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The Nature Tour Mobile Learning Application
Implementing the Mobile Application in Finnish Early Childhood Education Settings

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Abstract: This paper explores the implementation of the Nature Tour mobile learning application in Finnish early childhood education settings. The interest is to explore whether the concept of Nature Tour mobile application meets the needs of early childhood education in field trips. The idea of the mobile application is to help recording and comparing nature observations as well as to arouse children's interest in nature. The feasibility of the mobile application was evaluated through a theoretical framework, which includes the core aspects of mobile learning. The evaluation framework consists of two levels titled core level and medium level. Three of the core level aspects were realized well. These aspects were the aspect of context, time and space. The medium level aspects that were realized well were social aspect and learner aspect. While the device aspect was a slightly more challenging as the Nature Tour mobile application required literacy skills and therefore it required adult guidance. The study indicated that the technology use in the early childhood settings evidently requires balance between the curriculum, children's needs, human interactions, as well as technological and pedagogical support for the effective use of technology.

1 INTRODUCTION

The presence of media and technology has become extensive and ubiquitous in Finnish children's lives and the children usually learn to use media and technology at the very early age (Suoninen, 2011). Since the media and technology are so closely intertwined with children's everyday life, integrating those into curriculum can be an effective way to engage children in learning activities.

During recent years, the potential of mobile technology for enhancing and diversifying learning has received increased attention. Earlier studies have indicated that mobile technologies can enhance natural science and outdoor learning in many ways. For example, mobile technology can arouse children's interest in nature. In particular, technological tools can provide new choices and more flexibility for personal expressions and learning for children (Blagojevic & Thomes, 2008). Especially the benefits for study motivation and learning achievements are highlighted (e.g.,Tan, Liu and Chang 2007; Chen et al. 2008; Hwang, Shi and Chu 2011). Also considerable changes in teacher teaching and student learning have been reported (Zhang et al., 2010). According to Huang et al. (2010) mobile technologies and an outdoor learning strategy are very useful tools when teaching children about plants. However, many researchers are mainly studying primary and secondary school students and there are only a few studies that are focusing on children under school-age (aged 5-6 years).

This paper explores the implementation of so-called Nature Tour mobile application in Finnish early childhood education settings. The feasibility of the developed mobile application was evaluated through a theoretical framework, which includes the core aspects of mobile learning (such as the aspect of context, time and space, device aspect, social aspect and learner aspect). In this study, the interest is to explore whether the concept of Nature Tour mobile application meets the needs of early childhood education in field trips. The data was

mainly collected with the teachers' group interview. The study is part of a larger research where the aim is to develop both a theoretical framework for mobile learning as well as tools and practices for the use of mobile technology for teaching and learning at different levels of education.

Finland has a national curriculum that provides guidelines on early childhood education, but municipalities and the local authorities have the freedom to decide how early childhood education is organized (Stakes, 2003). Mobile technologies have made inroad in educational contexts little by little in Finland too, but unfortunately early childhood authorities and educators are not early adopters of these kinds of new technologies, even though mobile technologies could create new opportunities to early childhood education as well. This paper aims to highlight some of these opportunities.

In the following section, the mobile learning framework is presented with the focus on mobile technologies in outdoor learning. After this, the mobile nature tour application and Finnish early childhood education as the context of this study are described. The paper continues with the sections of the research design, results and finally, concludes with reflective remarks and proposals for the future research.

2 MOBILE LEARNING FRAMEWORK

This study has adopted the mobile learning definition given by O´Malley et al. (2005) "any sort of learning that happens when the learner is not at a fixed predetermined location or learning that happens when the learner takes advantage of the learning opportunities offered by mobile technologies" as it highlights that mobile learning is not merely about learning by using mobile devices, but also learning across different contexts.

