The digital challenges of school and teacher education in Norway: Some urgent questions and the search for answers

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Abstract This paper highlights the digital challenges within education in Norway and explains how the digital revolution creates new possibilities, dilemmas and challenges for school and teacher education in our contemporary society. Today we find a consensus among policy-makers, researchers, teacher educators and school management that digital literacy and ICT implementation must be given high priority and needs to be explored more deeply in our contemporary educational institutions. Despite this consensus, previous ICT efforts have revealed that implementation of ICT in the Norwegian context has been more strongly anchored rhetorically, than in practice. Consequently, the paper focuses on whether we now have learned from the past and are entering a time of upheaval within technology implementation and asks what kind of possibilities, challenges and dilemmas teacher educators and teachers face in this new pedagogical terrain. The paper focuses on some urgent questions and the search for answers within this pedagogical area, based on research findings from PILOT (Krumsvik, *IKT i det nye læringsrommet, 2* (ICT in the new learning-space, 2), Unipub, Universitetet i Oslo, 2004a; Krumsvik, *Norsk Pedagogisk Tidsskrift (Norwegian Journal of Pedagogy)*, 88:467–480, 2004b; Krumsvik, *Scand. J. Educ. Res.*, 49:27–50, 2005a; Krumsvik, *J.* Nord. Pedagog. Res., 25:190–207, 2005b; Krumsvik, *ICT in the school. ICT-initiated school development in lower secondary school*, University of Bergen, Bergen, 2006), other relevant research studies, policy documents and theoretical foundations.

Keywords Digital challenges · Digital literacy · ICT implementation · Teachers · New pedagogy

1 Introduction

The core perspective in this position paper is directed towards how the digital revolution and active use of the Internet creates new possibilities, dilemmas and challenges for school

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and teacher education in our contemporary society. In Norway there is a urgent need to explore this area more deeply because of the high technology density in society in general, the youngsters' massive use of technology in their everyday life and the difficulties experienced by teacher education and schools in integrating and utilising the technology for educational purposes. Teacher educators are increasingly affected by this digital revolution and in the *Rammeplan for Praktisk Pedagogisk Utdanning* (General Plan for Teacher Education; MER, 2003a, b) it is highlighted that teacher education students have to achieve digital literacy to be certified as teachers in this new pedagogical terrain. Since the school year 2002/2003, ICT has been compulsory in Norwegian schools [Action Plan for ICT in Norwegian Education. Plan for 2000–2003 (MERCA, 1999)]. In the *Program for Digital Kompetanse* [Program of Digital Competence 2004–2008 (MER, 2003a, b)], the White Paper no. 30 *Culture for Learning* (MER, 2003a, b, 2004), and in the new Norwegian, educational reform, *The Knowledge Promotion* (MER, 2005) digital literacy (digital competence) has been included and highlighted as one of the five mandatory, basic literacies (basic competencies) in all subjects.

Given this background there is a consensus among policy-makers, researchers, teacher educators and school management that the ICT area needs to be explored more deeply in our contemporary educational institutions. However, despite this consensus and good intentions one has to bear in mind that earlier efforts with ICT implementation in school and teacher education have been more strongly anchored rhetorically than in practice. Today we find that there is a discrepancy between the ICT visions of the new educational reform and the reality in school. Even if technology access in Norwegian schools is good compared to other countries, we still find that there is a lack of essential digital literacy among teachers and there is too much low-speed Internet access in the schools, neither of which is taken into account in the reformers' ambitious visions for ICT. This illustrates the complexity of this area and, consequently, raises a number of questions. Does the new, converging, Internet-based technology create a fertile ground for this new, mandatory digital literacy in school? If so, what happens to the teacher's role, to students and to subjects when digital literacy becomes mandatory in all subjects as the fifth basic literacy? Does the *screenagers*[1] "on-line" existence and digital literacy change our traditional perception of learning? Does this development contribute to a new (digital) epistemology within education? Does this alter how "teachers teach and learners learn" in the Norwegian school and teacher education? Is this just another "technology-hype" which will disappear like dust in the wind?

Therefore, this paper focuses on whether if we are now entering a time of upheaval within technology implementation, and what kind of possibilities, challenges and dilemmas will teacher educators and teachers face when trying to integrate the *new, Internet-based technology*, in educational activities. A major problem is: *How does the digital revolution affect schools and teacher education in our contemporary, Norwegian society?* This paper directs focus towards the new currents within this pedagogical area, based on research findings from the Norwegian, national ICT-project PILOT (Krumsvik, 2004a, b, 2005a, b, 2006), other relevant research studies, governmental policy and theoretical foundations.

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[1] Screenager: "Screenagers are techno-savvy young people. They are the first generation to grow up with television and computers at home, music downloads, instant messaging and cellular phones. Douglas Rushkoff first coined the term in his 1997 book 'Playing the Future'. Rushkoff argued that young people will have many advantages processing information and coping with change when they reach adulthood because they have used computers at home since early childhood. Their short attention span may be an advantage in coping with the huge mass of information that also bombards their elders" (Wikipedia, The Free Encyclopedia, http://en.wikipedia.org/wiki/Screenager).

There is a special focus on *screenagers*, and on the lower- and upper-secondary school where we find the most innovative and frequent use of ICT in Norway. This focus will contribute to teacher education and decrease the gap between this arena and the field of practice.

