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Digitally Competent School Organizations – Developing Supportive Organizational Infrastructures

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Abstract

While research on digital competences so far has focused on the level of single actors (teachers, pupils, and school leaders), a growing but occasionally overlooked field of research looks at school-level competences when promoting digitalization and educational change. The aim of this study is to explore how schools structure their organizations, institutional infrastructure, and activities as conditions for digitalization. The study relies on interviews with school leaders and educational technologists from five upper secondary schools with extensive experience in digitalization and remote teaching. By using three categories, namely setting the direction, developing people, and developing the organization, as an analytical framework, this study identifies two types of digitally competent school organizations: goal- and structure-oriented schools and culture-oriented schools. This study's insights serve as a point of departure for understanding the different ways schools can organize themselves to become comprehensive, stable, and digitally competent organizations and for understanding important challenges related to this process.

Keywords: Digital competence, Pedagogical digital competence, Digital literacy, Digitalization, Digital technologies, Information and communication technologies (ICT), Organization, School leaders, Teachers

Introduction

In the last decade there has been a rapid growth in digital technologies meaning new possibilities to teach and learn in the context of K-12 (Håkansson Lindqvist, 2015). However, taking on challenges that comes with digitalization and educational change might not always be an easy process (Blau & Shamir-Inbal, 2017). For digital technologies to become a natural part of schools as organizations, then schools are challenged to deal with both structural, educational and cultural transformation work in both classrooms and organizational structures (Hansson, 2013). This often calls for transformation in the norms and visions as well as educational changes in teaching and learning activities (Hauge, 2014; Olofsson & Lindberg, 2014; Pettersson, 2015).

Important aspects for taking on these educational and organizational challenges have for example been the development of digital competences among teachers, pupils and school leaders (Hansson, 2013). One example is teachers' competences to integrate technology, pedagogy and content in the teaching design (Mishra & Koehler, 2008). School leaders need to understand and support the technical and educational needs in the organization (Avidov-Ungar & Shamir-Inbal, 2017). However, while research on the digital competences for taking on transformational challenges so far has focused on the level of single

actors, such as teachers, pupils, and school leaders, a growing but occasionally overlooked field of research is the specific focus on school organizations and their abilities to become digitally competent in their way of structuring for, organizing for and supporting digitalization (From, 2017; Pettersson, 2017; Vanderlinde & van Braak, 2010). Ottestad (2008), Vanderlinde and van Braak (2010), and Wastiau et al. (2013) argued for example that school organizations' competences in building and structuring the organization as well as how they construct and mobilize supportive resources is crucial for supporting the work in these schools.

However, research on how schools organize to facilitate digitalization seems to be rather limited (Ottestad, 2008; Pettersson, 2017; Vanderlinde & van Braak, 2010; Wastiau et al., 2013). This paper deals with these challenges by exploring how schools can become digitally competent in their way of structuring their organizations, institutional infrastructure, and activities as conditions for digitalization. The specific aim is to explore components contributing to a supportive organization as perceived by the school leadership: school leaders and educational technologists. The following research questions are posted:

- How do schools structure their organizations, institutional infrastructure, and activities as conditions for digitalization?
- what differences in ways schools structure their organizations can be seen?

Review of Research

The concept of digital competence has been used in different educational contexts to describe the competences needed by teachers, pupils and school leaders working and learning in a digitalized knowledge society (From, 2017; Hatlevik & Christophersen, 2013; Krumsvik, 2009). According to Erstad (2010), Hatlevik and Christophersen (2013) digital competence or digital literacy has for example been a central concepts for describing pupils' possibilities in making use of digital technologies to access and process, but also to produce and distribute knowledge and information. According to Calvani et al. (2012) and Ala-Mutka (2011), this moves beyond basic ICT skills as it includes personal and cognitive competences for practical and strategic use.

