



technology, children, schools and families

Arenas for learning and the road to citizenship

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Preamble

In the classroom activity described by Krange and Ludvigsen (Krange, 2007, 2008), Grade 9 students struggle with the problems of repairing and sequencing the insulin gene. As resources for their work they have a computerized, dynamic 3D model of the insulin gene and its base pairs. They also have access to other resources such as websites and online library sources explaining the fundamentals of gene sequencing. Their teacher and fellow students are online in a LAN for an open exchange of ideas and information. Through the powerful and information-rich 3D model, they recognize the spiral structure of the DNA molecule from their previous lab activities. The intellectual challenges they face include repairing – in a virtual, ‘hands-on’ sense – a damaged insulin gene by comparing it with an intact one. Following this, they engage in the quite laborious sequencing of the gene. This implies that they have to identify the basic units – the pairs of bases – and keep in mind how they are bound together. This, in turn, implies that they have to familiarize themselves with the scientific notations (the famous letter sequences of the genetic code), what they stand for (A for Adenine, T for Thymin, C for Cytosine and G for Guanine) and how they are connected. In this microscopic world, way beyond human perception and to which even scholars did not have access until relatively recently, they have to navigate with conceptual awareness as they manipulate the building blocks of the DNA molecule and biological life in a virtual reality. As part of this challenge they have to bridge between abstract conceptual constructions of the language of microbiology and visual perception: how does this language codify what there is to see in these images? The bridging is necessary, since the virtual world is the framework in which they have to learn, but understanding how to do gene sequencing is still largely conceptual; it is a story to understand and to convert into manual activities, and, in spite of the support from multimodal representations, friends and teachers, this will take some time. At other levels they have to consider issues such as what are the implications – dilemmas, gains, threats – of this technology as it is employed for an increasing number of purposes including the production of food, the curing of diseases and, potentially, the design of living organisms?

In another Grade 9 classroom, the complexities of the connections between energy consumption and climate change are addressed. Such issues, which concern intricate

multidisciplinary problems, are understood and discussed in partially conflicting, partially overlapping discourses as is evident in media reporting every day. Basic questions about access to energy and sustainability of present-day consumption of oil, natural gas, nuclear energy and so on are debated by politicians, scientists, ecologists, economists, political scientists and representatives of a range of other kinds of expertise. What does it mean to be an informed citizen in relation to these decisive issues? The international and scientific dimensions of this topic of resources, industry and production serve as the focus of a seven week project work (Åberg et al, in press). The ambition is to prepare students to articulate their knowledge and values in the particular communicative format of a panel debate in which they are to represent various countries with different positions on these matters. What has to be realized is that argumentation about such issues is inevitably coloured by the resources, traditions and even identities of nation states. For instance, access to various types of energy will co-determine the positions from which one argues on the international scene, and what claims one considers reasonable when negotiating internationally binding agreements. Thus, there is no single scientific answer to these types of questions, and all claims to knowledge may be challenged and contested. The project work is not only about finding relevant sources of information (on the internet, in books, journals, newspapers and elsewhere), nor is it only a matter of validating information as legitimate 'facts'. In the process of preparing for a political debate on energy consumption, students also need to account for what counts as facts, and they have to take an active stance in terms of what facts are relevant in an argumentative context, where responsibilities for future generations are also at stake. The outcome of such an activity, if conducted successfully, is an informed opinion, a platform from which to reflect on and consider also the opinions of others, whose concerns may differ from one's own. Such a democratic conception of knowing is argumentative and moves the justification of claims to knowledge from matters of 'facts' to include matters of human concern and co-existence.

