Educational technology, epistemology and discourses in curricula in Norway*

Rune Krumsvik

(Department of Education and Health Promotion, Faculty of Psychology, University of Bergen, Bergen 5020, Norway)

Abstract: Why is Norway, the first nation in the world defining digital literacy, as the fifth basic competence in the national curriculum? How has epistemological and ontological issues influenced educational technology and how has this influenced discourse of educational technology in curricula which have led to today's "technology friendly curriculum"? These are central questions in this paper and one of the main aims within the paper is to analyze what kind of impacts, such underlying epistemological and ontological aspect, has been given in Norwegian curricula throughout the last decades in light of Koschmann's (1996) technological paradigms. As consequence of this, the paper will highlight the most relevant discourses about educational technology in different curricula as an entry point to ask, if the increased ICT (Information and Communication Technology) status in the new national curriculum has established new discourses and got any impact in the practice field yet.

Key words: educational technology; epistemology; discourses

1. Introduction

Norway implemented a new national curriculum in 2006, which increased the status of digital literacy to be the fifth basic competence in the Norwegian elementary school (stage 1-13). This was an historic event and never before has digital literacy achieved such status in curricula, neither nationally nor internationally. The relatively strong focus on the use of educational technology in this new national gives both a lot of new possibilities, but also challenges for schools, teachers and pupils in today's digitized society and school. This has contributed to debates around, e.g. how teachers shall implement ICT in the subjects, when the majority is digital illiterate and the pupils are digital confident. And do we need to expand the view of knowledge in today's digitized school when "everything is online"? A lot of other questions are also debated around this issue, but one question that is seldom asked in today's ICT-debate in Norway is: What then, about the actual technology's epistemological and ontological implications? This is often a under communicated area and in many ways this paper puts focus on such questions that the educational system have faced, and are facing, through the decades. In many ways, one might ask if this underlying epistemology within educational technology has established discourses about the technology in education and curricula, which very often are not debated within policy making, teacher education and schools. One of these discourse-challenges is the lack of theoretical foundations of the educational technology, which can be said to be a "missing link" in the technology driven development of educational technology throughout the years. For example, as Issrof and Scanlon (2002) point out: We only find reference to one theory in

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Rune Krumsvik, Ph.D. Philos., associate professor of Department of Education and Health Promotion, Faculty of Psychology, University of Bergen; research fields: ICT, digital literacy and learning.

the 1996 version of *Handbook of Educational Technology* and makes it relevant to ask if this is a ignored area within the area of ICT and educational technology. This technology-determinism might have influenced both the discourses of technology within education as well as the underlying epistemology. On the other hand, we know that educational theories have invariably influenced the development of educational technology and therefore this paper will first have a look at this in relation to different technological "paradigms" and follow this up with the discourse about the technology in the Norwegian educational system throughout the last decades. The paper is therefore focused around two problems: Can we see any relationship between the general epistemological and ontological trends in relation to the educational technology in different eras and in relation to today's digitized society? How is this reflected in the educational discourse and in curricula in Norway throughout the years?

2. The development of technology-paradigms within education

Koschmann (1996) has tried to draw some lines in this area, and here we note the span from early empiricist-characterised/behaviourist perspectives such as Computer Assisted Instruction (CAI), to today's sociohistorical/sociocultural perspective Computer Supported Collaborative Learning (CSCL) inspired by, among others, Leont'jev, Luria and Vygotsky. Perhaps surprisingly, Koschmann uses the paradigm-concept about these, and in connection with a discussion about paradigm shifts in science, he says, "…I argue that the shifts that have occurred in IT (Information Technology) were in fact driven by shifts in underlying psychological theories of learning and instruction" (Koschmann, 1996, p. 3). In this way, he connects the different "paradigms" with other epistemological and ontological positions in relation to (the previously mentioned) perspectives on knowledge and learning. These are interesting considerations, and in many regards, this is particularly interesting with respect to the new technology (the Internet and Web 2.0) which in many ways is a further "leap" from traditional software. Koschmann also claims that this has influenced the research perspectives within the area:

> …we are currently witnessing the emergence of a new paradigm in IT research; one that is based on different assumptions about the nature of learning and one that incorporates a new set of research practices.
>
> (Koschmann, 1996, p. 10)

He implies that the growth of the sociocultural perspective in the 1980s and 1990s has established a new paradigm within IT research. Many will probably say that Timothy Koschmann is quite bold when he asserts that research on IT and learning has undergone a paradigm shift. Most will agree that the research has shifted focus (and incorporated a broader view of knowledge and methodology), but fewer will probably assert that the last paradigm (refers to CSCL) completely replaces the previous research approaches on IT. Koschmann is aware that he is not using the concept paradigm quite in line with Thomas Kuhn (1962):

> Whereas it is quite true that instructional technology, as a field of study, is different in many respects from the scientific disciplines described by Kuhn, this does not mean that it could not be productively studied by the same means…Conducting a Kuhnian analysis of IT is an instructive exercise, requiring a re-examination of the theories that have motivated work in the field and the practices by which technological innovation are designed and evaluated.
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> (Koschmann, 1996, p. 3)

In the analysis of the research on IT and the learner, Koschmann raises four fundamental questions that question the assumptions that form the basis for the research on IT and learning. First, Koschmann is interested in what kind of epistemological foundation the paradigm rests on, and more specifically, on which theory (theories) about learning the paradigm stands. Koschmann's second question concerns the educational theories on which the

paradigm is based, and particularly how the educational theories relate to the use of IT in learning situations. Third, Koschmann is interested in the methodology applied by scientists within the paradigm: what is considered to support a hypothesis and what methods are being used. The fourth and final question he raises is what kind of research questions are accepted within the paradigm. These questions have certain epistemological and ontological characteristics and in many ways, he sets focus on areas that have been neglected by technology implementators in the school.

