EXPECTATIONS REGARDING THE UPTAKE AND USE OF DIGITAL TECHNOLOGIES IN A 1:1 COMPUTER INITIATIVE- POSSIBILITES AND CHALLENGES FROM A PUPIL PERSEPCTIVE

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Abstract

The uptake and use of digital technologies is studied in the One-to-One (1:1) research project Unos Umeå in Sweden. This paper studies the use of laptop computers from a pupil perspective, through an online survey (N=52) and a written task (N=23). Using the Ecology of Resources Model (Luckin, 2010), possibilities and challenges are analyzed. While laptops provide motivation and involvement and make schoolwork more fun, challenges are seen in increasing computer skills, helping pupils focus on schoolwork and assistance in creating their own learning environment. The results of this study point towards the importance of the teacher's role in the digitalized classroom.

Introduction

Educational change in schools has long been of interest, with the recent initiatives in implementing Information and Communication Technologies (ICT) in school as a solution. However, the process has proven to be complex. It may be that school change is often understood as a singular process with a single explanation, rather than multiple mechanisms that can be considered to be complementary (Engeström, 2008). This integration as a source of change can perhaps be described as a shift from the traditional schoolwork in a classroom to work with digital technologies, or as a shift from one dominant activity to a non-dominant activity (Sannino, 2008). It is when these many mechanisms interact as tensions between non-dominant and dominant activities in a school context, which "crossbreed and keep change alive" (Engeström, 2008, p. 379). This source of change through for example the tensions involved in the uptake and use of digital technologies, such as laptop computers in the classroom, could therefore hopefully create a learning environment for Technology Enhanced Learning (TEL).

However, while schools continue to invest in ICT, the efficiencies continue to be difficult to measure. It may very well be a case that can be compared to the productivity paradox of the 1900's – the efficiencies are there but cannot yet be seen (Hylén, 2011). Therefore, it is important to continue to invest in ICT in schools not only as source of making traditional schools more efficient, but also to see how ICT can improve pupils' learning through TEL. This means not leaving schools to be less technological than the world outside, but putting them in the front line for helping pupils to use and understand ICT in order to meet the needs of today's and the future's work market, where ICT skills are necessary (OECD, 2008).

The Research Project

The Unos Umeå research project follows two schools in the work in a One-to-One (1:1) initiative in the municipality of Umeå, Sweden during a period of three years. Here, 1:1 refers to both pupils and teachers having their own laptop computers. The pupils involved in this study were pupils in grade 7 classes in a compulsory school. The school is a middle-sized compulsory school in central part of Umeå and can be characterized as having an optimistic view of ICT for pupils' learning.

The aim of this paper is to present the findings of an online study done with pupils in grade 7 who are involved in the 1:1 computer initiative and report how they see their computer use when they are asked to describe *Me and my computer*. What common themes can be seen? What challenges and possibilities are represented in these themes? How can these be understood as filters (Luckin, 2010) in the pupils' learning environment? The disposition of this paper will include a short research review of ICT in schools and 1:1, theoretical framework and method. Thereafter, findings, discussion and conclusions will be presented.

Literature Review

Today's pupils, many having been born with technology, may be very good at using technology, but it is not the same thing as being able to use ICT as a device for learning. Reaching beyond the digital natives' debate (Prensky, 2005) is necessary to reach pupils who have never known a life without technology. The digital divide is not only a generational divide, but there may also prove to be a divide within the divide in regards to education and social and economic status (Bennett & Maton, 2010). Pupils are not homogenous groups. Therefore there are differences between participants, depending on their schools and ages, and influences on having their own PCs or Internet at home. It is also hoped that ICT will also strengthen the role of education and the importance of developing good teaching and learning materials in school (Li & Ranieri, 2010). Nevertheless, pupils are learning from digital technologies. The affordances of the Internet, digital photography and cyberspace are radically changing how knowledge is constructed, represented and accessed outside of school, while in school learning takes place in systems "originally developed to suit a now outdated social order" (Somekh, 2008, p. 258). This means that in school, pupils are working with what can be described as a conflict as the curriculum of the past interferes with the curriculum of the future: "Outside school, they are fully engaged by their 21st century lives" (Prensky, 2005, p. 5).