For teachers, pedagogical digital competence has been referred to as the ability to plan, conduct and evaluate technology-supported teaching and learning based on research, theory and previous experience (From, 2017). Pursuing a similar line of reasoning, Krumsvik (2009) discussed digital competence in terms of teachers' pedagogical use of digital technologies as a means to enhance students' and pupils' learning. With another theoretical framing Mishra and Koehler (2008, 2009) developed the Technological Pedagogical Content Knowledge (TPACK). The model represent a complex interplay between teachers' knowledge of content (CK), pedagogy (PK) and technology (TK), needed when designing for technology-supported teaching and learning.

Mishra and Koehler's framework was also used to study the practice and competence of ICT coordinators and ICT leadership in school. In their study, Avidov-Ungar and Shamir-Inbal (2017) added two components of organizational knowledge (OK) and leadership knowledge (LK). Accordingly, the study shows a complex role requiring broad competences needed when leading digitalization and systemic change in school. In another study, Leithwood and Riehl (2003, 2005; see also Leithwood et al., 2004; Leithwood et al., 2006) concluded that the components and processes of competent school leadership can be divided into three broad categories: *setting the direction* as identifying, formulating, and communicating goals and vision, *developing people* through supportive learning environments, and *developing the organization* by enabling supportive institutional infrastructure and a school culture based on shared goals and visions. Leithwood and Riehl's (2003, 2005)

three categories were later reconceptualized as a framework for analyzing the functions and practices of ICT leadership (Dexter, 2008; Petersen, 2014) and ICT policy planning in schools (Vanderlinde, Dexter & van Braak, 2012). Transforming categories into digitalized context further enabled the elaboration of complex developmental processes and practices related to digitalization in school.

Digitally Competent School Organizations

As argued by From (2017), Ottestad (2008) and Pettersson (2017), a concern for research is not only how teachers', school leaders' and pupils' digital competence can be developed and supported but also how schools can be digital competent in their way of structure and organize conditions and support in digitalized schools. From (2017) argued that digital competence is best understood in terms of the differing levels of the educational system, including the interaction, course, and organizational level. Along the same lines, Pettersson (2017) and Ottestad (2008) posited that digital competence should be considered as an organizational characteristic or task that includes various actors and competences as a part of a digitally competent school organization. One such example is Vanderlinde and van Braak's (2010) study on the e-capacity of a school defined as the ability or "collective competence… to implement ICT in a way that is a lever for instructional change" (p. 542). Taken together in the e-capacity model, there are a number of important aspects to achieve including leadership, goals, policy planning, decision-making, technological infrastructure, technology support, collegiality, professional development, staff's digital competence, and pedagogical use of digital technologies. In another study, Blau and Shamir-Inbal (2017) explored the complex and longitudinal process of developing a school ICT culture by adapting schools to the digital age. These researchers combined factors that predict such development: frequency of teachers ICT use, development of pedagogy by means of technology, teachers' digital competence, design and use of digital content, teacher-parents and school staff e-communication and pedagogical updates of class websites. From another perspective, Somekh (2008) argued that organizational and institutional infrastructure can either hinder or support educational and organizational change. On this matter, Somekh postulated that "organisational structures of schooling often make it impossible for ICT tools to be explored and appropriated pedagogically" and that educational systems "can be understood as outdated infrastructures resisting inevitable change" (p. 450).

In summary, research points towards several components which are central for developing a supportive school organization. With this previous research literature as a base, this study will attempt to provide further insight into possibilities and challenges in developing a digitally competent school organization. In the next section, methods and context of the study will be presented.

Method and context of the study

Five Swedish upper secondary schools with extensive experience in digitalization are included in this study. All of the schools are involved in remote teaching, meaning that digitalization is a prerequisite for the daily work in these schools. In Sweden, remote teaching is regulated in the Swedish school law, which implies that all schools need to consider certain quality standards (The Swedish Government, 2014). Digitalization and remote teaching are seen as a means to increase the access and quality of education, in this case in sparsely populated areas (compare Millet, 2012; Pettersson, 2017; Xiong, et al., 2016; Yu & Chen, 2016).