Koschmann is concerned with “going beyond” the applications that are used in order to understand their basis and purpose. “By focusing exclusively on the functional nature of the application, opportunities to consider other aspects of the work—such as theories of learning that motivated in the first place—are missed” (Koschmann, 1996, p. 17). This is a relevant criticism of much of the software that has been used in the school both nationally and internationally, and Koschmann has challenged the discourse of IT in education.

Koschmann finds that even if the first paradigm, Computer Assisted Instruction (CAI) is meant for education and is developed by people with background in teaching, these instructional tools are dominated by a view of learning where passive acquisition of formal knowledge prevailed. This epistemology reflected the period (1960s) when the instructional tools are developed in, where the empirists’ view of knowledge is dominating in educational settings.

The next instructional paradigm is the Intelligent Tutoring System (ITS, from the early 1970s), which has a clear similarity with the CAI-paradigm, and is influenced by Artificial Intelligence (AI) and Information Processing Theory. ITS has a strong focus on providing every student with a personal, machine-based tutor, with the assumption that this can support the students in the same way as a teacher can (in one-to-one tutoring). It supports a view of teaching as a delivery and a transmission model of instruction, and is grounded in a rationalist perspective. However, even if CAI has behaviouristic traits and ITS has cognitive-traits, they both have a similar epistemological standing-point (Koschmann, 1996).

The third paradigm, Logo-as Latin (1980s), has clear anchoring in constructivism and is based on Piaget’s theory of learning. Seymour Papert (1980) is a central premise provider for this paradigm and claims that the computer as “tutee” could allow the learner to assume the role of a teacher and “teach” the computer (Koschmann, 1996). This paradigm is based on a rationalist epistemology where acquisition of knowledge is central and “...adopts the view of mind as a phenomenon residing within the head of the individual” (Koschmann, 1996, p. 10).

The fourth and last paradigm, Computer Supported Collaborative Learning (CSCL) is influenced by the sociocultural perspective on learning (and developed in the late 1980s). Specially, Brown’s, Collin’s and Diguid’s (1989) contribution concerning the situated learning approach is an important preliminary for the development of CSCL. Koschmann states that CSCL’s specially grounded on social constructisim, Soviet Sociocultural Theories and theories of situated cognition, where the individual, artefacts and context mutually constitute each other (Koschmann, 1996; Paavola, Lipponen & Hakkarainen, 2002). It relies heavily on the participation-metaphor view of knowledge, where the ontology is an important part of the epistemological considerations. The applications designed within this paradigm have a much broader perspective than the previous one: “Applications have been designed within the classroom, to connect users across classrooms and in some cases to create “virtual classrooms” (Koschmann, 1996, p. 14). Littleton and Hakkinen (1999) mention that CSCL also has influenced the research methodologies and data interpretation in this area, where the importance of the cultural context has to be considered together with the educational technology.

If one compares Koschmann typology with previous attempts (e.g. Taylor, 1980), there is no doubt that Koschmann offers a very important contribution to this area of instructional "paradigm-shifts". He also takes some reservations, which seem to be important to consider when evaluating this area. However, even though Koschmann has certain reservations, Søby (2000) believes that it seems as though he ascribes underlying theories about both software and education exaggerated power. One might interpret this in regard to the fact that context and the teacher's pedagogical "credo" are often crucial to the way the technology is used and exploited, even if it is designed for special purposes. We can observe this in today's classrooms, where e.g. Excel-applications are used both in "restorative classrooms" (calculating teacher-given assignments) as well as in "progressive classrooms" (e.g. students illustrating their findings in project-work).

In Koschmann's reasoning about how the last paradigm (CSCL) is anchored and socially constructed, Søby (2000) believes that Koschmann's view of Information Technology tends towards the instrumental. He largely uses the metaphor *tools* as an external tool that is used in learning situations. In this way, he somewhat distances himself (in this area) from a number of positions within the sociocultural perspective emphasizing the mediating artefacts as something more than simply an external tool. However, Koschmann uses other descriptions as well (technologies, software, etc.), and if one considers this in light of what he claims elsewhere about CSCL, one might oppose such a critique. One can also interpret his use of *tools* and *IT* and his view of software, as a product of the period (the early 1990s) in which he expressed this. This was before the digital revolution, broadband, and the Internet had a heavy impact on the school and the educational system, when the rhetoric and terms around the technology was different (compared to a decade later). We can thus regard Koschmann's typology as important correctives that have contributed to the debate and discussion on epistemological and ontological aspects of the use of technology in the school.

