‘nature education revolution’ calls for a reversal of the technology/outdoor play nexus. That is, children need to put down the technological devices and go outside to interact with nature. To some extent this philosophy is reflected in the ‘no toys, no tools’ approach that is implemented in nature schools in order to connect children with the natural objects in the environment. Is this either/or approach the only option available to children? Technology, by definition, is the process of inventing tools and mechanisms that support humans to interact with the world around them. If we look at people who interact with nature in significant ways, either for leisure, such those who undertake wilderness trekking, or professionally, for example, scientists who participate in expeditions to the Antarctica, they don’t actually forgo technology to do this. What they do is select and use technology that is carefully designed and purpose built for the task.

Is it possible that we can use technology in a natural outdoor environment in ways that demonstrates authentic application to young children? In a project with slightly older children, Williams et al (2005) used mobile technologies to create “soundscapes” in outdoor environments. In the project, the children used digital recording devices to create a sequence of sounds on a mobile device that would trigger from sensors as the device was moved around an outdoor space. Cumbo et al (2014) engaged children to design a digital resource based on an outdoor play space. In doing this they required the children to identify key features of the environment to reproduce in a fantasy themed digital game design. Cumbo et al identified that their motivation for this project was to “get the children ‘off the couch’ and outdoors into their local natural places” (np), therefore establishing a connection between the natural and online worlds.

In the project reported in this paper, we investigate how educators and children can use mobile devices to access ‘just in time’ reference material during a bush kinder session. We propose this as an authentic use of technology that supports the core philosophy of nature education and therefore demonstrates that technology and nature education are not necessarily opposed.

3. RESEARCH DESIGN

3.1 Methodological Approach

The discussion presented here is framed by a case study and uses an ethnographical approach, informed by participant observation in order to consider how the use of technology might support the goals of a nature-based kindergarten. Brewer (2000) identified that Ethnography is a qualitative style research that requires the researcher to establish a close association and familiarity with the context. While ethnography doesn’t necessarily require actual involvement in activity, it is usual for the researcher to be situated within the context in the role of ‘participant observation’. This methodological approach was a natural fit for this study because the two researchers, both qualified and experienced early childhood educators, had expertise in the context. One researcher specialised in nature play and sustainability education while the other had research interests in the applied and creative uses of digital technologies with young children. Both researchers had an active interest in the bush kinder program and had already established connections with the kindergarten, the teachers and the families of children in the program.

For the research described in this paper, the two researchers visited the case study site on several occasions. A primary goal was to consider how the technology might be used to support the program but to also act in the role of a teacher/mentor to use technology devices with the children when relevant. This involvement equated to an “active participant-observer” role (Johnson et al, 2006) because of the authentic nature of the interaction.

3.2 The Setting

In Australia the term ‘bush’ is commonly used to describe natural bushland or forest. Consequently the Australian equivalent of a nature kindergarten is a ‘bush kinder’. The bush kinder reported in this study is aligned with a conventional kindergarten program in the outer suburbs of a regional city in Victoria. The bush program commenced with a successful pilot program in 2013 and was then implemented fully in subsequent years. The bush kinder children attend the kindergarten at the site on one day for three hours of fifteen hours of kindergarten attendance per week. The setting is located on what was once a rural school site, owned by the Victorian Education Department. It is approximately eight kilometres from the kindergarten and is almost three hectares of natural bushland bordered by small farms.

The sessions are held each week on location. Parents deliver their children directly to the site and then return to collect them at the end. Early childhood educators conduct the sessions, with an adult to children ratio of approximately 1:5 at each session. The old school building is still on the site in a clearing in the middle of the bushland, however, the kinder group does not access this building at all and the activity is situated entirely in the surrounding trees. At first glance the site seems to be undistinguishable from any other section of bush, however, the children are acutely aware of the physical boundaries of their ‘classroom’, which are marked with fallen logs, key trees and a natural parapet. The ‘entrance’ to the site is guarded by a ‘portaloo’ (temporary toilet) perched on the escarpment and the children know that they must not pass through this gateway unless accompanied by the adult that collects them at the end of the session.

The bush kinder program is managed by a sub-committee who work with the educators to determine the philosophy and curriculum. The children bring drinks and snacks but are not usually allowed to bring toys or other equipment in to the setting. The educators provide a large tarpaulin for the children to sit on but in keeping with their ‘no toys, no tools’ philosophy, they rarely have other teaching tools or materials. Additionally, they don’t allow the children to take any natural objects away from the setting. If materials are collected in the environment, they are left there for the next visit. Finally, the children need to be prepared for all weather conditions and bring warm clothes or wet weather gear if the weather is inclement. The only time bush kinder is cancelled is when it is very windy and there is a danger of branches falling.

