A new direction?

Digital literacy, student participation and curriculum reform in Norway

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Abstract Digital literacy is now defined as a key area of competence in the new national curriculum for schools in Norway. For policy makers the terms 'information society' and 'knowledge society' has been used to argue for implementing new technologies in education, and for improving learning. These views have been highly problematic, partly because they do not take into consideration how new technologies are used by young people, or how schools work as social practices. This article will focus on how we conceptualize a student perspective in schools related to the use of digital technologies. Combining an increased focus on digital literacy in school curricula with an increased focus on student participation challenges our conception of the school-aged learner. In discussing these issues I will draw on results from a number of school-based ICT projects that I have been involved in since 1998.

Keywords Digital literacy · Student-centred · ICT-rich learning environments · Curriculum reform

1 Introduction

In many countries around the world (New Zealand, Hong Kong, Scotland, Finland, Norway) digital literacy is now defined as a key area of competence in curricula for schools (Kozma, 2003). For policy makers the terms 'information society' and 'knowledge society' has been used to argue for implementing new technologies in education, and for improving learning (Osterud, 2004). These views have been highly problematic, partly because they do not take into consideration how new technologies are used by young people, or how schools work as social practices (Bereiter, 2002).

Considering the impact of information and communication technologies on young people's lives, it is clear that we need to look closer at the social and educational implications

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this has on literacy and learning (Bransford, Brown & Cocking, 2000; Livingstone, 2002; Wells & Claxton, 2002), and how they represent 'equipments for living' (Cole & Keyssar, 1985). How this comes together in school-based settings is less clear, and there is a need to analyze different aspects of digital literacy. Current perspectives range from broad cultural analysis linked to 'multiliteracies' (Cope & Kalantzis, 2000) to developments of specific standards for learning and ICT-literacy (see http://cnets.iste.org/).

My frame of reference for discussing digital literacy and schooling is mainly how we conceptualize a student perspective in schools related to the use of digital technologies. Combining an increased focus on digital literacy in school curricula with an increased focus on student-centred learning environments (Land & Hannafin, 2000) challenges our conception of the school-aged learner. In discussing these issues I will draw on results from a number of school-based ICT projects that I have been involved in since 1998.

1.1 A national agenda on digital literacy

The year 2006 marks 10 years of strategic development on ICT in the Norwegian education system. These 10 years can be divided into three main phases. The phases indicate the overall national agenda for scaling up activities using digital media in Norwegian schools. The three phases are also expressed in specific 'action plans' from the Ministry of Education (http://www.odin.dep.no/kd/english/doc/handbooks/015081-990004/dok-bn.html).

The first phase, from 1996 until 1999, was mainly concerned with the implementation of computers into Norwegian schools. There was less interest in the educational context. In the next phase, from 2000 until 2003, the focus was more on whole school development with ICT and changing learning environments. The phase we are in now, from 2004 until 2008, puts more emphasis on digital literacy as part of knowledge building among students, and what learners do with technology. This opens future perspectives on technology and education. The data I will present here illustrates the transition from the second to the third phase.

One immediate challenge in these developments has been the balance between 'top-down' and 'bottom-up' strategies. One element has been to commit the Ministry of Education to developing ICT in Norwegian schools, another has been to get schools to use ICT more actively. The latter has been more difficult, and there has at times been too much pressure from 'the top' initiating projects, without too much happening at 'the bottom'. In the last 3–4 years this has changed in the sense that more schools initiate activities themselves.

As a consequence of such processes, a discussion on knowledge creation on a national level has surfaced in Norway. Some, mostly on the policy level, argue, based on PISA results, that knowledge in the basic skills of reading, writing and numeracy should have priority, while some researchers argue that our conception of knowledge is under transition (Osterud, 2004).

An interesting compromise has been that digital literacy and the ability to use digital tools has been written into the new national curriculum and is defined to be as important as reading, writing and numeracy. The implication is that all students on all levels and in all subjects should use and relate to digital media in their learning processes in Norwegian schools. The emphasis is mainly on skills in using the technology, but also implies broader issues of competence such as evaluating sources critically when using the Internet and using ICT to collaborate.

In addition the Ministry of Education has initiated a specific 'Program for digital competence 2004–2008', with different research and development work on different levels in the education system.

1.2 What is digital literacy?

In this context it is necessary to ask what is meant by digital literacy and the implications this has on our construction of the school-aged learner. In the new curriculum it is unclear what is meant by this, and they often use the term 'using digital tools' as a curriculum goal. In the white paper, making the framework for the curriculum, it is described as:

> Digital literacy is the sum of simple ICT skills, like being able to read, write and calculate, and more advanced skills that makes creative and critical use of digital tools and media possible. ICT skills consist of being able to use software, to search, locate, transform and control information from different digital sources, while the critical and creative ability also imply an ability to evaluate, use sources of information critically, interpret and analyse digital genres and media forms. In total digital literacy can be seen as a very complex competence. (Ministry of Education, 2004: p. 48, my translation)

In a recent book (Erstad, 2005) I have used this description of digital literacy to present a definition of digital literacy as "skills, knowledge and attitudes in using digital media to be able to master the challenges in the learning society". This is a broad definition linked to the challenges of what some call the 'learning society' (Qvortrup, 2001) indicating a more active, process-oriented perspective on society than terms like the knowledge, information or networked society.

