Professional Digital Competence in Teacher Education

Geir Ottestad
Head of Department at the Norwegian Centre for ICT in Education
geir.ottestad@iktsenteret.no

Marijana Kelentrić
Adviser at the Norwegian Centre for ICT in Education
marijana.kelentric@iktsenteret.no

Gréta Björk Guðmundsdóttir
Senior Researcher at the Norwegian Centre for ICT in Education
greta.gudmundsdottir@iktsenteret.no

INTRODUCTION

Digital competence has been gradually introduced into school curricula, assessment tests and classroom practice over the past decade. During the same period, the term was subjected to policy processes that resulted in descriptions of digital skills as one of the five basic skills for learning in school. The term has also been the subject of several academic definition processes. Common to the developments in both policy and academia is that it largely has been the pupils' digital competence understood as an end product that has been conceptualized. There are few studies and texts that describe what should comprise the specifics of a teacher's digital competence, i.e. competence that enables the teacher to foster students' digital skills through work with academic subject material. In this context, teacher education is of foremost importance for the development of digitally competent teachers. What is then known about the use of ICT for pedagogical and didactic purposes in Norwegian teacher education programmes?

Ørnes et al. (2011) found positive attitudes to the administrative use of ICT among student teachers. Furthermore, they found that student teachers understand digital tools as key tools in academic life that greatly affects the quality of their education. This is particularly evident with regard to the possibilities for easier collaboration and contact between students and teachers, easier access to information and literature, and more variation in the use of learning materials.

Tømte, Kårstein and Olsen (2013) found that the development of professional digital competence all over is weakly instituted at the management level of teacher education programmes, and that most programmes lack a comprehen-

sive approach to the development of such skills. Furthermore, they found that teacher educations institutions' academic profiles on the topic are poorly developed, and that the expertise of the academic staff is highly variable. The fostering of professional digital competence of student teachers in many teacher education programmes depends on enthusiasts among academic staff. There are relatively few examples where a teacher education institution articulates how digital competence can be related to what a good teacher should be, what kind of teachers one will educate, or what kind of teachers' digital skills qualifications training will bring about. Tømte, Kårstein and Olsen also point out that it is necessary to have better cooperation between practice schools and teacher training institutions. This means that supervising teachers need higher digital competence and schools need better digital equipment.

Gudmundsdottir, Loftsgarden and Ottestad (2014) found in a study that few newly qualified teachers were satisfied with their knowledge and skills acquired in initial teacher training – knowledge about working in classroom equipped with digital tools. At the same time, teachers were found to be very interested in further evolving and deepening their digital competence, even if the schools they work in do not articulate clear requirements for the use of ICT for teaching and learning.

Evidence suggests that teacher education institutions and programmes still have some ground to break before they fully integrate digital competence into their practice. Student teachers are most likely not prepared to integrate the fostering of mandatory digital competence in their subject teaching even when they graduate. Thus digital competence is often neglected or reduced into more shallow and instrumental activities, like *learning to use the computer* or *searching the Internet*. On the other hand, it is also necessary to provide a clear concept of pupils' digital competence for teachers to use. Even this might be a demanding task, as digital competence is by no means clearly or unambiguously defined.

DIGITAL COMPETENCE FOR PUPILS IN SCHOOLS

A good place to start for understanding the specifics of digital competence in Norwegian schools is the national framework for basic skills. Digital skills are given a general definition, as well as a division into four sub-categories: *Search and process*, *Produce, Communicate* and *Digital judgement*. The skill is also described in alignment with subject learning:

> The development in digital technology has changed many of the conditions for reading, writing and oral forms of expression. Consequently, using digital skills is a natural part of learning both in and across subjects, and their use provides possibilities for acquiring and applying new learning strategies while at the same time requiring new and increased powers of judgment (Norwegian directorate for education and training, 2012).

The term 'digital skills' might be slightly misleading, as the text and stated intentions behind the framework clearly point towards descriptions of competences. Thus, for the sake of parsimony, *digital competence* is the preferred term in the rest of this article.

In his discussion of the concept of digital competence Erstad (2005) writes that competence is a more comprehensive term than skills. Competence includes both the technical aspects relating to the management of hardware and software and the more cognitive aspects related to knowledge and education.

