Final reporting for the VASS project
The virtual world meets the authentic world in sensuous and integrated learning

Content

Introduction

The starting point for the Vass project was to conduct a closer examination of how ICT works in an outdoor educational and curriculum controlled context with students in years 4, 5, 6 and 7. VASS stands for virtual world meets a real in sensuous and integrated learning.

   The VASS project has been carried out by Västra Ramlösa school and Miljöverkstaden in Helsingborg as well as National Centre for Outdoor Education (NCU) and SICS East Swedish ICT both based at Linköping University. The project, which has run during the period 2012 – 2015, was made possible through support from the Marcus and Amalia Wallenberg foundation with 1,3 million SEK. Inger Edforss Fuchs, teacher leader at Västra Ramlösa School in Helsingborg has been the project leader.

   The project had three main starting points

X   The teaching is based on a curriculum which gives the starting point for the teaching and learning in school and therefore also for lessons connected to the project.

X   Where we conduct the teaching, meaning the relation to place, is of great importance for the students' learning. This pedagogical perspective and outlook related to the where-aspect of teaching and learning characterises outdoor education.

X   Teaching in an outdoor educational context can be carried out with the help of ICT.

   There are a number of different examples of the use of ICT in combination with outdoor education, but the focus of this particular project was the close connection to the curriculum and its targets where outdoor education was included as a starting point.

   We choose to present the project here through four different essays which all represent different perspectives. Inger Edforss Fuchs starts by describing the work that has been carried out at her school in Helsingborg. Ingemar Nyman wants to show the gains in environmental theory of pedagogy the schools can make by using IT in outdoor pedagogical work. Mattias Arvola, who does research on the interface between people and digital devices, describes the development work that has been carried out within the framework for the project in his department at Linköping University. In the last essay Anders Szczepanski shares his view of how IT supported outdoor educational work affects the way students and teachers look at learning.

   We would like to thank the Marcus and Amalia Wallenberg foundation for wanting to support this project. Without their help it would not have been possible to carry out the project, which would also have meant that we would not have got this far in the important work on developing the schools' use of ICT in a curriculum based and outdoor educational context.

Helsingborg June 2015

Inger Edforss Fuchs
Project leader

Mattias Arvola

Ingemar Nyman

Anders Szczepanski

Inger Edforss Fuchs
Västra Ramlösa skola
S. Hunnetorpsvägen 213
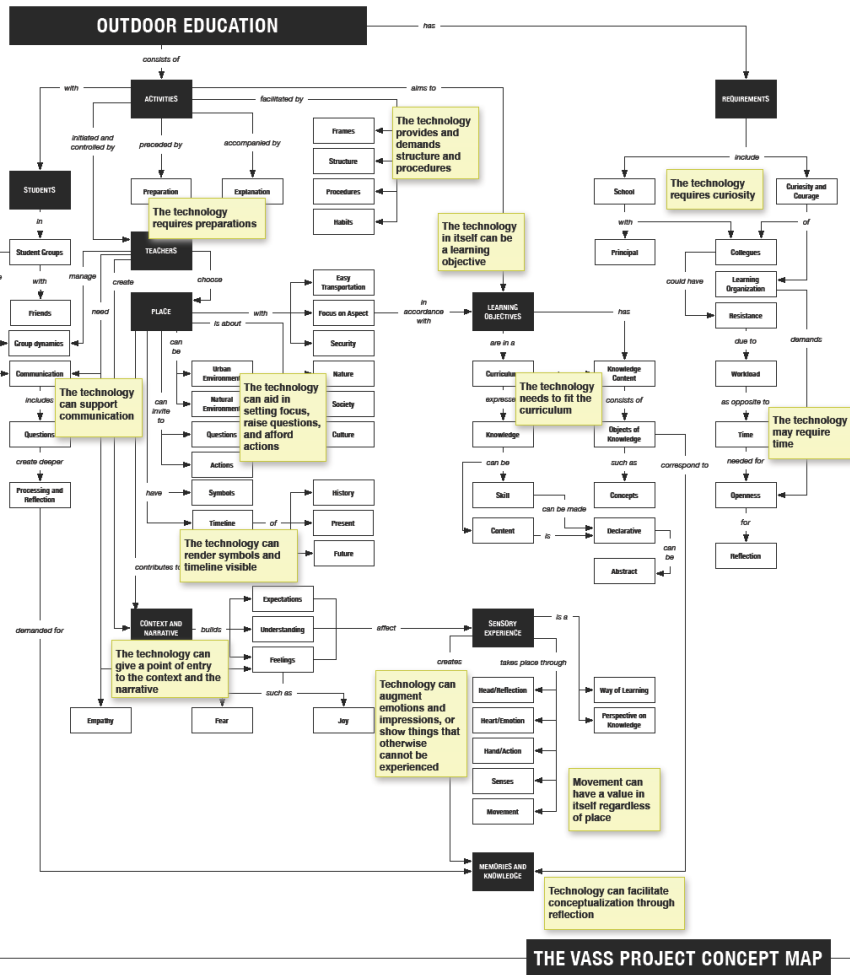256 56 Helsingborg
Switchboard: 024-10 51 00
www.helsingborg.se

Starting point and Thoughts

We wanted to, all of us having either completed the course in outdoor education or taught on it; find ways of using new technology combined with outdoor education. We have, with the support of 1,3 million sek project funding from the Marcus and Amalia Wallenberg foundation for three years, 2012 – 2015, run the project "The virtual world meets the authentic world in sensuous and integrated learning"

   Our vision while working on the project: " *Can we get more students to find the learning situation meaningful? Can we use the outdoor learning environments to widen the students' awareness of the local environment and society? Can we weave together facts, understanding, skills and familiarity in the learning? Can we develop an environmental perspective with sustainable development in our teaching?"* while we were to especially prioritise "…*focusing on how places in our local environment can be used with the help of new technology, in order to promote all the students' abilities. Making places in the local environment, outside the classroom context, the starting point can increase the authenticity of the teaching"*

   While working on this project we also wanted to develop the app Minnesmark, which builds on earlier development work by Linköping University and Astrid Lindgren's world. " *In the project, which was called augmented landscapes in Astrid Lindgren country, a platform for mobile augmented reality (AR) was developed. The aim was to investigate how the experience of a place can be strengthened through computer power."*

The project funding has made it possible to give two project participants in Helsingborg a 10% reduction of their normal working hours throughout the project time. With the support of Linköping University we have let a programmer work on developing the app Minnesmark for about 1,5 years, part time. We have had project group meetings in Helsingborg with researchers from Linköping, but also partial meetings in Linköping with some of the project participants. We have met approximately 3-4 times a year. During the meetings project members, researchers and programmers continuously evaluated, for example a concept map that we built at a workshop on the state of the connections between indoor and outdoor education.

OUTDOOR EDUCATION

has

consists of

ACTIVITIES — facilitated by

aims to

REQUIREMENTS

with

initiated and controlled by

preceded by

accompanied by

Frames

Structure

Procedures

Habits

The technology provides and demands structure and procedures

include

School

The technology requires curiosity

Curiosity and Courage

of

STUDENTS

Preparation

Explanation

The technology requires preparations

with

Principal

Colleagues

could have

Learning Organization

Resistance

in

Student Groups

TEACHERS

create

choose

Easy Transportation

Focus on Aspect

Security

in accordance with

LEARNING OBJECTIVES

has

The technology in itself can be a learning objective

due to

Workload

demands

have

with

manage

Friends

Group dynamics

need

PLACE

is about

can be

Nature

Society

Culture

The technology can aid in setting focus, raise questions, and afford actions

are in a

Curriculum

expresses

Knowledge

Knowledge Content

The technology needs to fit the curriculum

consists of

Objects of Knowledge

such as

as opposite to

Time

The technology may require time

needed for

Communication

The technology can support communication

Urban Environment

Natural Environment

Questions

Actions

can invite to

can be

Skill

Content

can be made

is

Concepts

Declarative

correspond to

Openness

for

Reflection

includes

Questions

create deeper

Processing and Reflection

have

Symbols

Timeline

of

History

Present

Future

Abstract

can be

The technology can render symbols and timeline visible

contributes to

CONTEXT AND NARRATIVE

builds

Expectations

Understanding

Feelings

affect

SENSORY EXPERIENCE

is a

creates

takes place through

Way of Learning

Perspective on Knowledge

demanded for

The technology can give a point of entry to the context and the narrative

such as

Head/Reflection

Heart/Emotion

Hand/Action

Senses

Movement

Technology can augment emotions and impressions, or show things that otherwise cannot be experienced

Movement can have a value in itself regardless of place

Empathy

Fear

Joy

MEMORIES AND KNOWLEDGE

Technology can facilitate conceptualization through reflection

THE VASS PROJECT CONCEPT MAP

In Helsingborg we have started a research project on how to combine an outdoor education with mobile technology in primary school. It is called VASS, which stands for The Virtual World Meets the Authentic World in Sensuous and Integrated Learning.

Above is a concept map for how we conceive outdoor education and it is a starting point for discussions on the role of IT. The yellow notes indicate the role of technology in outdoors education.

The project is funded with 1.3 million SEK funding from the Marcus and Amalia Wallenberg Foundation.

Partners are the SICS East Swedish ICT and the National Center for Outdoor Education (NCU) affiliated to Linköping University, and Miljöverkstaden and Västra Ramlösa school in Helsingborg.

Main Participants:

Inger Edforss-Fuohs, Västra Ramlösa skola, Helsingborg, inger.edforss-fuchs@helsingborg.se
Ingemar Nyman, Miljöverkstaden, Helsingborg, ingemar.nyman@helsingborg.se
Mattias Arvola, SICS East, Linköping, mattias.arvola@liu.se
Anders Szozepanski, NCU, Linköping, anders.szczepanski@liu.se

Thanks to funds from the Wallenberg foundation we could buy 15 iPads with SIM-cards that made it possible for us to take groups of students outside to test different apps and how they could create learning outside the classroom, in our local environment. Since we needed to have our own app, Minnesmark, developed and tested several times we had to focus on finding out how we could use new technology with other possible technical solutions and applications.