One of the main aims of this study is to further build the theoretical framework for mobile learning (Rikala, 2013). The framework advances the two most recent theoretical frameworks (Koole 2009 & Kearney et al. 2012), that suggest that mobile learning has certain elementary characteristics that separate it from other types of learning. The current framework consists of two levels (see Figure 1.) titled core level and medium level. The core level and medium level are shortly explained as follows. The mobile technologies have the unique ability to support learning anywhere and anytime. For example, they can expand the learning environment to authentic contexts such as parks, museums, and nature. Therefore, the aspects such as context, time and space form the core level of mobile learning.

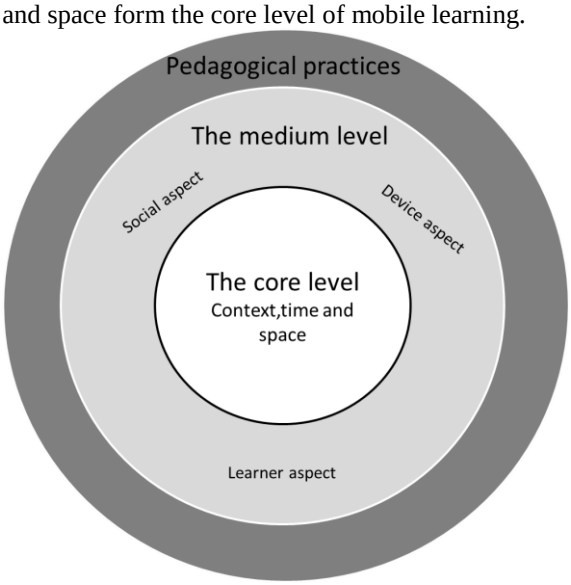

Figure 1: The Mobile Learning Framework.

The medium level comprises the other important aspects in the mobile learning process, which are the learner aspect, device aspect, and social aspect. The learner aspect refers to an individual learner's cognitive abilities, memory, emotions, possible motivation, attitudes, and experiences, which are in a significant role in the learning process and thus mobile learning process as well. In the device aspect the physical, technical, and functional characteristics of a mobile device are emphasized as they are important factors of the device usability. The physical, technical and functional characteristics include input and output capabilities, storage capabilities, power, processor speed, compatibility, and expandability. These characteristics influence the device usability which in turn influences the learner's experience, perceived ease of use, and perceived usefulness. The social aspect, in turn, is associated with the processes of social interaction and cooperation. For instance, the philosophy of social constructivism views learning as collaborative and it emphasizes social interactions. Thus, the impact of interaction on learning cannot be underestimated. (Koole, 2009)

The pedagogical aspect (i.e. pedagogical practices) was also added to the evaluation framework. The earlier mobile learning pilot tests have indicated that the pedagogical aspect is one considerable aspect (Rikala & Kankaanranta, 2012).

In this framework, the learner aspect can be realized by ensuring that the learner's needs are taken into account, whereas the social aspect can be

realized by ensuring that the learners can exchange information and collaborate. The device aspect should be taken into account when planning the mobile applications as well as when planning the mobile learning activities. Pedagogical practices and especially the activity design, in turn, influences on the core and medium level aspects and how those are realized. In this study, these aspects provide an evaluation framework in which the feasibility of the Nature Tour mobile application is analyzed.

3 OUTDOOR LEARNING MEDIATED BY MOBILE TECHNOLOGIES

Outdoor education is widely recognized as the most feasible method of teaching the phenomenon of the natural world (Tan et al., 2007). Nonetheless, the field trips can be physically and mentally challenging and sometimes difficult to fit in educational situations (Bedda-Hill, 2012). However, the experiences and quality of outdoor education can be enhanced with information and communication technologies (Osawa et al., 2007).

The core level aspects (context, time and space) can be fulfilled with mobile technologies. For instance, mobile systems can enable learning with the learner's own preferred route and speed (Shih et al., 2011). Real-life observations conjoin with access to digital technology and contents can help learners to make distinctions for example between the plants in authentic context (Shih et al., 2011). Thus, at the best learners can learn anytime and anywhere so learning can be very personalized, situated and authentic. This kind of spontaneous use has been raised as one of the core features of mobile learning in many mobile learning studies (e.g., Traxler 2005).