This is the case for pupils all over the world, not in the least in Swedish schools, in which work continues to increase ICT skills and use among pupils (National Agency of Education, 2013). The Swedish government, in line with European Parliament, seeks a more conscious and structured integration of IT in teaching, in which ICT is not only used as a replacement for other tools, but also used in a manner that develops both subject-related teaching and pupils' digital competence (Swedish Schools Inspectorate, 2012). While pupils rank their ICT skills as high, there appears to be a lack in basic computer skills as

well as seriousness for using ICT as a tool for learning and teaching (Samuelsson, 2010). A recent report from the Digitalization Commission (SOU 2014:13) reports that although access to ICT is good, and continues to increase, often in the form of 1:1 computer initiatives, pedagogical use in the classroom appears not to be at the same level (SOU 2104:13).

A research synopsis of the effects of 1:1 initiatives (Penuel, 2006) shows that the motives behind implementation itself may be one of four factors: improved study results, increased access to computers and therefore technological, pupil adaption to the work market as well as improved quality in education. Results provided show minimal effects on academic results (Cuban, 2001), while other studies report improved results in digital competence and writing (Penuel, 2006). Academic results are however only one part when attempting to measure improvement in learning environments. As work with digital technologies provides many opportunities that may lead to an increased interest in learning, motivation, involvement, and engagement (Bebell & O'Dwyer, 2010). Pupils learning with laptops are more engaged, reflective, and active (Holcomb, 2009). Mabry and Snow (2006) report positive impact on individual research, pupil responsibility, technical skills and spontaneous collaboration. Results have also shown that laptops may help with tasks involving learning, communication, expression, and exploration (Lei & Zhao, 2008).

In summary, many 1:1 initiatives that have been evaluated or are in the process of evaluation provide "evidence of impact on motivation; student-centered learning: teaching and learning practices; learning outcomes; and parents' attitudes" (Balanskat, Bannister, Hertz, Sigilló, & Vuorikari, 2013). Studies in the Swedish context (Fleischer, 2011; Fleischer, 2013; Grönlund, Andersson, & Wiklund, 2014; Grönlund et al., 2011; Tallvid, 2010; Tallvid & Hallerström, 2009) are in line with international results. One 1:1 initiative (Tallvid & Hallerström, 2009) showed that pupils' work with texts improved in quality and length. Pupils experienced better planning opportunities, calmer classrooms and were happy to have direct computer access. However, a recent study among eleven municipalities in Sweden showed that there is a continued need to move further or beyond in 1:1 initiatives, especially in regard to pedagogical leadership (Grönlund et al., 2014).

Theoretical Framework

The surrounding environment or context and therefore design is important in a learning setting. The Ecology of Resources Model provides a framework for this context (Luckin, 2010). Three resource elements, *Environment*, *Knowledge and skills*, and *Tools and people* can be seen as a holistic view of the learner and the resources available to the learner. Between the learner and these resources there are elements, *filters*, which can be said to restrain or impede the resources available to the learner. The interpretation of the filters is twofold; the filters can be seen as having a negative or excluding impact on the learning process or be interpreted as a source of understanding, not only providing insight in design but also possibilities for enhancing the learning process. Identifying and making filters visible can be seen as an important part of creating possibilities for change and enhancing learning through

technology (Luckin, 2010). These insights can be interpreted and analyzed as the manifestation of filters within a TEL environment in which traditional classroom work methods and digital technologies are intertwined.

Method

The empirical data in this study contain two parts. The first part entails an initial online survey (N=52) taken anonymously by pupils in the compulsory school (late fall 2011) upon the start of the 1:1 initiative. The survey was based on questions regarding *four themes*: access to digital technologies, use of digital technologies in school and at home, a self-evaluation of skills in digital technologies, and own learning related to digital technologies. The pupils were also given the possibility to write their own comments. These comments in the open questions have been noted as Pupil and Number *(P, N)*.

