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Digital competence across boundaries - beyond a common Nordic model of the digitalisation of K-12 schools?

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ABSTRACT

This paper explores policy related to digital competence and the digitalisation of Nordic K-12 schools. Anchored in some key transnational policies on digital competence, it describes some current Nordic movements in the national policies of Denmark, Finland, Norway and Sweden. The concept of boundary objects is used as an analytical lens, for understanding digital competence as a plastic and temporal concept that can be used to discuss the multi-dimensional translation of this concept in these Nordic countries. The paper ends with a discussion of the potential to view digital competence as a unifying boundary object that, with its plasticity, temporality and n-dimensionality, can show signs of common Nordic efforts in the K-12 school policy.

ARTICLE HISTORY

KEYWORDS

Boundary objects; digital competence; digital technology; K-12 school; nordic countries; policy

Introduction

From a historical perspective, the so-called Nordic model refers to the Nordic countries' society and education after the Second World War. This model has been associated with positive connotations of unity, as it is intertwined in politics and in the building of the various Nordic nations (Blossing, Imsen, & Moos, 2014; Imsen, Blossing, & Moos, 2017). Researchers have further investigated and questioned several of the Nordic model's aspects over the last decades (cf. Moos, 2013; Telhaug, Mediås, & Aasen, 2004, 2006). This paper is interested in the studies regarding digital technology in education as a point of departure to compare Nordic countries. For example, Pedersen et al. (2006) stated that the Nordic countries are known to be world leaders in this area, and Ottestad (2010) compared the innovative pedagogical practices of three Nordic

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countries. In both these examples, researchers assumed positive accounts of the educational use of digital technologies in Nordic countries.

Interestingly, although digital technology has a long history in Nordic countries' education systems, prior to 2003 it was not available in a more coherent way related to other policies in the field (Plomp, Anderson, Law, & Quale, 2009). Equally interesting is that more recent research that moves beyond the policy and practice of each Nordic country is scarce. In more recent transnational comparisons, such as PISA 2015, TIMMS and the ESSIE studies (Wastiau et al., 2013), the Nordic countries are described as rather well-developed and highly equipped in the digital technology field in education. However, as Ottestad (2010) shows, there are differences in how pedagogical practices take shape and, for example, manifest in teachers' digital technology use. Put differently, there are variations in levels of digital competence across countries. In this paper, using the concept of boundary objects (Star & Griesemer, 1989) we focus on how digital competence can provide the possibility to trace signs of how intentions at the transnational policy level are translated, negotiated and inscribed into Nordic national policy. In the end we discuss whether digital competence as a boundary object can reach beyond each country, providing a Nordic perspective.

Digital competence – a plastic boundary object?

To further elaborate on Nordic policies related to digital competence, we use the boundary objects analytical lens (Star, 2010). Specifically, our intention is to view digital competence as a boundary object allowing us to discuss and draw *one* nuanced picture of the way digital competence has been translated, negotiated and enacted in educational policy in Denmark, Finland, Norway and Sweden. According to Fox (2011), a boundary object is an element with a flexible meaning and with the potential to "enhance the capacity of an idea, theory or practice to translate across culturally defined boundaries" (p. 71). Islind, Lindroth, Lundin, and Steineck (2019, p. 426) suggest that an object or idea becomes a boundary object when it functions as a catalyst during the processes of transformation, translation, and negotiation within and between professional boundaries. In their 1989 seminal paper, Star and Griesemer wrote that different stakeholders can always understand a boundary object in different ways because it is located and active in several different practices; however, they also point out that boundary objects are "plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (Star & Griesemer, 1989, p. 393). Put differently, "boundary objects are at once temporal, based in action, subject to reflection and local tailoring and distributed throughout all of these dimensions. In this sense, they are n-dimensional" (Star, 2010, p. 603). Kertcher and Coslor (2020) acknowledge that thus far, research has often discussed boundary objects' power to connect different practices – from global to local practices – and facilitate the creation of joint understandings within each practice. In this paper, the relations Star and Griesemer (1989) laid out, depicted in Figure 1, are used as an analytical lens to discuss the question of translation in Nordic educational policy on digital competence.