The schools included in this study are located in two different municipalities in the northern Sweden. They have some from 200 to 1000 pupils and about 30 to 120 employees. Each school has a number of courses, subjects and activities conducted online, primarily synchronously through live-send lectures and seminars. Online courses often include a blend of online pupils and pupils located in same school as the teacher. There is a mix of teachers sharing classrooms with their pupils and teachers conducting lectures in their offices facing all pupils primarily online. The latter is often developed as a solution facilitating one learning design (online) instead of two (online and face-to-face). To support remote teaching activities, all schools sending or receiving remote teaching have remote facilitators supporting pupils in their classrooms. Teachers are often responsible for their specific subject while working in teacher teams in different programs. All schools have a learning management system (LMS) for distributing handouts, instructions, schedules and such administrative aspects of teachers work.

Interviews

As the study focus on organizational aspects, and has the perspective of school leadership, it was decided to conduct in-depth interviews with school leaders (N = 5) and educational technologists (N = 5). These actors are seen as representatives involved in digitalization and organizational change. Before conducting interviews a two-day trip was conducted to meet respondents (all but two). This included a closer presentation of each school, participation in online remote teaching and meeting with teachers, pupils, school leaders and educational technologists. Due to long distances, the interview study (cf. Kvale, 2009) was thereafter conducted by phone. The interviews were conducted by means of a semi-structured interview guide (Kvale, 2009). Areas for the interviews were, in broad terms, how schools formulate their goals and visions, how they construct and mobilize resources and activities, and how they elaborate on supportive infrastructure to enable digitalization. The interviews lasted between 37–82 min, were recorded and transcribed in their entirety.

Data Analysis

Content analysis was carried out using the method of coding and categorizing in the program NVivo. This included a systematic (yet open) process of analysis with the potential for developing categories in the data. As an analytical tool, the three categories of *setting the direction*, *developing people* and *developing the organization* (Dexter, 2008; Leithwood & Riehl, 2003, 2005) were used to guide the analysis. The three predefined but broad categories allowed focus on central components for developing a digitally competent school organization, while still allowing unexpected subcategories emanating from data.

In the first step of the analysis, sentences or text parts were coded by giving names describing their content (e.g., visions, professional development, pedagogical support, leadership). Codes were then further analyzed and placed into the three categories: *setting the direction*, *developing people*, and *developing the organization* (Dexter, 2008; Leithwood & Riehl, 2003, 2005). Within each category, codes that seemed to bear a resemblance were placed into groups, forming subcategories of meaning; there were 12 subcategories, and these 12 are presented in Table 1.

Table 1 Categories and subcategories

Visions, Content, and Activities of Digitally Competent School Organizations
1. Setting the direction
Formulating and communicating goals and visions
Shared visions mean easy decisions

Goals and vision at different levels

2. Developing people
   - Technical and pedagogical support
   - Internal and external professional development
   - Collegial learning
   - Strict developmental requirements

3. Developing the organization
   - Hardware and software
   - Technical and pedagogical support structures
   - Building digitally competent teams
   - Time
   - Budget and external collaboration

The analysis was also performed on an aggregated level to display different types of digitally competent school organizations. For this step, different patterns in *setting the direction, developing people* and *developing the organization* were identified. The differences provided further insight into two types of digitally competent school organizations: *goal- and structure-oriented schools* and *culture-oriented schools* (see Table 2 in the Results section).

Results

The results indicate that several components and processes are important for developing a digitally competent school organization. In this section, the three categories and subthemes will be presented.

Setting the Direction

Setting the direction was described by all respondents as essential for developing a digitally competent school organization. Digitalization is, in different ways, seen as a prerequisite for schools' survival in today's digitalized knowledge society. Accordingly, the respondents described a determination in leading the work towards an environment in which actors and practices are given room change and develop. However, becoming what they consider digitally competent is not about digitalization per se but rather about finding solutions and conditions to reduce workload, improve the work environment in psychosocial terms, develop new teaching and learning designs, and ensure schools' quality and survival in rural areas.