The second part comprises pupil tasks (N=23), which were done in class with a teacher in Swedish and Art (spring 2012). The researcher initiated the task. However, the teacher executed the task, and the pupils handed in their work to the teacher. The task given to the pupils was that they draw or write something about themselves and their laptop. They were given the heading *Me and my computer*. The material was collected, interpreted and then analyzed. The pupils' work in the form of drawings and texts can be said to be *visual material* and can be seen as "representations of material culture" (Hammersley & Atkinsson, 2007, p. 148). These representations describe a situation in which the materials are integral to social action and integration. The data can be described as personal documents produced by the pupils that are authentic, credible, and representative and have meaning (Scott, 1990). The document analysis was done in the form of qualitative content analysis, the most prevalent approach (Bryman, 2008), in which underlying themes were sought. Thereafter, these themes were analyzed as the manifestations of filters with the Ecologies of Resources model (Luckin, 2010).

Ethical Issues

The Regional Ethical Review Board, Umeå University, Sweden, reviewed this study, registration number 2011-269-31Ö.

Findings

In this section, the findings are presented. First an overview of the online survey is presented, followed by the findings of the pupils' tasks. The findings are presented in text, tables and figures.

The Survey

As mentioned above, the online survey was based on questions regarding *four themes*: access to digital technologies, use of digital technologies in school and at home, a self-evaluation of skills in digital technologies, and own learning related to digital technologies. The questions within the *first theme* regarded access to computers at home, broadband, mobile phones and pupils' overall view of the 1:1 initiative. The *second theme* posed questions regarding how pupils used digital technologies at home and in the classroom. The *third*

theme comprised self-evaluation questions concerning ICT skills. The final and *fourth theme*, own learning, related to digital technologies, posed questions regarding if school work with digital technologies was facilitated, made more fun, or if pupils' use of a laptop increased their level of responsibility for their schoolwork.

In regard to the first theme, the majority of the pupils in the study had access to a computer at home, broadband and their own mobile phone or tablet. Being involved in a 1:1 project and having their own laptop in school was thought to be very good or good by 90% of the pupils, with the remaining 10% were undecided, negative or did not know. Differences in how pupils used their computers at schools and at home are illustrated in Table 1.

Table 1

Pupils (N=52) Who Use Computers for Internet, Writing, Communities, Games and Communicating Daily – Differences in Use at School and at Home

Activity	At School	At Home
Internet, Searching for Information	29 %	27 %
Writing	50 %	13 %
Online communities	22 %	71 %
Games	35 %	56 %
Communicating	27 %	54 %

Here, pupils appear to use their computers more for writing at school, while using online communities, games and communication more widely at home. Results for student evaluation of their ICT skills are shown in Table 2.

Table 2

Pupils' (N=52) Self-Evaluation of ICT Skills

ICT Use in the Classroom	Very Good or Good Skills	Not Very Good, Not at All
E-mail	96 %	4 %
Chat	98 %	2 %
Presentations	94 %	6 %
Sound	75 %	25%
Images	80 %	20 %
Multimedia	79%	21 %
Homepage	75 %	25 %
Online Communities	89 %	11 %

Pupils evaluated their own skills as being very good or good in communication skills and images, but not as high in regard to multimedia, homepages and sound. One pupil noted the following: "You can do lots of

things on the computer. I am not sure that I can do everything so great, but there should be a way to do it" (P16). Another pupil noted the difficulties in the self-evaluation itself: "I use many of these alternatives very seldom or never, so it is difficult to estimate" (P17).

Pupils were also asked to estimate how often they used their computers in school for non-school activities. As illustrated in Table 3, pupils reported that non-work activities with games, chat, and online communities were similar, were either used often or less often. These two groups were also represented in the pupil's comment: "I don't sit and play games all the time. For example, I check social media while I am waiting for the teacher to give new information" (P16).

