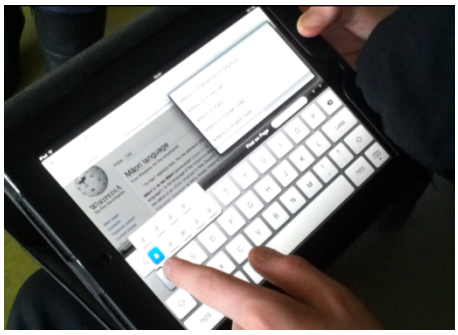
Participatory Learning through Introduction of Tablet Computers and 1:1 Pedagogy in Norðlingaskóli, Reykjavík

Skúlína Hlíf Kjartansdóttir & Sólveig Jakobsdóttir



Reykjavík, september 2012

UNIVERSITY OF ICELAND
SCHOOL OF EDUCATION

The Center for Educational Research on ICT and Media (RANNUM)

Abstract

The paper presents the first results of an evalution study of a development project for the introduction and use of tablet computers (iPads) at the lower secondary level in Norðlingaskóli (compulsory school), Reykjavík. This study aims to assess the impact of the tablet computers on instruction and students' learning in grades 9 to 10, and on school development in Norðlingaskóli. First results show that that the project came to a good start, despite some differences that the school had with city administrators and technical problems in beginning. Most students brought their tablet home and used it for formal, as well as informal and non-formal learning. The introduction of tablet computers enabled access to software for learning, tools and games. It stimulated communication and collaboration. Products of learning increasingly involved multimedia elements and networking. The study indicated increased satisfaction, interest and independence of students in learning, development of individualized learning, increased student engagement and an improved use of class time. Teachers felt that the use of tablet computers stimulated their professional development and enhanced their work satisfaction. Parents were generally supportive of the use of tablet computers and were of the opinion that the school should continue to invest in new technology for learning. Indications were of insufficient availability of learning materials in Icelandic and a start of co-configuration of partners to remedy the situation. The evaluation revealed some weeknesses, challenges and opportunities for further development which will discussed in this paper.

1 Introduction

The study aim is to identify best practices in use of tablet computers in Norðlingaskóli, a compulsory school in Reykjavík, and to analyse those practices in co-operation with administrators, teachers and students of the school, in order to identify key issues in efficient integration of tablet computers technology and 1:1 pedagogy at the school. The project is a pilot project in Iceland. The school initiated it and partners are: the National Centre for Educational Materials (NCEM), the City of Reykjavík (Education Department and IT Centre), Epli.is (Apple's agent in Iceland) and the University of Iceland-School of Education/RannUM. The partners role is to support school development with the use of tablet computers in teaching and learning, during 3 semesters in 2012-2013. The collaborators each have different roles, providing technical expertise and support. The role of The Center for Educational Research on ICT and Media (RANNUM) and the aim of the research is to evaluate this development and its outcomes.

Research questions:
What are the key issues in efficient integration of tablet computers and 1:1 pedagogy?
How do they contribute to best practices in use of tablet computers?

During the research phase and interviews questions were asked on the issues of introduction of the tablet computers, policies and curricula, ICT and mediation, use of tablet computers (in-and-out-of school), organisation of teaching and learning, competences and results and on views of all participants on their participation and various other aspects of the pilot.

Pilots to introduce 1:1 pedogogy came about as early as 1990, around the time the first laptop computers arrived on the market (Methodist Ladies College (MLC), 2012). Around the same time revision of pedagogy started in MLC under the influence of constructionism, e.g. that students should learn with multimedia rather than from it and through production that they could share with others (Jonassen, Myers, & McKillop, 1998). The computers were used frequently for project work and computing was used to individualise learning. Laptop use appeared to increase student's independence and self-esteem. The results of other early pilots varied and the effect on student's learning appeared limited (e.g. Gardner&Morrison studies). Cuban remarked on the stronghold of diehard classroom traditions in relation to introduction of new technologies (Cuban, 1986). However, access to computers in schools in this early period of computer use in schoolswas limited; an access of 1 computer per 10 children was considered very good in the mid 90's (Jakobsdóttir, 1996). Around year 2000, projects, such as 'Anytime Anywhere Learning' (Rockman et al., 2000) indicated that students using laptops, had more confidence using computers and employed more techniques in using them, in school and at home, than students in control groups. The teachers who used laptops were more willing to change their teaching and the laptops played a part in that change, with student-led inquiry, collaborative appproach and teamwork. These teachers, in contrast to control groups, were likely to believe that they could have impact in the classroom. Results from standardised tests was examined, but there were difficulties in obtaining a sufficiently

big sample to gain valid results. Furthermore, standardised tests were not consided to be measuring all learning that access to the laptop provided.