The learner aspect can be fulfilled in many ways. Firstly, the mobile devices can support, guide, and extend the learner's thinking process within and out of the classroom (Chen et al., 2008). Secondly, the mobile systems can improve learner creativity as well as ability explore and absorb new knowledge as well as solve problems in different locations (Tan et al., 2007). Thirdly, when learners are using mobile devices they can express their own perspectives more freely (Shih et al., 2011). Fourthly, as the mobile systems can enable learning with the learner's own preferred route and speed, and can support and guide the learner' thinking process, the learning can be more independent and self-reliant (Chen, Kao & Sheu, 2003). For these reasons mobile technologies can have positive effect on the involvement and motivation (Huizenga, Hordijk & Lubsen, 2008). Hence, outdoor learning could be more enjoyable and challenging for learners.

Also the social aspect can be fulfilled as the mobile systems can encourage social interaction. Huang et al. (2010) for instance argue that the mobile technologies can stimulate students to engage enthusiastically in assigned outdoor learning activities, as well as stimulate social interaction and discussion about course material.

The device aspect should be taken into account when planning the mobile applications as well as when planning the mobile learning activities as the device usability influence the learner's experience, perceived ease of use, and perceived usefulness. When the device is comfortable to use it can help to reduce learner's cognitive load and increase task completion rates as the learner is able to concentrate on the activity rather than the mobile device. (Koole, 2009)

Based on the literature review, mobile technologies can enhance natural science and outdoor learning in many ways. However, there are only a few studies that are focusing on children under school-age (aged 5-6) which increases the significance of the present study.

4 THE NATURE TOUR MOBILEAPPLICATION

The Nature Tour mobile application was developed and implemented as a part of the Personal Mobile Space project (during the years 2009-2012) in the University of Jyväskylä, Finland (see Kankaanranta, Neittaanmäki & Nousiainen, 2013). The Nature Tour mobile application is developed especially considering the early childhood and lower primary education settings. The idea for the application was based on the demands of the day care experts.

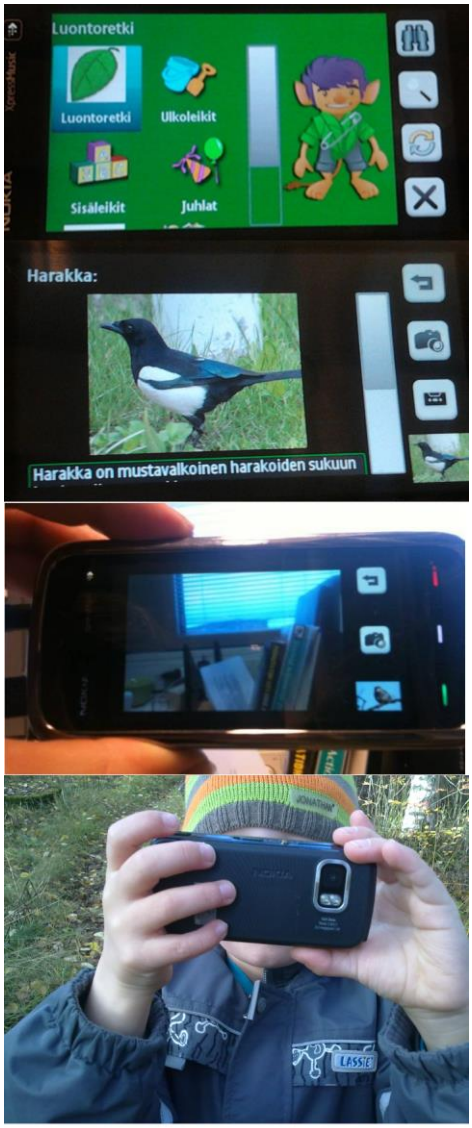

Figure 2: The screen captures of the application (the opening view, relevant information about the species, taking a photograph, and child recording observation).