Table 3

Pupils' (N=52) Use of Computers During Class for Non-work Activities

ICT Use in the Classroom	Every Day/ A Few Times a Week	A Few Times a Month/ Almost Never
Games	45 %	55 %
Chat	48 %	52 %
Online communities	48 %	52 %

Finally in the last theme 92% of the pupils in this study reported learning better when they used a computer. One pupil noted: "I think it is easier to understand the task on the computer" (P13), while another pupil explained, "I think that it is better because it is more fun and then you have more desire to learn" (P51). Another pupil noted, "I cannot keep away from social media, when it is so close I do this instead of work" (P7).

The same percentage of pupils, 92%, reported that they found lessons more fun when they could use their laptop in school. When describing their work in the classroom, 98 % of the pupils described their work as individual work, with 2% describing their work as group work.

The Pupils' Tasks

When the pupils were given the task *Me and my computer*, the result was 23 different pictures or drawings expressing personal use of their laptop. Of the 23 drawings, six were colored or had elements of color, while the remaining 17 were pencil sketches or texts. Two of the drawings involved text alone, while one drawing was just a drawing with a small element of text. The remaining 20 were a mix of text and drawings, many of which used a mind-map or mind-map-inspired technique to describe how they used their computers. The pupils' tasks could be placed into three main categories according to the number of themes, or qualitative content themes, illustrated in the tasks. *Category one* involved three themes or less, *Category two* involved four to six themes, and *Category three* involved seven or more themes. These three categories are described according to the number of themes presented. Two figures are provided within each category as a source of illustration of the tasks and the number of themes involved in each category.

Category 1. In this category, there were 10 drawings, which comprised three themes or less. Figure 1 and Figure 2 below can be seen as representative examples within this category.

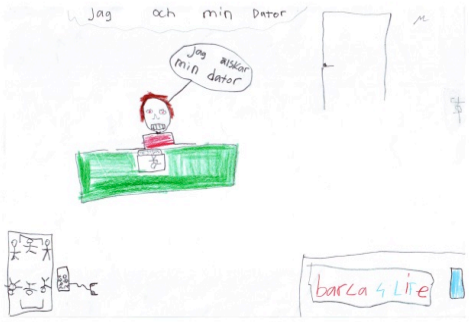

Figure 1. Pupil drawing 1.

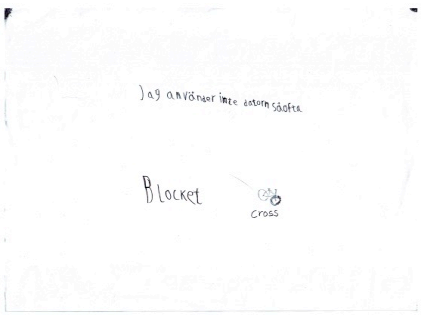

Figure 2. Pupil drawing 2.

Here computers were used for, as one pupil noted contact: Facebook, Skype, Youtube as well as games. Pupils also connected their computer with sports "Barca 4 life," and "Goal, goal, goal!" and "cross." One pupil also "buys and sells things" on the Internet. In this category, pupils also noted how much time they used on their computers: "I usually play games on my computer or I talk on Skype or I am on Facebook for about 3-4 hours per day," or "Games 3 hours, Skype 3 hours and Facebook 30 minutes." Another pupil noted, "Facebook 3 hours, games 2 hours and Youtube 40 minutes." Contrasts are also found, while one pupil writes, "I love my computer!" another pupil describes computer use as: "I don't use my computer very often." Two pupils in this category noted using their computer for "homework" f for "school, homework etc."

Category 2. This category included 7 drawings in which four to six themes were included. Figures 3 and Figure 4 are examples of tasks in this category.