Weston og Bain (2010) point out in a recent review of research on 1:1 laptop initiatives in schools, that they should be considered an innovation. Innovation in schools are not easily implemented in practice and expenditure on computers in the current economic climate has to be defended and results argued. Some schools have started to work with the BYOD (bring your own device) model, where students are relatively free to bring the computer/tools they chose to work with and connect up at school (Farley, 2012; Jane, 2011). The high cost has also spurred a discussion on social inequality and digital divide in this context. The project One Laptop per Child was initiated to develop inexpensive computers for children in third-world countries, in which 2,4 million children have received a computer, software and access to educational materials for 'collaborative, joyful and self-empowered learning' where they can become 'engaged in their own education, and learn, share, and create together' (OLPC, 2012).

Some scholars and educators have become anxious because of the lack of student's interest and motivation in formal education, poor literacy and of the fact that schools seem to be lagging behind in mediating technical knowledge and comptences (Gee, 2008). Increasingly educational projects which attempt to reverse this and test new technologies in the classroom are being started in the US (Quillen, 2011) and Europe, such as the Acer-European Tablet Pilot in eight countries (European School Network, 2012b), the school system in Chicago, where 23 schools were given 32 iPad tablet computers and Virginia Department of Education, which now is in a second phase of a pilot project using iPads (Virgina Department of Education, 2011). The objectives of these and similar pilot projects/research include, how to use learning materials in an effective way to stimulate student activities while learning, to increase learning results and to empower teachers at work, using participatory approaches in professional development (Jenkins, 2012). Focus was also set in the Virginia pilot on the production of quality learning material with less costs and to look at the policy, social and technical implications of exchanging traditional textbooks with digital learning materials. Companies increasingly assist in the participatory learning process and community building, creating the conditions for it to develop further (Rao, 2012).

Improved access to the Internet, learning materials and information has gone hand in hand with increased availability of new technology and this has encouraged a steady development in blended learning, where net-teaching and face-to-face teaching is interwoven. A recent report gives an overview of several teaching models that have been evolved in USA at the primary and secondary levels (Staker, 2011)[1] and it indicates a rapid development in mobile learning with digital equipment, like mobile phones, smartphones, tablet computers etc. Bonk predicted that an increased emphasis will also be put on production of content for these devices, piping for the content, and school culture that emphasises participatory learning

[1] Blended learning at these school levels (primary and secondary levels, K-12) is defined in the report as learning which students do at least partly at a specific location (in a school building or another location outside the home) and partly on the internet. The definition also makes the condition that the student has some control of his/her time of learning, location, course or speed of learning.

(Bonk, 2009). Initiatives of co-design of learning materials (Jenkins, 2012) and sharing of open content (OER Commons, 2012) is now an open path for educators to follow, in open learning networks (Rudd, Sutch, & Facer, 2006) where partipants cooperate on creation of new meaning and knowledge.

Recent developments in mobile and distance learning have caused a blur of the boundaries of learning in and out of school. Siurala (2006) has distinguished between formal education, informal learning and non-formal learning:

> **Formal education**: institution-based, structured, hierarchically and chronologically graded, teacher/trainer-centred education which emphasises objectivity of knowledge, memorizing and aims at certification.
>
> **Informal learning**: learning in everyday life which does not aim at certification but where a diversity of actors each with their own intentions impose meanings on the learner.
>
> **Non-formal learning**: learner-centred and practice-based learning process which emphasises intrinsic motivation, social context of learning, and the usefulness of knowledge, and aims at identity growth, social change and integration into society. Learning is voluntary, involves conscious educational aims and may be credited. (Siurala, 2006).

The informal learning happens daily without any specific objectives, but the non-formal learning is being initiated by the learner and is driven be inner motivation, with objectives set by the individual. Whether in formal, informal or non-formal learning, participating in learning communities or 'communities of practice' (Wenger, 1998) enables the individual to reach out, disseminate his/her experience, knowledge or skill and to learn from others. The community of practice can exits in a school setting and within it students and teachers can participate in learning tasks. The term participatory learning 'involves exploring information and concepts within a community of learners who all engage in making and discussing through enquiry'... 'sharing knowledge from aspects of their lives'... making the discussion more meaningful and relevant (Jenkins, 2012). The learning environments are characterised by participatory, interactive practices (Kumpulainen et al., 2010).

As Wenger pointed out people belong to communities of practice at the same time as they belong to other organizational structures, that can connect to take on tasks. Such collaborative approaches take on different forms and are described in terms like, interagency, multiagency or partnerships. A definition by Lloyd et al describes different levels of collaboration (Warmington et al., 2004):

> **Interagency working**: more than one agency working together in a planned and formal way, rather than simply through informal networking (although the latter may support and develop the former). This can be at strategic or operational level.
>
> **Multiagency working**: more than one agency working with a client but not necessarily jointly. Multiagency working may be prompted by joint planning or simply be a form of replication, resulting from a lack of proper interagency co-ordination. As with interagency operation, it may be concurrent or sequential. In actuality, the terms 'interagency' and 'multiagency' (in its planned sense) are often used interchangeably.
>
> **Joined-up working**, policy or thinking refers to deliberately conceptualized and coordinated planning, which takes account of multiple policies and varying agency practices.