Lankshear (2003) puts some of Koschman's thoughts in a perspective that more concerns the new technology of education (digitalisation, broadband, the Internet) today which relies on CSCL, but takes a step further and considers the digital revolution's impact on epistemology and ontology in the new millennium. What makes this issue interesting in this paper is that we see that the growth of new digital, multimedia, and Internet-based technology influences general assumptions of epistemology and ontology. Lankshear has studied this and shows how the new technology challenges our perceptions about what *knowing* is in the digital age. He further asserts that this *digitisation of daily life influences*, and will influence, how we think about education and school. He divides this in four dimensions and first mentions *changes in the world around us* (object and phenomena) that are related to digitisation. He asserts that the transition from "atoms" (e.g., knowledge stored in a book) to "bytes" (e.g., knowledge stored in a laptop computer, the Internet, etc.) raises epistemological questions (Lankshear, 2003). Lankshear also mentions a dimension which is associated with changes in conceptions of knowledge and processes of "coming to know" (Lankshear, 2003, p. 170). This is associated with the phenomenon that in digital networks, there is a distinction between knowing in virtual settings in relation to nature. This has epistemological consequences and Lankshear believes that we should always ask ourselves if one can believe what ones see in such digital, Internet-based learning environments. Lankshear also talks about "changes in the constitution of 'knowers'" (Lankshear, 2003, p. 175), and how we move from the individual to the collective in increasingly more areas in school contexts as well. And "changes in the relative significance of, and balance among different modes of knowing" (Lankshear, 2003, p. 177) deals with the digital epistemological challenges. Here, Lankshear asserts that *propositional knowledge* and *procedural knowledge* are complementary and can make the school less scholastic and decontextualised in this new pedagogical terrain. He mentions that we may talk about a new

performance epistemology where knowing as an ability to perform is in the centre, and can be related to Wittgenstein's *I know how to go on* (Lankshear, 2003). Based on this, he believes that we must always evaluate and revaluate our epistemological and ontological considerations. Lankshear also discusses how these epistemological and ontological considerations characterise our theoretical point of view. Lankshear's contribution to this area is important, but at the same time it shows that we are still in the "infancy" of the area. Therefore, I will claim that there is an urgent need to consider Lankshear's thoughts in light of new empirical findings from the field of practice in school.

As a summary, one can interpret the development of educational technology and a digital epistemology as a process which continuously creates cyclic movements, to improve our understanding of this area. It seems reasonable to consider that today's perception of educational technology where the cultural context is highlighted gives important contributions to explore and understand this area. But even if this view claims that certain features will have an impact on knowledge and learning, we still do not know more concrete what that impact is for student's learning-effect.

Therefore, it seems important to explore and examine this area further to capture how educational technology influences the learning process in school under a growing, digital epistemology. In the next part, I will consider how the technology-discourse in school stands in relation to epistemology and ontology in different eras in the Norwegian secondary school.

3. The discourse of technology in the Norwegian school

How do these epistemological and ontological considerations have consequences for the school, teachers, and students? Lund (2003) asserts that the alteration of our perspective of the child, from being a family member to being a student in the school has ontological implications. They learn both the school's and the classroom's explicit and implicit rules and norms, and they learn another discourse, abstraction, and collaboration. But in the age of digital revolution, we see that we constantly meet new challenges in relation to epistemology and ontology that we did not experience earlier. This creates an area of tension between "the new and the old" in the society. For example, is it educationally correct that the children of today should learn to write with pencils and not keyboard and word processing (Søby, 2000)? We can observe that the net-generation (Tapscott, 1998) and screenager's grows up with the technology as a natural factor in their human development. This makes them digitally self-confident from early ages, which challenge our traditional notion, well-established pedagogical conventions of, e.g., how we learn to write and read.

The basis for this established educational theory and practice lies in oral and written culture. In many ways writing and reading books can be considered as a form of technology. Cuban says, "When I refer to 'old technologies', I mean textbooks, blackboards, overhead projectors, television, and videocassettes" (2001, p. 12). Søby (2000) notes that there is a close connection between enlightenment philosophy and typography technique. By looking at the book's print as "natural"—something that has lost its technical character—education has forgotten how the technique and the culture are woven together. The book is, in a way, the first mass-produced "learning machine" and still has a hegemony that does not easily allow it to be challenged by the digital revolution in school (Søby, 2000). Even if policy documents and new curricula demand teachers to use ICT in today's school, technology is still considered as something unnatural among the majority of teachers in school and is still considered as something external to school's pedagogy. Such discourses of technology in school have its roots in

former educational decades and are often attached to pedagogical trends within these decades.