Keywords: citizenship, genes, biology, education

Introduction

- In most European countries, public education systems were established in the early or mid 19th century. Industrialization, urbanization, the need of nation states to foster nationalism and proper religious attitudes among its citizens, as well as the increased importance of literacy skills, were some of the political incentives behind this development. When schooling expanded, the basic assumptions about how teaching and learning should be organized were already in place (Lindensjö and Lundgren, 2000). There were teachers and students with specific entitlements and obligations. Teachers lectured and students listened and were obliged to follow what was said, but they were not expected to take initiatives or assert their own interests. The authority relationships were clear, and even the architecture and the design of the classroom reinforced this pattern of a practice intended for monological recitation and verbatim reproduction. The curriculum was stable, and the institution was in control of the information about the world that reached the pupils. There was little, if any, competition from alternative sources of knowledge such as printed or other media. Successful learning was the ability to perform well under these specific premises.
- The metaphorical construction of learning embedded in these institutional arrangements exert a considerable influence over how we now understand what education is and what it should be. Claims about how education should be organized and how its outcomes are to be assessed, thus, never merely *reflect* an objective reality deconstructed through analytical endeavours. On the contrary, they are grounded in traditions that have emerged during a long time, in this case over millennia. As the Russian philosopher of language V.N. Vološinov (1929, 1973) once remarked in a totally different context, language both *refracts*

and *shapes* reality as we know it, and this is worth considering when debating the role and function of education in society and the nature of learning. The goals of education are complex and cannot be assessed through the use of simple performance measures. Instead, it is necessary to consider the consequences of the reflexivity that Giddens (1990) refers to as the double hermeneutics of knowledge about social life. This implies reflecting on how the discourses we currently employ for discussing such matters both shape our thinking about education and, simultaneously, co-determine the ways in which schooling is organized. Or, to borrow from another social theorist with an interest in reflexive relationships between discourses and institutional practices, we must treat discourses as “practices that systematically form the objects of which they speak” (Foucault, 1972, p54).

- This view of language, as intrinsic to our “ways of world-making” (Goodman, 1978), is a productive perspective to employ when examining the consequences of what is referred to as the knowledge society for the future of schooling. Not surprisingly, the controversies surrounding education and schooling are deeply ideological. Schooling is an ideological project; it is about using collective resources to provide people with knowledge, skills and attitudes that are valued in society. As argued by Cuban (2004), one could go as far as to say that in symbolic and real terms debates about schooling over the past 200 years have served as “battlegrounds for solving national problems and working out differences in values” (p71).
- In current debates, influential stakeholders such as international organizations, high-profile researchers, politicians, employers and representatives of the media all participate in lively debates and prophecies where claims are made about how things ‘are’, and what the future of education is, and should be, under the pressure exercised by the demands of the so-called knowledge society. In such argumentation, certain features of the current situation are selected as pivotal; they are conceptualized and shaped by ideological interests, and, as a next step, formulated as elements of visions and policies. These visions and policies, in turn, themselves become part of the reality they describe in a reflexive process, and they will therefore be consequential in shaping the future.
- One example of such circularity can be found in the report “Schooling for tomorrow” published for the OECD (2000). The report begins with the identification of a number of trends, particularly focusing on the knowledge economy, social exclusion and a changing family and community life. It is, for instance, claimed that “schools ‘structurally’ lie at the core of children’s activities, but other sources of interest and influence seem far more attractive and relevant for many” (p3), and that “growing individualism and social fragmentation bring their own problems for the young and for schools” (p4). With claims of this kind as starting points, six scenarios describing the future of schooling in 2020 are outlined by OECD analysts and ideologists. Two of the scenarios are held to “maintain status quo”, either by keeping what is described as a bureaucratic school system or through an exodus of teachers from the system. These options are characterized as inflexible and are claimed to be associated with maintaining and exacerbating inequalities and social exclusion. The scenario of a school as “focused learning organizations”, on the other hand, is described as being “revitalised around a strong knowledge agenda rather than a social agenda, in a culture of high quality experimentation, diversity and innovation” (p9). Thus, in this particular, and highly ideological, configuration of the world and the future of schooling, a “learning organization” is seen as in conflict with an institution which has “a social agenda” and which attends to the needs of those who, for some reason, do not fit into the knowledge economy.
- In such accounts, the compensatory and expansive functions of education are perceived as difficult to reconcile with the ambition of having a school with “a strong knowledge agenda”. If similar arguments had served as guiding principles regulating access to education in the 19th and 20th centuries, people with

disabilities, ethnic and other minorities and those living in remote areas, would have been largely excluded, ie precisely the groups that have profited immensely from the expansion of education. And, of course, opening up education at all levels to girls – who now, in many countries, outperform boys in educational achievement – would not have been high on the agenda. Thus, education is part of the transformation of societies, and therefore the criteria of what constitutes successful education are complex. This is precisely why debates on education cannot be premised on linear extrapolations of what the present seems to require; rather, they need to include considerations of what we would like the future of society to be, and how education may contribute towards a number of different goals.