Experience from a classroom perspective

Working with areas of learning outdoors is appreciated and longed-for by the students. They show clearly that they want to go outside, and that tasks outside, in a different context and in a different place often create motivation for learning and a wish to understand more. Learning outdoors with new technology requires presentations beforehand in school, to make sure that content, tasks and expected achievement is clear. It also requires thinking things through and making adequate preparations in order to increase student safety when they are outside the school grounds. Is it possible for us to move outside the school grounds? Is it possible to let groups of students go out on their own? If not, what is the solution? The tasks also need to lead on to work carried out afterwards in the classroom, where the students can find connections, strengthen experiences and terminology and make reflections.

   We realised at an early stage that we needed to carry out parallel work with other technical solutions and apps to be able to compare and learn where, how, when and with what we can use new technology connected to outdoor education. This was necessary since the work on our own app, Minnesmark, needed much time for programming and part evaluations. At the project leader's school there was a very low ratio of students to computers 3 years ago, approximately 1 stationary computer per 15 students. The school had done no work at all with iPads. We were also beginners when it came to doing school related work on hand carried devices, but many students had their own smart phones at home. Now we had, thanks to the purchase of iPads through the VASS project, the technology close by, especially for the three classes I had been working with as a class teacher.

   We started by using the camera on the iPad, then recording tools to add sound to the pictures. We searched for places in the local area with the help of pictures and downloaded places with stories that we told. We also went outside to carry out assignments that were suitable in an outdoor environment when we were working with the human body. This could be, for example, different experiments which were then filmed or photographed or tasks that required space, for example when the movement of the Earth and the Moon around the Sun was going to be turned, shown and filmed. *Low intensity movement also contributes to engagement and can thus be used as a motivating factor in the learning process. (http://www.ida.liu.se/%7Ematar/132-arvola.pdf Mattias Arvola, LiU).* Lessons started in the classroom, with for example tales from history, could also be recorded as short audio clips and linked to a QR-code that was scanned. The QR-codes were placed along a forest trail close to the school that the students are used to walking. -This way the stories were

repeated and new questions could be asked. We tried learning and repeating information about traditional festivals. Pictures were to be taken on site and via Instagram and answers were written for a hashtag. I, as class teacher, could then see where the students were in real time and answer their questions straight away from the classroom.

A practical context in the outdoor and indoor environment
We also collected GPS coordinates for important places close to the school. Places like the milestone, the fence, the marl pit, the brook, the tree with a hole in it etc. These coordinates could then be used when we wanted to add places to the our digital tools, either in the Minnesmark app or the web app "Lärplatser i Helsingborg" (places for learning in Helsingborg) which was developed as a result of the VASS project.

Experience of how many students could be sent out with one iPad showed that 2-3 worked best, while, in my experience, groups of 4 divided into two smaller groups. It was also important to be clear about who was responsible for what at, for example, a number of stops. Each student had to know who carried the iPad and that that person, with help from the others, was responsible for finding the place and also for reading the first task, and that not until that point was the next person to take over and lead the group to the next stop with tasks.

My experience as a class teacher during the first 2 years of the project (when I was responsible for the class the larger part of the day and in almost all subjects) and then as subject teacher in middle school is that since I had the control over longer lesson blocks as a class teacher it was easier for us to send students outside. As a subject teacher in three classes with shorter lessons, for example 45 minutes, it often takes too long before everybody has completed their task. The follow-up work in the classroom can then also be protracted and not come at the right place of the process for some student groups. We do know though, that going through the task, even when everybody has not completed it, can be an exercise to create prior knowledge but also a way of revising and putting what you have learnt or experienced into words.

My reflection is that the, sometimes time consuming, outdoor tasks mean that everybody does not have to do everything at the same time or during a certain period of time but that the students who go outside can be given different tasks to solve. The students are very much aware of whether they have been allowed to go outside or not though and they always, almost without exception, want to get the outdoor tasks. Getting the students to go outside has never ben a problem, but making them understand that they have to wait or that they need to be back a certain time is sometimes more of a challenge.

At the project leader's school, sharing of experiences could happen to some extent but there is a need for a clearer pedagogical plan to be developed in collaboration with the head master. This plan should focus on how outdoor education and new technology can be connected and used as natural components of the teaching. Reasons for other difficulties

can be the feeling of stuff crowding in school, lack of subject discussions and no time to have those discussions. Far too few have made use of the tips we have shared. The larger part of testing, doing, redoing and improving ideas concerning digital outdoor educational theory of pedagogy has happened long after the end of the working day. Places for learning and knowledge content connected to place are expected to be part of the peer learning that is now being developed at the project leader's school.

Risks and solutions

A safety issue can be when you send small groups of students outside the school grounds, when you, as a teacher are not with them. How do we handle the possible risk of being robbed of the iPad? How do we handle a situation where groups perhaps lose focus and forget their traffic sense or buy sweets when they pass by a shop? All these things need to be gone through several times already in the classroom. What is the purpose of the tasks? Why do we do them? What do we want them to learn? Etc.

We made iPad cases during handwork lessons, which could be used as a bag, making the iPads less visible and less inviting for potential thieves. We also tried to identify a number of places close to the school that could be used to be loaded with certain content or could be a place to discover. Close to the school, on the school grounds, it was easy to send groups of students out since they could easily return if a problem should arise.

We have talked much about how to handle traffic, on cycle paths, at junctions. If something should happen three students are better than two, especially if they move further away from the school grounds, but that is only suitable for students on year 5-6 or over. For younger students the best way is to create a trail where you accompany them and can keep an eye on half a class in smaller groups, for example 4 groups of 3, making a total of 12 students. This also has to be in a smaller, clearly marked, area.

Another risk factor, as with all lessons, is for the tasks to take place in an empty space, without follow through or preparation. One solution for avoiding this is to choose an area of learning which is really focused on and strengthened both before and after in the classroom. It is important to make sure you stick to that area of learning. The construction of knowledge needs to be made clear to the students and show connections to the abilities that permeate Lgr 11 (the national curriculum).

In evaluations the students have pointed to the outdoor work as a very positive part of the learning where movement, discussions, terms and reflections have been practiced and memory and repetition have been stimulated.

The lessons and the possibilities

While working on the project we have collected our lessons as a deck of cards, where the lesson suggestions are shown, among other places, in our blog; www.vassaute.se , we have included lesson cards in the attachment to this document. We started by, with the help from the camera and the iPad, documenting tasks that were solved outdoors. This picture could then be emailed to the teacher to be talked about in the classroom. The pictures could be shown directly from the iPad, when the class sat in a circle, or on the smart board.

We also made use of QR-codes already at an early stage. The codes were then used where the tasks had been placed to be solved on site in the local environment or just put there for the students to solve while moving/walking here foundation which can be put on the smart board in the class room) and in conversation with each other we have been able to repeat and develop the language and the knowledge that the teachers want to consolidate.

We have tried different ways of sending the results back to the teacher, either by email or via a specific hashtag on Instagram where pictures and text have to show what has been learnt or discovered. Another way that we have discovered is to put all the content in QR-codes, see here, and put the locations on a paper map with coloured markings. The students have to; when they have identified the place, which is close to the school, go to the place to

take a picture, as proof that they have been there. The work on the tasks can then be continued in or outside the classroom.

Project dissemination
We have informed and shared in different forums about how and what we have learnt among other things an article from a magazine from one of our departments: City Council Planning Committee in Helsingborg.

Teachmeet Helsingborg where teachers interested in technology- and theory of pedagogy go to share and take part of each other's experiences.
We, two teachers from Helsingborg, have been responsible for **workshops** during **training days** week 44 (27 October to 2 November) during the autumn term 2014.
Inset days at the project leader's school, where each teacher has been given the opportunity to test a few different tools to find their way to a place.
Subject group meetings that have been arranged in the municipality, for example for teachers of physical education, at these we have explained and advised about useful tools.
Pedagogical meetings have been carried out at a school taking part in the project. Here a number of tools have been tried and teachers have been given the opportunity to try practical exercises.
Reunions for the university course in Outdoor education. Circulation of information, through meeting and practical work, to teachers who have taken part in the 7,5 p university course which is arranged by Miljöverkstaden every year in collaboration with Linköping University.
Field trips to Singapore and Bali during October 2014, where we made five different school visits, see https://teachersgoeast.wordpress.com/. Funding was applied for and granted through SFUB. We were tree teachers from Västra Ramlösa school, one from Miljöverkstaden and one from Linköping University who took part in the visits.
We have also tried to spread the word about what we have learnt through **our blog**, www.vassute.se

Ingemar Nyman
 City Council Planning Committee
Department for City Environment, Miljöverkstaden
Faltarpsvägen 60
251 89 Helsingborg
direct: 072-188 55 15
Ingemar.nyman@helsingborg.se
www.helsingborg.se/

Aspects of environmental didactics in the VASS project

City Council Planning Committee in Helsingborg has a pedagogical department, Miljöverkstaden, which carries out environmental theory of pedagogy work, directed primarily towards the schools in the municipality. Miljöverkstaden has been part of carrying out the VASS- project, which was terminated during the spring term of 2015. Through their participation in the project Miljöverkstaden has had the opportunity to investigate the possibilities for ICT to strengthen its work with environmental theory of pedagogy. ICT usage, in this context, has, for Miljöverkstaden, primarily meant usage in an outdoor educational context. Several different ways of using ICT have been shown; primarily we have seen that an approximation can happen between work in school and work carried out in other places.

The work of Miljöverkstaden aims at developing the students' knowledge of environmental issues. An important part of that knowledge is dialogue and participation. The aim is for the students to learn what an active citizenship for a sustainable society means.