How, then, can we understand this from a historical perspective here in Norway? In 1970s and throughout the 1980s, there was a politicized debate (the politisation of the pedagogy) about Norwegian education that had a pronounced criticism of positivism. In many ways, one can consider this debate as a polarisation between the progressive pedagogy[1] (left-winged) versus the restorative pedagogy[2] (right-winged). Progressive education, in particular, sprang forth as a counter-reaction to positivism and greatly influenced the view of the education system (with Helga Eng, previous mentioned, as a reform-pedagogic pioneer). Progressive education also had supported among the Norwegian philosophers, such as Hans Skjervheim and Jon Hellesnes. Inspired by these two, many educators during the 1970s criticized the instrumentalism of education, which they thought was inspired by a technocratic thought. What Hellesnes feared was an education system that was shaped according to a technocratic and education technology model. In such a society, the individual would be socialized to answer to the needs of leaders of industry and commerce (Østerud, 2004). In a way, Hellesnes (and partly the Danish Knud Illeris) represented a renewal of progressive education in Norway and had several followers within the educational environments. In the book *Sosialisering og Teknokrati* (Socialisation and Technocracy), Jon Hellesnes wrote, “In short, the educational technology promotes adaptation in an effective way” (1975, p. 27). He continues, “More controversial is that it insists on educational technology includes a philosophical interpretation of pedagogy, and that this interpretation is positivistic. However, this is my main proposition” *(*1975, p. 142). Hellesnes’ argument was relevant, but he was not equally fortunate in what kind of initiatives would remedy this. In *Sosialisering og Teknokrati*, Hellesnes legitimises a total rejection of what he calls technocratic education and educational technology. The debate of the 1970s was however marked by a weakly developed technology concept, and Østerud (1998) claims that Hellesnes has not contributed to any clarification of the concept. Even if he attempts to make a distinction (under Norwegian conditions) between educational technology and instructional technology. In many contexts, he consistently uses the expression education technology and continuously emphasizes the intimate connection between instructional (teaching) technology and educational technology. He speaks of an interaction between them: the first works at the micro level, the second at the macro level (Østerud, 1998). However, Hellesnes does not discriminate between technocracy and educational technology, and is therefore somewhat unclear on the use of concepts. When Hellesnes fails to establish such a division, it must be because he perceives this technology as an effective instrument in the authorities’ efforts to manage all education by objectives. In addition, Hellesnes postulates, “My general view should be clear: An educational institution which is structured in correlation with educational technology, is a reprehensible institution” (1975, p. 151). In many ways, one can consider such statements and Hellesnes’ as premise provider for the technology-discourse in education in the 1970s-1980s, which very few pedagogy questioned. It is thus interesting to observe that in

[1] Progressive pedagogy: John Dewey (1859-1952) is recognized as a leading representative of the progressive movement in U.S. education during the first half of the 20th century, which has had a great impact on the Norwegian education after the Second World War. The most basic idea of progressive pedagogy in John Dewey’s thinking was that greater emphasis should be placed on the broadening of intellect and development of problem-solving and critical thinking skills, rather than simply on the memorization of lessons. Dewey is also one of the founders of the philosophical school of Pragmatism (along with Charles Sanders Peirce and William James).

[2] Restorative pedagogy: In the beginning of the 1980s a conservative reform-streams intended to re-establish the school as a “place to learn”. This was a international reform movement and in many ways this was a renaissance of ”transmission of knowledge”-pedagogy where the teacher should ”give” the student necessary knowledge. Under Norwegian conditions one can consider the former Minister of Education and Research, Gudmund Hernes as one important premise provider for re-establishing the restorative pedagogy in school, with the collection-code and goal-steering in the national curriculums of the 1990s (Telhaug, 1994).

retrospect, Østerud (1998) asserts that the new ICT can be a golden opportunity for the teachers to break with management by objectives and create a learning environment in the school, where the acquisition of knowledge occurs more on the students' premises, based on their interests. In many aspects, this was the main goal for both M74 and M87-curriculums.

Søby (2000) also asserts that the criticism of the teaching technology of the 1970s was primarily directed against the technocratisation of the educational system: traditional didactics represented goal-means rationality. The criticism of positivism had different variations in different subjects. In education, it had the character of a battle against the established educational tradition, which the critics claimed was characterized by instrumentalism, behaviorism, and a technocratic goal-means education. A common denominator for progressive educational approaches was the emphasis on communication and collaboration—a more situative/pragmatist-sociohistorical view of knowledge and learning, with epistemological and ontological consequences for education.

However, it is a paradox Østerud (2004) asserts that both restorative (right-wing) and progressive (left-wing) education had an instrumental view of technology, but in different ways. While the former praised technology for making education more effective, the latter distanced itself and saw technology as destructive for the face-to-face interaction and dialogue. And with the growth of CAI in the 1970s-1980s, progressive education criticised drill-programmes and the underlying behaviouristic learning theory. The criticism of educational reforms and drill programmes was appropriate at that time, but progressive education managed to a small extent, to develop alternative (and updated) views of technology as new, improved technology has developed (Søby, 2000). Even if the ITS-paradigm and *Logo-as Latin*-paradigm took some steps away from the drill-inspired CAL-paradigm, it seems like technology was perceived as unwanted by the progressive pedagogy during the 1980s.

Even though the *Action Programme for Experiments with Computer Technology in School* (MERCA 1983b) was initiated by *White Paper No. 39*, 1983-1984 (MERCA, 1983a), and the National Council for Primary School and the Data Secretariat made several advances, which were sporadic. These were often feeble attempts based on kindred spirits, which left a few, long lasting traces in the school and the educational environments. Nevertheless, both in the *White Paper No. 37* (1987-1988), *About Computer-Technology in School and Education* (MERCA, 1987) and M87-curriculum (MERCA 1987), the objective of IT had an approach, which (particularly in posterity) appears to have been constructive. Here, information technology and the mass media were closely connected and many wanted the students to build up a critical user competence for the dawning information society. Østerud (2004) thus claims that M87 in many ways was a future-oriented and anticipated convergence, i.e. that the media is merging as a consequence of digitisation.

However, the technology at this time was both unstable and inadequate, but perhaps most importantly, it had lodged the notion that the combination of technology and education always yields prefabricated learning packages and drill programmes. Søby (2000) asserts that this also had an impact on teacher education and survived as a technological scepticism among both students-teachers and teachers. Seen in retrospect, we can, to a certain degree, assert that this technological scepticism had (political) moral undertones, and showed signs of a building ideal where morality has the task of simply drawing boundaries in relation to new technology (Lippert-Rasmussen, 2004), or repudiating it entirely as something cold and inhuman. This sprang up as a form of goodness discourse (Loga, 2003), which has a style of language for the contextless and good values (e.g., face-to-face interaction, community, collaboration, solidarity, warmth, etc.). A special characteristic of this is the power that is found in the character of goodness and the ability to brand its opposites as negative and evil. When the goodness discourse within views of technology at this time stood (virtually) uncontradicted, it can be interpreted as though opposition

was regarded as an opposition to goodness, for example, to promote technocracy, education technology, goal-means didactics, the unfeeling, cyberhuman, alienation, instrumentalism, etc. Pushed to the extreme, we can say that in many ways in education, this led to a perception that the more sceptical stance one had on technology, the better ones moral habitus.