The role of schooling in preparing children and young people for citizenship at some stage must rest on an analysis of what are central skills and competences for active citizenship in a changing democratic society. In this context it is interesting to see that even for scholars, the implications of the transformations of the ways of learning and communicating that are linked to digital technologies are difficult to come to grips with. What is happening to our modes of developing and communicating knowledge in the wake of these technologies, and what are the basic competences required under such circumstances? One of these interesting debates concerns the differences between the nature of skills that are relevant for traditional print literacy and those that are assumed to be relevant for multimodal and networked information technologies. The opinions on this matter go in very different directions. Some argue that the use of technology might result in the loss of traditional skills, since it seems as though people “go online to avoid reading in the traditional sense” (Rowlands et al, 2008, p295). Others claim that traditional literacy skills are more central than ever, “as people need to critically scrutinize and scroll tremendous amounts of information, putting increasing emphasis on developing reading and writing abilities” (Kellner, 2004, p17). But there are also those who argue that this kind of scrolling, skimming and browsing is essentially the same kind of reading that we know from before, and that there is nothing really new in this.

While new types of literacy are associated with the capabilities of accessing and handling massive amounts of textual information, they are also connected to an increasing significance of images and other forms of mediated communication as was illustrated in the two scenarios at the beginning of this text. Jenkins and colleagues, for instance, define “21st century literacy” as the overlap of aural, visual and digital literacy. A particular emphasis is put on “the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to easily adapt them to new forms” (2005, p25). Kress (2004) argues that the current “rearrangement in the constellations of modes of representation and media of dissemination – from writing and book to image and screen – is having profound consequences for meaning making and hence for learning” (p16). In the literature we now find terms such as *information*, *computer*, *media* and *multimedia* literacy (Kress, 2003; Jewitt, 2006) as attempts to characterize these new competences. Literacy also increasingly takes the plural to signal the diversity of modes of expression of the current media ecology. In a similar vein, Brown makes a very specific argument about the future of literacy and predicts that “the real literacy of tomorrow entails the ability to be your own personal reference librarian – to know how to navigate through confusing, complex information spaces and feel comfortable doing so” (2000, p12).

- Although our task in this chapter is premised on ambitions that are similar to those of the OECD report, and this whole genre of visionary forecasts for what seems to be an increasingly unpredictable future, we wish to question the extent to which claims about a knowledge society provide sufficient and educationally relevant guidelines for attempting to transform education. To discuss these issues, we find it necessary also to reflect briefly on the language and the metaphors of the so-called knowledge society in which these discussions unfold.

It is, in our opinion, important to avoid adopting too narrow and reductionist approaches to understanding the complex and culturally very significant issues of what learning is and what schools are for. One element to consider when reflecting on the future of schooling, thus, is to highlight some of the ideological underpinnings on which the alleged needs for reforming schools in one way or another are grounded. In the following, we first address some features of the discourse on the knowledge society and how it seems to lead us into characterizing the value of schooling primarily in its instrumental functions in relation to short-term economic goals. Following this, we will discuss the manner in which technology has become a central part of many young people's lives outside school – and what this development might imply in terms of the necessity of schools to adapt to the lives of students rather than the other way around.

