Editorial

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Recent years have seen the increased use of digital technologies for educational activities at all levels of the education system (Jopling, 2012). The one-to-one initiative (also called the 1:1 initiative), referring to one digital device per student (Penuel, 2006), is widespread in many parts of the Western world (see, for example, Bebell & O'Dwyer, 2010; Fleischer, 2012), with the Nordic countries being no exception (Kroksmark, 2011; JRC, 2013). On a policy level, digital technologies are said to influence teaching and learning (OECD, 2009) and to embody the potential to both improve and change activities in school settings (European Commission, 2008). This optimistic yet also naïve understanding of digital technologies in K-12[1] schools expressed on the policy level represents a challenge.

The uptake and use of digital technologies in K-12 schools have turned out to be relatively complex activities because schools are multidimensional practices (Engeström, 2008) in which it is important to acknowledge socioeconomic status, student diversity and cultural differences (Warschauer & Matuchniak, 2010). This also applies to the introduction of digital technologies to teaching and learning. Schools are multi-level organisational institutions where each level has its own more or less explicit assumptions concerning how, when and why schools should uptake and use digital technologies (Olofsson et al., 2011). This implies a need for different levels within the school to communicate vertically and horizontally to start a process of transforming towards a digitalised educational practice. In other words, school leaders, teachers and students must work together toward a common vision; they need a continuous dialogue about the school's uptake and use of digital technologies and must reflect upon what is happening when classroom learning practices are becoming increasingly digitalised (Somekh, 2008).

Parallel to this, there is a need to strengthen the relationship between research and practice concerning the uptake and use of digital technologies in K-12 schools. For instance, Lawless and Pellegrino (2011) asserted:

> Much of the activity under way on multiple levels of the educational system is driven by a very strong perceived need for action, but it is often not guided by any substantial knowledge base derived from research about what works and why with regard to technology, teaching, and learning (p. 576).

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This thematic issue of *Education Inquiry* consists of three research papers that in different ways describe and provide perspectives on the development and status of the digitalised K-12 schools in Sweden and Norway. The main thrusts of these papers will be outlined below. However, first we will make a few overall comments about the present status in these two countries regarding the uptake and use of digital technologies in schools. Second, we will provide an example from a country in which the implementation and use of digital technologies for teaching and learning in K-12 schools are moving rapidly, a country that from different educational aspects is particularly interesting: the example of China.

Since the 1990s (and before, if technology is considered in a broad sense), the question of the uptake and use of digital technologies in Swedish schools has been the subject of frequent debate (cf. Jedeskog, 2005), and educators have made substantial efforts to introduce digital technologies in K-12 schools. For example, several initiatives have been taken by the Swedish government related to teacher professional development since the late 1990s (Gu & Lindberg, 2009) and, at present, approximately 254 of 290 municipalities ("Datorn i utbildningen", 2013) are working with different forms of one-to-one initiatives. However, Swedish authorities have discussed the effect of these efforts in school practices (the Agency for School Improvement, 2008). The Swedish National Agency for Education (2009) has pointed out that the possibilities of using digital technologies to enhance learning, organisational development, and change in schools have not been fully exploited in classrooms. The main impression is that the technologies should be used more effectively. The same Swedish authority also argued there was a lack of research concerning the use of digital technologies in relation to teaching, learning and the competencies needed in K-12 school organisations.

In addition, the National Agency for Education (2007, 2009) in Sweden argued that such research studies ought to include a specific focus on the prerequisites for use, actual use, and the results of the use. In Sweden at that time, they claimed that schools lacked clear strategies on an organisational level regarding the uptake and use of digital technologies, and that Swedish schools lacked governmental strategies concerning the uptake and use on the national level. The country to learn from was Norway, the other Nordic country included in this special issue of *Education Inquiry*. Norway is said to have well-thought-out strategies for influencing the uptake, use and development of digital technologies in schools in a productive way (cf. Education and Research Department (Norway), 2004, 2007).

In Norway, a lot of effort and economic resources have been expended in the development of digital competence among students in K-12 schools. A milestone in Norway came when, in 2006, the government decided that digital competence should be regarded as one of five basic skills for students to develop. Digital competence was thereby given the same position as the competencies of reading and writing in K-12 schools. The main reason for integrating digital technologies in K-12

schools (Utdanningsdirektoratet, 2007) was to prepare students to live and work in the knowledge society (NIFU, 2013, compare Erstad & Hauge, 2011). Results from the ITU Monitor (2009, 2011) show that digitally competent teachers, together with support from the school organisation and in particular school leaders, were key factors in Norwegian students' use of digital technologies for learning purposes and thereby for developing the digital competence needed in a knowledge society.