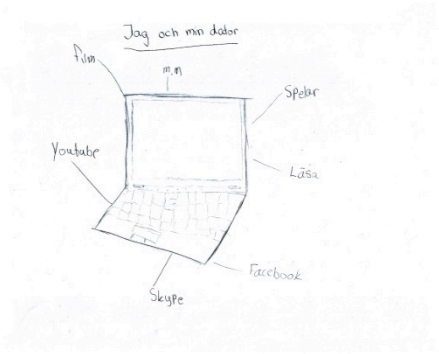

Figure 3. Pupil drawing 3.

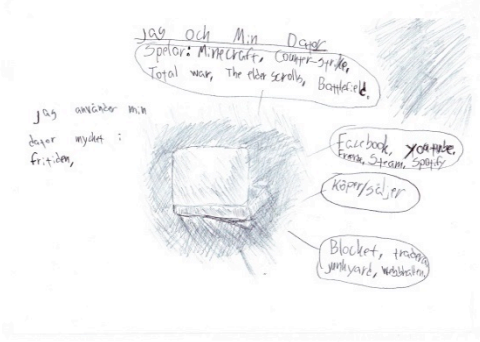

Figure 4. Pupil drawing 4.

Here, pupils used computers for Facebook, Skype, Youtube and games and a "lot of other things." In this category, pupils used their computers for music, Spotify, reading and film. Two pupils wrote that they used their computers for

blogs, while two others "buy and sell things" on the Internet. In this category, pupils did not estimate the time used on the computer, but noted that they use their computers quite a lot: "I use my computer quite a lot and I use my computer a lot on my spare time." Two pupils noted the use of the computer for "doing homework or schoolwork," of which one also noted the use of the computer for "checking what to bring to school."

Category 3. The final category comprises some six drawings that include seven or more themes.

Figure 5. Pupil drawing 5.

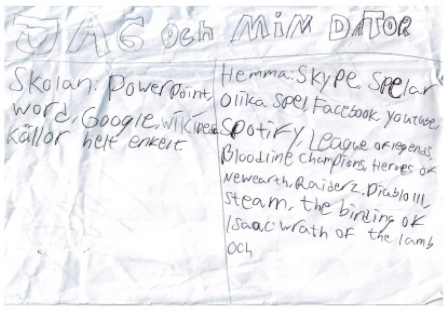

Figure 6. Pupil drawing 6.

As in the categories above, these pupils use their computers for Facebook, Skype, Youtube, buying and selling things on the Internet and games. Music is also included with Spotify, ITunes, Ultimate Guitar, Songpop, Blogs as Twitter, as well as photo sites, Picasa and Mediaplayer are noted. One pupil includes Word as a program. Two of pupils include daily newspapers and weather sites, as well as the school's homepage. Finally one pupil includes "games (30 min,) Facebook (3 hours) and Skype (5 hours). "Three pupils here note school use, by referring to "school." One pupil specifies school use as: "School: PowerPoint, Word, Google, Wikipedia, sources quite simply."

In summary, as Table 4 indicates, 7 of the 23 drawings included themes that were school-related, while the remainder were related to non-school themes.

Table 4

Number of Non-schools and School Themes Included per Drawing and Category

Category	Non-school Themes Only	Non-school Themes and School Themes	Total
Category 1 (- 3 themes)	8	2	10
Category 2 (4-6 themes)	5	2	7
Category 3 (7- themes)	3	3	6
Total	16	7	23

Discussion and Conclusions

In the light of the Ecology of Resources Model (Luckin, 2010) the pupils' use of digital technologies mentioned above can be interpreted as the manifestation of filters as learners are surrounded in a learning environment in which traditional classroom work methods and digital technologies meet. These filters can be understood within creating new teaching and learning environments for pupils (resource element *Environment*) and in increasing pupils' ICT skills (resource element *Knowledge and skills*) as well as within the use of computers (resource element *Tools and people*).