Warmington et al. (2004) term this as co-configuration: ‘a form of work oriented towards the production of intelligent, adaptive services, wherein ongoing customization of services is achieved through dynamic, reciprocal relationships between providers and clients’. For resolving tasks crossing of boundaries are often necessary, as are changes to structures or removal of hindrances that impede development. Lloyd quotes recommendations of a ‘Making it happen action team’ about ways of overcoming professional, organisational and cultural barriers and three types of barriers, that it identified:

> **Structural and functional barriers** – fragmentation of public services because of range of organisations involved in their delivery; agencies structured around the services to be delivered rather than the areas or groups served.
>
> **Process barriers** – inflexibilities caused by the financial procedures of agencies; the processes of some central government funding which encourages short-termism and forced partnerships.
>
> **Cultural barriers** – each profession, each organisation can have their own way of doing things and their own sometimes ill-informed views of the other organisation and professions with which they deal. (Lloyd, Stead, & Kendrick, 2001)

The interagency working can contribute to building quality study environments, but barriers can easily impede or prevent development towards this aim. In the case of the Norðlingaskóli project the balance between interagency working efforts and barriers will determine the quality and results of the co-configuration.

2 Method

Data were gathered with quantitative and qualitiative methods. Interviews were conducted in April/May 2012 with all students (9th grade – 20 girls, 9 boys) and school staff (teachers, 4 women, 4 men). Interviews were conducted in May/June with partners. Some classroom obersvations were carried out in april and just over a third of the students answered a survey on the use of apps. These apps were analysed using the Evaluation Rubric for iPad/iPod created by Walker and Schrock in 2011 (Schrock & Walker, 2011).

Collaboration was established with the European Schoolnet on the use of survey questions used in their research to evaluate the results of the use of netbooks, in several schools in six European countries. These surveys are a part of the Acer-European Schoolnet's Educational Netbook Pilot, a research on netbook use and the implementation of 1:1 pedagogy (European School Network, 2012a). The surveys for parents and student were translated, adapted and introduced electronically in June. The surveys for teachers were in English, printed and introduced in July. The parents of 21 children (12 girls and 9 boys) responded. The participation was 72%, 100% among the parents of boys, but 60% among the parents of girls. A higher proportion of girls responded to the student survey (3 boys – 33%, 11 girls – 55%), but the overall response rate was 48% (14 students of 29 in group). The response rate in theacher's survey was 71% (2 females, 3 males).

Observation of web entries of teachers was carried out as well as monitoring of social media, where teachers disseminated their experiences. A review of text data was carried out for national and local autorities policy documents and school policies and curriculum.

In this phase of the research no attempt was made to gather data on exam results, performance of tasks or competences of students.

3 Results

3.1 Induction and use of tablet computers

The background to the project connects historically with the establishment of Norðlingaskóli. As a new school it is entitled to equipment budget, but has to seek delivery from the centralised ICT centre of the city. The headmaster instructed teachers to make a 'wish-list' and teachers opted for iPad tablet computers introduction in the 9th grade, to be assessed in 2 years time, when the students would complete their compulsory education.

The City of Reykjavík, categorically, rejected the request and it delayed the start of the project. The schoolmaster gave it full support, as did Epli.is and other partners, that did show an interest in the project. The teachers' vision was based on the school curriculum 'to provide every individual with learning conditions, so that he or she may, on their own terms, develop and thrive, and graduate from the compulsory school as an independent, strong, but not least a happy individual' (Norðlingaskóli, 2012a). They had already experimented with making digital learning materials and soundbooks, with the intention to make learning more interactive and individualised, in accordance with student needs. To counteract the rejection from the city centre teachers blogged about the problem (Ragnar Þór Pétursson, 2011), this along with headmaster's support seemed to turn the tide, as Apple consequently decided to loan a few iPads to teachers and the NCEM offered to provide learning materials as PDFs for the project. The city and its IT centre's then decided to come aboard and provide their expertise in digital technologies and system management. RannUM was consequently invited to join as a research partner. A formal agreement was made for a three semester collaboration.

There were minor technological hindrances in the beginning (firewall, wireless connection, saving of data), that were quickly resolved. Teachers managed the systems of communication and used gmail and facebook to organise with the students, but the content produced on the tablet computers was not saved on the city's systems. The ICT centre's managment chose low spec iPads, that did not have possibilities of a 3G connection, without consideration to future use and school policies. Care was taken to introduce the computers and teaching plan to both students and parents, whose majority supported the project from the start. Teachers also created facebook groups and a website to be able to inform regularily about the project and to disseminate their experience and new ideas (Ragnar Þór Pétursson & Júlía Hrönn Guðmundsdóttir, 2012).