With this backdrop, many educators remained passive with respect to a more future-oriented discussion about how we should really prioritize and utilize new technology. By taking such a view of technology, educators over time lacked insight into the strong and weak sides of technology and have therefore had difficulties in expressing themselves on the basis of experience in the area. This and the other (referenced) educational trends, contributed to the establishment of a kind of technophobia as a "hidden subject curriculum" in the educational environments.

Søby (2000) claims this is a paradoxical situation since the last paradigms of Koschmann focuses on the catchwords of today's progressive education, e.g., interactive learning and Computer Supported Collaborative Learning. The latter paradigm (CSCL) emphasizes the objective of progressive education: digitalization promotes communication, dialogue, collaboration, and problem orientation. In this way, the educators (through the 1980-1990s) have distanced themselves to a horizon within their own area and have gradually emerged as "computer illiterates" in the post-modern condition of the information society (Dale, 1996). In the absence of these, there have been other premise providers (engineers, software developers, commercial actors, etc.) for epistemic considerations about technology in the school, and these were often associated with rhetoric of efficiency and excellence rather than education and pedagogy.

Did any of our Norwegian philosophers foresee this (and this in a sense) paradoxical development? In 1991, philosopher Hans Skjervheim seems to have reconsidered his perception of technology and says the following about this theme, "Technology and technological competence are an equally important cultural phenomenon as literature and literary ability, also for humanists" (Skjervheim, 1996, p. 200). At the same time Skjerveim expresses an important premise for this and that the technology should be a part of the culture: that we have a reflexive distancing in relation to the internal technological problems (with which, for example, engineers and software developers often are occupied). But even though Skjervheim asserts this, he probably has other postulates (e.g. The Instrumental Mistake, Skjerveim, 1972) that receives greater attention. It can seem as though progressive education got locked to a perception that was allowed to live its own life, independent of other trends in the community. In many ways, Hargreaves and Fullan summarize some of the problems in this field:

> …schools and teachers are affected to an increasing degree by an increasingly more complex and harassed post-modern world with its demands and possibilities. But the reactions are often inexpedient or ineffective, because they allow existing systems and structures to remain intact, and seek refuge in the reassuring myths of the past.
>
> (Hargreaves & Fullan, 1996, p. 116)

As mentioned, the curriculum (M87) had a pre-understanding of the technology which, in many ways, was ahead of its time. And the *White Paper No. 14* (1989-1990) (MERCA 1989), *White Paper No. 42* (1989-1990) (MERCA 1989) and the *White Paper (proposition) No. 125* (1991-1992) directed focus towards the technology in school and education. However, the technology was both little developed and it held a completely different position than today both socially and educationally, and therefore much of the content in M87 and these White Papers was most likely interpreted as a "future scenario" by school managements and teachers.

4. New national curricula—New technology-discourse

Through *Reform 94* (MERCA, 1993) and *Reform 97* (MERCA, 1996), IT gained momentum and became a formal part of the subject curricula in the primary and secondary schools and in upper secondary education. These subject curricula emphasised the use of IT in the school, but gave the schools a trial-period to give them an opportunity to adapt. These subject curricula must be seen in light of *White Paper No. 24* (1993-1994): *Om Informasjons teknologi i utdanning* (About Information Technology in Education) (MERCA, 1993) and *IT norsk utdanning* (Action Plan IT in Norwegian Education, Plan for 1996-1999) (MERCA, 1995), which outlined the broader focus on IT in society, school, and education. This plan outlined an escalation plan with a gradual implementation of IT over this four-year period. Lieberg (2002) claims that we can roughly recognise four common levels and main aims from these plans: Level 1 can be described as the general aim (developed by policy-makers) to develop the educational institutions as *learning organisations*. Level 2 can be related to ICT-initiated school development and the schools' possibility to transform and improve their educational structure. Level 3 can be related to evolving new, ICT-related educational learning-forms in school and education. Level 4 can be described as the possibility to change the subjects and subject content, as well as the chance to develop new didactical and pedagogical strategies based on ICT-use (Lieberg, 2002).