The question is what it means to teach for sustainable development? And from the point of view of the VASS-project: how has the project contributed to teaching for sustainable development?
  In a legislative report, SOU 2004:104, by the Committee for education for sustainable development

"The knowledge of how education should be structured in order to contribute to conditions enabling sustainable development… the following characteristics were identified as essential:

- Many and multifaceted highlights of economic, social and environmental conditions and processes are treated integrated, supported by interdisciplinary ways of working.
- Conflicts of aims and synergies between different interests and needs are made clear.
- The content spans a long period of time from the past to the future and from global to local.
- Democratic working methods are used in order to give the students influence over the form and content of their education.
- The learning is reality based with close and frequent contact with nature and society.
- The learning is directed towards problem solving and stimulates critical thinking and preparedness.
- Both the process and the product of the education are important.

All these characteristic should be present in order for education to be able to contribute to sustainable development." (p. 73).

None of these points is in opposition to the work Miljöverkstaden in Helsingborg does. On the contrary, these texts have often been used as examples in the courses we have arranged with outdoor education and sustainability issues as a starting point. One point catches the eye, the one about reality-based learning with close and frequent contact with nature and society. This can and should be interpreted as meaning that the outdoor environment, with a number of places connected to it, are important for education in sustainable development. Miljöverkstaden regards it as a priority to explore ICT: s use from this perspective when we got the opportunity to take part in the project.

   The use of outdoor environment in school is a central question and the legislative report points to shortcomings in the schools both when it comes to making the teaching reality based and in the amount of contact it has with the local community. " The few studies that have been carried out lately show that the there is a scarcity of the kind of reality- based learning the education for sustainable development demands. Contacts with local society are few and infrequent" (p. 90).

This highlights the importance of environmental theory of pedagogy being established in the local environment.

The importance of place in teaching

The fact that places are important from a learning perspective is reflected in the outlook of the theory of pedagogy that outdoor education represents. There are more examples of descriptions of the importance of place for learning (Dahlgren & Szczepanski 1999; Fägerstam, 2012; Nikolaisen Jordet, 2010).

   Further, the outdoor educational way of working means learning that is connected to authentic situations and learning environments. See for example the NCU homepage 92015): "Outdoor education is an approach which aims for learning in an interaction between experience and reflection based on concrete experiences in authentic situations." On the same page it is also pointed out that the outdoor educational area is thematic and interdisciplinary something the legislative report (2004) states as points in an education for sustainable development.

   Letting students get first hand experiences outside the classroom, where learning takes a central place, is nothing new and many people have argued for this (Dewey, 1997; Fägerstam, 2012; Nikolaisen Jordet, 2010; Kolb, 1984; Szczepanski, 2008). Thus, it is not the new technology, in the form of IT, that has made us look for new places for learning outside the classroom. One of the starting points for the VASS project was the fact that there was already an established way of thinking about outdoor education, independent from the development of digital tools.

   However, something that struck me while working on the project, parallel to or independent of outdoor teachers, was the fact that it has often been the people developing new digital technology who have chosen to make use of different places in the outdoor space. When you have a kind of technology that can communicate with the user and other users, regardless of where they are, choosing to work in different locations becomes quite natural. You could say that the technology enables use of alternative locations.

   Through the development of digital technology, which has become increasingly mobile and competent in a number of ways, for example through increasingly exact positioning, the interest for combining virtual world with real world has increased. Simply the fact that we

can make use of mobile technology in different places outdoors. FitzGerald et al. (2012) says that "location aware technologies has dramatically increased" (s.2). They also say that the touch screens and advanced cameras and sensors of hand carried devices have increased the possibilities for users to get place-based information. We can "enhance *situated* meaning-making" (s. 3). In another study (Bouvin & Hansen, 2009) they describe the possibilities: "It is becoming didactically desirable as well as technically possible to move learning outside of the classroom and take advantage of the rich sources of information available beyond books and computer screens" (p. 6)

   With his technical development as a starting point the possibilities of teaching outside the classroom have increased and Bouvin & Hansen (2009) describe it as: "When learning moves outside, it becomes essential to bring the experience back into the classroom for further work and discussion" (s. 11).

Teaching context

Liu, Tan, & Chu (2009) point to many of the advantages there could be when using digital media both in and outside the classroom. An important aspect in this project was that we did not want to detach the students' experiences in the outdoor space from parts of a learning process, which involves work indoors. We learn not only through our experiences outside in the real world but the learning involves many different stages and places and is then preferably regarded as a process. According to Säljö (2000) the learning happens in contexts. If there is no connection between what is to be learnt and the situation or context we risk getting a de-contextualisation. Which can then problematize the learning since our learning does not have a direct connection to reality.

   At an early stage of the project it was clear that the teachers who took part wanted to strengthen and vary their teaching through the use of different places. In other words, they wanted to be able to change the teaching space. Another way of expressing this is to say that they wanted to use different contexts in their work.

   Choosing to work in different places with different contexts as starting points and with ICT as one of the tools also meant that the work was shaped according to the context the students were working in. They did different things in the different contexts even though they might be working with the same subject.

   Our conclusion, having tried using ICT in different outdoor educational situations, was that ICT could help the teacher to send students out on missions. This could be done since there are digital navigation tools, which help the students find their way to different places. This way the teacher can decide where the students should go. We could further conclude that we now have the possibility to inform the students of tasks through ICT when they have reached the place even if the teacher is not present. Thus ICT can be useful both for navigation and informing about tasks. ICT can be used to document different happenings from what the students are doing in a certain place. This way, they can bring back material they have produced on site. The students can continue working with material they created in different places even when they are somewhere else. ICT can also inform the students of what they should do when they reach the place. In conclusion we can, trough digital technology, make it clear to the students where they should go and what they should do. They also bring a digital tool, which can help them relate to the place they are in. The didactic questions of what they should do, where they should do it, why they should do it and how they should do it are important since the outdoor environment can be distracting compared to the classroom environment. From this point of view it becomes important to describe the technology as a tool. As something that helps us in a quest for learning with the starting point in different contexts.

ICT gives focus

In the outdoor environment the objects/phenomena need to be directed and steered towards our desired learning outcome for the students. The teachers stress the fact that the place-based experience is important. However, it is also important for the students and teacher to get an opportunity to discuss and reflect on their place-based experiences. ICT can create a focus in the activities in the different places and can thus make it possible for the activities to have their starting point and content based on what we want the students to learn.

   Focus, in this context, can also mean focusing in a classroom situation. What we bring back in digital form can be more easily brought out in the classroom. The material we have collected is connected to and produced by us.

A model

To look more closely at how ICT worked from a didactic perspective three teachers, who all had experience of ICT and outdoor education, were interviewed. From their answers different categories could be created where the ability of ICT to serve as a bridge/link between different contexts was seen as central and important. This is how the model looks (see below):
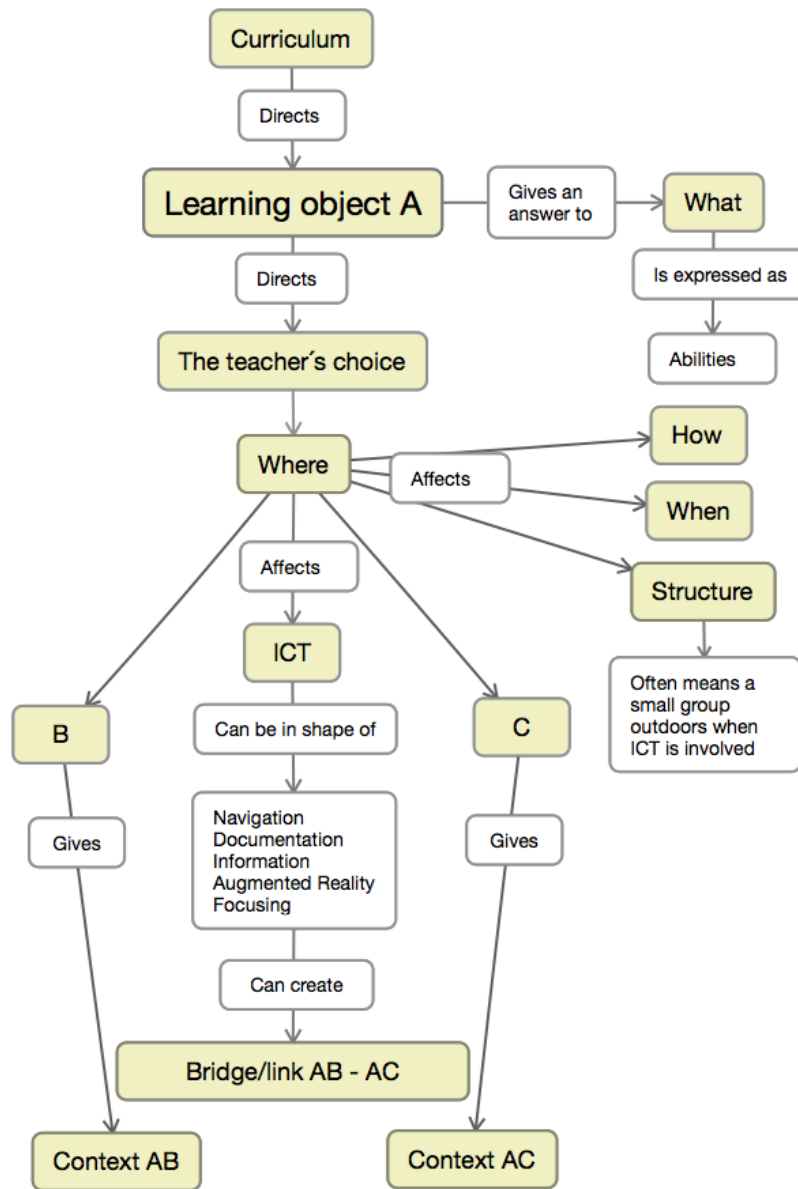
The model can be described this way:

   The school is supposed to work from the curriculum and when this work is to be concretized the work is centred on a few points, which in the end decide the quality of the work with the students. It has to do with **what** the students are going to work with – a learning objective. It also has to do with **how** they work with the learning objective and this how is very much about whether the teacher chooses to use different environments than the classroom. **When** is about adjusting to the time that is most suitable to go outside, factors such as logistics and weather are yet another reason for time to be included as an important factor.   **Where** is a central issue. In outdoor education the answer is a key factor in lesson plans where different contexts decide how the lesson plans will look. Learning can take place in one context or in one single place. For example in a classroom or in an outdoor space. But throughout this project the importance of the connection between the classroom and the outdoor space is a key point. For this reason, teaching and learning put forth by the teachers that happens in only one context and situation can be regarded as an exception here. This is why the way we look at connecting different contexts and places is central to this way of working.