Nevertheless, despite the massive efforts made over the last 10 years in Norway, the pace of change regarding teaching and learning with digital technologies seems not to have lived up to the expectations expressed on the policy level (ITU Monitor, 2009). Researchers have reported large differences in K-12 schools' development of their practices in line with the demands from the surrounding society and in systematically integrating digital technologies into their teaching practices. Teachers need continuous opportunities to develop themselves and their teaching with technology. Teachers also require training in educating and support in the development of their educational and didactical digital competence (NIFU, 2013). The debates in Swedish school politics have also touched on these two elements.

Thus far, we have primarily referred to two Nordic countries that show similarities and differences in their efforts to work toward the uptake and use of digital technologies in K-12 schools. Both countries have striven to prepare students for the society of tomorrow and to give them opportunities to develop the digital competence claimed to be needed in that society. Below we will provide an example of a rapidly growing economy with clear educational goals of becoming one of the strongest knowledge countries in the world.

In China, digital technologies in K-12 schools have become increasingly important in the practice of educating knowledgeable and skilful Chinese students. The Chinese one-to-one initiative called "eSchoolbags" is growing quickly. We believe it is important to learn from countries that are not so often discussed in the research literature, in this case focusing on the one-to-one initiative. Looking into the way China deals with its issues of digital competence and school development opens the possibility of bringing in different perspectives on the challenges Sweden and Norway face.

China

The introduction of computers in K-12 schools in China can be traced back to the early 1980s, but it was the advances after the mid-1990s in information and communication technology (ICT) that accelerated the process to an unprecedented degree. In the past decade, with the development of wireless networks and the popularity of mobile devices, one-to-one initiatives are in vogue and the number of schools and municipalities involved in one-to-one initiatives in some way has risen drastically (Zhiting & Xiaohua, 2011).

Students in K-12 schools in China have always had their schoolbags weighed down by textbooks and different kinds of exercise books. These schoolbags are too heavy to carry on the back and so to lighten students' schoolbags and integrate mobile devices into teaching and learning advocates tried to replace students' traditional schoolbags with mobile devices they named "eSchoolbags".

In China the one-to-one initiatives are also known as "anywhere, anytime" or "laptops for students" programmes. These programmes provide students with personal portable computers to enhance opportunities for learning. The devices help K-12 schools engage the digital generation by nurturing one-to-one learning experiences. It began with a vision that, when used effectively, mobile devices such as laptops, tablet PCs, iPads and others could not only fundamentally change the culture of learning in the classrooms and at home, but also gradually transform students' heavy traditional schoolbags into mobile devices (Inan & Lowther, 2010). Different kinds of mobile devices such as laptops, iPads and others were introduced and allocated to students in primary and secondary schools in urban areas in China. A few local educational authorities and ICT companies, which can reap fabulous profits from sales of mobile devices, have promoted one-to-one initiatives in K-12 schools in China.

In 2001, schools from cities such as Beijing, Shanghai, Shenzhen and Dalian launched their one-to-one initiatives. These were some of the earliest one-to-one initiatives in K-12 schools in China. From then on, more and more one-to-one initiatives have been launched in well-equipped schools in advanced urban areas. In 2009, the Hanwang Technology Company cooperated with Intel to release its own one-to-one device for K-12 schools in China; the Digital Publishing Company under the Guangdong Provincial Publishing Group also launched a one-to-one initiative. A workshop on the technical standards of eTextbooks and eSchoolbags, supported by the National Committee of Technical Standards of Information Technology and the Ministry of Education, was held in Shanghai on 4 November 2010. Since then, one-to-one initiatives in China have grown rapidly (Younghe, Zhiting, & Chao, 2012). China's 12th Five-Year Plan includes the development of eSchoolbags, with the HongKou District of Shanghai City having been selected for the first pilot project set to begin in the second half of 2011. Many other cities have initiated their own one-to-one initiatives.

Although one-to-one programmes are gaining in popularity, they are still a relatively new instructional intervention. Students from K-12 schools running one-to-one initiatives have enjoyed using multimedia, searching the Internet, and writing their papers on their own computers. Schools involved in one-to-one initiatives with laptops for every teacher and student must focus on how this hardware will support and further a wide range of educational activities.