Much of the rhetoric and discourse around the technology in these plans and at this time in general, were typically connected to technology determinism and the instrumental view of the technology. We can find the traces of this rhetoric in, for example, the subject curriculum work for the 10-year primary and secondary schools (L97, MERCA, 1996), where a preparation of the students for the information society (Castells, 1996) is being used to legitimise ICT in the school. We see the contours of the Internet's growth and that the school must keep up with the rest of the community in this area. It is also interesting to see that they intend to use the technology to promote a more active education in subject, theme, and project (something which alludes to Computer Supported Collaborative Learning, and Koschmann's fourth paradigm, 1996, CSCL). Therefore, one also senses a more positive view of technology, and in addition this also emphasise the importance of conducting local experiments, making adaptations, exchanging experiences, and thinking interdisciplinarily. If we take a further look at parts of the subject curriculum, it is open for a good amount of use of ICT at the primary and secondary school levels, but at the same time, it is characterised by diffuse formulations. Lieberg (2002) says that as a consequence of these diffuse formulations, it is difficult to find how ICT shall be integrated in the subjects and how teachers shall utilise the technology to improve the pedagogical practice. He considers the canonical knowledge view in the curriculum as an obstacle to utilise the new technology positively and states that "For the school and curricula this means that the knowledge about the selection is the most important, while the selection of knowledge ends up in the background" (Lieberg, 2002, p. 2). He finds some of the answers in the fact that the main parts of the curriculum were developed from 1993 (*Reform 94*) to 1996 (*Reform 97*), and this gives a situation were the curriculum in less degree reflects the ICT-situation today. Lieberg (2002) claims that this calls for a new, communicative curriculum-code which can capture such new streams as the digital revolution.

In *L97* (guide to IT in the primary school, Nasjonalt Læremiddelsenter, 1997), two main goals were further defined as the bridge for this, *learning to use* and *using to learn*. This implies that we acquire a necessary basic competence in using ICT, plus—when we have this basic competence—that we are able to use it for learning in the different subjects[3]. The dichotomy also meant that technology skills were emphasised more, while pedagogical

[3] Parallel to this curriculum, in 1996 a basic course in the use of ICT was introduced for student teachers in teacher training to give future teachers a basic competence in ICT to meet the demands set by *L97*, where "learn to use" stood in focus.

use was secondary. The problem with these good intentions was that the majority of schools and teachers experienced that a lack of infrastructure and a lack of ICT competence made it difficult to realise these main goals in *L97*. In addition, the curriculum was characterised by a collection code where a national subject curriculum was introduced and the local freedom (local subject curriculum work) was toned down in relation to M87 (Østerud, 2004). This was often a paradoxical situation for many teachers because *L97* was an ambiguous "hybrid", where the schools stood with one foot in the collection code and one in the integration code (Østerud, 2004).

With this backdrop, the ICT efforts during this period were technology driven. We concentrated on putting the schools in working order in relation to equipment and competence. We mainly thought about acquiring technology; when we eventually did, we had few educational strategies for how people would use it. Many teachers thought that the technology did not have any natural place in the school and as a result, there was little educational use of IT in the school, even though it now had its place in the subject curricula. In addition, the technological development moved faster than the school and what the teachers could keep up with. Consequently, a certain resignation spread among teachers who experienced that the students knew more about computers than themselves, which may also have been a contributing factor (together with technophobia) to why the introduction of ICT in the 1990s was often done by realists and technology-interested (men). The use was often more associated with the actual technology than with the education. Therefore, this focus on educational development work, use of ICT in the subjects, and few structural changes were made in the school to put the technology to use. Consequently, the gap between the formulation arena and the realisation arena was large and much of Cuban's (2001) criticism was therefore also justified (at this time).

However, even if the curriculum could be experienced as somewhat instrumental on IT in general and somewhat diffuse in the subject curricula about IT, things were well arranged for using the interactive and collaboration-oriented character of recent technology. The curriculum's emphasis on precisely the interactive and on collaboration was found to shape the flexible working methods, inter-disciplinarity, and some local freedom of the cornerstones, which supports a natural use of ICT in open learning environments. It can, however, appear as though the teachers have not managed to utilise this potential and to turn the paradoxes and the ambiguities in the curriculum to their own advantage. They could have utilised the free space (Østerud, 2004) which, despite everything, lies in the current curriculum (even though it was not as large as in M 87), but at the same time, this might also indicate that the other referenced barriers (infrastructure, competence) overshadowed the potential of the curriculum at this time.

The report *Innovasjon eller Tradisjon?* (Innovation or Tradition? Erstad, 1998) more systematically documents that Norwegian IT efforts in the period 1996-1999 (based on *Action Plan for ICT,* 1996-1999, MERCA, 1995) were characterized by many, scattered experiments around the country. These were often isolated experiments without a national coordination or coordination across the nation (Erstad, 1998). On a more positive note Erstad (2004a) says that the projects *Den Nye Skoleveien* (The New School Way, Grepperud & Tiller, 1998) and *Elektronisk Ransel* (Electronic Knapsack, Østerud & Wiig, 2000) (that were set in addition to the Action Plan) provided useful experiences. These focused on challenges for both small and large schools, and how the technology could give new possibilities for school development. Erstad (2004b) expresses that both perspectives were part of the research basis for the future projects. Erstad (1998) concludes his report by saying that an all-out effort is needed in the focus on IT in education—a systematic move and a joint effort—where a large project is started and where there is a stated strategy for evaluation or research. The project should be anchored with different actors on different levels, and an overall perspective of IT in education which includes technology,

education, and organization[4].

Towards the end of the 1990s (when these trial periods of IT in the school ended, and from the school year 2002/2003), all IT use was a mandatory requirement in the school. At the turn of the millennium the *IKT i Norsk Utdanning* (Action Plan for ICT in Norwegian Education, Plan for 2000-2003) (MERCA, 1999) came, which outlined the escalation and focus on ICT in school and education. The teacher education was also characterized by this, and there were quite clear words that set direct requirements about active use of ICT in the teacher education. We also sense a slightly different and more nuanced view of how ICT should be used. The fact that it explicitly mentions that ICT will be used in education, that the designation IT has become ICT, and that this will take place in open learning environments, indicate that Koschmann's (1996) fourth paradigm (CSCL) has had a certain influence on this.