The primary objective of the developed Nature Tour mobile application is to enhance children's outdoor learning experiences by helping the documentation of the field trips. Continuity of the learning experience is promoted with activities before and after the field trip. Before the field trip, children can familiarize themselves with plants, animals or fungi as the mobile application is associated with a web page which contains relevant information. After the field trip, the children can view the recorded observations and for example create stories. The idea of the web page is also to enable the comparison of what species or phenomena have been observed across the country. For example, one group from southern Finland and another group from northern Finland can record their observations and make comparisons.

The function of the developed mobile application (see Figure 2) is to help recording observations during the field trip. The mobile application allows the user to save observations with photographs or with audio recordings and to send these recordings to the web page, where they can be viewed later on. The main categories of the Nature Tour mobile application (in the opening view) are Nature Tour, Outdoor Plays, Indoor Plays, and Celebrations. The nature tour category is used for the nature observations during the field trips. Other categories allow the wider use of the mobile application in daily life.

The nature tour category includes subcategories such as animals, plants and fungi. Each of these categories opens up a list of the species as well as small pictures. By choosing the species, the user can have relevant information (e.g., picture and core information) about the species and can record observations. For instance, a child can take a picture of a plant or try to record bird's chirping.

The mobile application requires the ability to read and for that reason it requires adult guidance. Hence, the application is designed to provide concrete experiences in nature with the guidance of an adult inasmuch as it is important that the educator describes and explains situations.

5 EARLY CHILDHOOD EDUCATION IN FINLAND

In Finland, the compulsory primary school starts usually at the age of seven and the early childhood education concerns children under school-age. Therefore, the preschool is considered a part of early childhood education and it is intended especially for six-year-olds but it is voluntary. (National Board of Education, 2000)

The national curriculum gives guidelines on early childhood education, but municipalities and the local authorities can decide for themselves how early childhood education is organized (Stakes, 2003).The core of the learning in Finnish early childhood education is the interactions between children, adults and the environment rather than accurate contents. Hence, nature and the immediate neighbourhood are considered the important elements of the learning environment. (Ministry of Social Affairs and Health, 2004)

All the themes, phenomena and contents covered with should be linked to children's immediate environment, daily life and concrete experience. For instance, animals and plants can be located in children's immediate environment indoors and outdoors. For example, modern information technology offers possibilities to create and share contents in different contexts. (Stakes, 2003)

The early childhood educator's role is to set up the fertile activities and learning environment for the children where the information technology can be one component but not dominating. It is important to find the right balance as technology cannot replace human interactions or relationships. The successful integration also requires educator's knowledge about learning as well as knowledge of how to integrate technology into the curriculum to meet the needs of children.

New creative media and information technology in early childhood settings is a quite seldom used in Finland. There are some projects funded by the Finnish national board of education (e.g., Molla project) which aims to bring updated information and action models to people implementing media and information technology such as iPads at pre-school education. The first findings of the Molla project are indicating that media and technology can enhance children's learning. Differentiated learning materials can serve children with different learning needs (the learner aspect). The mobile technologies such as tablet devices also give the children opportunity to perform tasks together which encourages interaction (the social aspect).

6 THE RESEARCH DESIGN

This is a case study that examines the feasibility of the Nature Tour mobile application in the context of specific early childhood education in Central Finland. The research included two parts: one short-term pilot test in the spring 2012 and one longer-term implementation in the autumn 2012. The use of a case study method is appropriate because it provides in-depth examinations and gives understanding of perspectives, opinions, and expectations of the smart phone usage and application.

The short-term pilot test provided guidelines for the further development of the mobile application and ideas for the longer-term pilot test. The short-term pilot experiment was entirely research-led activity involving observations as a research method. Eleven children and one teacher were participating in the field trip which duration was three hours. At the end of the field trip, the teacher stated that she is voluntary to continue the experiment in the autumn.