Digital competence relates to both an ability to operate technological applications and to use technology to accomplish personal and collective needs. In this sense, it raises important questions about new digital divides in the population, between those who know how to operate the technology and those who do not, and between those who use the technology to gain relevant knowledge for education and those who use it for other purposes.

Important perspectives on this broader cultural issue can be found in the literature about the changing features of literacy in our culture (Kubey, 1997; Lankshear, 1997; Warschauer, 1999). In her book 'Literacy in a digital world' Kathleen Tyner (1998) studied some of the elements of a modern interpretation of literacy both related to what she termed 'tool literacies', which imply having the necessary skills to be able to use the technology, and 'literacies of representations', which relate to the knowledge of how to take advantage of the possibilities that different forms of representation give the users, especially the new information and communication technologies.

The background of this terminology goes back to the overall critique of the traditional conception of literacy as the ability to read and write (Graff, 1979; Street, 1984). A broader socio-cultural understanding of literacy builds on our relationship to many different forms of representation (Barton, 1994), all collected under the heading of media literacy, and later, digital literacy (Buckingham, 2003).

The term digital literacy has also grown out of discussions about media education in schools and analysis of how children and youth use different media. In a Norwegian setting media education has had a clear objective of creating critical and analytical competences among the young in their use of media. Media education in schools takes into consideration

the media experiences from outside the school, what might be called the 'everyday concepts' and experiences of the students, and established certain 'scientific concepts' and content that the students are introduced to in the school in order to increase their reflection and understanding of the media. This line of thinking has now been transferred to discussions about digital literacy. However, where media education has been structured as one subject in schools, digital literacy is defined more broadly within all subjects on all levels. This raises some critical issues on how this is to be done, and the implications this has for both teachers and students.

We can conclude from the above that digital literacy is high on the political agenda, but it is not clear what is meant by this term, especially when we try to link in-school and out-of-school activities.

1.3 Voices of multi-literacies

In order to communicate and make sense of the world we use different kinds of mediational means. Many researchers from different perspectives have been interested in this phenomenon. In relation to learning and development, the perspective of most immediate relevance is the socio-cultural perspective first developed by Russian psychologists during the 1920s–1930s. I briefly highlight four elements of relevance.

The first is the importance of studying the tools and resources used for human development in social practices. Any culture incorporates a number of different tools, or what many call artefacts. In order to study the culture you need to grasp the knowledge and ideas built into the developments of certain tools or artefacts. Development of material resources goes hand in hand with the development of ideas and intellectual knowledge (Säljö 2000:p. 29).

The second point, based on this socio-cultural perspective, is that learning is studied as interdependence between collective and individual processes in specific situations. Learning evolves initially as a social process through communication, and later on, at an individual level (Vygotsky 1978). In contrast to Piaget's theory of learning and development, it becomes much more important to study how we construct meanings together and in relation to each other. Another implication is that knowledge is negotiated and not something that is available for the person out there in the world, as we find in the theories of Piaget. Knowledge is a result of struggle and engagement and is deeply related to argumentation and mediated action in a social context (Säljö 2000:p. 26).

The third point of relevance indicates that the way we organize and understand learning changes over time according to broader cultural change. Again this is in contrast to most other theories of learning. These changes could be both the result of developments in tool structures and related to broader social and cultural developments, for example the changing roles of youth in society over time. It has been common to describe youth as innovators of new technologies. Youth is the first group in society to take up new technologies and use them in social practice. By doing so they assume an important role for the diffusion of innovation in society.

The fourth element is the concept of 'mediated action' elaborated by Wertsch (1998). One of his questions on mediated action is 'how the introduction of novel cultural tools transforms the action' (Wertsch, 1998, p. 42), and he mentions many different examples, ranging from sports to classroom activities. Transformations of mediated action can be seen in the introduction of the calculator and the computer, and the controversies these developments raise among educationalists.

One could focus on the emergence and influence of a new mediational means in sociocultural history where forces of industrialization and technological development come into play. An important instance of the latter sort is what has happened to social and psychological processes with the appearance of modern computers. Regardless of the particular case or the genetic domain involved, the general point is that the introduction of a new mediational means creates a kind of imbalance in the systemic organization of mediated action, an imbalance that sets off changes in other elements such as the agent and changes in mediated action in general. (Wertsch, 1998, p. 43)

This infers that modern technologies are important cultural tools to take into consideration, and that they have broad cultural and social implications. In this sense new technologies cannot only be seen as a continuation of old technologies like the typewriter or a calculating machine, as most teachers do (Erstad, 2005), but also as something transforming the way we create knowledge and meaning, communicate and interact.