In this plan, previous difficulties with the use of technology were also acknowledged and the plan emphasized the need for larger national ICT projects to remedy this. PILOT as a project was first mentioned in *White Paper No. 1* (1998-1999), it emphasizes a need for additional knowledge and experience about how to integrate ICT into basic education. MERCA wanted to initiate projects with a focus on ICT seen in relation to the local context and with innovative schools in the districts (Erstad, 2004b). On this basis, in the spring of 1999 MERCA initiated a large national project aimed at the educational use of ICT in primary and secondary schools and upper secondary education. The project was called PILOT and would run over three years. PILOT as a project was thus integrated into the *Action Plan for ICT in Norwegian Education, Plan for 2000-2003* (MERCA, 1999). Seen as a whole, this plan also indicates a further development of the foregoing given that the educational challenges associated with the use of the new technology are emphasized even more strongly. This constituted to the national frameworks for PILOT (Erstad, 2004b). PILOT thus indicated a joint effort in the focus on ICT in Norwegian education and included 120 secondary schools. The focus involved complex and extensive processes that posed great challenges for the research. At the same time, it gave the research a unique opportunity to follow activities over several years.

Much of the rhetoric on ICT in the school during this period moved from the excellence of technology in the educational system in general to trying to create content for the use of ICT in the subjects in the school. This created fertile soil for both innovation and change in both teacher education (PLUTO, Ludvigsen & Flo, 2002) and the school. The problem, however, was that while quite a few of the selected PILOT-schools and *Bonus Schools*[5] were promoted, schools in general (and particularly high schools) were lagging behind. And some schools are tending to fall back to "old technology-free practices" after the project period was over. However, the relatively extensive focus in this programme has provided a lot of useful knowledge and experiences in the area, both within school and teacher education, and formed the basis for the next four-year programme[6].

Based on the recommendations from *Kvalitetsuvalget, I første rekke* (The Committee for Quality in Primary

[4] As a general summing up of the 1990s, Østerud (2004) asserts that we should take hold of M87 instead of the reforms of the 1990s in relation to the view of ICT and its place in both subject curricula and the school.

[5] The Ministry of Education and Research select every year some schools which receives grants for their innovative practice. These are named *Bonus-skuler* (Bonus schools) and *Demonstrasjonsskoler* (Demonstration schools).

[6] We can also sense a tendency that the rhetoric around the use of technology has shifted focus and can ask whether Cuban's (2001) criticism is just as legitimate as before, seen under Norwegian conditions. Cuban (2001) has thus been concerned with the general rhetoric around technology, but to a lesser degree has looked at what ICT is being used for in the subjects. The phrase "maximal access – minimal change" can therefore also be accurate for the use of technology in the school through the 1980s and 1990s. But we can sense the tendencies towards a time of unrest and upheaval here at home where we, through PILOT, PLUTO, and other projects, have generated knowledge and experience about that which Cuban (2001) is searching for in his criticism of the rhetoric.

and Secondary Education in Norway, in first Row, NOU 2003, p. 16), Utdanning og Forskingsdepartementet (UFD) (Ministry of Education and Research, MER, 2003), a new programme for ICT in school and education was launched in 2003. The new, prevailing plan had the title *Program for Digital Kompetanse* (Program for Digital Competence, PfDC, 2004-2008) (MER, 2003). This plan must be seen in reference to the new school-reform *Kunnskapsløftet* (Knowledge Promotion, with the preliminary abbreviation L-06), and the White Paper *Kultur for Læring* (Culture for Learning, White Paper No. 30, MER, 2003). This school-reform involves, among other things, a 13-year basic education, new curricula in all subjects and an identification of digital competence as the fourth (eventually fifth) basic skill. Here, a description of what MER's perception states on the concept of *digital competence* is outlined, but not operationlised properly. Despite of the frequent use of the term *digital competence* in this PfDC only parts of the content in the five-year programme build on the ITU's problem memo: *Digital Danning* (Digital competence: from four basic skills to digital competence, ITU, University of Oslo, 2003), where the foundation of digital competence is elaborated. In this way the PfDC have dissociate itself from a more thorough operationalising of the term digital competence. In the ITU's memo, *digital competence* has reference to the *fourth basic skill* and the *fourth culture technique* (Andresen, 1999), which aims to capture the digital revolution's impact on school and education. Another key document in the PfDC is the *Skole for digital kompetanse* (School for Digital Competence, a report for the Board of Directors in HØYKOM[7]) (The Research Council of Norway, 2003) which, in many ways, sees this in relation to the new technology, broadband and the Internet.