One problem here is that public education in China has not had sufficient means to put enough mobile devices in the hands of students. To push mobile devices into

classrooms and implement one-to-one initiatives, three kinds of solutions have been implemented in recent years: some schools have encouraged parents to invest in laptops or iPads for their students and piloted experimental classes; some K-12 schools, with the help and support of local educational authorities, have launched one-to-one initiatives; and a few companies that focus on ICT in education have donated mobile devices to students and helped primary and secondary schools carry out one-to-one initiatives.

Many of the one-to-one initiatives in China share several features:

1. most were supported by ICT companies and local educational departments (Fengguang, Juan, & Ping, 2013);
2. the majority have developed in well-equipped schools in big cities;
3. laptops or iPads were the most common one-to-one devices allocated to students in pilot schools;
4. they have involved the design and development of learning management systems to support teaching and learning in one-to-one classrooms;
5. materials and resources for teaching and learning in one-to-one settings are urgently needed; and
6. research on the pedagogy of teaching and learning in one-to-one settings was not highlighted by the programme developers (Weston & Bain, 2010).

The papers included in this special issue

In this issue, two studies illustrate and examine the uptake and use of digital technologies in K-12 schools in the Swedish and Norwegian contexts. These studies highlight the potential and challenges for the pedagogical use of ICT. The third paper examines the interaction of policy and technological education in Norway and Sweden.

Håkansson Lindqvist describes the status quo of practical classroom use of laptops at the start of an ongoing one-to-one initiative in two upper secondary schools, as well as the students' self-reports on their expectations of, attitudes toward, and experiences with digital technologies in different learning environments. The author identifies and analyses the potential and challenges for technology-enhanced learning (TEL) using the ecology of resources model (Luckin, 2010), which stresses technology-rich learning contexts in terms of resources.

Håkansson Lindqvist identifies a range of resources, including knowledge and skills (e.g. subject matters, ICT competence, classroom management, and others), the environment (the location and its affordances), and tools and people (software and computer use, teachers, student peers). These resources are interrelated, and the learners' interactions are filtered by them. In this respect, the study contributes by recognising filters that can help educational planners identify opportunities for adjustment and improvement in the practical use of digital technologies through

redesign of the learning context. As an empirical study at the beginning stage of a longitudinal research project on one-to-one initiatives, this article provides rich information about the conditional factors, especially from the learner's perspective, that will be necessary for examining and evaluating the outcomes and effects of one-to-one initiatives. It also provides data for further transnational comparative studies within this field.

Isling Poromaa's article assumes a critical approach in dealing with the pedagogical phenomenon of ICT use in Swedish lower secondary schools, emphasising the social and political dimensions of the potential and challenges in the process of the "pedagogisation of technology" in school settings. The study explores the relationship between school structure and culture and the pedagogical use of ICT in classrooms by looking at three schools with diverse social structures to examine how practices of ICT use are influenced by the social, economic and pedagogical preconditions of the schools. The author thus seeks to identify the social and pedagogical consequences of the various practices of ICT use in different contexts. Using the concepts of institutional habitus in general and school habitus and individual habitus in particular in relation to the existing pedagogy in these schools, the study underpins the importance of a school's social structure for integrating ICT into education. The study concludes that students from different schools have unequal opportunities with and to learn about ICT, and there is a danger of the reproduction of social inequality due to the differences in access, as well as teachers' competence and their pedagogical use of ICT.

Theoretically, this study contributes to a sociological perspective on examining and understanding the pedagogical phenomenon of the uptake and use of digital technologies in schools, highlighting the importance of social equality and the democratic value of education – a voice previously often absent from this research field. Empirically, the study presents a detailed contextual description based on comprehensive data collection consisting of classroom observations, policy documents, and interviews with the teachers and head teachers of different schools, applying the strategy of triangulation across cases suggested by Stake (2006). The context description and analysis provide a basis for educational application, not only in pedagogical practice but also in educational policy and its implementation.

In the third paper in this issue, Haugsbakk examines the relationship between new technologies and educational reforms at the policy and national action/initiative level. From a historical and comparative perspective, the author analyses and discusses the "patterns of reactions" and "measures taken" after the Sputnik and PISA shocks, respectively, in Norwegian and Swedish contexts, with a special focus on technology's relationship with school education. By reviewing a wide range of national and international educational policy documents and various investigation and evaluation reports and research, the author raises the question of why the

patterns of reaction were so similar despite the differences in time (the eras of Sputnik and PISA) and space (Norway and Sweden). The comparative analysis focuses on the similarities and dissimilarities at different levels and in different respects regarding the objectives and features of educational reform, technology's role in education, the position of the teacher, as well as pedagogy and the view of knowledge and skills.