Conclusions

Judging from experiences made during the VASS project the schools' use of the outdoor environments can be made easier through digital tools. The interviews with the teachers also show that there are advantages when the learning environments in the classroom is brought closer to the learning environment in the outdoor space. What the students work with indoors can be related to outside and vice versa. Examples of reports that discuss the significance of contexts from a learning perspective where ICT is also used is Eliasson & Ramberg (2012); FitzGerald et al. (2012); Bouvin & Hansen (2009); Lundblad (2012) och Liu, Tan, & Chu (2009).

   Increased use of outdoor environments is also something that is being aimed for in teaching for sustainable development; see for example (Björneloo, 2011; Ministry of Education, 2004).

   If we look at the points that are brought forth in the legislative report, except close and frequent contact with nature and society, a dominating issue is the content given in the teaching. This is not discussed here, on the other hand there is nothing in that issue that goes against either the use of ICT or more schoolwork happening in the outdoor environments.

Helsingborg, June 2015
Ingemar Nyman

Mattias Arvola
SICS East Swedish ICT
c/o. Linköping University
581 83 Linköping, Sweden
Telephone: 013-28 57 03
mattias.arvola@liu.se

Use and development of Minnesmark

In this project we have made use of, among other things, the Minnesmark platform. This is a platform for mobile AR (augmented reality) for Apple iPhone and iPad. It makes it possible to start and stop media activities on a hand carried device when the user reaches a place, or when the camera on the device recognises a graphic mark. The platform can also be used to place graphic objects on a graphic mark with the image from the camera in the background, which makes it look as if a virtual 3D- object is placed in the authentic and physical world.

Early stages of the work on Minnesmark are described in published scientific articles (Arvola, Blomkvist, Holmlid & Pezone, 2012; Nilsson, Arvola, Szczepanski, Bång, 2012). Earlier research has shown that one of the main advantages of augmented reality is the possibility to present information to the user in the situation and context where he or she is. For example, AR-applications can be used to give instructions by putting text and animations directly in the users' line of vision (Nilsson, 2010). This way the instructions take up less time from the user's main task. A similar example is when you walk through a museum wearing headphones and listen to a guide explaining things. This gives the experience yet another dimension. Liestøl calls this type of AR-experiences situated simulation (Liestøl, 2009; Liestøl & Rasmussen, 2010). Situated simulations require a connected smartphone that makes it possible to use advanced graphics, GPS-positioning, accelerometer and compass (Liestøl, 2009). With this type of hardware it becomes possible to combine two different perspectives – for example to add historical information onto the phone camera's present picture of the surroundings. Another example of how cultural experiences can be enhanced is the Westwood –project where an audio guide is used in combination with visual reinforcement on the phone in certain places along a guided tour around Westwood in California (Wither, Allen, Samanta, Hemanus, Yun-Ta Tsai, Azuma, Carter, Hinman & Korah, 2010). Mobile games can also be part of experience based learning, which had been shown, for example, in a mobile phone based treasure hunt where the students learn about historical events in Tainan in Taiwan (Wu, Chang, Chang, Yu-Ren Yen & Jia-Sheng Heh, 2010). In a subject like biology (but also in many other subjects) it is natural to work with outdoor education (Szczepanski, 2008) where students are brought out into nature, rather than bringing nature into the classroom, this is another case where mobile technology can play a part.

Earlier projects, however, have not evaluated how this type of technology can be used in outdoor educational teaching in schools. Based on the learning platform Minnesmark we have, in this project, developed a mobile phone application for place based learning in the regular teaching. With the aid of the application we want the students to be able to communicate with the place but also communicate about the place.

For Minnesmark to be able to live up to the expectations above we needed to develop it further to enable the teacher to give positions and update content, without the help of a programmer. It was developed through participatory design (Carr, 1997) between developers, researchers, and teachers. Originally we thought that Minnesmark needed to be extended in itself with possibilities to document places for students, but the tools already present in mobile phones and tablets can be used for that purpose instead. Minnesmark does not exist in a vacuum. Instead it has been used in combination with other applications.

Through Minnesmark the teacher can give different tasks where one of the starting points is that the students make use of a place. There can then be a number of basic facts related to the place. The facts can be given by the teacher at an earlier stage but could also be part of a data bank built by the students. Places can inspire students to want to find out more. An editing tool (Minnesmark Editor) is used to place stations on a trail and to connect media to the stations, along with visual markers that can be recognised by the camera on an iPhone or iPad and which can then start a media event. At the end of the trail links to selected media files can be sent by email to the student's or the teacher's email account.

It is easy to picture different positions and a digitalised collection of facts. These two parts can give a structural framework for a more varied way or working. The names of the trees in a specific place or when the building was built and which architect drew the house are all naturally important pieces of information. But different places can also serve as inspiration for further research according to the way knowledge is regarded in the curriculum. The meeting between a virtual world of knowledge and stimulation and an authentic world full of sensuous experience makes an exciting foundation for collected learning.

Movement in the schoolwork is stimulated through this method of working. Movement between places is an important foundation for varied learning. There is a health aspect included in this, which is stimulated by the application. Not only that though, exercises to be completed during movement can also be added.

At the beginning of the project we imagined an application, which becomes a tool to be used in different places in the teaching. It felt natural then that the students would take pictures where you can see in the application straight away where they were taken, but this was a function that did not need to be added to Minnesmark since it was already available in other available applications. The same goes for writing tools for the students to use when writing down their thoughts.

Minnesmark contributes to a family of applications which aim at stimulating learning both indoors and outdoors in school The applications is a help for the students to collect different experiences outside in different authentic environments which then make a base for continued learning.

Minnesmark can be used for giving students tasks to solve in places in their local environment. When they get to a place they can be given place specific information and collect information and material to bring back to the classroom or to another meeting point.

The continued development of Minnesmark has been described in three articles and one bachelor thesis, which are summarised below.

Title: Augmented Reality in Outdoor Education: Teachers' perspectives.
Written by: Mattias Arvola and Anna Holm
Submitted manuscript..
Scientific journal article
Accessible online: Will be made accessible through LiU E-Press.

Summary: Earlier research has shown that outdoor education can work as a complement to learning in the classroom. However, there are some obstacles to get past when taking the step to start teaching out doors. Mobile augmented reality (AR) makes it possible to put virtual objects and events as an additional layer on top of the physical reality, in order for the computer based information to be shown in the places and in the physical environment where it is meaningful. Arguments have been brought forth in earlier research, saying that this functionality can support student's learning in an outdoor environment. The purpose of this action research project is to try the mobile AR platform Minnesmark out on the field, in outdoor education at a Swedish primary school.

   The overall research issue is how primary school teachers can use AR in outdoor education. The first sub question is how teachers in the project used Minnesmark, and the second sub question is what he teachers regarded as possibilities and challenges in using mobile AR in outdoor education.

   Our study first describes the use of AR in outdoor education. Three iterations of design, construction and usability evaluations with a total of 37 users were carried out, and project documentation and communication was reviewed. The teachers then took part in the project in concept mapping to articulate their understanding of outdoor education. The teachers were also observed and interviewed before, during and after outdoor lessons. Last of all they took part in a validation of identified possibilities and challenges.

   The result shows that mobile AR can be used to put focus on exercises outdoors, raise questions, invite to activity, make visible the importance and time line (History, present and future) of a place. Offer a way in to the context and support reflection. The challenges were about producing content, structure the work flow for one self and the students, arrange student groups, and to get activities and content to correspond with the targets in the curriculum.

Title: Device-Orientation is More Engaging than Drag (at Least in Mobile Computing)

Written by: Mattias Arvola and Anna Holm

In: Proceedings of NordiCHI 2014. ACM, 2014.

Conference contribution: peer reviewed

Accessible online: : http://www.ida.liu.se/%7Ematar63/132-arvola.pdf

Summary: In Minnesmark teachers can add panorama pictures that are shown when a student gets to a place or scans a marker with the camera on the phone or the tablet. This panorama picture the students can then explore by keeping the phone or tablet in from of themselves and turn around. The phone or tablet then works as a peephole into the panorama picture. The question for this article is whether this way of panning contributes to involvement as intended. 20 users were asked to create panorama pictures by turning round, holding the tablet in front of them and by swiping their finger over the screen. The participants were also asked to fill in a survey that measured their involvement. It turned out that exploring the panorama picture by turning round created more involvement than to pan by swiping one's finger over the screen. Using one's body to navigate information can thus pull the user into an affective loop.

Title: User Experience Qualities and the Use-Quality Prism,

Written by: mattias Arvola and Stefan Holmlid

In: The fuzzy front end of experience design: Workshop proceedings / [ed] Eija Kaasinen, Hannu Karvonen, Yichen Lu, Jari Varsaluoma, Heli Väätäjä, Espoo: VTT, 2015.

Conference contribution (peer reviewed)

Avilalble online: http://www.ida.liu.se/~matar63/fuzzy-UXQ-final.pdf

Summary: Deciding on the desirable user qualities, or the targets for user experience, for a system like Minnesmark is important but difficult. This case study explores how a number of qualities are articulated during the concept phase of the design process for Minnesmark and for the the early test application Astrids spår (traces of Astrid). In the test application a physical environment was reinforced with stories about Astrid Lindgren's life and authorship. The results of the case study show that articulated user qualities and experience targets focused the design process. It was also observed that one single set of desirable user qualities did not work in all phases of the project, and that the design consequences propagated between different aspects of user experience.