The top corner of Figure 1 represents digital competence policy at the transnational level (e.g. OECD, and the European Commission). On the next level, so-called "passage

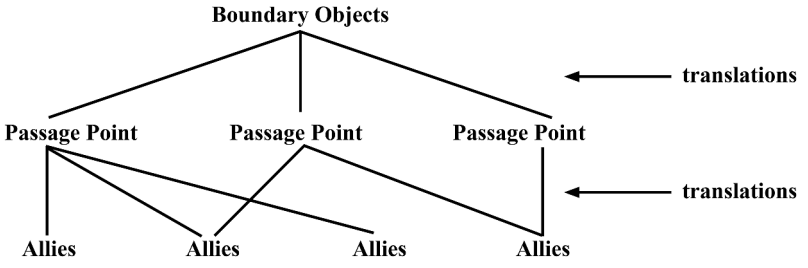

Figure 1. Adopted from Star & Griesemer (1989).

points" represent current trends in national policy on digital competence in Denmark, Finland, Norway and Sweden. The last level, "the allies", represents the K–12 school context in the Nordic countries. Notations between each level represent the translation processes through which the possible meaning of digital competence as a boundary object are negotiated and enacted. The plasticity of boundary objects becomes of interest in such processes, describing movements of educational policy into the practice in each of the four countries.

Movements in policy at the transnational and national levels

There seems to be synchronous policy discourses around the development of digital competences, both at a transnational level and a Nordic national level. This section provides a brief overview of the directions of formulations, intentions and goals in a few key transnational educational policies. It details and exemplifies movements in national policy on digital competence and the digitalisation of K–12 schools in Denmark, Finland, Norway and Sweden.

The transnational level

Numerous reports and frameworks have been published on a transnational policy level, focusing on digital competence – its meaning, implementation in education and importance for the society (Moonen, 2008). For obvious reasons, it is impossible to discuss them all, but briefly and through examples, we have chosen to describe some higher impact provisions of a few key documents from global or transnational policy actors who are frequently referenced in educational research (cf. Jakobi, 2009; Siddiq, Hatlevik, Olsen, Throndsen, & Scherer, 2016). Of course, this selection of documents can be criticised; we could have included more and other documents. However, the idea is not to provide a comprehensive, critical description of a large body of documents on this level, but rather to illustrate how this plastic concept of digital competence (a) has been relevant and evolved in policy over time and (b) if signs can be seen of how they have been translated and connected in Nordic educational policy.

Already in 2005, OECD posed the question, "What competencies do we need for a successful life and a well-functioning society?" (p. 4). One of three competency categories highlighted is the competence of using digital tools interactively. A competency is then divided into three sub-competencies, each with a distinct

technical focus: (a) use language, symbols and texts interactively; (b) use knowledge and information interactively; and (c) use digital technology interactively. The following year, the European Union (2006) presented eight key competencies for life-long learning, which included digital competence. Here digital competence is defined in a multi-facetted way, covering several aspects such as basic skills in information and communication technology (ICT), which includes searching, collecting and critically processing information; creativity and innovation; legal and ethical principles involved in using ICT; and producing, presenting and understanding complex information. "DIGCOMP – the framework for developing and understanding digital competence in Europe" (Ferrari, 2013) is another key policy that has played a central role regarding European education. Digital competence is described in more detail and divided into five general competence areas: (a) information, (b) communication, (c) content creation, (d) safety and (e) problem solving with several practical-oriented competencies (e.g. 25 in total) connected to each general competency area. The latest EU policy in the area we want to highlight is, "Digital education action plan – resetting education and training for the digital age (2021–2027)" (European Commission, 2020). Here, the importance of addressing digital competence in European educational institutions is related to how rapid digital transformation is continuously reshaping work and European citizen's daily lives. Two strategic priorities for the future in education are outlined, mirroring focuses of digital competence seen in former documents as well as pinpointing new ones. The first priority is to foster a high-performing digital ecosystem. The second priority is to enhance digital skills and competencies for the digital age.