ITU Monitor 2007 stresses that digital competence manifests itself in different ways in different situations and is strongly linked to the subject. In other words, students' and teachers' digital competence are two different concepts that should be operationalized in different ways (Arnseth et al., 2007). Monitor 2011 operationalizes digital competence in accordance with the framework of basic skills in the Norwegian curriculum. The report defines five dimensions of digital skills: operational use of ICT (formerly called digital skills), acquisition and processing of digital information, production and processing of digital information, digital judgment, and the ability to communicate digitally (Egeberg et al., 2012). In Monitor 2013, the definition of digital competence was expanded with problem solving and collaboration as key dimensions associated with the necessary skills in a network society (Hatlevik et al., 2013). These dimensions can also be found in newer definitions of digital competence in international studies (Calvani, Fini, Ranieri, & Picci, 2012; Claro et al., 2012; Ferrari, 2013).

The overview of the evolution of the definition of the concept of digital competence in the Monitor studies also shows that the understanding of the concept is influenced by technologies that have come along, and the ever-changing characteristics of ICT that require new skills and applications. This understanding is reflected in the more general definition of digital competence in the European e-Competence Framework (2014):

> Competence is a demonstrated ability to apply knowledge, skills and attitudes for achieving observable results. (…) [This] is a durable concept and although technology, jobs, marketing terminology and promotional concepts within the ICT environment change rapidly, the e-CF remains durable requiring maintenance approximately every three years to maintain relevance (p. 5, the European e-CF, 2014).

PROFESSIONAL DIGITAL COMPETENCE UNDERSTOOD AS A SPECIFIC TEACHER COMPETENCE

To further develop the understanding of the concept of professional digital competence among teachers, it is necessary to discuss the specific conditions that apply when teachers use ICT in their work, and to discuss teacher education as one of the crucial realms where the operationalization of the concept takes place.

idunn.no
Nordiske tidsskrifter på nett

Krumsvik (2007) provides a definition of digital competence specifically for teachers: "Digital competence is the teacher's ability to use ICT with a good pedagogical-didactic ICT understanding and to be aware of how this might impact the learning strategies and educational formation of pupils" (p. 68). This means that the teacher must make decisions about what kind of digital tools should be used in each teaching situation, how they should be used and why. Krumsvik points out that it is important to develop this type of awareness during initial teacher training.

Use of ICT in the classroom puts forward major challenges related to classroom management that must be included in an expanded understanding of teachers' digital competence. In a study, Danish Clearinghouse (2008) revealed that in the period 1998–2007, seventy research papers were published on the relationship between manifest teacher competence and student learning. The main findings about relationships found were: a) the teacher must be competent to establish a social relationship to the individual learner, and b) in relation to the entire class (all students) the teacher must direct the teaching work through being a visible leader who over time trains the students to conceive their own rules for learning and to keep following them. Both of these competencies are important for the development of overall objectives for strengthening pupil motivation and autonomy, and play a key role in promoting academic learning. Finally, c) the teacher must possess didactic skills in relation to teaching content in general and in individual subjects.

Põldoja, Väljataga, Tammets and Laanpere (2011) offer a model aimed at teachers' digital competence development. The model consists of five core areas of professional digital competence: a) prepare and inspire students in a digital environment, b) design and develop learning experiences and a learning environment, c) model and design work environments, d) promote and model digital democracy and accountability, and e) participate in professional development.

Ferrari published a comprehensive overview of various frameworks concerning digital competence (Ferrari, 2013). She attempts to identify common characteristics and contribute to agreement concerning a holistic framework for digital competence. The aim is a better understanding of what digital competence is and how it has developed in different European countries. Ferrari's approach is based on summarizing a number of European frameworks, analysing governing documents and interviewing a number of experts and stakeholders. Ferrari concludes by presenting a framework consisting of five categories. In addition to information, communication, production and digital safety, which are recognizable aspects of the Norwegian framework for basic skills, she also adds into the framework problem-solving as a fifth category (Ferrari, 2013). This framework represents an important starting point for the work to define the term 'professional digital competence' and how digital competence can be used in teacher education.