3.3 The Study

The study described in this report was conducted over a period of 12 months, spanning two kindergarten cohorts as data was collected in the second half of one year and the first half of the next. In 2013 (the pilot implementation), the bush kinder cohort consisted of 13 children in their kindergarten year (aged 5). In 2014, the cohort was expanded to 26 children. In both years the children attended bush kinder on a Monday morning for three hours from 9.00am to 12.00pm. The minimum adults in attendance for the pilot cohort were three, two educators and one volunteer helper, while the larger group had three educators and two volunteers. On occasions more adults participated in a session, for example when the researchers visited, however, the teaching team were very careful not have too many adults interacting with the children.

As described in 3.1, the two researchers visited the bush kinder sessions together or separately a number of times. On two of these occasions, a videographer also attended to film child activity and/or researcher and child interactions. For the other visits, the researchers took their own recording devices, a digital camera and/or a video camera to record activity when required. The intention of these visits was to collect data for several purposes, including immersing the researchers in the bush kinder culture, collecting footage for teacher education resources, observing the work of the educators in the program and, as presented in this paper, the application of mobile technologies in a nature education setting.

The bush kinder educators hadn’t previously used technological devices in the setting, however, for the purpose of the study, the lead teacher asked permission from the bush kinder committee to allow the researchers to bypass the ‘no tools’ policy to use some technology in the setting. On two occasions the researchers took a mini-iPad with cellular data access to the site in addition to the digital camera and the video camera. The researchers also provided two magnifying glasses for children to examine specimens. The researchers were free to interact with the children as they saw fit and any learning moments using the technology were spontaneous rather than planned. Typically, a researcher would initiate an activity with a child or a group based on a topical interest or an observation and then children might join or leave the group as they wished. These learning events were recorded, either by the videographer or the second researcher.

4. FINDINGS

Two vignettes of learning events where the mini-iPad was used to support authentic investigations of nature in the Bush Kinder setting (see Figure 1) are presented in this section.



Figure 1. Using the iPad in the bush kinder setting

4.1 Let's Look It Up!

In the first learning event, a group of three children had found a partial eggshell under a tree. The children were excited by their find and were imagining what animal might have hatched from the shell. One of the researchers scaffolded their discussion as they cycled through possibilities. The children quickly came to the conclusion that it would belong to a snake, because it was found on the ground. The researcher suggested to the children that they could use the iPad to look up pictures of snake eggs to confirm or refute their hypothesis. The second researcher joined the conversation, as they looked through the images.

Child 1: *This is a snake egg*

Child 2: *I think the snake might be near!*

Researcher 2: *What have you found?*

Researcher 1: *We found this (shows the eggshell to Researcher 2), and everyone is being so gentle with it, and we were just trying to match it to some pictures. Do you think that is a fairly close match?*

Child 3: *(holding a down feather that he found) Look at this! Do you know which bird this comed (sic) from?*

Researcher 2: *Do you think it is from a bird or a reptile, a snake?*

Researcher 1: *At this stage (Child 2) thinks it might be a snake, but we aren't sure, so let's have a look at bird eggs.*

The group google 'bird egg identification' and find a page from the Museum of Victoria "Identifying birds eggs". They recognise that the found eggshell is far similar to the bird eggshell pictures.

Researcher 1: *We have to wait a while for the Internet to load. Here we go...*

Child 1: *Oh no. Too different.*

Researcher 1: *Is our shell anything like that (Child 2)? Can you see any similarities? Have a look at the patterns...What about these ones...Are there any here that look similar?*

Child 1: *No...Wait, wait! That one.*

The children and Researcher 1 looked carefully at the picture. She showed them how to use their thumb and finger to zoom in on the page. The children all had a turn at operating the zoom in mechanism. The children decided, however, that the picture didn't match their egg. They continued to look until they find a picture of a Tawny Owl egg that was almost identical. They read the information on the Tawny Owl and found out that it is a nocturnal bird and lives in the local area. The children then decided that the eggshell should be placed in the 'Bush Museum', an arrangement of found natural objects displayed on a tree stump.

4.2 Identifying Plants

In the second learning event, Researcher 1 worked with two boys in the group and they were examining flowers under the magnifying glass. She again used the mini iPad with them to identify the specimen.

Researcher: *We want to find out what this flower is called. (Child 2) will you come over and help me please? OK, guys, do we have the specimen handy? (Child 1), can you put it under your magnifying glass? (Child 2), are you having a good look? Now, I'm going to show you some pictures...*

Child 1: *Then we can see what we can call it...*

Researcher: *Yeah, we want to find its real name.*

Child 1: *So we can call it something.*

The two boys look carefully through the magnifying glass and the researcher points out the various parts of the flower. They look at the images on the iPad again.