All this illustrates the importance of studying how new technologies represent new cultural tools that create new meaning structures. These tools create new possibilities for how people relate to each other, how knowledge is defined in negotiation between actors and also how it changes our conception of learning environments in which actors negotiate meaning. Empowerment is related to the active use of different tools, with people who have the competence and power to use them. All this comes together in the term multi-literacies (Cope & Kalantzis, 2000), where the changes in our conception of new literacy practices are highlighted (Lankshear, 1997; Snyder, 2002).

1.4 Youth, media and school

The points detailed above lead to reflections about the concept of competence in a digital world. In studying digital competence it becomes evident that young people gain most of their competence outside the formal institutions of learning (Drotner, 2001). Thus, digital competence among young people today is of direct relevance to discussions about learning in schools, and it seriously confronts earlier conceptions of literacy and learning.

In addition the media environment of young people is changing. In a large scale European study these developments were related to access and use of different media where new digital technologies play an increasingly important role. Livingstone (2002) summarises the active exploration by young people in these new media environments by saying that: 'Perhaps the main lesson learned from our wide-ranging study of young people in 12 nations is that media both shape and are shaped by the meanings and practices of young people's everyday lives' (p. 309).

Much youth research has defined media use in contradiction to or as an element that opposes schooling. Media and technology are looked upon as a sort of parallel school. This makes it necessary to focus more on young people's learning processes in general and especially their relationship to media and technology. As a consequence we also have to get a better understanding of the relationship between formal and informal contexts for learning.

The Danish media researcher Drotner (2001) has, in several of her books, shown how young people use different media, both in relation to content and as tools for producing media products. One of her points is that a lot of the experiences and impressions that young people gain from their media use are never incorporated into learning activities in schools. If they are incorporated, there is a class difference in the sense that it is the media

experiences of middle-class children that are made relevant. This point can also be made in relation to young people's use of new technologies like computer games and chat that many teachers define as not being relevant for learning in schools (Erstad, Frølich, Kløvstad, & Vestby 2000).

This gap between the school as a learning arena and media use outside of schools is something the students are aware of. The following quotes express common conceptions about the role of schooling among students.

The things you learn in school are to do with education and to get jobs. You're not really using them in actual real life. (18-year old; Bentley, 1998)

I guess I could call myself smart. I mean I can usually get good grades. Sometimes I worry though, that I'm not equipped to achieve what I want, that I'm just a tape recorder repeating back what I've heard. I worry that once I'm out of school and people don't keep handling me information with questions... I'll be lost. (15-year old; Bentley, 1998)

There will always be a gap between these two settings. The issue is, however, that the experiences and the competencies that young people make outside of schools become increasingly important when related to learning processes. However, the school as an institution with all its standards and norms, and the teachers' habitus (Bourdieu, 1984) has been a barrier to the inclusion of new media and technologies in school settings. This is still a challenge which must be overcome in order to achieve the ambition of digital literacy in schools.

The concept of a learning environment has gained a lot of attention lately. It is being used to describe changes in the way we organise learning activities, both in real life settings in classrooms and in virtual environments. This indicates a change from learning environments where the teacher and the textbook structure, define and control the learning process, towards student-centred learning environments where the students themselves are the main frame of reference for defining the learning process.

Jonassen and Land (2000:viii) have described this as a transition from 'instruction' to a 'student-centered learning environment' comprising many different dimensions. Student-centered learning environments are designed to support individual efforts to negotiate multiple points of view, while engaging in authentic activities. Important assumptions in these environments are that the learner defines how to proceed, based on individual needs, and that learning is highly attuned to the situation in which it takes place.

In this scenario of more student involvement in learning activities at school we need to discuss how we conceptualize the school-based learner and how the students look upon their own roles as 'youth', as 'learner' and so forth. Often there is a naïve belief that the technology itself will activate the students.

1.5 School based ICT projects—Norway

For the last 8 years I have been head of research at a national research centre (ITU, www.itu.no) responsible for researching the main ICT initiatives in Norwegian schools. In our research we have been working closely with different research communities in Norway, with teachers and also with policy makers as a way of feeding research results back into both the policy level and the school level. A central issue in developing research and projects during the last 10 years has been the scaling up of activities.

The projects reflected on here represent both quantitative and qualitative data, mainly interviews and observations.

1.5.1 Students and ICT

To give a contextual understanding of the current situation of ICT in Norwegian schools I present some data from several surveys we have carried out over the last 2 years. According to our national monitor (ITU Monitor), published every second year, there are, on average, two students per computer at upper secondary level and six students per computer at both lower secondary and primary level. Broadband access in schools has also been steadily improving, even though 65% of teachers think access to the Internet is too slow (Erstad, Kløvstad, Kristiansen, & Soby, 2005). The majority of schools still have specific computer rooms where most of their computers are located. In the last 2 years there has been a gradual shift towards moving more computers into classrooms making for better access. There is also a tendency for more schools to combine the use of stationary, portable and handheld computers (Erstad et al., 2005).