The UNESCO framework for teachers' ICT competence describes various aspects of teachers' digital expertise and levels of progress within them. These aspects are a) policy and framework, b) curriculum and assessment, c) pedagogy, d) knowledge and skills, e) learning environments and administration, and f) personal development and professional understanding (UNESCO, 2011).

The research project ITL (Innovative Teaching and Learning Research project, 2012) presents a concrete description of the requirements for good didactic use of ICT in the design of educational programmes. This description is one of six 'categories' for '21st century learning' and concerns specifically ICT in learning processes. Digital education is in this perspective narrowed to the specific activity of 'designing learning programs'.

Tømte, Kårstein and Olsen (2013) show that there are only a few explicit written accounts for professional digital literacy in teacher institutions' description of courses and curricula, although there are many fragmented examples of educational use of ICT in teacher education. At the same time, the report shows that it is necessary to develop definitions of different types of professional digital competence associated with different academic or occupational areas (e.g. nurse, lawyer, teacher). For teachers, the authors put forward a thematic definition of professional digital literacy: "In practice, this means being able to use ICT to prepare educational programmes, educational use of ICT in their teaching, in their own administrative work and in evaluation and research" (p. 12).

Lund, Furberg, Bakken and Engelien (2014) argue that the use of digital technology in teacher education should be aimed at promoting pupils' knowledge construction in the classroom. This means that student teachers need to learn how to transform their theoretical knowledge into subject-specific didactics, classroom management, and assessment of how students make productive use of available cultural resources.

Gudmundsdottir, Loftsgarden and Ottestad (2014) understand professional competence as expertise that is central to teachers' professional practice. It includes not only the teachers' digital, pedagogical and subject-specific skills, but also awareness of the need to continually develop through teacher education and teaching practice in class.

TOWARDS A CLEARER DEFINITION OF TEACHERS' PROFESSIONAL DIGITAL COMPETENCE

A clear need to simplify and straighten out the concept of teachers' professional digital competence is evident from the presentation above. Different dimensions and important aspects have been aligned to the concept by different researchers with different agendas, that in effect makes it difficult to arrive on a broad, simple and contextualized definition.

By starting, and engaging in, a process for describing teachers' professional digital competence, the Norwegian Centre for ICT in education aims to bring the digital skills embedded in the framework for basic skills and school curricula closer to the understanding of pedagogical use of ICT in teacher education. In this work lies an ambition to place the concept of professional digital competence into the core of teacher education institutions in Norway. From the student teachers' perspective, this means fostering the ability to design learning processes through selecting learning objectives, means and types of evaluation, and choosing appropriate technology to support this relationship (Bakken, Engelien, & Lund, 2013). From the perspective of the academic staff, it means to actively use technology in their own teaching and evaluation of students, and to describe specific didactic choices within subject contexts that students should both adopt and reflect upon.

A very tentative proposal for narrowing down the concept was presented and discussed in two workshops held by the Norwegian Centre for ICT in Education in spring 2014. This proposal serves at least two purposes. First, it is a starting point for an operational framework for a formative assessment of student teachers' professional digital competence. Second, it serves as an invitation to present and future contributors to the field to engage in a more precise debate on the content of the concept.

The proposal consists of three main dimensions to describe teachers' professional digital competence:

– *Generic digital competence* cuts across subject disciplines and specifies the general knowledge and skills that teachers, teacher educators and student teachers alike should obtain in order to function as digital educators. This dimension is most likely identical, or very close to, the already existing descriptions of general digital competence.

– *Didactic digital competence* captures the digital specifics in each subject that the individual teacher educator deems significant. It is in this dimension that the actual distinctive differences in the didactics between subjects would be described, for example, mathematics taught with ICT versus foreign language or pedagogy taught with ICT.

– *Professional oriented digital competence* describes digital traits of the extended teaching profession, the question of what teachers need of digital literacy in other parts of the job, for example when they are planning subject lessons, sorting evaluations, recording marks and detention, communicating with parents and other groups, etc.

These three dimensions can be further broken down either into theoretical coherent descriptions of interfaces with general pedagogy, didactics and the study of the teaching profession, or into discreet specifications to suit necessary operationalization in a test. Either way, the Norwegian Centre for ICT is

excited to extend an invitation to a scholarly debate on the content and under-standing of teachers' professional digital competence, and we are all looking forward to forthcoming academic explorations into a new and exciting realm.