When setting a school's direction, goals and visions are described to be formulated by different stakeholders. One school leader mentioned that there is a near-exclusive focus on bottom-up goals for setting the direction: "*With us, [teachers] have a great opportunity to influence their everyday lives and formulate different types of strategies that we want to use to develop the organization. Therefore, we do not need to set long-term goals*."

Other schools highlighted the importance of larger, holistic goals as a prerequisite for meeting the challenges of urbanization, digitalization, and educational change. Some school leaders also described the importance of not letting single actors, such as technologists or external experts, formulate and decide on goals but rather letting developmental visions come from the practice and be supported by experts.

Another component relates to "shared visions mean easy decisions," as shown in Table 1. With this notion, several respondents stressed that having people

united around common goals and visions facilitated decision-making in their school organization: "*We don't have to spend time discussing whether to invest in digitalization; everyone knows that we have to*."

Hence, developing a digitally competent school organization is not dependent on single actors who might disappear from the organization; instead, visions are anchored in school management and preferably in the entire school organization.

As it stands, schools have different strategies to convey goals in the organization. Although some schools seem to discuss and remind employees of goals verbally on a regular basis, others do not mention goals:

> We do not mention goals and visions. There is too much talk about goals and how to transform them into concrete goals at specific schools. We are trying to instead show how to achieve these goals, namely by building a culture and forcing people into our mind-set.

These school leaders describe how they take action by showing: "*We show by doing. Out in the halls, we show how we do things and where we want things done.*" However, other schools have strategies to communicate goals and visions to staff on a regular basis (e.g., during meetings).

Another aspect is that instead of local ICT policy plans, several schools seem to be driven by larger and sometimes political strategies related to, for example, flexible and available education in rural areas, meaning that digitalization becomes a natural process for reaching these goals. In these cases, digitalization does not become the goal per se but rather the tool and strategy for schools' survival in rural areas. This is also pointed to as a benefit when having visions anchored in larger political goals and strategies at both municipality and national levels.

Developing People

In meeting goals related to digitalization and the development of digitally competent school organizations, the development of people appears to be a central issue. In this category, the analysis signals three central components: technical and pedagogical support, internal and external professional development, and collegial learning and requirements of development.

As it comes to technical and pedagogical support, there seems to be opinions on how such support should be organized. In some schools, support from ICT coordinators, ICT support, and educational technologists seems to be essential: "*They do need a lot of support constructed by the management*." In contrast, for other schools, the focus has been on building a culture in which teachers assume the primary responsibility. Professional development is here processed and supported in and by the teacher group: "*Individuals don't need that much support; what they need is peace and quiet as well as time to develop through collegial learning*." Teachers in such schools are required to learn both the technical and pedagogical issues needed for the development of and work in digitalized schools.

Another component concerns the importance of both internal and external professional development. Some school leaders describe how they arrange "*internal seminar series, learning cafés, inspiration blogs, web courses, and web-based materials for staff*". Beyond this, school leaders and educational technologists also argued for external professional development in the form of formal courses, guest speakers, lecturers, or researchers as inspiration.

A third component concerns building the conditions for collegial learning. On this point, some schools describe how they arrange for teachers' collegial

learning: "*Sometimes, we arrange formal meetings and get together for teachers to provide with informal content*." Other school leaders described how teachers are given time to arrange for collegial learning themselves: "*Much is made about creating conditions [i.e., time] for sharing knowledge and allowing problems to stem from practice. That is, waiting for problems to appear and then seeing what they might be and how they can be resolved*."

At a general level and related to all components, there seems to be an attempt to establish strict requirements for technical and pedagogical development. Some respondents also argued for having goals transformed into concrete requirements expressed as *"all teachers should be able to do X."*. A problem raised by several respondents has for example been the initial challenges in having teachers moving from technical to pedagogical use and development of digital technologies in the classroom.