2 Stability and change

In recent years Norway has become one of the leading countries with regards to accessibility of technology in schools and in society in general (Castells, 2001; OECD, 2003; Vaage, 2005). In the *eNorge 2009—det digitale spranget* (eNorway 2009—the digital leap; MOD, 2005) further plans for broadband development are declared. In the school-year 2005/2006 the technology density is 6.3 students per computer with Internet access in the Norwegian primary school (SSB, 2005) and 2.5 students per computer in secondary school (Kløvstad, Erstad, Kristiansen, & Søby, 2005). Ninety-three percent of the computers in lower secondary school have Internet access and 6% of these schools have ISDN-access (Kløvstad et al., 2005). If we examine Norwegian students in lower secondary school (13–15 year-olds) private access to technology, 95% have access to home computers, 82% have Internet access at home and 96% have mobile telephones. These youngsters are the highest consumers of Internet and 73% use Internet daily (for, on average, 81 min; SSB, 2005). The escalating use of the Internet over the last few years is due to the fact that most Norwegian homes have implemented high speed, broadband Internet access, which implies they can use the Internet around the clock with no extra expense. In addition, in Norwegian society, public libraries are well-equipped with broadband-based Internet access and "Internet-cafés" are a common phenomenon throughout the country. This digital revolution has already made a profound impact on society and has changed our relationship towards established institutions of society. Net-banks have replaced the traditional bank, net-based newspapers have overtaken ordinary newspapers, e-mail and SMS have replaced paper-based communication, and overall society has "disappeared" into the digital room. How have these trends influenced our contemporary school system?

Despite relatively good technology access in school and throughout society, there is still a discrepancy between the ambitious ICT visions in the new educational reform and the density and quality of the PCs in school, as well as the actual subject use of ICT in the Norwegian school (Kløvstad et al., 2005). We find some of the same tendencies in Norwegian teacher education (Ludvigsen & Rasmussen, 2005). Thus we need to ask critical questions about policy-makers' ICT visions and the reality in school. We cannot just blame the policy-makers' ambitious ICT visions; we must also ask how Norwegian schools and teacher education organise use of the available technology.

A number of earlier studies revealed that school as an organisation adapts slowly to technological alteration, despite the fact that many attempts at implementation have been initiated (Cuban, 2001). Many people raise critical questions regarding the discrepancy between expectations and results when ICT is implemented. A popular perception of many technology projects seems to be that, when ICT is introduced in the classroom, changes will occur more or less by themselves (Cuban, 2001). This understanding has prevailed and the rhetoric has been so sweeping that few have questioned it and the presumed excellence of the technology has overshadowed the more problematic issues. We therefore see that many of the more comprehensive technological experiments from the 1980s and 1990s appear to be dominated by a technological deterministic view where ICT was to confer competence and knowledge and effect changes in the classroom. ICT has thus been considered as a means for improving and increasing the efficiency of teaching, and as a tool students must

learn to master in order to succeed in their studies and careers (Ludvigsen, 2000). According to Arnseth (2000) and Ludvigsen (2000) the conditions for implementing ICT in school are determined by participants other than the school itself. Cuban and Tyack state: "In the top-down process of advocating and implementing technology, teachers were rarely consulted, though it was mainly their job to make it work in the classrooms" (Cuban & Tyack, 1998, p. 121). This might explain why changes often happen only on "the surface" (*first order*, Cuban, 2001 or *solution innovation*, Engeström, 1995), and conceal a traditional school reality where one primarily did what one had previously done. Consequently, Cuban and Tyack sum up the technology efforts thus: "The overall picture that emerges after a decade of advocates' claims and public urgency is that computers play a marginal role in regular instruction in public schools. A one-line summary of the situation to date might be: computers meet classroom; classroom wins" (Cuban & Tyack, 1998, p. 126). Cuban and Tyack are critical of the rhetoric concerning the implementation of technology in school and education and point to the discrepancy between the arenas of formulation and realisation in this field. On this backdrop, there is reason to believe that despite government's good intentions, the "ICT pedagogy" is more strongly anchored rhetorically than in practice. Essentially teachers are actually are doing what they have always done and traditional teaching methods and technology-free learning environments are dominant. This situation also has epistemological implications and Brown, Collins, and Duguid (1989) argue that much common educational practice is the victim of an inadequate epistemology:

> A new epistemology might hold the key to a dramatic improvement in learning and a completely new perspective on education (...) It is, however, already possible to begin serious reappraisal of the assumptions about learning that underlie current classroom practice (Brown et al., 1989, p. 13).

This has gained momentum in our contemporary society where digitalisation and the Internet are changing the underlying premises for the subjects. In the new educational reform, *The Knowledge Promotion*, we find some dawning examples of this issue. For example, in the subject of Norwegian (primary school, 5–7 stage), one of the aims for subject content is to let the students work up digital texts and discuss the consequences of such a writing process. Implicit in these aims is the acknowledgement that we relate to digital texts written in e.g., word in a different way from the way we write with pen and paper. We can move and transform the text, include hyperlinks, videos and pictures to visualise our text and our thoughts. These processes give a non-lineistic character and create new entry points for both the student and the texts. This is an emerging example of the fact that the underlying premises for the subject of Norwegian are changing, because the basic cultural technique for writing transforms the writing process. We find such examples throughout the whole curriculum in the new educational reform, and there is a special focus on how the school can utilise the Internet for educational purposes.