REFERENCES

Arnseth, H. C., Hatlevik, O. E., Kløvstad, V., Kristiansen, T. & Ottestad, G. (2007). ITU Monitor 2007 – Skolens digitale tilstand 2007. Oslo: Universitetsforlaget.

Bakken, J., Engelien, K. L., & Lund, A. (2013). Lærerutdanning som design: teknologirike læringsforløp og omgivelser, In: Trine Fossland; Kirsti Rye Ramberg & Eva Gjerdrum (Eds.), *Ulike forståelser av kvalitet i norsk, fleksibel høyere utdanning – teknologi og læring på og utenfor campus.* Norgesuniversitetet.

Berge, O., Hatlevik, O. E., Kløvstad, V., Ottestad, G. & Skaug, J. H. (2009). The Digital State of Affairs in Norwegian Schools 2009. Oslo: ITU

Calvani, A., Fini, A., Ranieri, M., & Picci, P. (2012). Are Young Generations in Secondary School Digitally Competent? A Study on Italian Teenagers. *Computers and education, 58*(2), 797–807.

Claro, M., Preiss, D. D., San Martin, E., Jara, I., Hinostroza, J. E., Valenzuela, S., . . . Nussbaum, M. (2012). Assessment of 21st century skills in Chile: Test design and results from high school level students. *Computers and education, 59*, 1042–1053.

Egeberg, G., Gudmundsdottir, G. B., Hatlevik, O. E., Ottestad, G., Skaug, J. H. og Tømte, K. (2012). *Monitor 2011. Skolens digitale tilstand.* Oslo: Senter for IKT i utdanningen.

Erstad, O. (2005) *Digital kompetanse i skolen – en innføring*. Oslo: Universitetsforlaget.

European e-Competence Framework 3.0: A common European Framework for ICT Professionals in all industry sectors. European Commission.

Ferrari, A. (2013). DIGCOMP: A Framework for Developing and Understanding Digital Competence in Europe. Seville: European Commission, Joint Research Centre, Institute for Prospective Technological Studies.

Gudmundsdottir, G.B., Loftsgarden, M. & Ottestad, G. (2014). *Nyutdannede lærere: Profesjonsfaglig digital kompetanse og erfaringer med IKT i lærerutdanningen.* Senter for IKT i utdanningen.

Hatlevik, O., Egeberg, G., Gudmundsdottir, G.B., Loftsgarden, M. & Loi, M. (2013). Monitor skole 2013: Om digital kompetanse of erfaringer med bruk av IKT I skolen. Oslo: Senter for IKT I utdanningen.

ITL research (2012). 21CLD Learning Activity Rubrics. SRI International.

Krumsvik, R.J. (2007). *Skulen og den digitale læringsrevolusjonen*. Oslo: Universitetsforlaget.

Kunnskapsdepartementet. (2006). Kunnskapsløftet. Hentet 11. februar 2014, fra http://www.regjeringen.no/nb/dep/kd/tema/grunnopplaring/kunnskapsloeftet.html?id=1411

Lund, A., Furberg, A., Bakken, J., & Engelien, K. L. (2014). What Does Professional Digital Competence Mean in Teacher Education? *Nordic Journal of Digital Literacy, 9*(4), 281–299.

Norwegian directorate for education and training. (2012). *Framework for basic skills*. Oslo. Retrieved from http://www.udir.no/Lareplaner/Forsok-og-pagaende-arbeid/Lareplangrupper/Rammeverk-for-grunnleggende-ferdigheter/

Tømte, C., Kårstein, A. & Olsen, D.S. (2013). *IKT i lærerutdanningen. På vei mot profesjonsfaglig digital kompetanse?* Oslo: NIFU.

UNESCO (2011). ICT competency for teachers. Version2.0. Paris: UNESCO

Ørnes, H., Wilhelmsen, J., Breivik, J., & Solstad, K. J. (2011). *Digital tilstand i høyere utdanning 2011: Norgesuniversitetets monitor (vol. nr. 1/2011).* Tromsø: Norgesuniversitetet.