With this contextual backdrop of the main thrust in a few key transnational educational policies and keeping in mind the plasticity of digital competence as a boundary object, the next section presents descriptions of digital competence as it appears in more recent national educational policy for Denmark, Finland, Norway and Sweden.

Denmark

National policy on digitalisation in Danish K–12 schools can be traced back to the 1960s and different phases of development distinguishes it. The fourth and current phase (year 2016 ff.) (Bundsgaard, Bindslev, Caeli, Pettersson, & Rusmann, 2019) is characterised by the hindsight and insight into the policy that the ability to use digital technology may not be sufficient – one should also know how to produce and understand digital content. This skill requires an understanding of how digital technology functions and processes information, and the insight has led to a renewed focus on critical thinking skills (e.g. evaluating data and avoiding being cheated online) in K–12 schools as well as an emphasis on computational thinking.

Danish schools are divided between primary, lower secondary and upper secondary schools, with various strategies used in each. In primary and lower secondary school, the strategy was to develop and embed into the mandatory curriculum a new subject called "Technological Comprehension" (Smith, Bossen, Dindler, & Iversen, 2020). Preliminary testing of this strategy was concluded in 2020, and results are still being analysed. In upper secondary school, digital competence has been woven into the fabric of each subject, with the latest reform from 2016 (Ministry of Education, Denmark, 2016). Instead of creating a new subject to foster pupils' development of digital

competence, as was done in primary and lower secondary schools, the responsibility in the upper secondary school is spread among every school subject; digital competence is conceptualised as strengthening the subjects and emanating from within.

Established in April 2018, the so-called Danish Technology Pact further supported the development in policy and practice of competencies connected to using digital technology throughout the educational system (Ministry of Industry, Business and Financial Affairs, Denmark, 2018). It was designed to enhance STEM (e.g. science, technology, engineering and mathematics) skills and competencies through trilateral collaboration between government, educational institutions and businesses. Moreover, it strongly emphasises digital competence in relation to professional vocational qualification and citizenship education in a democratic society.

Finland

The interest that policy and practice show in using digital technology in education is not new in Finland; the first attempts were implemented in the 1980s (Saarikoski, 2006). For Finnish educational policy, international evaluations of using digital technology in the 2000s (OECD, 2004) were favourable, but later evaluations (OECD, 2015) were less positive. From the 2010s on, a more active policy was implemented. First, matriculation exams were digitalised in 2011, which quickly increased the use of digital technology in upper secondary schools. In 2016, a few initial subjects implemented electronic exams, and the last subject tests were conducted in electronic form in 2019 (mathematics). However, digital matriculation exams put pressure on teachers, and it became evident to schools and teachers that they had to help pupils pass the exams. Another change was new curricula, both for primary and secondary education, which were accepted in 2016 (Finnish National Agency for Education, 2014, 2019). In addition to plans for every subject's content, the methods were somewhat described, including plans for adopting digital technology in the subjects as part of the methods.

In Finland, the concept of digital competence is not explicitly mentioned in policy strategies or national roadmaps for education. In primary school, the term ICT is used in the national curriculum (Finnish National Agency for Education, 2014), and pupils are meant to gain ICT competence in four main areas: 1) understanding the use and principles of ICT for making products; 2) using ICT in responsible, safe and ergonomic ways; 3) using ICT in information searches as well as for inquiry and creativity; and 4) using ICT in interaction and networking. In upper secondary school, the term for digital technology is also ICT, although in primary school "multiliteracy" is used when speaking about the Finnish language (Finnish National Agency for Education, 2019).

Norway

In Norway, the first official report on digital technology in education was titled "About Data Technology in Schools and Education" (Meld. St. no 37, 1988). National reports during the 1990s (Statistics Norway, 1995 &, 1997) and SITES (1999) showed a need to strengthen the use of digital technology in Norwegian schools. This need was reflected in a strategy that emphasised digital technology's importance for pupils' learning (Ministry of Church Affairs, Education and Research, Norway, 2000). In 2004, a new

strategy for digital competence was introduced. Digital competence was a new concept at the time, bridging reading, writing and numeric skills with those needed to use digital technology creatively and critically (Ministry of Education and Research, Norway, 2004). In 2006, the Norwegian Ministry of Education and Research introduced the educational reform for primary and lower secondary school known as the "Knowledge Promotion Reform". Norway then became one of the first countries in the world to include digital skills within the national curricula in compulsory education. This approach emphasised five basic skills of equal importance: oral, reading, writing, numeric and digital skills. For digital skills, the competence goals were related to using digital technology for learning purposes.