Paul Gilster describes the Internet as the great paradigm shift beyond traditional media and states that if the core competency of the use of the Internet is critical thinking, to understand its online application we must move beyond the concepts that we have been taught to apply to other media (Gilster, 1997). Lankshear (2003, p. 167) underlines the fact that this information technology revolution gives a time of upheaval for epistemologies and states that: "(...) it is concluded that conventional epistemologies face serious challenges. These challenges in turn have far-reaching implications for contemporary educational practice and education." Paavola, Lipponen, and Hakkarainen (2002) support this and (with background in Sfard, 1998, metaphors) underline the need to develop new metaphors for

knowledge and learning in this new, pedagogical terrain. We therefore need to develop a *digital epistemology* to understand this development, to capture the changes and assess how they influence schools and learning.

3 New digital areas—Time of upheaval?

Even if Cuban and Tyack have a critical perspective on the implementation of technology in school, they also recognise factors that distinguish the computer from other technological artefacts: "Computers are far the most powerful teaching and learning machines to enter the classroom. Students and teachers can interact with computers in ways impossible with film, radio, and television" (Cuban & Tyack, 1998, p. 126). In Norway, Søby and Rasmussen (1993), Dale (1996), Erstad (1998), Østerud (1998, 1999) and Grepperud (1999), among others, have asked whether it is possible to weave together pedagogy and ICT in order to create new digital fields in school and education. This has become increasingly relevant over the last four or five years as the new, digital technology (broadband, Internet, World Wide Web) has had a relatively huge impact on society, with an increasingly improved infrastructure and technological density. A whole gamut of new net-based teaching resources, portals, ultra-fast search engines, multimedia and interactive teaching platforms (Learning Management Systems) together with the general digitalisation of daily life exemplifies this development. Lower-secondary school students are in many respects *internauts* and are digitally self-confident in this new online, digital "landscape". They are more comfortable with the innovation of the Internet than their parents' generation (Tapscott, 1998). They write, they search, they construct knowledge, they communicate, they play, they find digital teaching aids, they try out identities, and they make films. As a result of the technological convergence they have an arsenal of teaching tools available at the click of a mouse, which provides a completely different basis than a decade ago when the PC was unknown in school and the textbook had hegemony. The digital format and the Internet are an important part of their contemporary culture, but this is often associated with entertainment and leisure activities, and to a lesser degree related to knowledge and formal learning. Our contemporary culture has consequently an ambivalent attitude to the new, converging media. However, according to Drotner (2001) we should acknowledge children's and youth's rights in this area. Drotner points to the United Nations Child Convention from 1989. Under Section 13 it is written:

> The child shall have the right to freedom of expression; this right shall include freedom to seek, receive and impart information and ideas of all kinds, regardless of frontiers, either orally, in writing or in print, in the form of art, or through any other media of the child's choice (United Nations, 1989).

This means that children and youth should be able to employ the cultural techniques and media the society and school can offer at any time. In our democratic and high-tech welfare society this is a premise for being an *e-citizen*. Løvlie (2003) talks about a techno-cultural *bildung* (*digital dannelse*) which is based on a more holistic understanding about how children and youth learn, as well as how they develop their identity. For today's screenagers in the network society, media and technology are important "construction-stones" in their "bildung-journey". From a culture-pessimist perspective this gives rise to concern for a *loss of presence* and a growing *anaemia of society* (Negt, 1985). However, Luhman (2000) does not support this concern and claims that it has to be considered as an evolutionary process of society, where the presence is challenged by new streams. These new streams consist of a kind of *bildung* which Qvortrup (1998) describes as *administration of hypercomplexity*. This, of course impacts

the development of a new learning environment in school and education. The techno-cultural "bildung-journey" and the abundance of technological methods available for the youngsters has consequences for the schools' activity-system, even if many teachers have witnessed the difficulties of weaving the technology constructively in their practice field. In many ways the school's *context* has changed radically over the last decade, but at the same time we can see that the school fumbles in its response to this development, and remains static and protected against technology, even if the students "bathe" in technology in their leisure-time. Not only do they gain the skills to use a special kind of technology, they also acquire a more general digital literacy that takes into account the increasing development in this area. However, it is legitimate to ask whether the screenagers digital competency also includes pitfalls like the "cut and paste" phenomenon, which undermine some of the foundations of the learning processes. From the Norwegian PILOT project (Krumsvik, 2005a) it is interesting to note that this problem seems to fade in parallel with the increase in teachers' digital confidence. It is also important to bear in mind that if students "cut and paste" from the Internet this should not always be seen as a pitfall in the learning process. A new, Norwegian doctoral thesis documents this issue (Rasmussen, 2005) and shows that for certain student groups there appear to be constructive entry-points in learning processes. These new developments challenge us pedagogically and also involve new forms of communication between students and teachers, with the use of electronic-mail (e-mail), Short Message Service (SMS) and online chat (chat) even after school-time. While individual teachers have entered this "online-existence", there are no structures in the schools which reflect this new teacher role. The lack of structures for this new pedagogical terrain can (interestingly enough) give a "bottom up" situation, where students' everyday use of ICT necessitates new remedial actions from the school which is witnessing this development.