The knowledge society – metaphors, rhetoric and tensions

- In the discussions of the changes that many societies undergo, a plethora of terms, etiquettes and metaphors are in swing and they are part of the reflexivity characterizing our discussions. Some of these terms take their point of departure from the differences between our contemporary conditions of life and those that characterized agrarian and industrial societies; we are, for instance, said to live in a *Post-modern*, *Post-Fordist*, *Post-industrial* or *Super-industrial* society. In other characterizations, new technologies and technological breakthroughs serve as a basis for the terms used. Thus, we live in the *Information* or *Digital* society, or in the *Space*, *Electronic* or even *Technetronic Age*. The latter characterizations are inspired by the traditional accounts of shifts in technology that we find in expressions such as the Stone and Bronze Ages.
- One of the expressions which has gained currency during the past decades is that of the knowledge society. The term, which was first introduced in the late sixties (Drucker, 1969), has not only become widely spread, it has also been "important for defining research, education and innovation policies" (UNESCO, 2005, p20). In other words, it has been consequential for political decision-making and for steering economic investments in many countries; it has, in the manner we described above by alluding to Foucault, become part of the discourse that produces the objects of which it speaks. Previously, knowledge was a term mainly used for talking about individuals and their skills, but today it is increasingly used in argumentation in a range of settings, irrespective of whether the discussion concerns individual competences and skills or the collective intellectual resources found in organizations, institutions and academic disciplines. When part of metaphorical constructions such as the *knowledge society*, the *knowledge economy* or the *knowledge industry*, the term has very little to do with Plato's classic definition of knowledge as "justified true beliefs" or Aristotle's writings on *epistêmê* and *technê*. Instead, knowledge has become an ideologically loaded metaphor, rich in suggestive connotations. The notion of knowledge in the expression of knowledge society is more closely connected to economy than to epistemology.
- While the concept of the Bronze Age marks the onset of a period when a civilization started to melt copper and tin and used the resulting alloy to cast bronze artefacts, knowledge was surely a fundamental feature of human existence and organized social life long before anyone thought of a knowledge society. Similarly, international trade and an international, trans-national economy were with us several hundreds of years before recent ideas about globalization. What is often pointed to as new and peculiar to the current situation, however, are the forces of the global economy relying on information technology in an increasingly networked global world. Much of the current European economy is dependent on the possibilities of instant communication with many people and organizations and a market where services and commodities travel over national borders in what is sometimes referred to as a

real-time economy. As Hutton and Giddens (2000) point out, it is "the interaction of extraordinary technological innovation combined with world-wide reach driven by global capitalism that gives today's change its particular complexion" (p. vii).

Some authors have argued that this development makes the world increasingly flat in terms of commerce and competition (Friedman, 2005), whereas others have pointed out that even though globalization has changed the economy in dramatic ways, it has not levelled it (Florida, 2005). Central to this latter argument is that not all people or all societies have access to resources that support innovation and productivity in the manner suggested by the proponents of the blessings of the new technologies; consequently, the world still has its "peaks, hills and valleys" (ibid, p48). And, as this is written in one of the deepest recessions in the world economy during the past hundred years, the metaphor of a valley seems quite rosy. It is obvious that in the discursive constructions surrounding the knowledge economy, knowledge is thought of primarily in instrumental and competitive terms. Using topological metaphors, the access to, and continuous development of, knowledge, accordingly, are seen as ways of reaching and staying at the top of a world primarily engaged in economic competition. As expressed in the World Development Report published by the World Bank, "the balance between knowledge and resources has shifted so far towards the former that knowledge has become perhaps the most important factor determining the standard of living – more than land, than tools, than labor" (1999, p16).

In discussions about the main resources for promoting innovation and increases in productivity, one therefore typically finds references to a well-educated workforce, to the ideas of support for continuous education and re-education of this workforce, and, as an added element of this equation, there are often references to cutting-edge research as the motor behind continuous innovation and product development making adaptation to new circumstances possible. This stress on knowledge as the main resource for economic development and competitiveness has been consequential for individuals as well as the educational system. When learning and education are held to be central to all parts of life through *life-long* and *life-wide learning*, the previous separation of life into mutually exclusive phases – education, work and retirement – is called into question. As pointed out by Kristensson Ugglå (2007), the meaning of the term "life-long learning" has changed during its short existence. Although there still is a tendency to see life-long learning as something that promotes individual growth, the connotations of the concept have changed as the rationales motivating investments in life-long learning nowadays are increasingly couched in economic terms. Life-long learning is no longer primarily seen as a means for promoting social inclusion, personal growth and active citizenship in a democratic society. Rather, it is talked about as a strategy for increasing a person's chances to compete with others on the labour market in a global economy. The individual nowadays is "doomed to life-long learning" (ibid., p117) – citizens are held responsible for their own learning so as to be prepared whatever transformations the labour market undergoes.