In the longer-term experiment two early childhood education groups were participating. Total of 29 children, two teachers, and one assistant were participating for two months. They used loaned smart phones which were preinstalled with the prototype of the nature tour application. The teachers were able to use the application independently and could plan the activities by themselves. The researcher provided a short orientation session for the teachers but otherwise the teachers worked independently. The mobile applications were used in appropriate situations. The teachers' and assistant's feedback about the mobile application was collected after the experiment with a group interview. The interview covered the core level and the outer level aspects, as well as the pedagogical aspect.

7 THE RESULTS

The feasibility of the Nature Tour mobile application was evaluated through a mobile learning framework (see Figure 1). The core level aspects, medium level aspects as well as pedagogical aspect are described in the following chapters.

7.1 The Core Level Aspects

The context where the Nature Tour mobile application was mainly used was field trips but the teachers also reported that they used it within doors and when they were documenting the phenomena of the first snow. Hence, the learning was applied appropriately in real-world contexts. The teachers reported that the Nature tour mobile application extended learning beyond the traditional learning space (i.e., classroom) in a motivating way. Both teachers reported that they organize several field trips for their groups during the year. The field trips so far, however, have been less structured (e.g. the children have been able to play and build huts). The teachers argued that the device and related instruction clearly directed the children's attention to nature.

The frequency of the application use was not very high. One of the teachers reported that she used the application three times with her group and the other teacher reported that she used the application several times but not every day. According to the teachers the use of the application was not specifically designed, but instead the activities were rather spontaneous situations. The children were

able to take pictures without restrictions. However, the time when the application was used, in other words field trips, were arranged according to the schedule. This was mainly due to the fact that the equipment was loaned and the fact that the pre-school groups have plenty of other activities during the autumn. Hence, unfortunately the implementation was not as spontaneous as it at the best could have been. At the best, a child could use the application whenever the need arises (e.g. when a child sees the first flower of spring).

7.2 The Medium Level Aspects

The device aspect was slightly challenging as according to the teachers there were various technical problems during the experiment which were difficult to solve alone. These encountered problems reduced the teachers' desire to use application. For this reason the teachers experienced the application difficult to use and this also led to the situation where the children were not able to use the application independently. This finding indicates that the device usability strongly influences the experience, perceived ease of use, and perceived usefulness. The teachers stated that the mobile application should be simplified more. As such, the application contains too much content and requires literacy skills. Pictorial information would be sufficient for children under school-age (aged 5-6 years). In Finland children start compulsory school at age of 7 and the majority of the children learn to read during their first school year. Because the application required literacy skills the teachers thought that they had to open the application to the state where the child could take pictures. The teachers however believed that the children could learn the use of the application very quickly and added that they simply did not have the adequate skills to guide children to use the application appropriately. These findings indicate that the teachers' need sufficient technological support for the effective use of technology. The Nature tour mobile application could also be further developed so that even small children would be able to use it easily (e.g. by adding voices, pictorial information). The application could be further developed in such way that it could enhance children's literacy skills at the early stages. In other words, at the best the Nature Tour mobile application could work as a tool for acquiring literacy skills.

The learner aspect was realized well. The teachers reported that the mobile device brought an inspiring and motivating element for the children. The mobile application inspired children to look at their surroundings in novel ways. They observed surroundings and tried to find interesting places and things to be photographed. The children's creativity was reflected in the pictures as some of the observation pictures were very imaginative and artistic. These findings conform to those of previous studies that have indicated that when children are using mobile devices they can express their own perspectives more freely and that mobile systems can improve creativity and ability to explore and absorb new knowledge (e.g. Tan et al., 2007; Shih et al., 2011). The teachers mentioned that the children had never paid as much attention to nature as during the experiment. The mobile application therefore opened up a whole new world for the children and they began to construct knowledge and awareness of nature. One of the teachers commented: "The children observed nature more closely. For instance, they noticed the flowers: "Hey! Here are still growing some flowers. I will take a picture." Normally, probably, no one would even notice the flowers." The mobile application clearly offered the children new perspectives.