One problem in Norway has been that teachers do not use the available computers much in their own teaching. The tendency has been that teachers mainly use computers and the Internet to prepare their teaching but don't actually use them in the classroom. When we asked the students how much they use computers in school activities during an average week 54% said that it was about 1 h or less, and 17% said never at all (Erstad et al., 2005).

Another issue is that students and teachers relate to technology in different ways. When we asked students and teachers what they used computers for, both at school and outside the school, the results showed that teachers had a more limited usage of information and communication technologies than their students. The students often (daily or 2–5 times a week) used ICT for different purposes, like writing, surfing on the Internet, sending e-mails, chatting, downloading music, playing games and making web-pages. Almost 90% of teachers used ICT for writing, sending e-mail, seeking information on the Internet or surfing for entertainment purposes. They almost never used ICT to download music, chat or play games. Teachers used ICT mainly as an extension of technologies they already knew, like the typewriter, calculator, letter writing and searching for information. Young people used the new technologies to seek out new possibilities of use. Teachers often have negative opinions of such ICT usage, but they speak less out of personal experience and more out of a general expectation. At the same time many teachers have a positive attitude towards computers and the impact it might have on students learning (Erstad et al., 2005).

As mentioned earlier the differences in computer use between home and school are important and are related to the issue of digital literacy. When students and teachers were asked about what they use computers for at home and at school we noted some very interesting conclusions.

Figure 1 shows that the differences between boys' and girls' use of the Internet or the computer for reading, writing and calculating are slight. However, in using computers for downloading content, communicating, creating and playing computer games the differences are more substantial. The gender differences are not major, either at school or at home, except for playing computer games. The boys do this more often.

From this survey we can also summarise the following differences about how computers are integrated in schools and at home:

ICT use at home	ICT use at school
–A majority of the students have better access to computers at home than at school.	–Computers are mostly used to search the Internet and text-based services by both students and teachers at school.
–Students use computers on many and more advanced tasks at home than at school.	–There are small differences between gender in how computers are used, both among students and teachers.

–Students spend more time with the computer at home than at school.
–Boys spend more time with the computer at home than girls do.
–The teachers use the computer for the same purposes at home as at school.
–Male teachers spend more time using the computer at home than female teachers do.
–Male and female teachers spend as much time with the computer when preparing schoolwork.
–Many students get parents, siblings and friends to help doing homework with the computer.

–The students use computers mostly in connection with project work at school.
–Teachers mostly use computers to prepare their teaching.
–Computers are not often integrated in subject domains at all levels.
–More than 50% of the students report that they use computers integrated in subject activities at school for less than 1 h per week.
–The teachers spend more time with computers at school than students do.

The other point that comes out from this survey is that many teachers link the use of computers to an increase in student activities and student participation. Figure 2 shows statements from teachers concerning different student activities linked to the use of computers. The data is from a project involving 120 schools during a 4-year period (Erstad, 2004). The responses were collected towards the end of the project.

As can be seen in Fig. 2 the teachers are positive about how ICT use is linked to different student activities. The teachers totally agree that students' learning outcomes increase when using ICT and that ICT creates more flexibility in learning activities. They also strongly agree that ICT creates increased differentiation.