In 2017, the National Framework for Teachers' Professional Digital Competence (PDC) (Kelentric, Helland, & Arstorp, 2017) was published. Subsequently, the Ministry for Education and Research funded digitalisation projects (9 million euro) in teacher education to increase PDC among teacher educators and students. In addition, several Massive Open Online Courses (MOOCs) on PDC for teachers have received funding based on the framework to enhance PDC with in-service teachers as part of a new competence development model (OECD, 2019). The latest report on digital competence in Norwegian schools (Sintef, 2019) shows that teachers use a variety of digital resources, and their digital competence has increased (see also Hatlevik, Egeberg, Guðmundsdóttir, Loftsgarden, & Loi, 2013). In 2020, Norway implemented a new National Curriculum for Knowledge Promotion, requiring pupils to use digital technology to reach competency goals across and within subject domains.

Sweden

In Sweden, interest in policy related to digitalising K–12 schools began in the 1960s (Jedeskog, 2005; Karlsohn, 2009). Even so, and despite several national large-scale projects over the years, evidence of advanced digital technology use in Swedish schools is scarce (Olofsson, Fransson, & Lindberg, 2020; Olofsson, Lindberg, & Fransson, 2017). However, recent comprehensive attempts have resulted in two national policies: "the National Strategy for the Digitalisation of the K–12 School System" (Supplement to Government decision I:1, 2017) and "the National Plan of Action" (Swedish Association of Local Authorities and Regions (SALAR), 2019). The latter was expected to guide Swedish school organisers on how to implement and realise the strategy. Sweden enacted these policies to support its intention of continuing to act as a leading country in digitalisation and digital competence. Parallel to the new policies, a revised curriculum highlighting digital technology use and digital competence in K–12 schools was launched in 2018.

In short, the national strategy consists of three focus areas: (1) digital competence for all in the school system, (2) equal access to and use of digital technology and (3) research on and follow-up of t digitalisation's possibilities. The main concept in the strategy, "adequate digital competence", concerns everyone in the school system – children, students, teachers, school leaders and other staff members. This signifies that the level of digital competence is always evolving and situated in context. However, previous research has shown that this way of defining digital competence in policy might pose challenges for K–12 schools in practice, because " … it seems

possible to describe the notion of 'adequate digital competence' as being both multi-layered and somewhat stretchable. It can be understood in relation to almost all aspects of education, and it offers a position that is not easy to contest" (Fransson et al., pp. 225–226, Fransson, Lindberg, & Olofsson, 2018). The strategy is to be realised no later than 2022. For that reason, and as discussed above, SAR was appointed to produce "the National Plan of Action". The plan consists of the responsible Swedish authorities mapping the current state, and the result is categorised in nine general needs on the national level, with 18 activities and initiatives designed to support the three focus areas in the strategy.

Discussion

This paper's initial and overarching aim was to search for signs of a Nordic model building on digital competence and improving digital technology in K–12 education. However, our attempt to describe a unified Nordic model turned out to be a rather difficult endeavour. Diverse focuses and desired movements manifest differently in each country's national policies, combined with a seemingly nonuniform process of school digitalisation, creating a multi-dimensional and difficult-to-define representation of what a Nordic model in this aspect could be. Interestingly, though, what appeared to unite policy in the four countries was a shared idea of digital competence's importance in the national K–12 education system. A "Nordic dimension" that also relates to how early these discourses were highlighted in national education policies as well as embedded in the curriculum, pedagogic delivery, or other education practices. Together, this paved the way for an understanding of the situation in the Nordic countries building on the boundary objects analytical lens.