Title: Introduction of new tools for outdoor education: underlying factors for experienced usability.

Written by: Sebastian Sylvan

Bachelor thesis in cognitive science, Linköping: Linköping University.

Available online: http://urn.kb.se/resolve?urn=urn:nbn:se:liu:diva-120254

Summary: This study has evaluated the usability in the system Minnesmark from the point of view of a target group consisting of teachers on duty. In order to investigate usability and what affects how individuals experience Minnesmark motivation and emotion were also measured and then related to the usability of the Minnesmark system. The average for experienced usability was high, but with room for improvement. The study found that the intrinsic motivation of individuals was in positive correlation to experienced usability and affected the individuals' attitude to use. Motivation for use can therefore be regarded as a foundation for the usefulness of this type of system.

Anders Szczepanski
Ass Prof. Outdoor Education
Director, National Centre for Outdoor Education (NCU)
Linköping University
www.liu.se/ikk/ncu

Presentation of the VASS-project – from an outdoor educational perspective

Outdoor education in combination with mobile theory of pedagogy was carried out between 2012 – 2015 in Helsingborg municipality at Västra Ramlösa school among a number of selected teachers and students. During a number of selected opportunities for learning, hand carried technology was connected to points of learning outdoors, close to the school. These environments, selected by the project management, were tied to the assignment, themes and subjects in Lgr 11 (national curriculum). In connection to the evaluation of the VASS-project a number of focus interviews were carried out with 6 primary and middle school teachers and 12 students from year 3 to 6. The focus interviews were done both before and after the educational intervention in outdoor education.

   A phenomenographic research method was used, which means a qualitative and inductive approach where a number of open questions (see below) are constructed. The questions were put to the respondents before and after the introduction of mobile theory of pedagogy. Phenomenography as a method aims at catching the recipients' opinions about phenomena. These are then categorised, where the variation of different opinions about central concepts form a sample space of categories, in this case about *teaching and learning in the outdoor environment and mobile theory of pedagogy.* The interviews were carried out with selected teachers and students; so called convenience sampling. The project leader at this school made the selection. The semi structured research questions used for the interviews with the teachers were: *Why do you teach the way you do? How do you perceive that the students learn in and outside the classroom? What is your experience of / how do you feel about teaching and learning with mobile theory of pedagogy and what do you want the students to learn? What is your experience of the outdoor space as a learning environment?*

   The research questions used on the students were: *what is your experience of teaching and learning using mobile theory of pedagogy? And what is your experience of the outdoor space as a learning environment?* In order to make a comparison between students' and teachers' opinions two of the questions were put to both students and teachers. These questions were: *what is your experience of teaching and learning using mobile theory of pedagogy? And what is your experience of the outdoor space as a learning environment?* Two main categories emerge in this material: *Teachers and students see the significance of the outdoor space for teaching and learning* and *teachers and students do not see the significance of the outdoor space for teaching and learning.* Through this, an insecurity regarding the significance of space in teaching emerges. These two main categories are evenly distributed in the material. However, most respondents perceive the combination of

mobile theory of pedagogy with iPads as positive for the learning situation where the social aspect and the cooperation are stressed.

The results from the first interviews before the educational intervention and mobile theory of pedagogy were introduced, show that most students already had good knowledge of the functions of an iPad since many students already had access to this type of technology at home. The students were not really used to formal teaching taking place outside the walls of the classroom and were excited about what would happen outside. In the group of teachers everybody except one, the project leader, were unfamiliar with the technology and unsure of how to use it in learning situations outdoors. But also how outdoor education and mobile theory of pedagogy were going to be received by the students. There was insecurity among the teachers of how to use outdoor education as a pedagogical tool.

The result from the follow-up interviews, which were carried out 1 ½ year later, show that in most cases the students felt that this "new way" of learning through a combination of IT-technology and outdoor education served as a new addition and perspective in the learning. This type of learning was not regarded as something that could take place in a traditional classroom situation. Meeting phenomena, processes and objects for learning in an authentic environment outdoors, and then processing them in the classroom, was perceived by the students as increasing the affordance, which then strengthened the classroom context. If this was better or worse than "traditional" classroom teaching is, judging from this limited interview material from 12 students and 6 teachers, hard to determine. Many students also explained that classmates who normally did not function very well in the classroom, " the students who find it hard to stay still" got more space to act in the outdoor environment. This was perceived as creating a better learning environment for the whole group in interaction between outdoors and classroom. It also emerged that both students and teachers found social and pedagogical gains in a clearer and more visible cooperation between students outdoors compared to learning in a classroom. The following is a selection of statements made by students in year 6:

The students feel that the encounter with the outdoor environment creates a freer way of working among the classmates and thus makes it easier to learn more from each other. "It is also more fun to learn outdoors." There is no clear explanation to why this is the case. Outdoors and indoors are perceived as being beneficial in different ways, but it is expressed as if "You might get more facts indoors." "You get good breaks if you switch between outdoors and indoors because then you also get some fresh air" "I think it's a good idea but you have to work for it" as one of the students expresses her/himself regarding the new way of working. Another student reflects about the fact that "You probably learn more indoors but also a bit outdoors, you have to collect factual information indoors and then develop it outdoors." None of the students have had the opposite perspective.

The time for outdoor education has been an average of one lesson approximately twice a month and taken place in a location very close to the school, often in Jordbrodalen (500 metres from the school). Sometimes things that had been worked on in the classroom were repeated outdoors with the help of digital technology.

The experience among the teachers was generally that the direct contact with the place and objects for learning increased the students' motivation, in a way that made the students interested enough to want to find out more about the lesson content that was later reflected upon in the classroom. The group of teachers felt that the younger students (year

3 and 4) were more enthusiastic than the older ones (year 6). The lesson content was mainly connected to the natural sciences (maths and natural sciences) but also to social sciences, primarily history, which the pedagogical trails were constructed around, all depending on the teacher's subject area. What would have been the content if the students had been given the opportunity to choose the questions?

The insecurity that remained in the group of teachers from the start of the project was a lack of knowledge regarding *where, when, what, how* and *why* the landscape can be used as "classroom and teaching material" when the digital technology was disconnected and the text based practice was not available outdoors. You were in a didactic "vacuum" outdoors, unable to connect the knowledge content, the subject and the theme to the different places for learning in a clear way. It is important in this case to tie outdoor education as a method to mobile technology in a clearer way. From this perspective, in depth didactic knowledge at an early stage of the project on using the local environment and the knowledge content of different places in the surrounding places for learning would have made a positive difference.

It means a didactic challenge when a new pedagogical tool is added to the learning and teaching and in this context also the ability to "read landscapes". A central question that we would like an answer to in this context is: *what importance could the place have as basis for explanation to the variation in the results of learning?* But also the next step: *what importance the combination of mobile theory of pedagogy and a move outside to new places for earning in the school's local environment can have for the learning process?*

The insecurity among the students regarding the usefulness of the outdoor environment in learning was also expressed in their opinions and consisted of several respondents still, in connection to the follow up interview 1 ½ years later, thinking that teaching and learning mainly happens in the classroom. The outdoor environment is not sanctioned enough by the learning system on all levels of the school. It became obvious during the student interviews that all participating teachers had not fully taken part in the outdoor learning situations together with the students. A picture emerged where the teachers mostly stayed in school when the students carried out their learning tasks in the local environment. The reason for this cannot be ascertained since it has to do with how the individual teachers plan their teaching and the way they work. An important component, which should be strengthened in future teaching, is review and written or text based reflection both indoors and outdoors. The need for a competence improvement regarding the use of outdoor educational methods in combination with increased knowledge of IT as a tool in mobile theory of pedagogy became evident among some of the teachers who were interviewed. The facts that were put in place for the students have not always been directly tied to the history or natural/cultural environment of the place according to some of the students. This can also be developed if the outdoor education is to be refined in a continued development project along with didactic competence as a tool with focus on the place, the method, the object and the process in learning and teaching. The knowledge about context, variation and interaction between different learning environments and the thematics need to be deepened. In earlier research on outdoor education and its relationship to learning and teaching one of the central research questions has been: *what is the perception of the meaning of place for learning and teaching in an outdoor educational context?* In these studies the metalevel is described with a starting point in the categories found in several of the interviews in a context which is tied to the landscape dimension, the knowledge dimension, the body dimension, the environment dimension and the time dimension. The core of outdoor education also emerges in parts of this empiricism and in a combination of ICT and outdoor

education in earlier pilot study (see Szczepanski, 2007, 2008, 2011, 2013, 2015 & Arvola et al, 2012)

It is possible to, in this VASS-project, clearly see great development potential for both ICT and for the outdoor educational applications and the space between these two innovative areas of knowledge in learning and teaching.

Omne tulit punctum qvi miscuit utile dulci – "He has gained every point who has combined the useful with the agreeable" (Horatius)

Bibliography

Arvola, M. & Holm, A. (2014). Device-orientation is more engaging than drag (at least in mobile computing). In NordiCHI '14 Proceedings of the 8th Nordic Conference on Human-Computer Interaction: Fun, Fast, Foundational: Paper presented at NordiCHINordic Conference on Human-Computer Interaction (pp. 939-942). New York: ACM.

Arvola, M. & Holmlid, S. (2015). User Experience Qualities and the Use-Quality Prism. In: Eija Kaasinen, Hannu Karvonen, Yichen Lu, Jari Varsaluoma, Heli Väätäjä (Ed.), The fuzzy front end of experience design: Workshop proceedings. Paper presented at The fuzzy front end of experience design. Espoo: VTT.

Arvola, M., & Holm, A. (n.d.). Augmented Reality in Outdoor Education: Teachers' Perspectives. Manuskript inskickad till International Journal of Human-Computer Studies.

Arvola, M., Blomkvist, J., Holmlid, S., & Pezone, G. (2012). A service walkthrough in Astrid Lidgren's footsteps. In Proceedings of ServDes.2012: Service Design and Innovation Conference. Espoo, Finland, February 8-10, 2012. http://www.ida.liu.se/~matar/arvola-servdes2012.pdf

Björneloo, I. (2011). *Hållbar utveckling - att undervisa utifrån helheter och sammanhang.* Stockholm: Liber AB.