Developing the Organization

Analysis indicate that to build a digitally competent school organization, it is important to develop an environment in which actors and practices are given room to change and evolve. In this category, central components are building digitally competent teams to drive change and development, implementing technical equipment, organizing technical and pedagogical support, managing time and budget, and addressing aspects of leadership.

The first component relates to the technical equipment. This was expressed by all respondents with arguments similar to "*nobody should be able to blame the technology*." This require firewalls, stable networks, servers, and such. Other components are selection of hardware and software. In this regard, some schools discussed the importance of free choice of software, whereas other schools argued for the standardization of tools (e.g., all teachers using the same software chosen by the school organization). The latter approach is expected to facilitate collegial learning. All respondents called for a shared school-management system and as much alignment as possible between systems and applications.

Some respondents also described how they put significant effort into organizing for technical and pedagogical support structures in terms of ICT support, educational technologists, ICT coordinators, etc. Other respondents seem to primarily delegate technical and pedagogical support to teachers and collegial learning. To give teachers time to develop is tantamount to teachers primarily serving as their own ICT support. Otherwise, as one school leader said, the question of digitalization and learning design is handed to ICT support rather than driven by teachers and school leaders.

A third important component for developing a digitally competent school organization seem to be building digitally competent teams at all levels of the organization, including digitally competent leadership, economists, ICT support, administrators, educational technologists, and teachers who are willing and able to drive and direct the organization's development. Furthermore, recruiting competent people aligned with the developmental goals and visions of the school is crucial.

Additionally, time seems to be a central issue for all schools: "*Take, for example, professional development and collegial learning; why is it so hard to achieve? Well, it's either about the will or the time. The will is not an option; therefore, time needs to be freed up, used and evaluated*." To address this issue, school leaders have different strategies, including the recruitment of specialists to facilitate teachers' learning, scheduled time for courses on teachers' professional development (TPD), and investment and development of administrative support systems to reduce workload and leave time for teachers.

Budget is another important component when developing school organization. Schools often have a limited budget for digitalization and organizational change, so several schools described collaborating with externals, such as researchers and development projects.

Typologies

An analysis was also performed on an aggregated level to display different types of digitally competent school organizations. This step revealed different patterns in *setting the direction, developing people*, and *developing the organization*, which were subsequently analyzed and described in terms of two types of digitally competent schools described (see Table 2).

Table 2 Visions, Content, and Activities of a Digitally Competent School Organization

	Types of digitally competent school organization	
Categories	Goal and structure orientation	Cultural orientation
Setting the direction	Focus on goals and visions for change and support Communicate goals and visions Shared visions mean easy decisions*	Focus on building culture of learning and development Communicate ways of doing Shared visions mean easy decisions*
Developing people	Formal courses and formal structures for collegial learning Technical and pedagogical support Strict developmental requirements*	Focus on collegial and collegial support Limited support, time for collegial learning Strict developmental requirements*
Developing the organization	Leadership responsibility Institutional support structures ICT coordinators Support for specific software Alignment between systems* Collaboration with externals* Digitally competent teams* Developing teaching and learning with support from educational technologists	Collegial responsibility Focus on collegial support Collegial support Free choice of software Alignment between systems* Collaboration with externals* Digitally competent teams* Developing teaching and with support from colleagues

Note. * = components included in both school types

The two types of digitally competent school organizations portrayed in Table 2 unveil some interesting differences in approaching visions, content, and activities in school organizations. For example, the way an organization interprets and acts on different categories also seem to make a difference in the way the school is steered and organized.

In the culture-oriented school, representing both small and large schools, focus seems to be primarily on building a culture: a mind-set, values, relationships, and, ways of doing rather than on formal structures and institutional support. Teachers themselves are responsible for digitalization and educational change, with time allotted in their schedules. Collegial learning and bottom-up visions and solutions are particularly rewarded and supported: “We find it hard to respond to strict structures that sometimes don’t lead us forward.” In these

schools, professional development consists mostly of collegial learning made possible by additional time in teachers' schedules.