3.2 Participation – teaching and learning

Five **teachers** took part in the pilot, teaching Icelandic, maths, English, social studies and science disciplines, but teachers of art, crafts and sports did not take part in the first phase. The teachers were in the age group 26-45 years, most of them with teaching experience 4-6 years and ICT experience of 1-6 years. Between them they used a variety of tools and software, but none of them used game devices or games. They employed "flipped teaching"

(Techsmith, 2012) and collaborated on making their own teaching/learning material, employing new tools, like "Teacher's Pal" (Apple, 2012), iBook Author and various productivity tools. Teaching plans included both individual projects and collaboration projects and learning tools were used to train students to plan their learning. Teachers put emphasis on peer learning and learning from students. Teachers also establised partnerships with individuals and agencies outside the school. The majority of the teachers indicated in a survey that they were very keen on taking part in the project. They were active in seeking out events relating to professional development and tablet computer use, as well using social media to further their cause.

Teachers at Norðlingaskóli all agreed on that their school organisation was well suited to teaching with tablet computers. This was in contrast with the results of the European Schoolnet survey on use of laptop computers, where only 64% of teachers agreed to this. The Icelandic teachers were, on the other hand, unsure, or dissagreed with, that the school offered enough support for harnessing the tablet computers, while 56% of the European teachers agreed to this. Teachers felt that the use of tablet computers in Norðlingaskóli contributed to their satisfaction at work and stimulated their professional development. They considered their work more productive than before, multi-faceted and that the tablet computer made integration easier in practice.

Teachers remarked on increased student interest, independence and engagement in learning. They also noticed acceleration of learning processes, increased efficiency of students, which relied partly on the steady feedback, that the use of tablet computer enabled. Problems mentioned were students time control difficulties in the beginning, as well as insecurities when new technologies and learning methods were employed. The tablet computer made their work easier, as it enabled individualised learning, and the "flipped-teaching" gave more time to attend to the needs of each student and attend to problem-solving in class. The teachers also mentioned improved communication, between peers and with their students. Various other benefits and development possibilities were mentioned, amongst those creating own learning materials and apps.

The **students** had some experience with new technologies and the group had considerable differences in social and learning status. They expressed confidence with new technologies in the survey and 86% of them had an additional access to a laptop computer at home. Students took part in a short course delivered by Epli.is and were encouraged to bring their ideas on learning and tablet use to the table. They could chose their own apps. The use of the tablet computers was voluntary and all students, except one, used it. They received one lesson each week where new apps were introduced by a teacher. The ownership of the computer was transferred to the students and all except one computer were in good order, by the end of term. Contract was made with parents on home use and interviews with students indicated an increase in self-directed learning and an active participation in chosing their own learning content and tools. Home use appeared to decrease the need for playing games at school and using social media websites during school hours, and provide opportunities for home studies. Students indicated in interviews that it was relatively easy to get support from peers and teachers on issues of use of the tablet computers and learning.

The iPad and AppStore invited great variety of learning content, learning software, games and tools. A third of students participated in a survey on apps they used (43 apps recorded in march/april) and this was mirrored against learning material on offer from NCLM, school schedule and national reference timetable (Ministry of education science and culture, 2012). It revealed shortages of learning content in the Icelandic language, specifically, in some disciplines, such as the arts and vocational studies, and an increase in the availability and use of lesson/learning planning tools and productivity tools. The evaluation, using the Walker-Schrock rubric showed relatively high scores for curriculum connection/relevance, user friendliness and student motivation, but lower on other features (Schrock & Walker, 2011).

Students resolved their tasks, not so much with texts and images, as before, but increasingly, with various media tools and expressive intrepretation. The students were asked about which learning environments and tools they used:

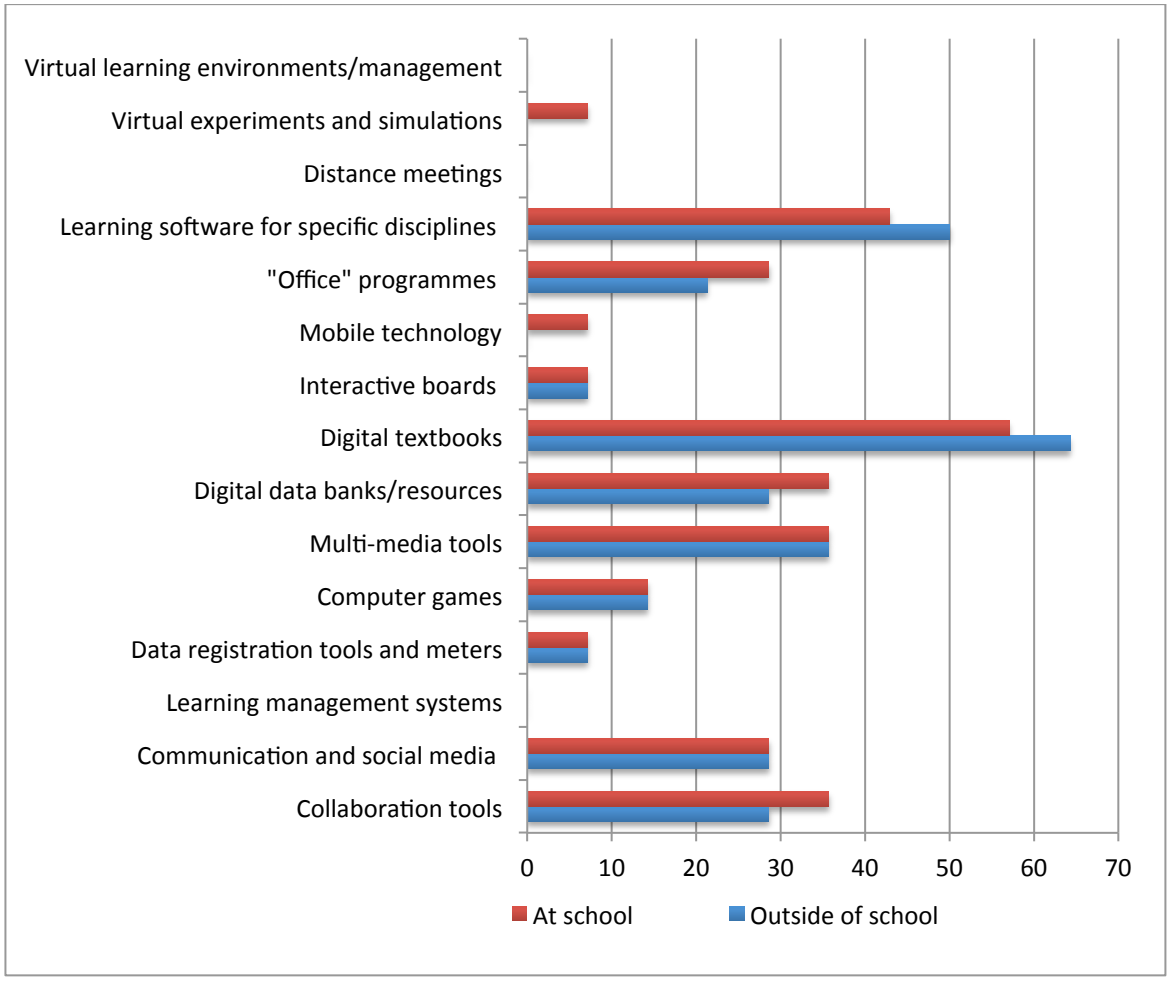


Figure 2. Students' use of tools and learning environments, in and out of school

The answers indicate that they use a learning software of choice nearly as often as they use digital textbooks, and an array of tools, games and other digital resources. It is also noticable that their use of communication tools, social media websites and collaboration tools is on a similar level, both in and out of school.

School work was taking preference, but interest areas, planning own learning and sports were also high on the agenda. Students were also asked in the survey if they used the tablet computer to learn about something that did not relate to schoolwork. Around 50% indicated that they sought information on their interests, 42,9% said they tried to develop skills that related to their leisure interests and a third indicated an interest in current affairs, looking for in-dept information on school tasks or on subject not taught at school.

Students were also asked if they thought that tablet computer use had a positive impact on certain issues relating to school work:

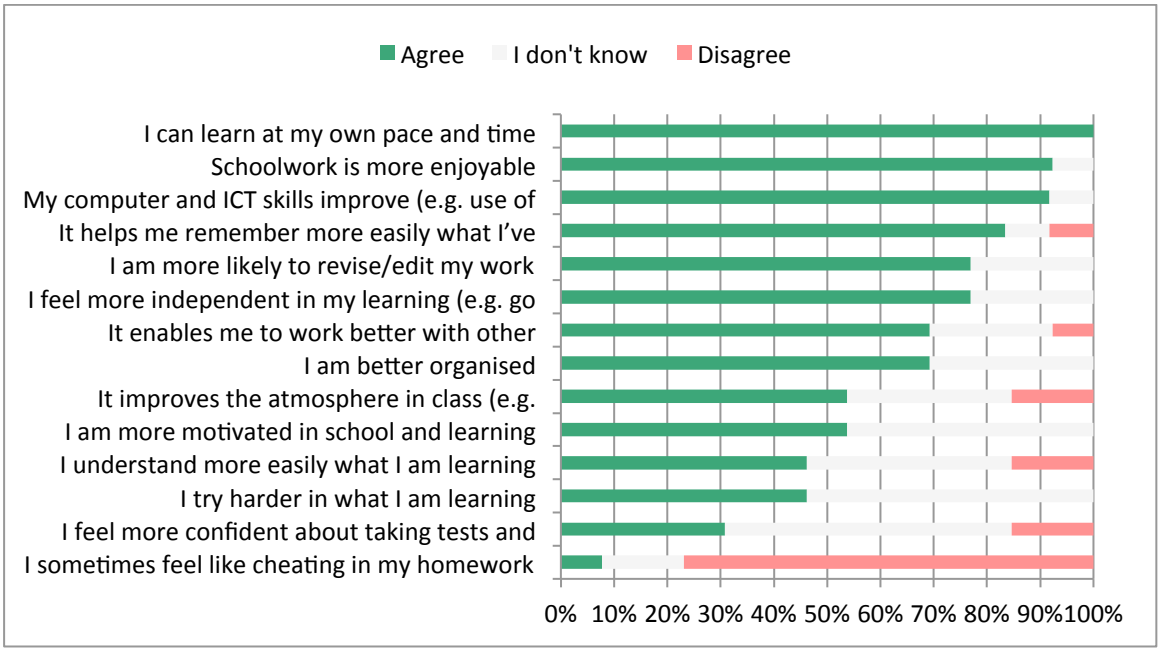


Figure 3. Students opionion on the effect of using tablet computers.

These responses indicate that students seem to enjoy schoolwork more than before and that individualised learning is taking hold. It also seems to have positive effects on various aspects of learning and engagement.

Parents were all for the school applying 1:1 pedagogy and 71% thought that the school should continue to invest in new technologies. They took interest in their children's computer activities and 43% of students said that they discussed the use of the tablet computer with their parents at least once a week, 14% almost every day, 14% rarely or never (21%). Relatively many in the student group said that they had helped adults in their family to use the tablet computers (64%). Around 38% of parents indicated that they would like more information on the use of the tablet computers with their children, or on technical matters or support from the school (14%). 92% of parents acknowledged that their children were more proficient in using digital technologies, could learn at their own speed (90%) and that their childrens' interest and participation in learning had increased (90%). Neither parents nor their children reported many negative issues relating to the use of tablet computers, but some parents worried about ergonomic issues and a few students said that hand-writing was difficult and complained about eye-pains.

Partners took on their own supportive tasks, either on school/teachers' demand or encouraged by the collaboration, that was formally established with a contract and followed up during the first project phase. The level of involvement differed somewhat; Epli.is and NCLM paid regular visits to the school, sharing their expertise, support services and learning materials, but the City's school division and IT centre's assistance and communication was crucial in the beginning of the project, but seemed to vane later and some of their support offered became redundant. Opportunities for extended collaboration arose, such as on development of content and learning materials with NCLM, but new incentives also surfaced to look for partners, for cooperation on assessment and various learning tasks. NCLM appeared very willing to learn from teachers, to learn of their needs and to collaborate on learning materials, teacher guides and learning tasks. According to NCLM representatives most schools currently do not call for digital materials, but they estimated that increased use of tablet computers might call for "interactive digital material – as it was the future".

3.3 School policies, curricula and policy making

Norðlingaskóli (Norðlingaskóli, 2012b) puts great emphasis on the school taking advantage of its natural and cultural environment, and that education and welfare of students is a shared task of the home and school, that builds its work on mutual trust, shared responsibilities and reciprocical information exchange. Its school curriculum (Norðlingaskóli, 2012a) emphasises meeting individual students needs, but also developing social competences, collaboration and team work at school. The school runs a progressive educational policy, wants to create an encouraging work environment for staff and students alike, and to offer teachers opportunities for continued professional development. The school also emphasises teaching art and vocational disciplines.

A comparison with Reykjavík city school development plan (Reykjavíkurborg, 2010), and the new main curriculum from the Ministry of Education (Ministry of education science and culture, 2012), revealed that the project's objectives were in good keeping with school vision and curriculum. The national curriculum rests on the following main pillars: literacy, sustainability, health, and welfare, democracy and human rights, equality and creativity. It also advocates distributive responsibilities for schools and teachers, a call to which teachers at Norðlingskóli have responded to. The research revealed differences between the school vision/national curriculum and objectives of the Reykjavík city's IT center. The national curriculum emphasises that "school work "needs to be in constant flux" and that "changing circumstances and technical innovation demands changes". It stresses that "cooperation and collaboration are a "key issue in successful school development" and advocates reversal, from centralised governance to distributive responsibilities. Reykjavik city's IT centre, on the contrary, has objectives to go from distributive management to centralising and uniformity, with the aim to handle complexity and volume and to secure efficiency (Hjörtur Grétarson, 2011). These objectives seem irreconsilable with those of the school and the main curriculum. Interview response indicated potential changes in the IT centre policy, as tablet computers were increasingly used by different professionals in the city services, although economic conditions are hampering renewal of computers in the school system.