The main problem with the PfDC is not the ambitions and strategies, but the avoidance of operationlising the new concept and terms it highlights properly. Consequently, since PfDC has been the premise provider for the new reform *Kunnskapsløftet*, the scant description of key-terms has leaved its mark on several documents. In the *White Paper No. 30* (2003-2004) *Culture for Learning* (MER, 2004b), the digital competence is mentioned, but is described only partially. It is also worth to note that this White Paper include a new (fifth) competence: *the ability to express oneself orally*. The Ministry believes that the most central basic skills are:

> (1) The ability to express oneself orally;
> (2) The ability to read;
> (3) The ability to express oneself in writing;
> (4) The ability to do arithmetic;
> (5) The ability to use information and communication technology.
>
> (Norwegian Ministry of Education and Research, 2004, p. 32)

However, in retrospect the PfDC goes further in elaborating the concepts associated with the use of technology than previous departmental plans. The PfDC is clearer with regardness to the expectations for the use of ICT in the school and in a way raise the status of the technology by referring to this as a fifth basic skill. Still, there has been some criticism against both PfDC and the subsequent White Paper, *Culture for Learning*, in that *digital skills* (with a technology-focus) have received too much emphasis, at the expense of a broader understanding of digital competence. In the curriculum-draft (out on hearing in spring 2005, The Directorate of Education, 2005), the broad digital competence-term from the ITU memo, was (in many ways) reduced and narrowed down to *learn to use digital tools*. It is also interesting to note that the financial investments in the same period had been halved in relation to the previous programme-period for ICT (2000-2003), and new national

[7] HØYKOM: An abbreviation of the Norwegian "HØYhastighets KOMmunikasjon", which means High Speed Communication, or Broadband Communication.

"steering-instruments" (national tests) had been introduced (with a "tell them and test them" model) which many felt could "park" the ICT efforts. Several skeptics ask if this was the "right wing" technology-discourse which (again) impacts the school. But when it came a government shift in 2006 and the new left-winged government took over, they dismantled the national tests and the curriculum stayed unchanged from the draft in regard to digital literacy. Regardless this government shift, the new final version of the national curriculum (MOK, 2006) was an historic event in Norway concerning ICT and educational technology in school, because of the increased status of ICT and digital competence as the fifth basic competence in all subjects at all levels. This demanded teachers to use educational technology in their subjects, because several competence aims in the curriculum are very specific concerning ICT use in the subjects. This increased status of ICT can be said to be an time of upheaval concerning the curricula throughout as well as a emerging "wind of change" within the discourses of technology in school (attached to Koschman's fourth paradigm, CSCL). At the same time we can ask if it will occur a discrepancy between the formulation (curriculum) and the realization arena (practice field), which we have also seen in previous implementation endeavors in school and education. This is still an open question, but the clear demanding in the curriculum, the digitized society and school and the fact that the teacher's use of technology outside school-settings might alter the technology discourse and the epistemology within school.

5. Summary and implications

In this paper, I have focused on two problems: Can we see any relationship between the general epistemological and ontological trends in relation to the educational technology in different eras and in relation to today's digitized society? How is this reflected in the educational discourse and in curricula in Norway? Firstly, I will claim that it is possible to register general epistemological and ontological trends in relation to the educational technology in different eras within the Norwegian educational system. But, it is reason to say that these trends have been easier to recognize within psychology and paradigm shift within psychology, than in pedagogy. In pedagogy, (both in teacher education and school), it seems like Koschmann's first paradigm Computer Assisted Instruction (CAI) based on a epistemology which reflected the period of empirists' view of knowledge (1960s), has prevailed throughout the decades in teacher staffs and constitute a considerable scepticism to technology. As a consequence of this, the epistemology and ontology underlying the educational technology within pedagogy, has been perceived as behavioristic and attached to Koschmann first paradigm throughout the 70s, 80s and 90s, even if new technological paradigm shift has occurred during this time.

Secondly, this mismatch between technology epistemology and other educational trends has marked the educational discourse and curricula throughout the same decades. In retrospect, it is interesting to notice that especially the progressive pedagogy has "met ones former self" when it comes to the neglect of educational technology as possibility to promote more active learning in school. But the last decade one can see that the digital revolution has left some marks on Action Plans, White Papers, and the use of concepts in curricula. The historic rise of increased ICT status in the latest curriculum (MOK 2006) has given new opportunities and more clear visions in how ICT should be used in school, but this is mostly based on ITU's ground work—not Norwegian pedagogue's minor engagement. In this way, ITU has been the most important premise provider for the status of ICT in the new curriculum, even if it is actually the pedagogues and teachers who have to deal with the consequences of this in their everyday practice in school. At the same time we see that the same curriculum neglects to adopt the broad perception of the term digital competence which ITU wanted implemented (mentioned

earlier). A consequence of this is that some of the underlying, instrumental discourse of technology seems to have prevailed to a certain degree with a rhetoric that is directed to the pupil's need of skills in ICT. From some of these formulations there is a reason to assert that in the school, the PC is still perceived as external technology, while the textbook is an integrated part of the culture. Recent studies in Norwegian schools (Kløvstad & Kristiansen, 2004; Arnseth, Hatlevik, Kløvstad, Kristiansen, & Ottestad, 2007) show that the use of ICT in the subjects is still limited, the skill aspect has the strongest focus, and the view of technology is often instrumental among teachers. Consequently, Lankshear's thoughts about a new, digital epistemology have everything gained little entry into the average Norwegian school, despite fine visions in the new "ICT friendly" curriculum. This is partly because of the teachers are still too digital illiterate, the book still has more authority than digital learning resources and are the premise provider and steering instruments for exams. At the same time one can say that the curriculum to a certain degree prepare for another, more positive discourse around educational technology tied to Koschman's fourth paradigm CSCL. Even if some teachers are digital literate enough to increasingly utilize this situation today, the majority of teachers are still too digital illiterate to both cultivate such "new discourse" and value a broader, digital epistemology in their daily practice. Therefore, until the teachers are digital literate we will probably find that the traditional epistemology and discourse concerning educational technology will still prevail for some years, even if the curriculum has increased the ICT status in Norwegian schools considerably.

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