Bouvin, N., & Hansen, F. (2009). Mobile Learning in Context - Context-aware Hypermedia in the Wild. *International Journal Of Interactive Mobile Technologies , 1*.

Carr, A. (1997). User-Design in the Creation of Human Learning Systems. Educational Technology Research and Development, 45(3), 5-22. doi: 10.1007/BF02299726

Dahlgren L.O., Sjölander, S., Szczepanski, A. & Strid, J-P. (2007): Utomhuspedagogik som kunskapskälla: närmiljö blir lärmiljö. Lund: Studentlitteratur.

Dahlgren, L. O., & Szczepanski, A. (1999). *Utomhuspedagogik: boklig bildning och sinnlig erfarenhet.* Linköping: Linköping University.

Dewey, J. (1997). *Experience & education.* New york: Touchstone.

Eliasson, J., & Ramberg, R. (Apr-Jun 2012). Design Guidelines for Location-Based and Contextual Learning Supported by Mobile Devices. *International Journal of Handheld Computing Research , 3* (2), ss. 26-43.

FitzGerald, E., Adams, A., Ferguson, R., Gaved, M., Mor, Y., & Thomas, R. (2012). Augmented reality and mobile learning: the state of the art. *11th World Conference on Mobile and Contextual Learning*, (ss. 62-69). Helsinki.

Fägerstam, E. (2012). *Space and Place: Perspectives on Outdoor Teaching and Learning.* Linköping: Linköping University.

Gustafsson, P. E., Szczepanski, A., Nelson, N., & Gustafsson, P. A. (2011): Effects of an outdoor education intervention on the mental health of schoolchildren. Journal of Adventure Education & Outdoor Learning pp. 1-17, London: Routledge.

Klopfer, E. (2008). *Augmented learning: research and design of mobile educational games.* Cambridge: MIT press.

Kolb, D. (1984). *Experiental learning; Experience as the source of learning and development.* Englewood Cliffs, N.J.: Prentice-Hall.

Liestøl, G. (2009). Augmented reality and digital genre design: Situated simulations on the iPhone. In Proceedings of the IEEE International Symposium on Mixed and Augmented Reality - Arts, Media and Humanities(ISMAR-AMH '09), 29-34. Washington, DC: IEEE Computer Society.

Liestøl, G. & Rasmussen, T. (2010). In the presence of the past: A field trial evaluation of a situated simulation design reconstructing a viking burial scene. In Proceedings of the EDEN 2010 Annual Conference, Media Inspirations for Learning: What makes the impact? (Universidad Politecnica de V alencia, V alencia, Spain, 9-12 June, 2010), 42. Budapest: European Distance and E- Learning Network.

Liu, T.-Y., Tan, T.-H., & Chu, Y.-L. (Oktober 2009). Outdoor Natural Science Learning with an RFID-Supported Immersive Ubiquitous Learning Environment. *Journal of Educational Technology & Society , 12* (4), ss. 161-175.

Lundblad, T. (2012). *Simulerad verklighet i gymnasieskolans fysik - En designstudie om en augmented reality simuering med socio-naturvetenskapligt innehåll.* Department for society and welfare studies. Norrköping: Linköping University.

 Läroplan för grundskolan, förskoleklassen och fritidshemmet 2011 (Lgr 11). (2011). Skolverket.

National centre for outdoor education: http://www.liu.se/ikk/ncu den 18 januari 2015

Nikolaisen Jordet, A. (2010). *Klasserommet utenfor: tillpasset opplaering i et utvidet laeringsrom.* Cappelen.

Nilsson, S. (2010). Augmentation in the Wild. Doctoral thesis. Linköping: Linköping University.

Nilsson, S., Arvola, M., Szczepanski, A, & Bång, M. (2012) Exploring Place and Direction: Mobile Augmented Reality in the Astrid Lindgren Landscape. In Proc. OzCHI 2012, 411-419. New York: ACM.

Sylvan, S. (2015). Introduktion av nya verktyg för utomhuspedagogik: Bakomliggande faktorer för upplevd användbarhet. Bachelor Thesis in Cognitive Science. Linköping: Linköping University.

Szczepanski, A. (2008): *Handlingsburen kunskap – Lärares uppfattningar om landskapet som lärandemiljö* Licentiate Thesis, Linköping: Linköping University, Department for Behavioural Science and Learning, Department for culture and communication, Department for the Arts.

Szczepanski, A. (2013): Platsens betydelse för lärande och undervisning – ett utomhuspedagogiskt perspektiv *Nordic Studies in Science Education* (NorDiNa) Vol 9, No 1.

Szczepanski, A. och Andersson, P. (2015): Perspektiv på plats – 15 professorers uppfattningar av platsens betydelse för lärande och undervisning utomhus Pedagogisk Forskning I Sverige Årg 20, No 1-2

Szczepanski, A. och Dahlgren, L. O. (2011): Lärares uppfattningar av lärande och undervisning utomhus *Didaktisk Tidskrift,* Vol 20, No 1.

Szczepanski, A. *Utomhuspedagogik för hälsa, lärande och lek*. I: Hult, H. (red.) (2000): *Undervisning och lärande.* 4:e Conference of University Pedagogics at Linköping University. Nr 7, CUP:s series of reports.

Szczepanski, A., Malmer, K., Nelson, N. och Dahlgren, L.O. (2007): Utomhuspedagogikens särart och möjligheter ur ett lärarperspektiv – En interventionsstudie bland lärare grundskolan *Didaktisk Tidskrift*, 16, 4. (revised version, reprint, August, 2008).

Säljö, R. (2000). *Lärande i praktiken; ett sociokulturellt perspektiv.* Stockholm: Norstedts Akademiska Förlag.

Minstry of Education (2004). *Att lära för hållbar utveckling (SOU 2004:104).* Statens offentliga utredningar. Stockholm: XBS Grafisk Service.

Wernberg, A. (2009). *Lärandets objekt.* Kristianstad: Högskolan Kristianstad
Wither, J., Allen, R., Samanta, V., Hemanus, J., Yun-Ta Tsai, Azuma, R., Carter, W., Hinman, R., Korah, T. (2010). The Westwood Experience: Connecting story to locations via Mixed Reality. In IEEE International Symposium On Mixed and Augmented Reality, 39-46.

Wright, S., & Parchoma, G. (2011). Technologies for learning? An actor-network theory critique of 'affordances' in research on mobile learning. Research In Learning Technology, 19(3). http://www.researchinlearningtechnology.net/index.php/rlt/article/view/17113

Wu, S., Chang, A., Chang, M., Yen, Y-R., Heh, J-S. (2010). Learning Historical and Cultural Contents via Mobile Treasure Hunting in Five-Harbor District of Tainan, Taiwan. In 6th IEEE International Conference on Wireless, Mobile and Ubiquitous Technologies in Education, 213-21.

Attachments

Sylvan, Sebastian Bachelor Thesis "Introduktion av nya verktyg för utomhuspedagogik"

Mattias Arvola, project participant, **introduces Minnesmark,**
https://youtu.be/QQrPGGWxCVk

Om Googleeffekten, http://www.sciencemag.org/content/333/6043/776.abstract

Om foto o minne, https://drive.google.com/file/d/0ByS-61JjwjMRc2lWTTBVWFhmRW8/view?usp=sharing

Ted talks "Get hooked on nature", https://youtu.be/ArhjLa4xbNk

The Swedish national Agency for education on GIS in teaching and in geography,
http://www.skolverket.se/skolutveckling/forskning/amnen-omraden/so-amnen/geografi/undervisning/gis-i-geografiundervisningen-1.197433

Huffington post," Connecting with nature" http://www.huffingtonpost.com/ben-klasky/connecting-with-nature-th_b_6266890.html

Lesson cards:
The lesson cards show a few examples where we have used ICT in the project.

Ecoart – learning through works of art with natural materials

Lesson: The lesson was about the participants constructing a work of art at the place were we had gathered. The participants used material from the place and also some material brought by the course leader. But the main purpose was to connect to the place through its materials. In the bigger context it was about teaching for sustainable development.

Use of IT: The works of art were documented with the participants' phones and sent to the course leader who could then use the pictures. When the participants sent the pictures they wrote the name they had given the work of art on the subject line. In this case a power point was made from the material. In connection to a lesson in the classroom environment we could reflect on what we had done.

Evaluaton: The digital photo technology via phone or tablet makes it easier to document different events. The digital pictures makes it easier to reconnect to experiences made. In this case the reconnection happened reflection both between the participants and with the course leader. Apart from the above each participant could upload the presentation through a link for personal reconnection.

Discussion: When you send pictures it is advisable to check their size. The pictures are easier to handle if they are not too big.

Reflection with pictures on iPad

Lesson: The lesson was on astronomy and I wanted the students to understand how the Sun, Moon and Earth move in relation to each other. I wanted the students to understand the Moon as a satellite to the Earth, how it moves more slowly, in the same direction as the Earth, and the Earth's movements around its own axis while it circled the Earth. The students were also supposed to, after the lesson, be able to understand and explain concepts like day, season and month. And show me.

Use of IT: Groups of students, 4 at a time, got their task via the iPad, in an image created through the app Skitch, where short facts and questions were written on the image of Earth in space. With the help of the iPad the students were supposed to film or take pictures of and tell, for example with the help of Fotobabbel, to then show some of the films to the whole student group. ..\..\My Pictures\2014-01-22 140122\Skitch månen.png

Evaluation: Since none of the student groups carried out the first recording correctly it was natural for the group to go trough the material again when they did their to get the correct content, which strengthened their knowledge. The small group made it possible for more students to dare to speak. The task of moving like the Moon and the Sun was demarcated but still required both cooperation and discussion about direction and speed. The iPad made it easy to share the film directly to ne as the teacher, and to lärlogg at the webpage for eäaluation.