4 Conclusions

Norðlingaskóli's initiative to introducing tablet computers and 1:1 pedagogy can be seen as an attempt to create a budding *learning ecology*, where both teachers and students are learning to tackle new devices and learning tools, and where new ways of organisation and methods are forming for the benefit of education. A strong vision and willingness to collaborate has enabled the teachers and the headmaster to build a framework for supporting progressive school development, to introduce 1:1 pedagogy, as well as a collaborative learning scenarios for students and teachers. Furthermore, it has influenced establishment of interagency working with parents and partners, on the periphery of the school setting. Although the school vision is not entirely compatible with some of the partners, collaboration and an ongoing dialogue has been established to drive the development. Challenges can be observed in keeping a fruitful dialogue and interagency working going, and providing results. Shortage of resources and development technical infrastructure for the tablet computers could test the collaborative effort. Expansion of the project and including more students and teachers/peer collaboration, could bring challenging tasks. Developing teaching methods and learning aids for students with special needs is an additional challenge.

The largest gain can be seen to be the increased engagement and enthusiasm in students' learning. Several testimonies to this can be noted, such as:

- increased satisfaction, interest and independence of students in learning
- development of individualized learning
- development of informal and non-formal learning, out-of-school activities
- developing networking, communication and collaboration competences
- aquisition of technical competences, multi-media techniques and increased media-awareness
- students' broad choice of software for learning, tools and games

Various *opportunities* can be observed at this point in the project. One has emerged for developing the partner collaboration further, especially in the field of content and learning tools. Others are less obvious or developed, such as collaboration with software developers, in the field of edutainment and learning assessment. Learning opportunities also exist for using iPads in outdoor teaching and learning, for gathering digital data in the field.

Further research interests have surfaced during the course of the project. The most poignant are self-directed learning of students and teachers, mechanisms and potential of interagency working for expansions of learning environments and the interplay between developing pedagogy and students progress/results.

5 Bibliography

Apple. (2012). TeacherKit. *iTunes Preview* Retrieved 11.ágúst 2012, from http://itunes.apple.com/us/app/teacherpal/id389584618?mt=8

Bonk, C. J. (2009). *The world is open: How web technology is revolutionizing education*. San Francisco: Jossey-Bass.

Cuban, L. (1986). *Teachers and machines: The classroom use of technology since 1920*. New York: Teachers College Press.

European School Network. (2012a). 1:1 pedagogy for schools Retrieved 22.07.2012, 2012, from http://1to1.eun.org/web/acer

European School Network. (2012b). Acer-European Schoolnet Tablet Pilot Retrieved 15.09.2012, from http://1to1.eun.org/web/acer/tablet-pilot

Farley, G. (2012). Moving schools forward with BYOD. A principal's reflections Retrieved 31. ágúst 2012, from http://esheninger.blogspot.com/2012/03/moving-schools-forward-with-byod.html

Gee, J. P. (2008). Getting over the slump: innovation strategies to promote children's learning. New York: The Joan Ganz Cooney Center.

Hjörtur Grétarson. (2011). Upplýsingatæknimiðstöð Reykjavíkurborgar - UTM, almenn kynning október 2011 Retrieved 25.júlí 2012, from http://www.slideshare.net/hjortur/upplsingatknimist-reykjavkurborgar-november-2011

Jakobsdóttir, S. (1996). *Elementary school computer culture: Gender and age differences in student reactions to computer use.* (doktorsritgerð), University of Minnesota. Retrieved from https://notendur.hi.is/soljak//thesisvef/

Jane, M. (2011, 1/11). Each to their own: Student ICT in the classroom. *IT Guide in Education Executive magazine*.

Jenkins, H. (2012). Designing with teachers: participatory approaches to professional development in education. *Confessions of an Aca-fan - the official weblog of Henry Jenkins* Retrieved 16.09.2012, from http://henryjenkins.org/2012/09/designing-with-teachers-participatory-approaches-to-professional-development-in-education.html

Jonassen, D. H., Myers, J. M., & McKillop, A. M. (1998). From constructivism to constructionism: learning with hypermedia/multimedia rather than from it. In B. G. Wilson (Ed.), *Constructivist learning environments - case studies in instructional design* (pp. 93-106). New Jersey: Educational Technology Publications.

Kumpulainen, K., Krokfors, L., Lipponen, L., Tissari, V., Hilppö, J., & Rajala, A. (2010). Learning bridges *Toward participatory learning environments* Retrieved from http://s3.amazonaws.com/academia.edu.documents/24996083/LearningBridges%281%29.pdf?AWSAccessKeyId=AKIAIR6FSIMDFXPEERSA&Expires=1347920125&Signature=9ZddkpoakwGrcmKIXosOfgx6mUQ%3D

Lloyd, G., Stead, J., & Kendrick, A. (2001). *Hanging on in there: a study of inter-agency work to prevent school exclusion in three local authorities*. London: National Children's Bureau.