Environment and Filters

In the Ecology of Resources Model, the first resource element is *Environment*. The filters here are manifested in tensions within creating a new learning environment with old school methods and the uptake and use of laptop computers. The pupils in this study describe their computers as a relatively new tool in their school environment. That their use mainly lies in interests related to spare time use could be interpreted in terms of novelty. However, the number of references to computer use for schoolwork is low. If this use is transferred to the classroom, it will manifest a filter, as computer use for spare time activities are transported into the classroom and use becomes other than schoolwork. This would mean that spare time use and computer use in school becomes blurred. Here, the teacher and pedagogical leadership will be of importance in helping the pupils to create a working environment with their laptops.

Knowledge and Skills and Filters

The second resource element is *Knowledge and skills*. The drawings that the pupils in this study produced show a widespread use of digital technologies for contact, searching for information, music, film, games and other uses. Furthermore, the amount of time used for these activities, although self-assessed, appears to be large. Those who note school-related use state a number of programs that are necessary for schoolwork. The low number of pupils who connect the laptop with school use can be interpreted as a filter. These pupils need to be made aware of the programs in their computers that can help them in their schoolwork. They will need to learn, and will need to have help to learn to transfer the knowledge and skills that they frequently use in their spare time to the school classroom. Increasing these skills, such as collaborative wikis, searching and critically assessing information, increased use and skills in programs such as Word and Excel, under the supervision of the teacher, will alleviate this filter and provide the pupils with need to know knowledge and skills for their schoolwork at hand and future work outside of school.

Tools and People and Filters

Tools and people is the third resource element in the Ecology of Resources Model. In this resource element, the need to see the computer as a tool for schoolwork can be analyzed as a filter. As mentioned above, skills and knowledge in the private sphere are important, and in many cases can be transferred to the school context. However, using the computer as a tool for schoolwork and homework demands a different form of use. Furthermore, a

high level of non-schoolwork use may also be considered as a filter. Difficulties on focusing on the task at hand, and not social media and games, will perhaps be demanding for these pupils at times and distract them from their studies in the classroom.

Discussion and Conclusion in Summary

For the pupils in this study, when using their drawings or representations as an empirical base the focus appears to be on non-school activities. As these pupils have relatively recently received their own laptops through the 1:1 initiative this may be the result of the novelty of having an own computer. However, it may also represent a very authentic and credible picture of pupils' computer use at present in which they have directly transferred their ICT skills (see Prensky, 2005). When the empirical findings are analyzed as filters, these filters must most likely be alleviated, which entails the need for these pupils to have help with these challenges. First, they will need to create their own learning environment with their laptop in school, in which the computer is expected to be used as a tool for schoolwork (National Agency of Education, 2013). This will involve increased use in school-related programs. Second, they will need to have help by teachers who are competent in ICT skills (Swedish Schools Inspectorate, 2012) to help them to learn the ICT resources that are necessary for school work, as well as learning to use other ICT programs which are not represented in their drawings, but which will help them in their school work and therefore further TEL. The same can be true for games and social media, which many of these pupils appear to use frequently, and which may be transferred to learning in school contexts. Third, they will need to focus on the work at hand, leaving spare time use outside the classroom, meeting the requirements for school work, preparing themselves as good citizens, and gaining skills that will make them attractive on the work market.

On the individual level, these drawings produced by pupils illustrate widespread differences in ICT use and interest. This warrants the need to address the issue of increasing the use of ICT and ICT skills among pupils as a form of TEL for achieving technological equality (Bennett & Maton, 2010) and work skills (OECD, 2008). There is no doubt that most of the pupils use and enjoy using their computers to a great extent and see their computer as a source of motivation and engagement (Balanskat et al., 2013; Holcomb, 2009; Mabry & Snow, 2006). Their use can also be seen as what could be said to be a non-dominant use in reference to spare time use. When this use is brought into the non-dominant use in the traditional school classroom, there will be challenges and tensions, but also possibilities (Engeström, 2008; Sannino, 2008). Here the teacher, as a pedagogical leader (see Grönlund et al., 2014) will have an important role. How pupils and teachers together in this 1:1 initiative bring together the non-dominant and dominant use into the classroom, increase ICT skills in certain areas, transfer skills in others, creating a new environment for TEL and the result of the changes thereof are important questions for future research.

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