This increasingly market-driven and instrumental view has spread widely and dominates the debates and decision making in the European Union on future policies, where the prime role of schools and universities is to make people "employable", a terminological innovation which seems to be held in high regard in EU-speak. Limiting the role of education to this concern, its significance in the lives of citizens will be dramatically reduced, as will our discussions about what are the potentials of educative experiences. Through the commodification of skills and knowledge, the role of education will be little more than to supply the labour market in fast capitalist societies with workers, who are "eager to stay' but also 'willing to leave'" (Gee, Hull and Lankshear, 1996, p19). Along the same lines, it is interesting to see that using these metaphors the debate today often takes a turn where schooling is seen as hampering rather than promoting social and economic development. The OECD (2000), for instance, arguing in these terms questions

if educational institutions “can define a new role for schools in building and servicing a knowledge-based society, or will that society marginalize them?” (p11), and further what role schools can legitimately “fulfill in the emerging learning society that would not be better fulfilled by other actors and institutions?” (ibid.). As noted by Robertson “this line of questioning, where the form of schooling is at issue, is a very different order of challenge to the one that drove the restructuring of education during the 1980s and 1990s” (2005, p153). What seems to be at stake here is the assumed ability of current institutions to “accelerate the restructuring sufficiently to produce learners able to contribute directly to accumulation” (loc. cit.).

From a historical point of view, arguments like these appear both paradoxical and fatalistic, if we consider the consequences they imply. It is as if political deliberations and strategies lack the capacity to shape the future and transform social institutions simply because we are living in something referred to as a globalized knowledge society. Of course, employability is vital for the well being of individuals as well as society as a whole, but there are still options when it comes to shaping education and society. The reliance on such a narrow instrumental perspective is not only unwarranted, since we do not know very much about what will make people employable in future, it also distorts the role that education can play in the lives of people living in a dynamic era where knowledge and technology are such important ingredients in our possibilities to exert agency in a democratic society. Instead of being held hostage to such a limiting conception of education and learning, it seems worthwhile to return to a different and more principled understanding of the role schooling in society; ie to begin the discussion from a point of departure that is somewhat less coloured by current hypes on employability and competition, but without denying the implications of the globalization and digital technology for learning and schooling. Thus, if we assume that education has broad functions in democratic societies expanding far beyond what current accountability measures imply, it is interesting to probe into the issue of what the present technological changes may imply for pedagogy and the organization of teaching and learning.

Reconfiguring school practices in conditions of instability: New arenas for learning and new learner identities

In a social situation which is not entirely unlike our own in the sense that it involved a rapid change from one type of society (early industrial) to another one (advanced industrial capitalism), John Dewey (1897) analysed the difficulties of the school system in fully engaging young people in productive forms of learning. He formulated his observations in a number of points, one of which is the following:

I believe that much of present education fails because it neglects this fundamental principle of the school as a form of community life. It conceives the school as a place where certain information is to be given, where certain lessons are to be learned, or where certain habits are to be formed. The value of these is conceived as lying largely in the remote future; the child must do these things for the sake of something else he is to do; they are mere preparation. As a result they do not become a part of the life experience of the child and so are not truly educative. (p78)

- What Dewey addresses here is the conflict between, on the one hand, traditionalist accounts of the role of schooling in reproducing large, and rapidly increasing, bodies of information and knowledge that are taken as given, and, on the other hand, ideals conceiving of education as a space for human development, deliberation and critical reflection with the aim of promoting

generative skills and a democratic mindset. The challenge that Dewey formulates is that if our ambition is to make schools contribute to making the young person "an inheritor of the funded capital of civilization" (1897, p1), he or she must be familiar with the manners in which claims to knowledge are produced and substantiated in public discourse as well as in more specialized institutional settings. This implies that we must not make the mistake of assuming that the "statements, the propositions, in which knowledge, the issue of active concern with problems, is deposited, are taken to be themselves knowledge" (1966, p187). If our interest is in knowing as the "active concern with problems", the current metaphor of knowledge in the expression "knowledge society" gives little guidance when it comes to organizing teaching and learning.