Methodist Ladies College (MLC). (2012). History of MLC Retrieved 13.09.2012, from http://www.mlc.vic.edu.au/about/history_of_mlc_60.htm

Ministry of education science and culture. (2012). *The Icelandic national curriculum guide for compulsory schools - general section*. Reykjavik: Minstry of education, science and culture. Retrieved from http://brunnur.stjr.is/mrn/utgafuskra/utgafa.nsf/xsp/.ibmmodres/domino/OpenAttachm

ent/mrn/utgafuskra/utgafa.nsf/C590D16CBC8439C500257A240030AE7F/Attachment/adskr_grsk_ens_2012.pdf.
Norðlingaskóli. (2012a). Skólanámsskrá Retrieved 01.08.2012, from http://www.nordlingaskoli.is/index.php?option=com_content&view=article&id=101&Itemid=488
Norðlingaskóli. (2012b). Stefna Norðlingaskóla Retrieved 31.07.2012, from http://www.nordlingaskoli.is/index.php?option=com_content&view=article&id=23&Itemid=55
OER Commons. (2012). Open your classroom - with open author Retrieved 17.09.2012, from http://www.oercommons.org/
OLPC. (2012). one laptop per child Retrieved 14.09.2012, from http://one.laptop.org/
Quillen, I. (2011). Educators evaluate learning benefits of iPad. *Educational week - digital directions*. Retrieved from http://www.edweek.org/dd/articles/2011/06/15/03mobile.h04.html
Ragnar Þór Pétursson. (2011). Heimar sem þurfa að kynnast - 1. október 2011. *Maurildi* Retrieved 22.júlí 2012, 2012, from http://maurildi.blogspot.com/2011/10/heimar-sem-urfa-kynnast.html - .UAwqYXDEG3w
Ragnar Þór Pétursson, & Júlía Hrönn Guðmundsdóttir. (2012). Notkun spjaldtölva í námi - upplýsingaveita vegna þróunarverkefnis við Norðlingaskóla í notkun spjaldtölva (iPad) í námi.
Rao, L. (2012). Apple: 20.000 education iPad apps developed; 1.5 million devices in use at schools Retrieved 31.08.2012, from http://techcrunch.com/2012/01/19/apple-20000-education-ipad-apps-developed-1-5-million-devices-in-use-at-schools/
Reykjavíkurborg. (2010). Stefna og starfsáætlun Menntasviðs 2010 Retrieved 29.07.2012, from http://issuu.com/gudrunk/docs/stefna_og_starfsaaetlun_menntasvids_2010?mode=embed&layout=http%3A%2F%2Fskin.issuu.com%2Fv%2Flight%2Flayout.xml&showFlipBtn=true
Rockman et al. (2000). A more complex picture: laptop use and impact in the context of changing home and school access. The third in a series of research studies on Microsoft's Anytime Anywhere Learning Program *Anytime Anywhere Learning* San Franscico, CA.
Rudd, T., Sutch, D., & Facer, K. (2006). Towards new learning networks (pp. 1-27). Slough.
Schrock, K., & Walker, H. (2011). Evaluation rubric for iPad/iPods apps Retrieved 27.07.2012, from http://www.google.is/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&ved=0CCgQFjAB&url=http%3A%2F%2Fkathyschrock.net%2Fpdf%2Fipad_app_rubric.pdf&ei=zy5TUKqgB6Xf4QTolYGgCw&usg=AFQjCNFjJsgc-ilZ9Qpag12mjIKm4v-hMA
Staker, H. (2011). The Rise of K-12 blended learning: profiles of emerging models: InnoSight Institute & Charter School Growth Fund.
Techsmith. (2012). Teachers use technology to flip their classroom Retrieved 11.ágúst 2012, from http://www.techsmith.com/flipped-classroom.html
Virgina Department of Education. (2011). Beyond Textbooks - year one report. Richmond.
Warmington, P., Daniels, H., Edwards, A., Brown, S., Leadbetter, J., Martin, D., & Middleton, D. (2004). Interagency collaboration: a review of the literature *TLRPIII: Learning in and for interagency working*. **Bath**: Centre for Sociocultural and Activity Theory Research, University of Bath.
Wenger, E. (1998). Communities of Practice: Learning as a Social System. *The Systems Thinker, 9*(5), 10.

Weston, M. E., & Bain, A. (2010). The end of techno-critique: The naked truth about 1:1 laptop initiatives and educational change. *Journal of Technology, Learning, and Assessment, 9*(6), 5-24.