Child 2: *I think it looks like that.*

Researcher: *This one? What do you think (Child 1)?*

Child 1: *I think it is that one (points to another flower).*

Researcher: *Do you? OK. We need to investigate.*

Researcher: *OK, let me tell you a bit about this one. It is called the Prickly Wattle and it blossoms in the spring, which is now.*

The group looked through the information displayed about the Prickly Wattle and decide that their specimen matches the photograph and description.

Researcher: *OK, are we happy with this name?*

Child 2: *Yes.*

Researcher: *Alrighty. I want to have a look at the other one you spotted. Where was that?*

Child 2: *Over there.*

Researcher: *OK, lets go. (The group walks through the bush)*

Researcher: *Where is it? (Child 2 shows the researcher)*

Researcher: *Wow it is too. And that is different! What is different?*

Child 1: *It is different because it has big leaves!*

Researcher: *Did you notice that too (Child 2)? The leaves are quite different. The leaves on our other Wattle were quite small and these leaves are large. And it is certainly higher, it is taller!*

Researcher: *So lets see what we can find...the leaf is quite different on this one isn't it?*

Child 1: *But the same model!*

Researcher: *Yeah. Similar flower, different leaves.*

5. DISCUSSION

The two vignettes presented here show that it is viable to use connected mobile technology as an investigative tool to solve authentic problems in a natural setting. In these scenarios, the iPad were used by early childhood educators (the researchers) to engage young children in scientific investigation processes. In these learning events, the children were asked to wonder about objects they found and hypothesise about where they might belong in the natural world. They were also required to examine the characteristics of the objects and compare and contrast to online photographs for classification purposes. In these conversations they also learnt about natural processes such as life cycles and seasons and they used nomenclature and scientific terminology such as 'specimen' and 'similarities'.

The first learning event was instigated by a discovery, the partial eggshell. The children assumed that the egg belonged to a land animal (a snake) because the eggshell was found in leaf litter and so the 'just in time' information provided on the iPad helped the educators to address this misconception and steer them in a more appropriate direction of inquiry. This activity also gave the educator an opportunistic moment to teach the children more about using the iPad and supported the children to practice physical skills required to zoom in and position pictures on the screen. Additionally, the event helped to highlight authentic connections between the Museum of Victoria, the source of the information, and their own Bush Kinder Museum.

The second learning event was more devised by the educator (Researcher 1). In this activity, she addressed the scientific practice of naming species with the children. Rather than simply identifying all flowering plants, as ‘flowers’, or by colour, ‘yellow flowers’, she used the iPad connectivity to introduce early concepts of biological classification and to help the children to differentiate between similar species. It was interesting to see that in this vignette the children didn’t pick or even touch the flower they were examining. They examined the specimens in situ and then used the iPad to photograph the plants for future reference.

As described previously, these two events were spontaneous interactions between the children and the researchers rather than planned curriculum activity by the bush kinder educators. They do, however, provide a useful insight in how mobile technologies may be used to support the early childhood curriculum in a nature education setting. Not only can this type of technology use support just in time investigations by giving children and educators access to online information, it is possible to use the technology to capture the moment for extended reflection. The educators could bookmark the relevant websites at the time in order to revisit with children later in the week at the conventional kindergarten. They could also photograph the objects, video the children’s interactions or record on the spot reflective observations for later reference. The Bush Kinder program has a policy where objects are not removed from the location and so digital collection is a way to build connections and extend learning back in to the kindergarten sessions. Further, the children from the bush kinder could use digital media to represent their own stories about bush kinder. This will also enable them to reflect on their experiences in the setting and share them with family and friends.

An added advantage of using technology in the bush kinder setting is that educators can also use it to reflect on their own teaching practices. During the ‘Let’s look it up’ learning event while the group were debating whether the egg was from a bird or snake, one of the children (Child 3) was holding a down feather that he found in the same location as the eggshell and asked ‘do you know what bird this comed (sic) from?’ Neither of the researchers noticed him at the time, but the feather was distinctly from an owl and if his contribution had been included in the conversation, it would have been a valuable clue to the identity of the eggshell! It is important that early childhood educators are informed about the natural environment they are working in order to support the children they are working with (Grogan, 2014). The use of technology to record interactions in the bush is an effective way to raise awareness for educator reflection on teaching moments and curriculum planning.

6. CONCLUSION

The ‘no technology’ position taken by nature education advocates stems from some fundamental concerns about sanctity of childhood and the diminishing connection that children have with nature. Technology is seen as an unwelcome distraction for children as they are sucked in by pervasive entertainment technologies that are mind numbing and addictive. We respect this concern and also lobby for the ‘back to nature’ movement where children can explore and connect with the natural environment. We, however, believe that games and electronic entertainment offer a very narrow perspective of technology and it is important that educators recognise the powerful ways in which the broader spectrum of technology can be used to support learning in any context. We consider that technology, and particularly mobile technology devices such as iPads can provide exciting possibilities in a nature education context and we are truly grateful for the opportunity to explore this avenue in our bush kinder.