However, Drotner (2001) warns against the possible hazards if we overestimate the value of youngsters' "online-existence" and digital competence in a pedagogical setting. She suggests that if children and youth are used as truth-witnesses for technology use in school, we may get a situation where *Big Brother* and *Playstation* are legitimised in schools. This form of solidarity with the informants, or in some cases the students, (anthropologist Geertz, 1988) termed *ethnographic ventriloquism*, often results in a sympathetic, inside-out-description, in which one can rapidly become house-blind. Therefore, one has to be aware of this issue in different settings, but Drotner (2001) emphasises that the innovators in the technology arena, the youth, can give us new perspectives on how to utilise the technology. This is based on the fact that screenagers are digitally self-confident and utilise the technology in new ways that the software-producers have not anticipated. Not even Bordieus' (1994) term *cultural capital* or *symbolic capital* seems to capture the net generation's digital competence and "techno-cultural bildung" journey. This is based on the discrepancy between the elitist bildung-foundations in school and the counter culture among screenagers where mass media plays an important part of their "cultural capital". Schools premiere a special kind of cultural habitus, often based on traditional, scholastic thinking. Consequently, we know what kind of cultural capital counts in school and we should ask if school has to reconsider what common values and "cultural capital" it should be founded on. Screenagers cultural habitus and narratives have to be incorporated in such "re-thinking" of school in our contemporary society. Thus, one has to explore what this really means for our schools and educational systems and examine how curricula can incorporate such currents.

4 Digitalisation and the convergent technology

Digitalisation has led to a much easier distribution in several areas where digital format is superior to paper format. Young people have discovered the potential inherent in the digital

format and use the Internet as a publication channel to distribute texts, pictures, music, animations and films to a "real audience". In general more and more texts are being digitalised and "shovelled out" on the Internet, with resultant positive and negative effects. Castells expresses it thus: "So, overall, textbooks are going online" (Castells, 2001, p. 198). At the same time he claims that in regard to books in general: "(...) does not seem that demand is fading (...)—after all, it is a very user-friendly and portable device" (Castells, 2001, p. 199). The continuous escalating of "bytes" (the digitally) compared to "atoms" (e.g., books) is linked with the fact that technology is becoming easier to use, we use it more than before, it goes faster, it is (often) more updated and it is more eco-friendly. The increasing use of hyperlinks, animations and videos in digital text-documents is a leap from the paper-based text documents, and gives several new opportunities for the writer to illustrate and for the reader's perception of the text. Many are critical of all the information that is "shovelled out" on the Internet, (described by many as garbage), and question what it actually contributes to pedagogical practice in school. Others ask critical questions about whether a digital textbook on the Internet is progress when it has the same structure as a traditional textbook. In general, the web has been held in low esteem in education and academic contexts since its "birth", in the beginning of 1990s (Castells, 2001).

Another dilemma is raised by Eriksen (1998) who states that digitalisation and the Internet have considerably shortened the "life-length" of books in our contemporary society. At the same time there has emerged a new "symbiotic" relationship between books and the Internet and books have increasingly become dependent on the Internet as a marketing and distribution channel (e.g., www.Amazon.com). We can see similar trends in the music industry, where the law of intellectual work for Internet distribution of music (MP3-format) is accepted among the artists. This increasingly alters people's consumption patterns. There is good reason to believe that it is just a matter of time before we will experience the same tendency with books in general. Within scientific journals this is (more or less) already established practice. This new stream has created new paths and new terrain for both producers and consumers, and even if the printed textbook still seems robust in an educational context one can see an emerging transformation of this "terrain", which will increasingly influence school and education. Gilster (1997) points out the complementary potential in this process. He suggests that the digital networking supports and extends the power of print rather than supplanting it. Gilster concludes that the two technologies intertwine like DNA strands, the double helix of the twentyfirst century's intellectual revival (Gilster, 1997).

What other traits characterise the Internet and distinguish it from traditional software and learning resources? The Internet tones down the distance dimension and we can no longer equate the geographically distant and the unknown. Rural parts of Norway (which has suffered throughout decades from such rhetoric) has increased its accessibility to information and knowledge through the digital format and Internet. Today it is no longer a future scenario to participate in online, synchronic, video-conference seminars where e.g., the lecturer is situated in the city of Bergen, while the participants are hundreds of miles both from Bergen and each other. A legitimate question is: where does this seminar take place? In Bergen? At the participants' different locations? We are facing a situation where we have to reconsider our perception and attitudes in regard to time and place, as well as access to information and knowledge. Thus, the Internet contributes to globalisation and under Norwegian conditions we may say that the Internet has a democratic and district-friendly potential where the growth of "the global in the local" increases continuously. Nørretranders (1997) expressed the view that the Internet is the counterpart of the personal presence and can be described as *personal absentness*. In many ways he claims that the

Internet can be regarded as the most important transitional force in our culture (Nørretranders, 1997) and, for example, for many youngsters in rural parts of Norway, the Internet has become an important, new trajectory, "a window to the world", based on personal absentness. There is justification in the claim that the value of personal absentness, paradoxically, has increased communication between Norwegian youngsters of today. Their "online-existence" with a dense use of text-messages, chat, Skype, e-mail and weblogs gives quite new forms for communication and a reason to re-consider the (overestimated?) value of face-to-face interaction in our contemporary culture.