In contrast, goal- and structure-oriented schools, also including both small and larger schools, seem to focus on developing stable and comprehensive infrastructure to support change and development. School leaders are responsible for formulating and communicating goals and visions while building structures through which teachers feel safe and confident. Moreover, there is emphasis on recruiting competent staff, standardization of digital tools, and development of formal courses and structures supporting TPD and collegial learning.

Despite differences, there seem to be similar components in both school types. One example is efforts on TPD and strict developmental requirements (i.e., not optional for or questionable by staff). Another aspect is the focus on allotting time for TPD. The third similarity is that few schools seem to have an updated ICT policy plan for setting the direction; instead, both types of school are focused on or driven by larger political goals and strategies formulated at municipality or national level. A fourth important aspect is having everyone united around common goals and visions as part of the overall school culture. As indicated in the results, this facilitates decision-making and strategic investments, for it means that visions of digitalization and educational change are anchored in the entire school organization.

Discussion and Conclusion

The aim of this study was to explore how schools structure their organizations, institutional infrastructure, and activities as conditions for digitalization. The specific aim is to explore components contributing to a supportive organization as perceived by the school leadership: school leaders and educational technologists. Moreover, to provide insight into differences in schools ways of structuring their organizations. According to the analysis, a digitally competent school organization can be said to embrace the environment in which actors and practices are given room to change and evolve, where conditions for new forms of digitalized teaching and learning are provided and where goals on digitalization and educational change can be accomplished (cf. Ottestad, 2008; Pettersson, 2017; Vanderlinde & van Braak, 2010; Wastiau et al., 2013). A well-organized school also seems to serve as a prerequisite for sustainable learning and development insofar as it provides resources, supportive environments, and shared goals and visions in both long-term and short-term perspective (see also Leithwood & Riehl, 2003, 2005). Moreover, it seems to be an organization that recognizes the importance of supporting its actors and what culture and structure are needed for sustainable technical and pedagogical development.

A central component to developing a digitally competent school organization seems to be having goals and visions anchored in larger political goals and strategies (cf. Dexter, 2008; Petersen, 2014). Most schools in this study do not seem to have an updated and active ICT policy plan; instead they focus on strengthening their respective schools' quality, position or survival in rural areas (cf. Vanderlinde et al., 2012). This exemplifies how digitalization is not the primary goal or vision per se but rather a tool for achieving larger political goals and visions. Having staff engaged in and united around the same goals and visions also seem to facilitate decision-making and the introduction of the developmental projects needed for schools to progress (Leithwood & Riehl, 2003, 2005). However, schools being digitalized must also know how to work with strategic organizational development. Similar to Avidov-Ungar and Shamir-Inbal (2017), this requires, apart from TPACK, to have staff who are familiar with organizational knowledge (OK) and leadership knowledge (LK). For example, to support strategic change, there needs to be an interplay between the knowledge in and development of teaching and learning practices

(technological and pedagogical) and the knowledge and development of the organizational structure. In addition, the ICT leadership knowledge needed to drive and support the work.

By using the three aforementioned categories as an analytical framework (Leithwood & Riehl, 2003, 2005), two types of digitally competent school organizations were identified: goal- and structure-oriented schools and culture-oriented schools. Among school types, differences were identified in the underlying processes in acting on challenges related to digitalization. For example, schools' approaches to setting direction diverged in terms of communicating respectively doing and showing goals and visions. Underlying goals and visions also seem to influence how responsibility for developmental processes is distributed across staff respectively school leaders. An important insight here is for example the differences in how professional development is supported and carried out. In the first type of school, the focus is on formal structures and courses for teachers, whereas in the second type of school, focus is on collegial learning. At the heart of this understanding is also that ways of organizing support influences how responsibility for the development of core practices (i.e., teaching and learning) is distributed. Put differently, although both types of school aspire to develop teaching and learning in technology-rich environments, the differences in organizing the school influences whether such processes are top-down or bottom-up activities driven by for example teachers in the school.