The author argues that, in a Scandinavian context, the rationales for educational reforms are closely related to the political demands for social change, integration, nation-building, and solidarity, as well as changes in individuals. As a result of the "pendular swings" between centralisation and decentralisation, Haugsbakk describes top-down-up processes as general structural features of the reforms. However, when comparing the two nations the author identifies Norway as preferring bottom-up strategies more than Sweden. From the Sputnik shock to the PISA shock, in spite of the changes in the features of technologies and their use in teaching, both nations saw technology as one of the key solutions for improving the effectiveness and efficiency of education, which is in line with the ideology of instrumentalism.

Generally, when a society has undergone dramatic changes (such as the shocks described in the article by Haugsbakk), education bears the brunt of calls for educational reforms. Previous research on educational reform has paid much attention to the political, ideological and economic influences on the changes in policy and curriculum, as well as the impacts, efforts and outcomes in school practices. Yet this article provides a new approach by illustrating how technology has been involved and played an important role in the conceptualisation and realisation of educational reform in different system contexts.

Some final comments

During recent decades, many countries around the world, including Sweden and Norway, have set out a series of policy initiatives and strategic ICT improvements in education. These have involved changes in curriculum and assessment at the system level, provisions for ICT infrastructure, teacher professional development, and technical and pedagogical support for teachers (Haugsbakk, 2013). However, despite these initiatives the effective pedagogical uses of ICT in classrooms have been relatively limited in the Swedish cases (Håkansson Lindqvist, 2013; Isling Poromaa, 2013). In other words, there have been discrepancies between the overall policy, the expectations regarding the impacts of ICT on learning, and the true state of ICT use in classrooms. Perhaps this was because many initiatives have applied a top-down strategy, as Haugsbakk (2013) points out, which gave very limited attention to local conditions that could ensure the successful implementation of policies. At the local and school organisational level, the social contexts, cultural and structural

characteristics of the school, school leadership, and pedagogical premises have correlated to the levels and outcomes of ICT use in practice.

The issue of inequalities in ICT-related educational resources and experiences based on socioeconomic differences must be addressed. Perhaps a school-based curriculum that enables the application and translation of national goals and initiatives into routine school procedures and actions could be one of the solutions. Further, at the individual level, teachers' ICT skills, their acknowledgement, attitudes, and motives for using ICT as a learning and cognitive tool in knowledge construction, and their beliefs in their own capability to use technology in the classroom are important prerequisites for successful ICT integration. This highlights the need for revisions of teacher education and new frameworks for teachers' professional development that emphasise the relationships between subject knowledge, ICT skills, and didactical or pedagogical competence. As for students, their activities in and out of school as well as their learning conditions and environments are affected by computers and the Internet. Distinctions and binaries of ICT use in different settings represent both the potential of and challenges for K-12 education.

It has been taken for granted that ICT holds the potential to improve teaching and learning. However, future research will likely include more in-depth studies on the nature, approaches, processes and outcomes of teaching and learning in K-12 one-to-one environments. The results from the articles in this special issue raise the following concerns that are crucial to the uptake and use of digital technologies and one-to-one initiatives in K-12 schools: 1) the emerging need to integrate the effective use of ICTs within the school system and into the school-based curriculum; 2) the digital gap due to the uneven opportunities for students and schools to access digital tools; and 3) the demands for teachers to acquire ICT knowledge and skills and technology-enhanced professional development.

These concerns have deep implications for each of the education systems concerned in this thematic section since they concern issues about schooling as such. The always present duality of schools as systems for cultural production and reproduction makes the nature of school-based curricula and the question of equal opportunities a challenge indeed. In countries such as Sweden and Norway one might suspect that there are some variations in this respect, while in China the variations may even be greater. Access to the professional development and skills teachers need to stay professional when it comes to the digitalisation of schools is also subject to great variation, not only between these three countries but also within each country. Such variance can be productive, but it might also be subject to different benchmarking activities that streamline the use of digital technologies. If comparative approaches in education are to become a fruitful way of expanding knowledge of both one's own practices and those of others, comparisons need to be guided by more than measures of effectiveness and increased use. Since comparative

approaches may take on different guises, we hope this thematic section provides insights into the practices of others and thereby renews our readers' interest in examining and continuously improving their own practices by highlighting concerns that go beyond the simple idea of accelerating the digitalisation of schools.

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Note

1 K-12 is a designation for the sum of Kindergarten, primary and secondary education.

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