However, Luhmann (2000) asks how we can participate in society when we are physically absent? How can we contribute to societal evolution without being in an interactional system, which requires synchronic participation both in time and space? The fact that these complex questions have greater impact under Norwegian conditions is because of our relatively minor digital divides and a technology-density which is among the highest in the world. According to Castells: "In terms of density of use of the Internet, Scandinavia, North America, Australia, (...) South Korea, came clearly above all other countries" (Castells, 2001, p. 209). This means that most of our youngsters become well-acquainted with the technology through their leisure time at home, in school, in the library and through society in general. Today's students are in possession of an important *cultural technique* (Andresen, 1999) that schools so far have neither "welcomed" nor considered worthwhile. The question is how can schools can learn to utilise this potential? How can schools utilise and challenge their digital competence for the benefit of the learners? These are complex questions we must answer because we find ourselves at an educational crossroad where the new, Norwegian educational reform, *The Knowledge Promotion* (MER, 2004) demands schools and teachers should give digital literacy a high priority in all subjects. This implies that the teachers need to become digitally confident in order to understand how they can utilise their students' digital self-confidence in the processes of knowledge construction and learning. From the Norwegian PILOT project (Krumsvik, 2005a) we found that one of the main acknowledgements that digital literacy must be achieved by teachers was Sarason's statement: "Educational change depends on what teachers do and think—it's as simple and as complex as that. It would be easy if we could legislate changes in thinking" (Sarason, 1971, p. 193). Therefore, the teachers have to see the added value of ICT if they are going to use it. Achieving this is a complex process, but pre-service training within digital literacy, action learning and teachers participating in a "apprenticeship-culture" in their everyday practice, seem to be necessary steps which would increase teachers' digital literacies and help them recognize the added value of ICT. There is also reason to claim that in order to incorporate digital literacy in an effective way, we might have to develop a new pedagogy, *The Third Way* (Østerud, 2004) or *Blended Learning,* where school, pedagogy and the evolving digital literacy among teachers and students captures these new trends. As Castells (2001, p. 259) expresses it: "The critical matter is to shift from learning to learning-to-learn, as most information is online, and what is required is the skill to decide what to look for, how to retrieve it, how to process it, and how to use it for the specific task that prompted the search for information." Tapscott (1998) shares this understanding and states that the *digital revolution* requires the ability to navigate in the information society. Implicit in this is the need to achieve the ability to collaborate, investigate, analyse and distribute to succeed as "digitally literate", students in school today. Erstad (2004a) and Kløvstad et al. (2005) thus argue that it is necessary to revitalise the term digital competence (or digital literacy) in school, decrease the skills focus and give it a broader content than it has traditionally enjoyed.

In this new pedagogical terrain the need to develop new forms of assessment which capture the escalating use of computers in school is obvious: "Increasing use of computers in schools has led to a misalignment between the way some students develop skills and how they are tested (...). Paper-based tests (...) require students to produce written responses [that] underestimate the achievement of students who are accustomed to writing on computer" (Russel, 2002, p. 1). The Apple Computer of Tomorrow (ACOT) study confirmed that students develop new competences with the use of the computer which traditional tests do not capture (Baker, Herman, & Gearhart, 1996). Fisher, Dwyer, and Yocam (1996, p. 5) also state that the use of computers among the students leads to a digital competence: "(...) not being captured by traditional assessment measures." Under Norwegian conditions this urgent need for new forms of assessment has (to a certain degree) been followed up by the Directorate of Education, which outlined (in 2003) a step by step escalation of ICT-based exams from spring 2004. The main aim of this escalation is to develop new forms of assessment and to increase the status of ICT in school. In this way it is almost impossible for the Norwegian school in contemporary society to avoid using ICT in their educational activity and teachers are more obligated to use ICT when it is tied to "steering-instruments" like forms of assessment. As a consequence of this development we found that some new Norwegian assessment initiatives (digital portfolios) have been uplifting (Petersen, 2004), and need to be explored and developed further to capture this new pedagogical terrain. However, despite the urgent need for new forms of assessment we see that the new Norwegian reforms in *Knowledge Promotion* (MER, 2004) are continuing with paper-based exams and textbooks as "steering-instruments". Norwegian debate around PISA, TIMMS, PIRLS and national tests seems to, paradoxically, result in supporting and preserving (and partly "electrifying") traditional forms of assessment. This "teach to the test" rhetoric has several problems, but the main problem within the area of ICT is captured by Angela McFarlane:

> I think computer-based tests can be useful but they have their place, and at the moment my worry is that we're going to miss the point by putting a lot of effort and resource into moving current paper-based tests onto the computer without really changing the assessment criteria and the assessment frameworks, which frankly won't get us any further forward (McFarlane, 2002, pp. 2–3).

These gaps between intention and reality result in several educational paradoxes and shows us how difficult it is to achieve governmental aims even though the technology is present.

5 ICT and curriculum—"Hand in hand"?

How can ICT become more than an "add-on" in the classrooms and what distinguishes today's efforts to implement technology in school from earlier efforts? Castells (1996) argues that both the digital revolution and the new millennium's emerging network society affect how we perceive time, space, interaction and knowledge. This can be observed through the escalation of digital format and the new Internet-based technology that has led to transformations in society in general. This has changed our society, but what kind of impact has this digital revolution had on schools? Darrow (1932) maintained the radio could "bring the world into the classroom" (Darrow, 1932 cited in Cuban, 1986, p. 19). Cuban demonstrates that this has not happened. The radio never gained a place in classrooms, even if the expectations at the time were quite high. Some of the same rhetoric is heard concerning the World Wide Web's potential impact in school, and the critics ask if

we are now "recirculating old trails". Others claim that the World Wide Web is a considerable technological leap away from radio's potential. Here the virtual and the real world are increasingly joined together (Drotner, 2001). Nevertheless, a common tendency in many earlier technological efforts was the dilemmas and technological problems ordinary teachers experienced when they were trying to use the technology. The question is: will transformations speed up when new and more user-friendly technology with a lower threshold is launched? Does the convergent and transparent technology shift the focus away from the technology issue to the pedagogy?