Digital competence as a plastic boundary object – connecting the global and the national with potentialities for the local

Considering digital competence as a boundary object, we drew *one* condensed picture of the way each Nordic country has included digital competence in educational policies. Since boundary objects do not carry a fixed meaning (Fox, 2011), but rather carry inherent potential to travel between different practices, they can be considered temporal and n-dimensional (Star, 2010). As Star and Griesemer (1989) put it, boundary objects are " … plastic enough to adapt to local needs and the constraints of the several parties employing them, yet robust enough to maintain a common identity across sites" (p. 393). In this paper, this plasticity means that digital competence is not a concept with a fixed global meaning, formulated on a transnational policy level, that trickles down into national policy without change of meaning. Instead, digital competence becomes a concept that carries an intended meaning, which can be translated and negotiated relative to national educational needs and beliefs and with a possibility to be enacted in different ways in a situated local practice (see Figure 1). For the four Nordic countries in this paper, digital competence as a boundary object has its resonant bottom in transnational policy. Analytically, it seems possible to both understand the plasticity of digital competence and to search for signs of Nordic traits in the translations, movements and activities of digitalisation in K–12 schools.

Beyond a unified Nordic model?

In this last section, we briefly point at and touch on whether it is more reasonable to discuss digital competence as a uniting plastic boundary object in research and policy related to the digitalisation of the K–12 school context, rather than continuing to endorse a so-called Nordic model. Numerous transnational policies are related to digital competence and the digitalisation of K–12 schools. We chose to display digital competence's plasticity using a few key transnational policies as examples, from periods ranging from when the concept was coined, up to today and beyond. All four seem to share the common idea that digital competence is a necessity for any citizen in a society to participate and contribute to the development of wealth, both on an individual and a collective level. In early writings, digital competence was considered a technical skill and the ability to use digital tools in a sufficient way (OECD, 2005). However, in time digital competence, manifesting its temporality and n-dimensionality, became more complex and stretched out, mirroring the rapidly digitalising of European societies. Moreover, the importance of digital competence in K–12 schools was high on the agenda, for example, it was viewed as connected to creativity, innovation and safety (European Union, 2006; Ferrari, 2013). In the "Digital education action plan – resetting education and training for the digital age (2021–2027)" (European Commission, 2020), digital competence's role in educational settings is related to current and future digital transformations in Europe. It envisions schools enhancing digital skills and competences for the digital age while functioning as part of a high-performing digital ecosystem in which digitally competent and confident teachers play a central role. In short, the concept's plasticity allows an understanding of digital competence as a boundary object that includes specific technical dimensions as well as a skill that lays the groundwork for being part of a circular and digital societal ecology.

In the translation of policies on digital competence from the transnational level into national educational policy, all four Nordic countries have noticeably increased production of new policies and strategies over the past five years. Moreover, the focus has shifted away from understanding digital competence as essentially a technological competence, to a formulation of digital competence that includes several other dimensions of the adequate ability to use digital technology and acknowledges citizens' role in the digitalised society. However, the plasticity combined with the robustness in digital competence as a boundary object seem to allow different conceptualisations in recent national policy, without losing connection to the origin, to the transnational arena of formulation. In Danish national policy, digital competence is formulated with a focus on technological comprehension and subject-specific digital literacy. In Finland, the ICT competence concept is divided into four main areas of competence (for example, understanding the use and principles of ICT for making products and the relationship of ICT to inquiry and creativity). In Norway, teachers' professional digital competence is stressed as based on the idea that this competence represents basic skills pupils must master to navigate across and within subject domains. In Sweden, the focus in relevant policy documents is on developing adequate digital competence in K–12 schools, understanding digital competence not as a fixed competence but rather as temporal, contextual and n-dimensional – digital competence is a moving target to be taught in a way that mirrors the technological development in society.

Conclusion

By analytically understanding digital competence as a boundary object, we have discussed how intentions on the transnational educational policy level are translated into national policy in four Nordic countries. The picture that emerges suggests that rather than viewing the digitalisation of the K–12 school as a Nordic model, it might be more valuable to view digital competence as a unifying concept that with its plasticity, temporality and n-dimensionality represents common efforts in Denmark, Finland, Norway and Sweden. Such insights lay the groundwork for further research into Nordic pupils developing the digital competence necessary for them to participate in the society of tomorrow.

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