REFERENCES

- Brewer, 2000. *Ethnography*. Open University Press, Buckingham.
- Clements, R., 2004. An Investigation of the Status of Outdoor Play. *Contemporary Issues in Early Childhood*, Vol. 5, No. 1, pp. 68-80.
- Cumbo B. et al, 2014. What Motivates Children to Play Outdoors? In *Proceedings of the 26th Australian Computer-Human Interaction Conference on Designing Futures: the Future of Design*, 2 - 5 December, 2014, np.
- Davis, J. et al, 2010. Healthy Children, Healthy Planet: The Case for Transformative Education in Schools and Early Childhood from an Australian Perspective. *International Public Health Journal*, Vol. 2, No.4, pp. 561-570.

- Di Blas, N. et al, 2012. Collective Digital Storytelling at School: A Whole-Class Interaction. In A. V. Vasilakos, T. Moher and N. Pares (Eds.) *International Journal of Arts and Technology. Special issue: Interaction Design and Children*, Vol 5, No. 2/3/4, pp. 271-292.
- Dowdell, K. et al, 2011. Nature and its Influence on Children's Outdoor Play. *Australian Journal of Outdoor Education*, Vol. 15, No. 2, pp. 24-35.
- Ebbeck, M. and Waniganayake, M., 2010. *Play in Early Childhood Education: Learning in Diverse Contexts*. Oxford University Press, South Melbourne, Vic.
- Ellaway, A. et al, 2007. Nowhere to Play? The Relationship between the Location of Outdoor Play Areas and Deprivation in Glasgow. *Health Place*, Vol. 13, No.3, pp. 557-61.
- Ernst, J. and Theimer, S., 2011, Evaluating the Effects of Environmental Education Programming on Connectedness to Nature. *Environmental Education Research*, Vol. 17, No. 5, pp. 577-598.
- Fjørtoft, I., 2001. The Natural Environment as a Playground for Children: The Impact of Outdoor Play Activities in Pre-Primary School Children. *Early Childhood Education Journal*, Vol. 29, No. 2, pp. 111-119.
- Grogan, L., 2014. Investigating Pedagogical Practices in a Bush Kinder Setting in Relation to Early Childhood Education for Sustainability to Inform Pre-Service Courses in Early Childhood Education. Unpublished master's thesis. Charles Sturt University. Albury-Wodonga.
- Johnson, J. et al, 2006. The active participant-observer: Applying social role analysis to participant observation. *Field Methods*, Vol. 18, No. 2, pp. 111-134.
- Kellert, S.R., 2005. *Building for Life*. Island Press, Washington.
- Larson, L. et al, 2011. Children's Time Outdoors: Results and Implications of the National Kids Survey. *Journal of Park & Recreation Administration*, Vol. 29, No. 2, pp. 1.
- Leinonen, J. and Sintonen, S., 2014. Productive Participation: Children as Active Media Producers in Kindergarten. *Nordic Journal of Digital Literacy*, Vol. 9, No. 3, pp. 216-236.
- Lester, S. and Maudsley, M., 2007. *Play, Naturally: A Review of Children's Natural Play*. National Children's Bureau Enterprises Ltd, Los Angeles.
- Louv, R., 2005. *Last Child in the Woods: Saving Our Children From Nature Deficit Disorder*. Algonquin Books, Chappel Hill.
- Maller, C. and Townsend, M., 2006. Children's Mental Health and Wellbeing and Hands-On Contact with Nature, *International Journal of Learning*, Vol. 12, No. 4, pp. 359-372.
- McCurdy L. et al, 2010. Using Nature and Outdoor Activity to Improve Children's Health. *Current Problems in Pediatric and Adolescent Health Care*, Vol. 40, No. 5, pp.102-117.
- Plowman, L. et al, 2010. *Growing up with Technology. Young Children Learning in a Digital World*. Routledge, NY.
- Sandseter, E., 2009. Affordances for Risky Play in Preschool: The Importance of Features in the Play Environment, *Early Childhood Education Journal*, Vol. 36, No. 5, pp. 439-446.
- Seitinger S. et al, 2006. A New Playground Experience: Going Digital. In G. Olson & R. Jeffries (Eds), *Proc. Of CHI 2006*, ACM, New York, NY, pp. 303-308.
- Strife, S. and Downey, L., 2009. Childhood Development and Access to Nature: A New Direction for Environmental Inequality Research. *Organization & Environment*, Vol. 22, No. 1, pp. 99-122.
- Williams, et al, 2005. Children and Emerging Wireless Technologies: Investigating the Potential for Spatial Practice. In *Proceeding of the SIGCHI Conference on Human Factors in Computing Systems*, pp. 819-828.
- Wilson, R., 2012. *Nature and Young Children: Encouraging Creative Play and Learning in Natural Environments*. Routledge, Abingdon, UK.