Another interesting result of this study is that certain components remain the same regardless of how schools decide to organize for developing a digitally competent school. Although visions, practices, and processes may differ in important aspects, there are common denominators: having people united around shared goals and visions, assigning time for professional development, and establishing strict requirements for expected development. Another important component seems to be shifting responsibility from single actors to larger teams or, ideally, the overall school organization. This observation is important as it demonstrates aspects that go beyond individual and contextual preferences of the schools. Moreover, it demonstrates aspects that preferably are considered for several schools striving for becoming a digitally competent organizations.

To conclude, the insights provided in this study serve as a point of departure for understanding how schools, in different ways, can set the direction, develop people, and develop the organization to become a comprehensive, stable, and digitally competent school organization. In this study, typologies have served as a useful analytical tool for analyzing different approaches to digitalization and organizational change. The use of typologies has also supported development of a vocabulary used for describing the differences between school types and the processes and components needed when developing supportive school organizations (compare Carlén & Jobring, 2005). However, this study is based exclusively on qualitative data and a rather small number of schools. Further research could preferably analyze a larger number of schools, including additional actors such as teachers and pupils. Further research could also explore schools with different profiles or approaches to digitalization (remote teaching, one-to-one, blended learning and such). Studies could then add to the understanding of how different school types and ways of organizing for digitalization play out in practice

References

Ala-Mutka, K. (2011). Mapping digital competence: Towards a conceptual understanding. Seville: European Commission, JRC-IPTS. Retrieved from http://ipts.jrc.ec.europa.eu/publications/pub.cfm?id=4699.

Avidov-Ungar, O., & Shamir-Inbal, T. (2017). ICT Coordinators' TPACK-based leadership knowledge in their roles as agents of change. *Journal of Information Technology Education: Research, 6*(16), 169-188.

Blau, I., & Shamir-Inbal, T. (2017). Digital competences and long-term ICT integration in school culture: The perspective of elementary school leaders. *Education and Information Technologies, 22*(3), 769–787.

Calvani, A., Fini, A., Ranieri, M., & Picci, P. (2012). Are young generations in secondary school digitally competent? A study on Italian teenagers. *Computers & Education*, *58*(2), 797-807.

Carlén, U., & Jobring, O. (2005). The rationale of online learning communities. *International Journal of Web Based Communities, 1*(3), 272-295.

Dexter, S. (2008). Leadership for IT in schools. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education* (pp. 543–554). New York, NY: Springer.

Erstad, O. (2010). Educating the digital generation. Exploring medial literacy for the 21st century. *Nordic Journal of Digital Literacy, 5*(1), 56–72.

From, J. (2017). Pedagogical digital competence—Between values, knowledge and skills. *Higher Education Studies, 7*(2), 43–50.

Hansson, A (2013). Arbete med skolutveckling–En potentiell gränszon mellan verksamheter? Ett verksamhetsteoretiskt perspektiv på en svensk skolas arbete över tid med att verksamhetsintegrera IT. Doctoral thesis, Mittuniversitetet: Avd. för Utbildningsvetenskap. ISBN 978-91-87557-09-5.

Hatlevik, O. E., & Christophersen, K. A. (2013). Digital competence at the beginning of upper secondary school: Identifying factors explaining digital inclusion. *Computers & Education, 63*, 240–247.

Hauge, T.-E. (2014). Uptake and use of technology: Bridging design for teaching and learning. *Technology, Pedagogy and Education, 23*(3), 311–323.

Håkansson Lindqvist, M. (2015). Gaining and sustaining TEL in a 1:1 laptop initiative: Possibilities and challenges for teachers and students. *Computers in the Schools, 32*(1), 35–62.

Koehler, M. J., & Mishra, P. (2009). What is technological pedagogical content knowledge? *Contemporary Issues in Technology and Teacher Education, 9*(1), 60–70.

Krumsvik, R. J. (2009). Situated learning in the network society and the digitised school. *European Journal of Teacher Education, 32*(2), 167–185.