- Most people would agree that the transformations of media culture we currently experience are quite dramatic, and that they have profound effects on our daily lives and on the socialization of new generations. The experiences of what is sometimes referred to as the *digital natives* or the *net generation*, who are "fluent in the digital language of computers, video games and the internet" (Prensky, 2005, p8), and for whom technology is "something akin to oxygen: they expect it, it's what they breathe, and it's how they live" (Brown, 2002, p70), differ from those of earlier generations. And since learning has to do with adapting to and mastering the discourses and the technologies through which information and knowing are communicated in society, the shifts we experience are significant. The rapid development of technologies further contributes to instability in terms of predicting the exact nature of future life skills, and this implies that pedagogy must be geared towards promoting generative skills in which the competences in literacy, numeracy and interactional skills are high on the agenda. At the same time, and as Dewey noted, neither the traditionalist nor the progressivist agenda seems to have a clear enough interpretation of what this implies. The metaphor of learning underpinning the traditionalist pedagogy is focussed on reproduction and gives the learner too passive a role, while the progressivist approach has been difficult to implement in a coherent and successful manner, an observation which Dewey made almost a hundred years ago. As Østerud (2004) points out, we have to find "a third way".

It is thus important to consider the affordances offered by the media ecology, and how the habits – in Dewey's (1963, p35) sense – developed by young people in response to these developments shape and encourage new learning practices and new modes of meaning making. The challenge for schooling today, as in Dewey's time, is to connect to children's everyday experiences and introduce new skills and knowledge in such a manner that they are able to bridge what they encounter in school with what they hear and see in other social settings. Schools must be seen as a form of social life in which children and young people engage in activities that they find relevant, meaningful, enabling and that are consequential in terms of learner interests and identities. We have to understand both the affordances of the new media and how they create new arenas and contexts for learning that can be successfully deployed to transform educational practices in directions which fully engage generations that are diverse in their interests and selective in their preferences. To some extent, the digital technologies may serve as an element in such ambitions. Again, however, there are risks of adopting too narrow an approach to education based on these accounts. In relation to Prensky's discussion about digital natives, for instance, both his claims that there are new preferences specific for a young generation and his suggestions for how to reform educational practices can be seen as overly reductionist (cf. Bennett, Maton and Kervin, 2008, p780). The idea of a new generation presupposes that the learning preferences are homogeneous and static; something students 'have'. A more reasonable point of departure is that the current media ecology contributes to an increasing diversity between people in terms of their experiences, interests, habits and skills. On similar grounds one could also question Prensky's (2001) conclusion that "one of the few structures capable of meeting the

digital natives' changing learning needs and requirements is the very video and computer games they so enjoy" (p5), a point of view also insisted on by Gee (2003, 2005) in many of his writings. Educational reform and classroom organization are highly complex and there are, as we have pointed to, many goals to accomplish. It is highly unlikely that we can reduce these issues to problems of software development and content packaging. For instance, large proportions of students would find extensive game-playing extremely boring (cf, Arnseth, 2008).

The examples at the beginning of this chapter illustrate some features of what this new configuration of learning practices imply. One example is that students can work and experiment in virtual realities with hands-on explorations of complex phenomena that they do not understand. The mediated and interactive environment provides a way into this world that would hardly be accessible through other channels. And from this platform students can make experiences in a micro-world of molecules and consider the wider social and even political implications of the technologies they are beginning to familiarize themselves with. Learning can expand both downwards into the details of molecules and genetics, but also upwards into the consequences of these technologies for the future of society. In this sense, such experiences provide short-cuts into highly specialized forms of knowing at the same time as they connect to issues about values and citizenship by showing the dilemmas which emerge with powerful technologies and that we will have to respond to as citizens in a democratic society.