From this research we see that both teachers and principals are very positive towards using computers, especially as part of specific projects. However, we find that teachers do
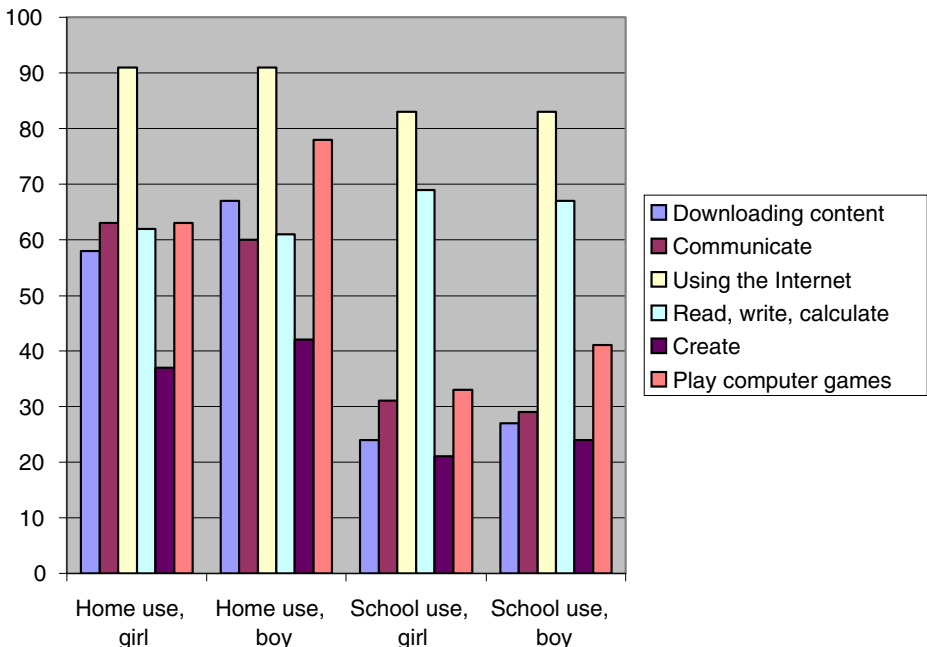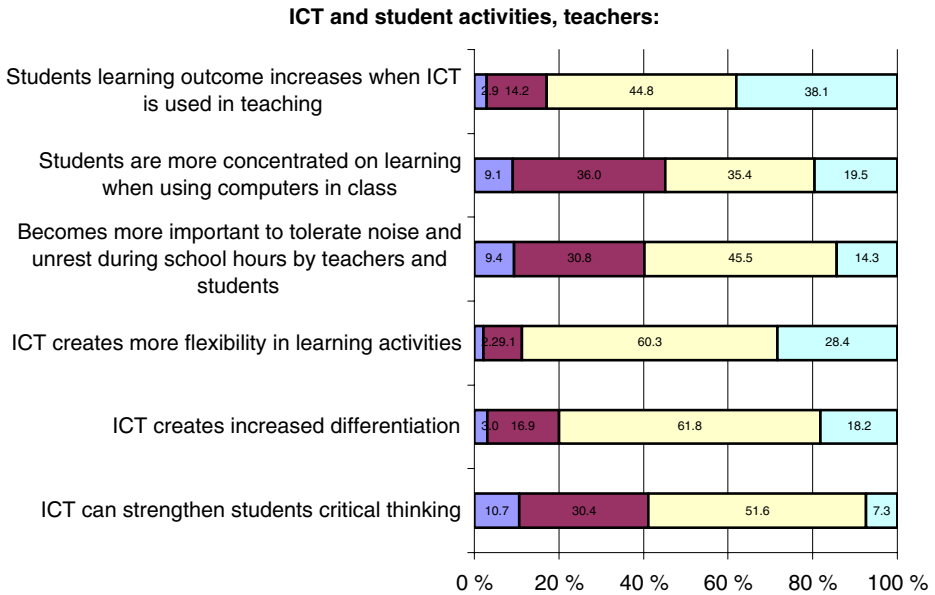

Fig. 1 Computer use at home and at school by boys and girls, in percent. $N = 3,382$

ICT and student activities, teachers:

Fig. 2 Teachers' opinions about ICT and student activities in percent. *N* = 248. Totally disagree, partly disagree, partly agree, totally agree

not use computers much in their actual teaching—they use them for planning and following up their classroom activities. This begs the question—to what degree is there really more student participation and empowerment when students use computers more in schools?

1.5.2 Digital literacy practices in schools

The above conclusions are supported by qualitative data, mainly interviews and observation, of students and computer use in schools.

The central issue raised in this article is how digital literacy practices are established in schools and how this reflects the use of computers outside of school settings. When going through different school-based ICT-projects it is striking how on one hand they reflect intentions for more student-centred learning environments using ICT. However, on the other hand, the results illustrate many problems and difficulties in doing this in school settings. Here are a few points that came up in several projects illustrated with some quotes from interviews.

Many studies on school reform show how difficult it is to accomplish real change in pedagogical practices (Cuban, 1986; Fullan, 1993). The research we have carried out using a more specific activity theoretical approach also show how difficult it is to work towards change and expansive learning (Engeström, 1987) to create more integrated use of ICT in learning activities and to create student-centred learning environments (Erstad, 2004).

When working with teachers it often became evident that their attitudes and convictions towards their own practice is hard to break. As one teacher told us in an interview at the beginning of one of the projects:

My students learned much more before these new technologies were introduced. I had long experience with teaching and know what works. New teaching methods create chaos. (Teacher, 2000)

This is of course something that the students are very aware of and often complain about when we interview them regarding the use of ICT in schools and the extent to which they are working towards creating student-centred learning environments. As some students commented:

Student 1: And many teachers are not so good in using PC, so the teaching does not relate to that.
Student 2: They continue with the traditional methods even though...
Interviewer: What do you mean with traditional methods?
Student 2: Using the blackboard and...
Interviewer: Can you describe a typical traditional teaching?
Student 2: When the teacher enters he says close all the computers and get your note-books. Writes everything on the blackboard. Write assignments with pen and pencil.
Student 1: Our teacher in religion is about 70 years old. She does not know much about using the PC. (Students)

These kinds of reflections among the students also become evident when the issue of innovation comes up in the interviews. It becomes clear that what is defined as innovative for teachers is not necessarily so for the students. In one of the projects a student sent me the following e-mail:

Hello! I am a student at a pretty normal school. We have a lot of computers and some other equipment... We also have study time. We are part of the PILOT project... Study time means that we have to sit with a bunch of assignments to work on. This is called innovative by the teachers. I call it old fashioned. It is just the same as it was in primary school, we almost never get time to work on the computer, it is just working with books and not directed towards the future. You have to do something about this! Best regards... (Student)