The convergence of technology and the interactive, flexible and network-engraved nature of today's ICT opens possibilities for access, manipulation, and production of information which surpass the objectives of the earlier software, educational system and curriculum which was created a decade ago (Lund, 2003). At the same time many experience these reforms and curriculums as ambiguous and, as Østerud (2001, p. 221) describes it: "(...) like the antique Janus figure the reform turns one face forward to the new millennium and one backwards to the industrial society which now, in increasing tempo, becomes replaced by the information society or network-society, as one also describes it." Østerud also problematises how this affects the teacher's role which has one foot in tradition and one foot in the new era: "Yes, even the information technology which has its starting point in line with the new millennium and the new society-formation, becomes at times mentioned as if it should be an effective instrument to preserve the established" (Østerud, 2001, p. 222). This technological ambiguity in curricula presents us with a situation where teachers adopt the "safe and well-known", instead of the "new and unknown". They become the "audience" and miss out on new possibilities for transforming the schools' pedagogy. Referring to the curriculum, Roschelle and Pea (1999, p. 23) say that: "Since these documents guide efforts to improve and reform schooling, it is very unlikely that technology can achieve a large-scale impact without tight coupling." We have seen this dilemma in Norway where (despite ICT becoming mandatory through the national action plan for ICT in the schools from 2002/2003 (MERCA, 1999) recent ICT-studies (Kløvstad et al., 2005) show limited subject use of ICT compared to its accessibility in school and society in general. One sees that the action plans and the rapid development and accessibility of technology create certain new possibilities for teachers, but these have to be clearly anchored in the curricula if they are to become institutionalised in schools.

In a way the network society opens new horizons where the local, national and global, distributed practice is woven together and challenges our perception of geographical distance, identity and culture. According to Lund (2003) we encounter a situation where new ontological[2] and epistemological aspects escalate and "disturb" well-established and institutionalised views of the core in education; knowledge, learning and instruction. In the ICT project PILOT (Krumsvik, 2006) one of the main findings was that the "screenagers" constructed knowledge in quite new ways in their "on-line" existence. This challenges our perception of epistemology. In many ways we can view this new "knowledge-formation" as a step further from acquiring knowledge only through textbooks and the teachers' voice in classrooms. However, it is still too early to state how such new knowledge construction can and should be implemented in the subjects. Can we expect any progress and change in this area when digital literacy has become mandatory and shall be integrated in all subjects in the new educational reform from autumn 2006? To illustrate the new dilemmas which

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[2] Ontology: "Ontology is the consideration of being: what is, what exists, what it means for something—or somebody—to be" (Packer & Goicoechea, 2000, p. 227).

emerge within this reform, one must first recognize that the new curriculum has relatively general aims of competence in the subjects and relatively large local freedom (25%) for schools' local curriculum activity. Nevertheless, it is reasonable to believe that the new textbooks developed for the reform will be given an even stronger position than normal, because they seem set to function as "guiding stars" for the teachers in the first years of the reform. This is understandable so early in the reform, but it presents a situation where the textbook (again) will be a "steering-instrument", and again poses the question of how digital literacy will be handled. In some subjects we find that some newly developed textbooks hardly mention the term digital literacy, and if they do, they refer to the publishers' own digital learning resources on the Internet (which are often poorly developed). This may give rise to a situation where digital literacy is accorded low priority in textbooks, even if the Government demands that digital literacy shall be included in all subjects in all stages in compulsory school (1–13). We may find that textbook authors and publishers steer some of the ICT use in school without highlighting digital literacy sufficiently (if this is intentional or not can be discussed, but it is conspicuous that they did not give digital literacy more attention when the Government demanded it so clearly in the new educational reform). This situation illustrates the need for textbook authors and publishers to give digital literacy higher priority and the need to develop solid, digital learning resources on the Net which can be a catalyst to avoid that textbook authors strengthen the low ICT use in school in a country with very high technology density. The first moves to alter this state of affairs is currently being debated in Norway. Teachers' organisations are demanding journals review not only new textbooks, but also new digital learning resources which are being developed for the new educational reform. In this way digital learning resources can get more attention and increase their status versus textbooks.

Another issue with Norwegian textbooks is raised by Selander and Skjelbreid (2004), who mention that together with the fact that textbooks still have the hegemony in Norwegian schools and control much of the instruction in the classrooms, they are also characterised by a conservatism that entails canonical texts and a canonical view of knowledge. As Haavelsrud notes:

> (...) cultural literacy does not provide enough attention to the daily culture of youth and different ethnic cultures in comparison to the established and static culture that has already been institutionalized (Haavelsrud, 1997, p. 251).

According to Østerud (2004), such cultural literacy (or cultural canon) is preserving the established in school and the strong position of the textbooks becomes an obstacle to the curriculum's emphasis on project work and the use of new technology in the subjects. While the digital learning resource Wikipedia manages to (in a certain way) incorporate the daily culture of youth and different ethnic cultures, it is not a part of this cultural canon in the schools of today, even if screenagers are using it almost around the clock to construct knowledge. Consequently, we can justifiably assert that, in the school, the PC is still perceived as an external technology while the textbook is an integrated part of the culture. Recent studies in Norwegian schools (Erstad, 2004b; Kløvstad & Kristiansen, 2004; Kløvstad et al., 2005) confirm this and show that the use of ICT in the subjects is limited, the skills aspect has the strongest focus, and the view of technology is often instrumental. A important reason for this situation seems to be the fact that Norway is still dominated by and favours paper and pencil exams, which undermine some of the main intentions of the government's reforms.