One of the most important consequences of media development in relation to issues of teaching and learning is that children and young people no longer are just consumers of media: they are increasingly producers of mediated communication in a range of activities such as online social communities, blogs, wikis and personal broadcastings. In Gaston's terms this implies that "the consumer of information is in charge – not the producer" (2006, p12), but the shift has many layers. An illustration of such recent developments is the emergence of Web 2.0 – a term which highlights the increased focus on media production, information sharing and collaboration among users. Even though Web 2.0 has been made possible by recent software developments, the term does not point to any specific technological developments. Instead, it refers to a change in how the web is used, particularly how content is produced and distributed. Although the statistics on how children and young people use the internet tend to be outdated rather quickly, it is obvious that user-driven media production is a phenomenon with a very substantial impact. According to one survey made in 2006, over 90% of American teens between 12 and 17 used the internet, and about 60% used it daily (Lenhart et al, 2007). Two thirds of the total number of users reported having engaged in some kind of content creating activity. Half of them reported uploading photos, just as many had created a profile on a social networking site and almost a third reported that they had been creating their own online journal or blog. Thus, the issue is not only about control of information, but also, and more importantly, a change in positions and identities when engaging in media practices.

The networked technologies create new platforms for learning with new kinds of involvements. These developments are visible even in rather traditional areas of teaching and learning. Recent research in the areas of second language learning, for instance, shows how such activities may be reconfigured and result in new types of learner involvement when networked technologies are used. In regular classroom conditions language learning – one of the core activities of schooling – is approached in terms of exercises, and there is an absence of tangible social consequences of uses of language. The communication is generally asymmetric and often rather artificial. In computer mediated activities and what is referred to as telecollaboration, the language to be appropriated may be used for purposeful, communicative purposes that imply exchanges with other learners or native speakers of the language in question (for overviews, see Blake, 2007; O'Dowd and Ritter, 2006). Telecollaboration between students may take place across linguistic and cultural boundaries, and when

communicating students will act “as agents who coconstruct not only shared meanings, but also their own roles within a bilingual chat community” (Blake, 2007, p78). This implies that the communication engaged in goes in different directions and serves different purposes besides learning language in a narrow sense. In such activities, the language registers used and the participatory roles of students will be varied and this will have implications for what is learned. They may build up lasting social relationships, explore various features of their daily lives and engage in a range of activities where not only language skills but also the pragmatic competence in the target language will be improved. Such “immersive environments” in which language use has more authentic qualities and is consequential will have implications for intercultural learning in a broad sense. Also in the case of gaming, there are opportunities for language learning in the sense that they serve as environments in which people use language in contexts of “carrying out tasks and social actions, which concomitantly embeds vocabulary and grammatical constructions in rich associative contexts” (Thorne and Black, 2007, p147).

The world of online communities offers a range of new contexts for learning literacy and language skills in ecologically challenging contexts. One such illustration is the so-called fan-fiction communities in which fans of “various media such as books, movies, television, comics, and video games borrow elements of these popular cultural texts, such as characters, settings, and plotlines” to “construct their own narrative fictions” (Thorne and Black, 2007, p144). These narratives circulate between participants who create complex stories through joint authorship over extended periods of time. Online communities in fascinating manners blur the distinction between learning and exploration of issues of concern to young people. Another such example is communities where young people can discuss issues that relate to their own life and their own identity when living in a predominantly non-Muslim environment. Larsson (in press) studies how young Muslims raise questions to Muftis on internet sites, such as IslamOnline.net and Islamweb.net, about whether it is permissible for Muslims to read Harry Potter and what are the arguments for and against doing this given that the Koran is negative to magic.

What these examples about learning and communicating in online communities and similar settings illustrate is the significance of issues of participation and identity formation for learning (Lave and Wenger, 1991; cf. Wenger, 1998). People develop skills and insights not just by studying in solitude, but also by participating in communities. In online communities and such contexts children have possibilities to engage in networking in which their concerns expand beyond what would be relevant in their roles as students in regular schooling. Such experiences will be conducive to promoting the kinds of meta-skills and awareness of the perspectives of other people that are necessary parts of knowing in a complex society and that can be argued to be a vital element in a democratic conception of knowledge and argumentation.