This is a really important issue. How the teachers conceive using ICT in learning activities and how they think they organize student-centred learning environments is often very different from what the students experience and how they conceive using ICT for learning. For example, on the subject of student involvement or increased participation in their own learning, one student commented that:

Student: They say 'responsibility for own learning', but I am not sure if that is correct.
Interviewer: What do they mean then?
Student: I don't know, and I am not sure if they know themselves. In one instance it is 'responsibility for own learning', and in the next it is attendance register and follow up of homework. I don't know how much 'responsibility for own learning' that is. It is just like before. You get a mark if you have not done your homework. The thing with 'responsibility for own learning' is just nonsense. (Student)

However, we also see examples where there are changes going on in the way the learning environment is developed and how the student role is defined. In one project the teachers focused on how they could change different situations in the school setting by using digital portfolios. One aspect of this was the meeting with the parents where the students traditionally were passive, but where they now became the centre of the discussions.

I experienced that this created a whole new situation for the traditional parents' conference, where the teacher is the active part and student and parents often become passive listeners. Now it was the student who started the whole situation by presenting his work and started a conversation based on this presentation. I experienced that it became a much more natural communication between equal partners. The parents became very impressed of what they were shown. The conversation flowed much easier and we could really sit much longer than the 45 min. (Teacher)

We also see that a few schools report on how using ICT changes literacy practices. One interesting quote comes from a mother I interviewed concerning the project work her daughters were involved in using IMovie to present their results in natural science.

My girls are academically weak because they both have dyslexia and during the years in primary school they have struggled all the time with not being able to prove themselves in any subject oriented way. I think it was incredibly positive for them to come here...to be able to work on computers and film and edit and such things. They have done a bit of that at home before, so they had knowledge that the other students could get from them, and through that they got a higher status in the group. So for them it has been like...I don't know...almost like a new life. It is very important that they gain ownership of their work. I think that is one of the keys to create engagement. For adults it is like this, and I do not think this is different for children. (Mother)

The teacher of these students added that:

Suddenly these students come into a learning environment where they have experience related to a new tool that becomes available for them without only focusing on reading and writing. But also for the students that are clever and learn things fast, this seems to give them more. Also for them it is a growth environment to produce good results. (Teacher)

The two important aspects of changing the learning process for these girls were, firstly, the importance of coming to a school with a much more open and flexible learning environment where they could use their strong competencies (visually) to strengthen their weaker competencies (reading, writing), and, secondly, the digital resources available at the school that supported different learning activities among the students in a more flexible way than before.

1.5.3 A case story

In this school they started what they call 'Go ahead' groups. This is an offer for, according to the principal, students "...that have more to go on". Students who perform well are offered the opportunity to go out of their regular classes to participate in specific projects that they have an interest in. However, they are expected to follow the progress of their regular classes in addition to participating in the project.

I will focus on a project called the "Antarctica project". The overall focus of the project was 'to make a dream come true'. It all started in October 1999 when the explorers Liv Arnesen (Norwegian) and Ann Bancroft (American) presented their ideas for an education programme connected to their Antarctica 2000–2001 expedition. This was presented as a global activity and schools in different countries could participate. A special database was developed so that anyone could follow the expedition. In addition the school had a special arrangement with one of the explorers, Liv Arnesen, that they would have direct interaction

before, during and after the expedition. This was both to get factual and research-based information, and information of a more personal nature about the experiences of the two women in Antarctica.

Regarding the use of new technologies in the school the principal explained that:

It relates to be able to use many senses, and to do things and to see that it works. To learn about another country by reading about it in a book compared to get it presented through Internet. Images and sound and experiences you might say, and communication with students in other countries direct through e-mail and chatting and all that which now is possible. (Principal)

The first step in the project was that the students wrote a short essay about their 'secret' dream. They discussed these dreams among themselves, and to what extent it was possible to make them come true. The next step was to exchange dreams with other students in other countries. Some teachers went on the net and found schools in the USA, Poland, Finland and Palestine. The teacher explained the impact of this as: "The students got input on how to understand youth culture, to understand life conditions, that they are different." As a result of this activity, the students saw that people have different dreams in different countries. While some of the students in Norway dreamed about becoming better on a snowboard, a Palestinian girl dreamed about a stable and secure school.

The next step was that a couple of teachers started a project to follow the two women crossing the Antarctic. A group of eight students joined this specific project. The aim of this project was to create a web page that would contain different kinds of reports and information gathered by the students about the expedition and Antarctica.

A collaborator in the project was one of the main newspapers in Norway which had a special agreement with the expedition organizers to get up-to-date information. The newspaper also put up a link to the students' web page on their web pages. In addition the students used the Internet to get access to more general information about Antarctica and downloaded a video-presentation programme and also digital programs to edit the interviews with the explorers and link them to their web page.

Critical evaluation of sources is something the students have become aware of since the journalists have interviewed them. The students became aware that they have to know the theme they are working on thoroughly when being interviewed. They saw how journalists used the information from these interviews and how they might change this information. In this way the students got a meta-cognitive perspective on the meaning of their own project. The same can be said about the consequence of publishing their own knowledge on the net so everybody, potentially, can see what they have written. It becomes very important to the students that their text was of high quality.