On this backdrop one can observe that the new educational reform, action plans, a more transparent technology and new digital learning resources create new possibilities for teachers, but have to be more explicitly anchored in textbooks and local curricula if ICT is

to be institutionalised in schools. In this way we might avoid textbooks becoming a "steering-instrument" for educational technofobia in the new reform.

6 Digital challenges for teachers

In the network society it is necessary to become digitally self-confident in order to participate in society in general as well as in school. Technology is becoming increasingly seamlessly integrated in the way we communicate and transparent in our practices. Consequently our traditional perception of communication has changed and the net-generation (Tapscott, 1998) is in many respects the innovator in this area. This communication transformation has its benefits and disadvantages, and opens new pedagogical terrain for the teachers. It is therefore reasonable to claim that this challenges the teacher in many ways. In the network society the teacher faces an increasing complexity very much in contrast with the situation only a decade ago when the World Wide Web was in its infancy. The Norwegian teachers of today have to deal with the fact that digital literacy has become mandatory in all subjects, the distance between the subjects in the formal school setting and "the real world" is decreasing and new trajectories are emerging. At the same time, the textbook hegemony is crumbling, the underlying premises for the subjects are changing and the subjects are expanding their knowledge foundations. This is not problematic and it is necessarily a common development if the technology density gives educational possibilities. The teachers' perception of the Internet's contribution to education varies widely and can be described as a "Rorschach-test of educational philosophy" (Resnick & Rusk, 1996). According to Resnick and Rusk (1996, p. 11) there are three main groups of teachers according to their instructional and educational philosophy: The first group "(...) sees education as instruction: If we could just "deliver" better instruction, we would have better education. The second and third are more "learner centered", based on the belief that people actively construct knowledge from their experiences and explorations." Resnick and Rusk (1996) point to epistemological and ontological aspects which, in many ways, reflect how differently the Internet is perceived among teachers and what its contributions to educational purposes might be. They are specially preoccupied with the third group which: "(...) puts a special emphasis on design and construction activities, based on the belief that people construct knowledge with particular effectiveness when they are actively engaged in constructing meaningful artifacts" (Resnick & Rusk, 1996, p. 12). Even if one believes that the Internet has this potential, one still encounters several challenges and dilemmas when one gets closer to the concrete use of Internet technology for educational purposes. Several questions emerge, such as: *Can one believe what one sees?*, *Is the web-page cited today gone tomorrow?* and *Are net-encyclopaedias as reliable as paper-format-encyclopaedias?* They all show a discrepancy between intentions and reality and illustrate we are in many ways still in the infancy of the instructional use of Internet in school. The dilemma the teacher faces is obvious: when net-portals, net-encyclopaedia, net-dictionaries are a mouse-click away for the students, why should students bother with borrowing (often old) encyclopaedias and dictionaries from the library (if they are not on loan?). The teacher also faces the dilemma between free, open-source, easy accessible encyclopaedias as Wikipedia (with its limited quality assurance) versus high-cost, paper-based *Store Norske Leksikon* [The Great Norwegian Encyclopaedia] and *Encyclopaedia Britannica* (which have high quality assurance). At the same time this terrain seems to be shifting, because in *Nature* an expert-led investigation with peer review of the coverage of science in Internet encyclopaedias, revealed that Wikipedia came close to Britannica in terms of accuracy

(Nature, 2005). This might change our perception of free encyclopaedias and how we can utilise such learning resources in school and to, for example, decrease digital divides.

Another issue will occur when all the paper-based encyclopaedias go (in full-version) online: should we value knowledge written on paper more favourably than the same words of knowledge in digital format on the net? These dilemmas give rise to a situation where actually: "Very few web resources are indexed to curricula, state frameworks or national standards" (Roschelle & Pea, 1999, p. 23), and are therefore not considered as valuable as paper-based textbooks, encyclopaedias, dictionaries. This is interesting in light of some of the findings from PILOT (Krumsvik, 2005b) where ordinary teachers developed their own digital subject portals on the Internet and included them in the syllabus. This helped transform the organisational structure of their school and markedly increased the status of digital learning resources. A "side-effect" of this school development process seems to be the fact that digital articles and texts on the Internet experienced a longer "life-span" than paper-based articles handed out in classrooms. Seven years after the teachers developed these subject portals, the same texts and articles have been updated and are still on the syllabus, while the paper-based articles are history. This has changed the teachers' perceptions of digital format versus paper format, especially the fact that the digital format can be accessed "anywhere and anytime" from the students' PCs and also that it enjoys a longer life-span because of the possibilities of storing and updating the texts. In relation to such aspects we might interpret the digital format as superior to the paper based format.

Therefore, the Internet's "Rorschach-test", the distinction between "atoms" (books) and "bytes" (digital learning resources) challenges us (Lankshear, 2003), and becomes continually revived; it enforces both pedagogical debates about educational philosophy in the network society, as well as the need for a broader digital literacy among teachers, teacher educators and students to capture these challenges and dilemmas. The first step in this new pedagogical terrain is to admit that the Internet is a considerable leap from traditional software and, Castells as states: "(...) the Internet (...) is not just a technology. It is the technological tool and organisational form that distributes information power, knowledge generation, and networking capacity in all realms of activity" (Castells, 2001, p. 269). Consequently, educators need to be aware of this distinction and aware of the digital revolution's powerful convergence of traditional media. The impact of technology will, in many ways, herald a time of upheaval in school and teacher education.