Conclusion: Knowing with technologies

- Digital technology offers an almost perfect solution to the problem of storing information. It provides the resources for building up a collective memory of an incredible magnitude. Through the internet and portable technology, the access to information, irrespective of where in the world we are, has increased dramatically over the past decade. We reach databases, libraries and most information sources from our homes. In these circumstances, our knowing to a considerable extent reflects our abilities to make productive use of such resources in accountable and creative manners for specific purposes. And it is precisely for skills of this kind that we are now held accountable: it is not for our memorizing capacities or abilities to respond to questions where the answers are already known.
- But the development is not just about storage capacity and access to information, as we have pointed out. It is also about other significant changes, for instance, in the uses of images, animations and other modes of representing the world and

even manipulating it as we illustrated in our first example from classroom activities. Multimodality offers new modes of expressing oneself and new modes of articulating knowing and insight. What we also experience is how tools come to inhabit traces of human reasoning and serve as powerful extensions of the human mind. Search engines, calculators, navigators, word-processors with features such as spell- and grammar-checks, book-keeping programs and a range of similar tools and software become increasingly sophisticated and powerful as cognitive amplifiers (Nickerson, 2005). A modern book-keeping program allows the user to make complex calculations and estimations within seconds, and the mechanics of the analyses and reanalyses can be produced almost without any intellectual costs to the skilled user. The efforts can be spent on the conceptual and analytical aspects of the activity (Cole and Derry, 2005; Säljö et al, 2006). And as yet another element following the expansion of the role of networked technologies in our lives, we encounter new contexts of learning about the world and other people. In these settings the traditional identity of being a student is challenged.

Put differently, and with a view to history, we inhabit a world that can be described as a Socratic nightmare. In Phaedrus, Plato (370 BC) lets Socrates articulate his aversion to letters and texts. Using such resources as external *aides-mémoire* "will create forgetfulness in the learners' souls, because they will not use their memories; they will trust to the external written characters and not remember of themselves". Failing to memorize the classic stories will dramatically reduce the intellectual capacities of the young and eventually cause their brains to shrink. Users of such artificial resources, Socrates argues, "will be hearers of many things and will have learned nothing; they will appear to be omniscient and will generally know nothing; they will be tiresome company, having the show of wisdom without the reality". Present-day users of computers, search engines, electronic calculators, navigators, word-processors and a range of similar tools exert their intellectual and creative powers in collaboration with an increasing number of cognitive amplifiers; they are knowledgeable and can handle information precisely because they can interact with such externalizations of human intelligence and powers of reasoning.

- A consequence of the pressure exercised on education through the new habits that digital media encourage is that new metaphors of learning are emerging. Knowing is no longer perceived as the ability to reproduce what is already known or mastered. Learning is increasingly conceived as the ability to transform information to knowing in manners that are relevant for particular purposes and specific situations. This is an essential feature of media literacy: learning is in the performative and in the ability to convert information to something that is accountable and knowing. Information is general and can be stored and searched through technological resources, but knowing is local and in response to an issue or a problem (Liedman, 2001). Learning is about analysing and synthesizing and coming up with answers that are consequential since they are embedded in an issue or a project that matters. Learning will be increasingly modelled on the activity that we know as research; it is, in Dewey's words, an active concern with problems and their solutions.

Instruction does not become interesting or better just because there are computers and digital technology in the classrooms. Anyone who has spent time in a school quickly realizes this, and the list of failed attempts to introduce information technology in schools is long. The novelty of even the most dramatic innovation soon wears off. The first attempts to make use of computer technology for educational purposes were launched fifty years ago, but the learning machine that many predicted would close the classrooms and make teachers out of jobs has not appeared. Nor will it, in our opinion.

What we are witnessing is a more profound change in which our world and our daily practices are transformed through the consequences of digital technologies. Pedagogy, the purposeful organization of educative experiences, must respond to these changes but schools and educationists must interpret what they imply for their own practices. There is no given yardstick which can simply be imported from other activity systems; what the current changes imply for learning and schooling must be interpreted within the educational system. But the general direction in which pedagogy must be transformed seems clear: learning is moving from reproducing what is given to the ability to convert information to accountable knowing and to engage in activities that are based on what Dewey refers to as an active concern with problems with educative potentials; and a successful learner is one who develops the identity of finding joy in doing this.

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