Discussion: By letting the students try and experiment in order to get an experience of the movements in the universe it will be easier to conceptualise the knowledge afterwards. The students are familiar with the content and many of their senses are activated, which makes it easier to explain.

   Filming the results makes it possible for us to watch it together over and over, learning from and learning about. It is easy to reflect on what could be improved. The presentation form is also tempting, more students dare speak more openly, move more through a medium.

   The film can then be sent to the class teacher or to the tool for the learning platform as a flippfilm where others can learn from and discuss/reflect

Reflection with QR-code

Lesson: The lesson was about reading, discovering and learning about different kinds of factual information and perhaps carry out tasks that are tied to each stop. The QR-codes can be filled with content which awakens new thoughts or repetition on what you have learnt or are going to start learning. The students are trained in interpreting and discussing, formulating and explaining in groups.
Examples of content,
C:\Users\ined1001\AppData\Local\Microsoft\Windows\Temporary Internet Files\Conten.Outlook\QR kod\Uppror Dacke QR-kod 3.doc här
And QR-kod here. QR-codes can be created through www.skaparquod.se/

Use of IT: Student groups or 2-3 in each were introduced to QR-code. We used the school's iPad with a SIM-card in order to get an active GPS-signal. In the app there is a possibility to read the task through saving it to be able to read it again. The students presented their results, their experiences or group solutions during the process. The information that had been coded to QR-code can be shown on the Smartboard when the documents are saved and shared by those who have completed the trail/ the stops. You need to know where the codes are, possibly there might be need for a map in order for the students to know where they are supposed to go if they are not already familiar with the trail, for example "walk on the bicycle tracks closest to the school. You are supposed to find 6 codes and they are numbered."

Evaluation: The students have appreciated being able to go outside to learn about the subject, for example in the theme "The reformation and the age of exploration". If the tasks chosen for the QR-stops are open and active much can at the chosen place, which can then be processed in the classroom or in another place.
   There can be problems with codes being removed by other people, just as often happened with questions on a traditional paper chase. It is therefore advisable to make two trails just in case and to cover the code cards in plastic and number them, to be able to know which have ben completed and which are left.
   Just like with the other tools, X-note or Everytrail, the students need to be informed of the importance of stopping at every task/station. Just rushing through the trail is not learning.

Discussion: The tool is flexible but requires a SIM-card to get the content. The students can use their own phones though, as long as they have a QR-reader, parts of the content, for example images and text be difficult to get a complete picture of on the screen though.
The code can create a feeling of mystery, a secret or treasure that cannot be understood until it is opened. It is tempting to find out what is hidden behind the coded square.
   You can write longer asks next to your photos/images compared to Everytrail and there are many possibilities to use school grounds and local environment to load a place with content. The students can test, and use their bodies to understand, talk and discuss different solutions that activate more senses for deeper memory.

Reflection with Every trail

Lesson: The lesson was on reading the map in the Every trail app (picture of the app here) And then read and understand information written for every picture taken along a trail marked on the map in the app (trail and picture here). The picture stops are marked as a dot on the map. (The trail can be marked as in zig zag if you have not moved the iPad as a figure eight before staring, see picture)

Use of IT: Student groups of 2-3 at a time were introduced to Every trail. We used the school iPad. The GPS function on the iPad/phone has to be on when you seek for the markings on the map showing nearby stops/stations and your own location to be displayed. It takes a great deal of discussion in the groups to be able to understand and interpret texts or tasks and to debate for or against various ways of solving the task. (example text here). The app enables the user to go back (or forwards) between the tasks to repeat what it has said or show what will be encountered further on. The students have to present their results either orally when they return or for example using pencil and paper. The trail can be displayed on the Smartboard if you connect it to an iPad.

Evaluation: the students have appreciated being able to go outside to get practical experience of what they have been working on, for example in their maths book. For example they could be asked to estimate length, circumference or area using their bodies, an example could be estimating the height of the school building See picture here (hyperlink)

Discussion: the tool is flexible to use but a SIM-card is needed to get good reception for content connected to place. The instructions for the tasks next to the pictures have to be kept fairly short. In spite of this there is ample opportunity to make use of school grounds and local environment to load a place with content. The students can give it a try, and use their bodies to understand, talk over and discuss different solutions, which activates more senses for deeper memory.

Reflection with Geocaching

Lesson: The lesson was on reading the map in the app Geocaching (picture of the app here), interpret the written clues, and then find treasures (= log book in large or small cache/box/bag)and then log it/write one's username both on the paper log and in the app.

Use of IT: student groups of 3 at a time were introduced to Geocaching, the global treasure-hunt movement. We used the school iPad, or the students who wanted the app themselves used their phones. The GPS-function on the iPad/phone has to be on when you search in order for the markings on the map indicating nearby treasures and your present location to show. In the app there are clues written by the owner of the treasure. With the aid of map, clues or the digital logbook that follows the treasure the students are supposed to work out where the treasure is hidden. There has to be a great deal of discussion in the groups to debate for or against where to look and to lead the group in the right direction.
The app is downloaded from geocoaching.com (picture of the page here)

Evaluation: the students were really taken by the "treasure hunt part" and gave it their full focus. It was often difficult to get the students to come back inside in time for the next lesson because the desire to find treasures was so strong. The small group made it possible for more students to dare to speak. The task of moving in an area close to the school demanded cooperation and discussion about time and distance. Several students spontaneously downloaded the app to their own phones, or said things like: "I'll do this with my mum" or I'm going to do this with my grandfather." The wish to be outside was apparent.

Discussion: so far we have only been looking for other people's treasures which has gotten the students physically active, made them talk and develop their language and map reading skills. (map marking here). There is a fact learning function since a theme text can accompany the treasure and describe something in the area, for example about air pollution or mining or "Who was Gisela Trapp?" We can develop this by creating our own content to read or reflect on.
    The app gives and experience that demands interpretation to then be possible to generalise, for example during the next treasure hunt. What was a successful approach last time? What do we need to bear in mind? What did we learn?

Inventory of bugs

Lesson: The purpose of the lesson is for the students to take inventory of bugs in different places. The intention is for the students to get a deeper understanding for the concept "multifaceted". Through the possibility to have experiences of different environments where bug can be found to enable them to connect an environment with the diversity concept.

Use of IT: The app Minnesmark was used to find the places. The app can both let the students find their way to the place and give them a task once they are there.

Evaluation: The students found their way to the places and could read their task. The places are not always marked with high precision.

Discussion: The app works as a navigation aid. The picture of the place that was added to this version of the trail confirms to the students that they have reached the right place. In the picture they also get a task that is to be carried out at that particular place. Apart from that the app does not add anything extra in itself, at least not at a trail of this type. Naturally they could get more information through the app but the interaction at the place does not happen in or through it, at least not enough. Documentation in this case was done by bringing keepsakes from the place. It would also have been possible to do this by writing things down, creating pictures or using other types of digital equipment in the documentation.

Inventory with a map

Lesson: We want to inventory an area to see what different places can offer. The participants get a task to move around the area and identify places that have something to offer. A theme could be, for example, environments for children's play. Which kinds of places attract children? But also: which places seem safe/unsafe to you? What races of people can be found here? Which materials can be found in this place? , Which buildings belong to the same style era? With the theme as our starting point we map an area. This means that we build a map with the help of the participants. When the map is ready it can be used in a presentation, as foundation for planners, as a way of inspiring and informing others via social networks; both locally and globally.

Use of IT: A digital map can direct the participants to predetermined places. Both by showing the laces but also though a virtual line that is marked. In this case we move according to a certain pattern. The foundation that is created can then generate stops from a certain way of moving through the landscape. Later tools can be "Minnesmark", QR codes etc.

   The participants can also move freely within an area and look for places themselves. In this case the places have to be positioned.

   In both cases positioning is used – but in different ways. The map is created with the participants' documentation as the starting point. Documentation can be pictures, videos; sound etc. the documentation can be transferred by email to the map maker. But documentation of what the participants do can also be taken care of by the person who makes the map.

   The material for the mapmaking was found in the ArcGis system and the positioning was made with a hand carried GPS unit. Documentation and transferring of pictures (not videos or sound in these cases) was done through units with 3G and 4G.

Evaluation: It is important that the participants understand the purpose of the map building – that the map is to be used at a later stage. Clarity is central to the theme – use of the outdoor space can happen in an infinite number of ways.

   We have tried both ways according to the explanation above (see under use of IT). We had no problem positioning ourselves in the landscape. However, it was sometimes difficult to send files with pictures. This could be because we were not familiar with this way of working. It takes practice to increase the familiarity with use of IT.

   Sometimes the reflection stage suffers when the participants are not familiar enough with the working process in the digital environment. When we evaluated and reflected on the exercises we used picture material sent in by the participants.

Discussion: Inventory for the purpose of planning the map can be built afterwards and used at a later stage. In a lesson context it is suitable for the map to be available for use in connection to the lesson. In that case the participants could "try" eachothers' place. An example would be if we make a story map in the landscape from our collected experiences. Monitoring can then happen later either on site or in another place.

Lichens in Slottshagen in Helsingborg

Lesson: The lesson is on examining the presence of lichen on trees in a city park. A working hypothesis was that the position of the tree influenced the amount of lichen that grew on the trunk. The students were from upper secondary year 3. Since the lesson was about comparing different trees, species identification, age and position of the trees were important parts of the lesson.

Use of IT: The position of the trees is marked on a digital map. The map can be read on a browser and can thus be used on hand carried devices. One's own position is shown on the map via GPS. Information about an individual tree can be easily uploaded through pressing a button. Important information such as species and the age of the tree can be made available quickly.

 The lesson was documented through pictures, which were then added to the students' lab reports.

 Added information and positioning on a digital map makes it easier to collect what the students need to know in one single hand carried tool. In this case it was important to determine species, position and age of the trees. The students do not need to use the teacher as their "key" in order to get started on the task.

 Positioning and central information can be connected on the participants' own hand carried devices regardless of operating system.