Also the social aspect was realized well. The teachers reported that the children observed the nature and paid attention to plants, fungi and other interesting nature phenomena and creatures. Some of the children even tried to identify the species independently and all the children were eagerly asking for the names of the species. The mobile application clearly encouraged social interaction with adults and with peers. The teachers reported that the children compared pictures with each other and gave the tips where they could take fine pictures. The children also interacted with the teacher by asking the species. The social aspect is one of the significant aspects because technology cannot replace human interaction or relationships. Especially in early childhood education human interactions and relationships are crucial as with them a child learns how to act and express oneself with an appropriate way in different situations (The National Board of Education, 2000). It was encouraging to find out that the Nature Tour mobile application stimulated interactions.

7.3 The Pedagogical Aspect

The teachers highlighted that they did not know how to integrate the use of the application in daily life and other materials. One of the teachers commented: "The fact is that we already have plenty of material what we are using here. If something new is brought and it is just in a way "glued" top of all that, it does not integrate easily especially if you are not technically skilled. I think that this is the biggest challenge in our case." The lack of necessary skills

to integrate the mobile application in the daily life was the main reason why the use of the application mainly remained a tool for photographing various things. The teachers mentioned that they just went to the field and took some pictures. The teachers considered that the use of the application and the follow-up activities should be planned in a more detailed manner and should be integrated into certain topics. In other words, there should be a clear pedagogical objective for each field trip. One of the teachers commented: "If we started to use this application, then it would require more detailed planning."

The difficulty of integrating the use of the application to other activities mainly was due to lack of necessary skills. The teachers did not have adequate knowledge about how to best integrate technology into the curriculum as the technology use in early childhood education in many places is a novelty or a seldom used. The teachers highlighted that the use of information technology cannot become a part of daily routines until the teachers have adequate training. The teachers' education was brought up and highlighted in the conversation. This finding is consistent with Mohammad and Mohammad (2012) who argued that successful integration requires educator's knowledge about learning as well as knowledge about how best to integrate technology into the curriculum. This clearly indicates the need for sufficient support (technological and pedagogical) for the effective use of technology.

8 CONCLUSIONS

The aim of the present study was to explore the implementation of the Nature Tour mobile application in Finnish early childhood education settings. The feasibility of the developed mobile application was evaluated through a framework, which included the core aspects of mobile learning. In this study, the interest was to explore whether the concept of Nature Tour mobile application meets the needs of early childhood education in field trips.

The present experiment indicated that the application has a lot of potential but also some major challenges. The experiment indicated that the application is quite easy to take into use and that it provides children tangible, motivating, and educative experiences in nature. The Nature Tour mobile application also encouraged social interactions with the adults and with the peers. The device aspect, in turn, was a slightly more challenging as the application required literacy skills. Hence, the guidance and the role of the adults were significant. On the one hand, the relationships and interactions with adults are important as the adult can guide children's observations and teach them how to act in different situations. Nevertheless, on the other hand, it would reduce teacher's workload if the children were able to use the mobile application more independently. For this reason the experiment indicated that as such the mobile application is not yet suitable for early childhood education settings but it has a lot of potential. Pictorial information would be sufficient for children under school-age (aged 5-6 years) who do not have literacy skills. The next step is to adapt the Nature Tour mobile application considering the discoveries and the feedback from the teachers.

One very significant observation was that the pedagogical aspect is very important. Based on the present findings it seems that the appropriate way to utilize mobile applications in early childhood education settings require the balance where technology use is matched with the curriculum, the children's needs, and human interactions. The technology use in the early childhood settings also requires sufficient support, in particular because the new creative media and information technology in early childhood settings still is a quite seldom used.

The experiment also brought out one major challenge: to promote mobile learning in early childhood education settings requires considerable change in teacher training as well as teachers' and policy-makers' attitudes. Therefore, the teachers' and policy-makers' attitudes should be investigated in more detail. Do the attitudes affect the way in which early childhood education is organized? Are the attitudes obstacles to the diffusion of technologies such as mobile technologies in early childhood education settings?

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