Concerning student outcomes they have gained different kinds of knowledge in such a project. As far as factual knowledge several students say that they have learned a lot about Antarctica. An important aspect of their learning has been the method by which they have approached the information, in the sense that they have been very active in finding relevant information and evaluating what to use. All the students have learned a lot about using computers for different purposes. In one conversation the students reflected on their own learning when saying that:

Girl: I think it is very exciting to hear how they (the explorers) can get messages, and also about the technical part, how we can get messages from them, where they are.
Boy1: You learn that, because on the Internet a lot is in English, and then you have to translate it into Norwegian.
Boy2: Yes and then, where we get information about how far they have walked, it is

formulated in miles, and then we have to calculate from (English) miles to (Norwegian) miles.

Boy1: We are also going to make a press release that we are going to give to...

In this conversation the students mentioned several outcomes that illustrated an integrated view of knowledge acquisition. They got to practice English, to use mathematics and natural science in a realistic way, for example they had to find out how many Norwegian miles was equivalent to one English mile. As the principal commented: "In the Antarctica project the students have to work with problem formulations about health, nutrition, pollution/ozone, whaling and weather/metrology..." In addition they got a different feeling for the process of writing and expressing themselves by putting different kinds of information on the Internet, by writing press releases, and so forth.

For the students the project created some new perspectives on the school as a knowledge institution. In commenting on the use of technology in such a project some students mentioned that:

Boy: It becomes more fun to be at school. When you split it up a bit more. Instead of having six hours in one stretch, then it becomes easier to get through the day.

Girl: For some it might be a big shock when they get into the work market, because you do not sit and make mathematical assignments as such. When we work on projects you get a better grasp on what is happening in real companies and such.

Boy: We should get more experience on how it is in real working life.

Commenting on the Antarctica project the teacher mentioned another meta-cognitive outcome: "I think they have seen a bit more of reality. I think they have seen that if you are going to accomplish something you have to fight for it." This is not something the students just learn through the use of new technology. They have projects at the school where they use art, music and other resources. In relation to this project the technology has provided opportunities and arenas for negotiation that creates exciting consequences for the students learning.

From a few projects like the one outlined above we can see some interesting results on how digital literacy is having an impact in school settings, and how the learning environment is defined. However, in the majority of projects I have gone through it is not clear what changes are taking place. Seldom do teachers refer to the experiences of students using ICT in their out of school activities and how this might affect learning activities in schools.

1.6 Entering the twilight zone

In this article I have presented some data across different ICT projects and programmes in school settings in Norway. In a national setting this represents a need to conduct meta-evaluation and reviews across projects. Different projects have provided specific results. However, we should look across projects to get a clearer picture of tendencies, major outcomes and stronger results.

Two issues have been highlighted in this article related to the curriculum initiatives of digital literacy. They are interrelated and it is important to clarify them to better understand how digital literacy should be defined in school settings.

One issue deals with changing student roles in schools, and the impact of ICT in developing such roles. It might be said that students are empowered by getting increased access to computers and the Internet in the sense that they depend less on the teachers

lecturing them. Students can find information and communicate in order to support each other in their learning processes. However, the projects referred to in this paper all report problems in regard to this.

The other issue deals with linking the school setting with young peoples' experiences with using media and technology outside of schools. Media and digital literacy has been defined by many researchers as something that is developed outside of schools as part of their everyday media use, or as part of specific programmes and activities after school hours. However, how are we going to define the zone between schools formal learning and young peoples' use of new technologies outside of schools?

A lot of attention is currently focused on changing the role of schools in our society in order to make them better adjusted to the challenges of the knowledge society. In several countries this is both related to strengthening basic skills in core subjects and advocating the need for digital literacy. How this will emerge in practical learning activities in schools is still an open question.

So, how do we answer the question in the title of this article? Can we talk about a new direction of using technology in education? My answer in this article is yes, related to the way digital literacy now is written into the national curriculum in Norway. This implies a much more educationally consolidated way of thinking about new digital technologies in schools than the former national strategies managed to achieve. The focus is now on how digital technologies influence knowledge building among students and literacy practices in schools. The way ahead brings new challenges in studying the impact of new technologies on learning.

One important issue that has been little researched is the new marginalising mechanisms that develop when focusing on digital literacy in schools. We need to ask who will gain from this being a learning goal in schools, and who will lose (Warschauer, 2004)? Furthermore, who is to define what counts as digital literacy?

The digital divide has been discussed, but only on a superficial level. It has been linked to differences in access to technology, gender issues or the information flow in our world. What kinds of differences are related to the competence of using new technologies, to know how to navigate in the information jungle on the Internet, to create, to communicate and so forth? This is where issues of digital literacy and empowerment come in.