Evaluation: the teacher printed a paper map, which was based on the digital version. This because the positioning was bad when the map was used on the hand carried devices.
The fact that the positioning was bad meant that the students could trust neither their own physical position nor the position displayed digitally.

 The main advantage of the method was increased accuracy in determining species and age of the trees.

 The aim is to make it possible to download the map as a web app on different devices. This did not work to a satisfactory standard.

Discussion: The possibility to download the map as a web app has to be improved. The positioning also has to be improved.

 but the possibility to connect different parts and to use these parts both outside on site and during the preparation phase indoors must be regarded as an advantage.

Literature seminar

Lesson: During a course in outdoor education a book was discussed. In order to follow through the discussion small wooden figures were crafted to illustrate core thoughts in the book. The task was to use he figures in a role-play that showed the core thoughts the participants had chosen. The role-play was presented as a picture with speech bubbles.

Use of IT: The figures that were made were photographed and the speech bubbles were added in an app. The pictures were then sent to the participants at the course. The speech bubbles could be added to the pictures in direct connection to when the pictures were taken.

Evaluation: The challenge in this method was to transfer the participants' thoughts about the book to the crafting of figures. This was an alternative to only expressing the participants' thoughts about the book in words in a discussion.

Discussion: the participants' thoughts about the book could be interpreted successfully afterwards through the pictures, at least by those who took part in the discussion. However, the pictures would have needed to be supplemented with a headline and a more explanatory text in order to be more easily understood by people who had not taken part in the seminar. It would not have been difficult to follow up the discussion with making figures which acted together. It would have meant a great deal more work to document the figures' role play through cartoon drawing though. Digital technology made it easier to document and communicate the task.

   We were supposed to follow up the documentation by going through everything together. This could easily have been done through looking at the pictures together.

Follow-up on lesson about mushrooms

Lesson: We examined different types of mushrooms in the forest together with the children. Both by dividing them into different categories together and by the children doing the same thing in small groups. When they carried out the sorting in their groups they got to choose their own method.

Use of IT: We took pictures of the sorting exercises and a headline was chosen for each picture on the basis of how he children had chosen to sort their mushrooms. The picture was then sent to an accompanying teacher for further processing in the classroom.

Evaluation: With the digital tool you can easily both take the picture and give it a heading while you are still in the forest.

Discussion: What needs to be thought through is whether it is better to create the headings for the pictures in the forest or in the classroom. This depends on the age of the children. Older children can develop the working method further. For the younger children it is more about getting to present what they have done.

Reflection with picture in iPad

Lesson: In this case the lesson was on the pre-historic age for year three. The location was Miljöverkstaden and the class spent half a day there. The lesson started with a presentation for everybody where, among other things, pictures were shown on iPad and projector. After the presentation the students' first task is to make protection for their thumbs. The purpose is for them to learn more about what people actually needed during pre-historic age in order to survive in a society in close connection to nature. They build the protection in small groups of about four students.

In order to give the students the opportunity to recall what they have done it is important to let them see what all the groups have made. And also to hear the others describe their work. The problem, if this is done outside, could be that perhaps everybody would not be able to see or hear what the others have done. For this reason we chose to do the evaluation in the classroom.

Use of IT: everybody got to go round and look at what the others had made when they had finished making their protection. During this time we used an iPad to take pictures of all the protections. Pictures were taken of students and protection but also of the protection on its own.

Reflection was done with the whole group. Then pictures of the protections were shown via a projector in the classroom. Each group then got to explain what they had made and which method they had used. When a group wanted to make a detail in their construction process extra clear the teacher could zoom in on the picture to make it clear what they were talking about.

All the pictures were then sent via email to the class teacher to be used at a later stage.

Evaluation: The purpose of using their own pictures in the reflection was that it was then easier for everybody to take part. Both for those talking and for those listening. An advantage with using the tablet was the possibility to zoom. But also the fact that the pictures could be sent to the class teacher straight away. Using the same tool for both parts of the process made it easier.

Discussion: It is, in this case, primarily used during the reflection phase. It makes it easier for everybody to be able to explain what they have made and how they made it. Moving on to the next stage and tying experiences to conceptualisation depends largely on the teacher's skills in taking the discussion further.

In this case IT helps put focus on the things made thus making the starting point in the production clear. Sending the pictures to the class teacher enables him/her to continue the re-connection. The pictures could also facilitate a continuation of the work on the theme.

Reflection on colour and shape

Lesson: In this case the lesson was about our senses. The location was Miljöverkstaden . The class spent half a day there. The children's task was to build sensuous figures outdoors on a white surface. Part of the task was to illustrate all the sensory organs. They used things that could be found on the ground as building materials. He whole class then got to see eachother's results at a vernissage. When the students had completed their figures they were photographed and printed. All the students in the group got a picture each. We looked at the pictures together and thought abut which colours were not represented. The next task was to collect the colours that were <u>not</u> found in the picture but could be found outdoors. These colours were then used as a foundation for making a frame around the printed picture.

Use of IT: The pictures were taken with the camera on the iPad. They were sent to the teacher via email and could then be printed out.

Evaluation: The way the work was planned enabled, apart form the reflection on the sensuous figure, reflection on which colours could be found outdoors. We could have done this in many other ways. But the fat that we used the students' own figures we achieved a closer connection to the students' work.

Discussion: it was important in this case that the printed pictures could be used in direct connection to the continuation of the lesson. It made this possible. The process between taking the picture and printing it on paper for the students was fairly short when making use of the IT tools.

Reflection on a lesson on the beach

Lesson: Students from year three together with a nature educator made a lesson on the seashore. An important part of the lesson was to fish out different creatures and then conduct a closer study of their habitats and adjustments. Some time was used to go through the finds both in smaller groups and with the whole class. But there was also a focus on the environment on the seashore as a whole.

Use of IT: Digital pictures were taken during the lesson to make it possible to use some of the impressions at a later stage.

Evaluation: The pictures were used during the follow-up lesson. There was a feeling of fellowship in the fact that the whole class had been at the beach together. To revive the memories of the lesson on the beach the pictures were shown again. The central concepts that were part of the lesson could be repeated and connected to in a more calm and focused environment.

Discussion: Teaching the children central concepts like for example food-chain only in as stimulating environment as the beach can be a challenge. On the other hand it can be challenging to achieve proper understanding of the concept if you do not have the sensuous stimulation from a visit to the beach. Digital photography can help bridge the gap between the different lesson environments.

Forest lesson

Lesson: The point of the lesson is for the students to learn more about the forest. One part of this is letting them collect things that have a connection to the place. The things are put on a tarpaulin The task then is to think of a way of sorting what we have found. One example could be human waste in one group and natural objects in the other. The natural objects can then be divided into groups of mushrooms/fungus, plants and animals (living objects) and dead objects. Through this colleting and sorting we can also learn more about the types of connections that can be found between the different objects.

Use of IT: In this case a picture was taken of the objects and then sent to the teacher. The picture can then be followed up in different ways. Both by the teacher and the students, since they can then reconnect to the common experience of that situation in a different environment. In the follow-up several different digital tools can be used.

Evaluation: taking a picture and sending it is very quick.

Discussion: In this case IT does not become "a burden" in the lesson in any way. The quality of the follow-up work depends on the situation that is created in the classroom. For example, the students could work in small groups or individually and explain why they placed the objects the way they did. The finished digital product can then be used in a presentation.

If somebody films the lesson this can also contribute to a foundation for a repetition of what happened outdoors. This can be an advantage if some students were not completely focused during the outdoor lesson.

Tree lesson

Lesson: The purpose of the lesson is to show the function and importance of trees in our local environment.

Use of IT: The trail was made in "Minnesmark" with different GPS loaded media events in the form of pictures but also sound. Markers had also been placed on the trail, which could trigger media events through the camera on the iPad.

Evaluation: The students' interaction happens primarily through them looking at a picture and reading a text to then do something according to the instructions the got on the picture. They get confirmation that they are in the right place with the picture and they can read the instructions for a task.

 Discussion: The changes that happen in nature are interesting to note. The students can get a picture from another, earlier, situation (for example seasonal changes) and compare to what things are like when they are there.

Ötzis in nature

Lesson: Ötzi is a man who lived about 5300 years ago. Finding him was an archaeological sensation since both his equipment and he himself are very well preserved. The find enables us to think about what we know today about the nature around us. And then in comparison to what Ötzi must have known. Places outdoors can be a good starting point to make this connection clear.

Use of IT: We used IT in several different ways. The starting point was a short file made in "educreation" that focused on the phenomenon "Ötzi" : http://www.educreations.com/lesson/view/oetzi-naera-naturen/16655410/ . The file was sent to the participants at the course as a link. The aim was to create a deeper understanding among the participants before we met for the lesson. During the lesson the map "lärplatser bhg" (places for learning) was used. Through that the participants could use different places to make the theme clear (Food, Water, Protection, Fire). The task at the different places was also to be documented with IT (using optional technique). He documentation was then sent to the course leaders via email. In most cases it was different pictures. The pictures were then opened in the classroom via projector and tablet. This way we could reflect together about the documentation.

Evaluation: The participants could open the previously sent link. The participants were familiar with a number of central concepts in this context. However, there is still more to be done regarding which hand carried devices the map could be used on. The positioning, among other things, is not satisfactory. But many people could open the map and use it as a regular map (there was also a paper version as a back up). Later documentation using the hand carried devices worked excellently. The same thing goes for up loading documentation with a projector.

Discussion: The link sent in advance makes it possible for the participants in the lesson to get a feeling for and actual knowledge about what that lesson sequence is going to be about. This makes it possible to somewhat raise the level of the introduction when we meet.

   The functions of the digital map are not entirely satisfactory at the moment (positioning and which platform is used). We do, however, have a strong belief in future use of this type of map. But we would, among other things, like a function on the map that made it easier for us to add places and place content.

   The common reflection worked very well the way we did it. In this case the participants had, at an early stage, access to the documentation. They could easily continue their use of this material at a later stage.