7 Summary

This paper has highlighted some of the possibilities, challenges and dilemmas which have emerged in the new digital terrain. In the first part I have pointed to the gap between the intentions and the reality within this area. In the second part I have highlighted the need for a new digital epistemology in school and education. The third part has focused on the need for a "third way" within pedagogy. In the fourth part I have drawn attention to the new educational reform in Norway and the increased status (and problems) for digital literacy. The fifth part has detailed the challenges for the role of the teacher and how the digital format has influenced the traditional role in particular. In the following and last part of the paper I make some concluding remarks.

8 Conclusion

This paper has detailed a perspective on how the digital revolution affects teacher educators, teachers and schools in contemporary Norwegian society. The main focus has

been centered around the question: *How does the digital revolution affect school and teacher education in our contemporary Norwegian society?* In this last section I summarise the paper and highlight some of the main challenges.

First, the paper has discussed why implementation of ICT only succeeds when the school organisation is able to restructure itself, and doesn't just overlay ICT on the old organisational structure. At the same time it is claimed that it is not sufficient to integrate ICT in such a process of alteration if one wants to achieve breakthrough innovation in school organisation. Other structural changes must be implemented simultaneously with the introduction of the technology and, to achieve this, it is important that both school leaders and teachers are the driving forces in these innovation processes and are able to transform a well intentioned project into a successful operation within the organisation, and to see it institutionalised.

One can also observe the importance of the impact of Internet resources impact on the institutional structure of the school. Digital artefacts have previously been considered as "just a tool", but once they are ascribed a higher authority in school (in the syllabus or as part of exams), they can contribute to the solution of digital challenges. This is a frequently encountered challenge for using the web in education. Digital artefacts have to be integrated into the school's structure if teachers and students are going to make use of them (Roschelle & Pea, 1999). It is also worth noting that web resources can be used as new methodological gateways by both teachers and students, and when in tune with local needs and screenagers "online-existence", they appear to have their strengths where traditional textbooks fall short (Krumsvik, 2006). There is no doubt that Norwegian students are digitally self-confident and motivated in the new pedagogical terrain, but at the same time, are dependent on digitally self-confident teachers and new assessment-frameworks if they are to avoid well-known pitfalls in technology-rich learning environments.

The paper also explains that the students' seamless, "online-existence", opens new educational possibilities which, to date, have received little attention or use in subject areas (web-blogging, high chat use, SMS, IP-telephone communication, PDAs, GPS-devices). This can be interpreted in light of Beck's (1992) term *subpolitisation*, where screenagers engage in issues which are tied to their lifeworld (including political issues). In particular, web-blogging seems have a interesting potential within digital literacy which schools must explore and incorporate as part of their curriculum and subject use of ICT.

With this backdrop I claim that one can consequently see the contours of a situation where the more technology is tied to the curriculum, the syllabus and forms of assessment, the better the structural impact on school organisation and the revitalisation of the role of the teacher.

Second, the paper examines whether we are facing up to the epistemological challenges in our contemporary educational system. From the history of our schools we know there has been a relationship between what we consider to be knowledge, and the means and methods by which this knowledge has been gathered, assessed and passed on through an educational system. The educational system has been built upon the premise that information has been restricted in terms of access (with distribution through teachers and textbooks). In this paper I argue that these premises are now being challenged in our contemporary society. A high technology density in Norwegian society combined with screenagers "online" existence and growing digital literacy, increasingly challenges the school's hegemony as the main "knowledge-arena" in society. Consequently, the digital revolution and the Internet force a re-conceptualisation of the core questions in learning and teaching: the what, the how and the why. I suggest that one can see the contours of new ontological and epistemological

aspects emerging which disturb well-established discourses on education, knowledge, curriculum, learning and teaching. Through new technology (the digital format and the Internet) the epistemological perception of "what knowledge is" and of knowledge construction has changed. To a certain degree we see the contours of learning as increasingly grounded in a social ontology, based on these emerging trajectories in the network society. The schools (and teacher education) has to incorporate these new trajectories, include this newly developed, broader, digital literacy (MER, 2005), and consider it as an important part of the screenagers' cultural habitus in the network society. If the school rejects the technology and neglects utilisation of the students' digital self-confidence we may find that (put to the extreme) "out-of-school" learning becomes a more important learning context than school. However, this emerging, digital epistemological and ontological development creates several dilemmas, challenges and problems which show that the area is still in its "infancy".

In conclusion, I propose that some of the digital challenges of the school can be solved by upgrading technology facilities to achieve the ambitious ICT visions in the new educational reform. At the same time schools have to make structural changes, through locally anchored strategies, with both the school management and teachers acting as "driving forces". As Cuban and Tyack say: "(...) whether teachers will embrace this new technology depends in good part on the ability of technologically minded reformers to understand the realities of the classroom and to enlist teachers as collaborators rather than regarding them as obstacles to progress" (Cuban & Tyack, 1998, p. 126). In this way the policy-makers, politicians, reseachers and school leaders have to consider the factor which is probably the most important in our contemporary, ICT-implementation: *the teacher*. They have to give him/her the necessary digital literacy to actually experience where the technology gives added value and where it is redundant. This can be constructive in achieving the mandatory ICT use in school in general and will help incorporate the mandatory digital literacy in all subjects. Such development can alter how "teachers teach and learners learn" in our contemporary society, instead of participating in the general rhetoric around the technology's excellence or the exaggerated scepticism. When ICT-use is not founded on technology discourses from the past but on more thoroughly "hands-on" experiences and new knowledge within this field, it is reasonable to believe that the digital revolution will affect school and teacher education positively in contemporary Norwegian society.

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