These issues are especially important in discussing the role of schooling in our society and the knowledge building processes going on inside and outside of schools. The divide between these two spheres is growing. The importance of these issues becomes evident when we are studying students and how they relate to new technologies. In this sense we have to re-evaluate our socio-cultural constructions of the school-aged learner, to prevent new marginalising mechanisms from developing.

References

Barton, D. (1994). *Literacy. An introduction to the ecology of written language*. Oxford: Blackwell.

Bentley, T. (1998). *Learning beyond the classroom. Education for a changing world*. London: Routledge.

Bereiter, C. (2002). *Education and mind in the knowledge age*. New Jersey: Lawrence Erlbaum.

Bourdieu, P. (1984). *Distinction: A social critique of the judgement of taste*. London: Routledge.

Bransford, J. D., Brown, A. L., & Cocking, R. (2000). *How people learn. Brain, mind, experience and school*. Washington, District of Columbia: National Academy.

Buckingham, D. (2003). *Media education. Learning, literacy and contemporary culture*. Cambridge: Polity.

Cole, M., & Keyssar, H. (1985). 'The concept of literacy in print and film'. In Olson, Torrance & Hildyard (Eds.), *Literacy, language and learning. The nature and consequences of reading and writing*. Cambridge, Massachusetts: Cambridge University Press.

Cope, B., & Kalantzis, M. (2000). *Multiliteracies. Literacy learning and the design of social futures*. London: Routledge.

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

Drotner, K. (2001). *Medier for fremtiden. Børn, unge og det nye medielandskab*. (Media for the future. Children, youth and the new media landscape) København: Høst & Søn.

Engeström, Y. (1987). *Learning by expanding. An activity-theoretical approach to developmental research*. Helsinki: Orienta-Konsultit Erlbaum.

Erstad, O. (2004). *PILOTer for skoleutvikling* (PILOTs for school development). UniPub. Report no. 28. ITU, University of Oslo.

Erstad, O. (2005). *Digital kompetanse i skolen* (Digital literacy in the school). Oslo: University Press.

Erstad, O., Frølich, T. H., Kløvstad, V., & Vestby, G. M. (2000). *Den langsomme eksplosjonen* (The slow explosion). UniPub. Report no. 11. ITU, University of Oslo.

Erstad, O., Kløvstad, V., Kristiansen, T. & Søby, M. (2005). *ITU Monitor 2005—På vei mot digital kompetanse i grunnopplæringen*. (ITU Monitor 2005—On the way towards digital literacy in basic education.) Oslo: University Press.

Fullan, M. (1993). *Change forces. Probing the depths of educational reform*. London: Falmer.

Graff, H. (1979). *The literacy myth: Literacy and social structure in the nineteenth-century*. New York: Academic.

Jonassen, D. H., & Land, S. M. (Eds.) (2000). *Theoretical foundations of learning environments*. New Jersey: Lawrence Earlbaum

Kozma, R. B. (2003). *Technology, innovation and educational change*. Eugene, Oregon: International Society for Technology in Education (ISTE).

Kubey, R. (Ed.) (1997). *Media literacy in the information age*. New Brunswick: Transaction.

Land, S. M., & Hannafin, M. J. (2000). 'Student-centered learning environments'. In D. H. Jonassen & S. M. Land (Eds.) *Theoretical foundations of learning environments*. New Jersey: Lawrence Earlbaum.

Lankshear, C. (1997). *Changing literacies*. Buckingham: Open University Press.

Livingstone, S. (2002). *Young people and new media*. London: Sage.

Osterud, S. (2004). *Utdanning for informasjonssamfunnet. Den tredje vei*. (Education for the information society. The third way.) Oslo: Universitetsforlaget.

Qvortrup, L. (2001). *Det lærende samfund. Hyperkompleksitet og viden*. (The learning society. Hyper-complexity and knowledge.) København: Gyldendal.

Säljö, R. (2000). *Lärande i praktiken. Et sociokulturellt perspektiv*.(Learning in practice. A sociocultural perspective) Stockholm: Prisma förlag.

Snyder, I. (Ed.) (2002). *Silicon literacies. Communication, innovation and education in the electronic age*. London: Routledge.

Street, B. (1984). *Literacy in theory and practice*. Cambridge, UK: Cambridge University Press.

Tyner, K. (1998). *Literacy in a digital world. Teaching and learning in the age of information*. New Jersey: Lawrence Erlbaum.

Vygotsky, L. (1978). *Mind in society*. Cambridge, Massachusetts: Harvard University Press.

Warschauer, M. (1999). *Electronic literacies. Language, culture and power in online education*. New Jersey: Lawrence Erlbaum.

Warschauer, M. (2004). *Technology and social inclusion: Rethinking the Digital Divide*. Cambridge, Massachusetts: MIT.

Wells, G., & Claxton, G. (Eds.) (2002). *Learning for life in the 21st century*. Oxford, UK: Blackwell.

Wertsch, J. (1998). *Mind as action*. Oxford: Oxford University Press.

Ministry of Education (2004). *Culture for learning*. White paper no. 30 (2003–2004). Oslo: Ministry of Education.