Kvale, S. (2009). *Interviews. An introduction to qualitative research interviewing* (2nd ed.). London, England: Sage.

Leithwood, K. A., & Riehl, C. (2003). *What we know about successful school leadership*. Philadelphia, PA: Laboratory for Student Success, Temple University.

Leithwood, K. A. & Riehl, C. (2005). What do we already know about successful school leadership? In W. A. Firestone & C. Riehl (Eds.). *A new agenda for research in educational leadership* (pp. 12–27). New York, NY: Teachers College Press.

Leithwood, K. A., Louis, K. S., Anderson, S., & Wahlstrom, K. (2004). *How leadership influences student learning: A review of research for the learning from leadership project*. New York, NY: Wallace Foundation.

Leithwood, K. & Jantzi, D. (2006). Transformational school leadership: Its effects on students, teachers and their classroom practices. *School Effectiveness and School Improvement, 17*(2), 201–227.

Millet, J. A. (2012). *Virtual learning in K–12 education: Successful instructional practices and school strategies*. Prescott Valley, AZ: Northcentral University.

Mishra, P., & Koehler, M. J. (2008). Introducing technological pedagogical content knowledge. Paper presented at the Annual Meeting of the American Educational Research Association New York City, March 24–28, 2008, p. 1–16.

Olofsson, A. D., & Lindberg, J. O. (2014). Moving from theory into practice–on the informed design of educational technologies. *Technology, Pedagogy and Education, 23*(3), 285-291.

Ottestad, G. (2008). Schools as digital competent organizations: Developing organisational traits to strengthen the implementation of digital founded pedagogy. *International Journal of Technology, Knowledge and Society, 4*(4), 10.

Petersen, A. (2014). Teachers' perceptions of principals' ICT leadership. *Contemporary Educational Technology, 5*(4), 302–315.

Pettersson, F. (2015). *Learning to be at a distance: Structural and educational change in digitalizing medical education*. Doctoral thesis, Umeå University: Department of Education. ISBN 978-91-7601-356-4.

Pettersson, F. (2017). On the issues of digital competence in educational contexts – a review of literature. *Education and Information Technologies*. Published online 3 September 2017. doi: 10.1007/s10639-017-9649-3

Somekh, B. (2008). Factors affecting teachers' pedagogical adoption of ICT. In J. Voogt & G. Knezek (Eds.), *International handbook of information technology in primary and secondary education* (pp. 449–460). London, England: Springer Science+Business Media.

The Swedish Government. (2014). Education Committee's report 2014/15: UbU3: Opportunities for distance teaching. Retrieved from: https://www.riksdagen.se/sv/dokument-lagar/arende/betankande/mojligheter-till-fjarrundervisning_H201UbU3

Vanderlinde, R., & van Braak, J. (2010). The e-capacity of primary schools: Development of a conceptual model and scale construction from a school improvement perspective. *Computers & Education, 55*, 541–553.

Vanderlinde, R., Dexter, S., & van Braak. (2012). School-based ICT policy plans in primary education: Elements, typologies and underlying processes. *British Journal of Educational Technology, 43*(3), 505–519.

Wastiau, P., Blamire, R., Kearney, C., Quittre, V., Van de Gaer, E., & Monseur, C. (2013). The use of ICT in education: A survey of schools in Europe. *European Journal of Education, 48*(1), 11–27.

Yu, L., & Chen, S. (2016). Synchronous remote classroom connecting K–12 schools in developed and undeveloped areas: A case study from China. In J. Zhang, J. Yang, M. Chang, & T. Chang (Eds.), *ICT in Education in Global Context* (pp. 277–291). Singapore: Springer.

Xiong, C., Ge, J., Wang, Q., & Wang, X. (2016). Design and evaluation of a real-time video conferencing environment for support teaching: An attempt to promote equality of K–12 education in China. *Interactive Learning Environments*. doi: 10.1080/10494820. 2016.1171786