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Educating Teachers for the New Millennium?

Teacher training, ICT and digital competence

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ABSTRACT

In this study we explored how teacher education institutions handle the use of ICT in teacher education. A qualitative approach conducted as a multiple case study design involved three teacher education institutions. Two case studies were conducted in 2009 and one in 2012. Findings revealed that teachers appear to have become more aware of the use of ICT in education in 2011 compared to 2009. Still, teacher students remain to be sufficiently well prepared on how to use ICT for pedagogical purposes, even if their technical skills are improved over the years.

Keywords

teacher training, ict, digital competence, curricula

INTRODUCTION

Norway was one of the first countries in the world to include Information and Communication Technology (ICT) within the national curricula in compulsory education. In 2006 the Norwegian Ministry of Education and Research introduced a new educational reform; the Knowledge Promotion reform; which included a new curriculum in compulsory and upper secondary education (1st–13th grade). The reform emphasized five basic competence aims considered equally important, and one of those was to develop digital skills¹. Consequently, teacher ability to provide learning opportunities in digital competences for their pupils was highlighted. Moreover, the use of ICT in teaching and learning became widespread in Norwegian schools (Egeberg, Gudmundsdóttir, Hatlevik, Ottestad, Skaug, & Tømte, 2011).

Another aspect was that teacher-training institutions in Norway were to include using ICT in their curricula, in order to prepare student-teachers for using ICT in their own pedagogical practice. The reform initiative was influenced by a set of three previous national initiatives: the PILOT-program in teacher education;

1. The five basic skills: digital skills, oral skills, being able to express oneself in writing being able to read, being able to do mathematics, being able to use digital tools (Norwegian Directorate for Education and Training, 2006, 2012).



the PLUTO-program and, finally, the Learning Network-program² (Erstad & Hauge, 2011).

Shortly after the introduction of the Knowledge Promotion reform, teacher education underwent change. In 2010 the initial teacher training program was split into two specialized educational pathways: National Curriculum Regulations for Differentiated Teacher Education Programs for Years 1–7 and for Years 5–10. Key objectives for both pathways were that education should be integrated, professional-looking and based on research as well as being of high academic quality (Følgegruppen, 2011). The ICT dimension was mentioned only vaguely, as will be demonstrated.

Several studies confirm the discrepancies between policymaking highlighting the ICT issue in education and the “slow uptake” of the use of ICT for pedagogical purposes among compulsory schools (Egeberg et al., 2011; Haugerud, 2011). Moreover, research on ICT in education is often concerned with ICT issues related to youngsters/ pupils, teacher use of ICT and school management (Biagi & Loi, 2012; OECD, 2010, 2012; Scheuermann & Pedró, 2009; Tømte & Hatlevik, 2011). Within teacher education institutions, the slow uptake of ICT has been documented by research (Granberg, 2011; Hetland & Solum, 2008; OECD, 2012; So et al., 2012; Wilhelmsen et al, 2009).

Studies on ICT in teacher training build upon several approaches, spanning the organizational framework of ICT in teacher training institutions (Adamy & Heinecke, 2005; Hetland & Solum, 2009; Wilhelmsen et al., 2009); teacher trainers’ attitudes, skills and practices on ICT in their own teaching (Judge & O’Bannon, 2008; Strudler & Grove, 2003; Whittier & Lara, 2006; Wilhelmsen et al., 2009) and student-teachers’ attitudes, skills and how they are being prepared to teach with ICT (Granberg, 2011; Haugerud, 2011; Wilhelmsen et al., 2009). Furthermore, ICT in teacher education has been a policy concern in many countries, and these concerns have also been reflected in international initiatives such as the ICT initial teacher training 2008–2010 at OECD (OECD, 2012) and at the ICT in Education strand within UNESCO (2011a, 2011b).

OBJECTIVES AND RESEARCH QUESTIONS

Bearing this in mind, the objective of this paper is to identify how teacher education institutions handle national guidelines and policies regarding ICT in teacher education, and to grasp how teachers and student-teachers consider

2. The first, The PILOT project involved 120 primary and secondary schools from 1999–2003. Six universities and university colleges conducted follow up research. Along with this initiative was the PLUTO-program, which involved eight teacher education institutions (universities and colleges) in development programs during 1999–2004. The last of the reforms, the LN- program engaged about 600 primary and secondary schools and 19 universities and university colleges in networks nationwide from 2004–2009 (Hauge & Erstad, 2011)

what constitutes the value of using ICT in teacher education. In this work the following research questions are posed:

- How are national curricula on teacher education and its guidelines on ICT reflected in the local framework of teacher education institutions?
- What do teachers and student-teachers consider important regarding ICT in teacher education?

These questions are addressed through a multiple case study approach, including document analysis and interviews with teachers and student-teachers.

The following sections elaborate on the use of ICT in education and on Digital Competence, and give an overview of the national curricula for teacher education. Then follows a presentation of data and methods; findings from three teacher education institutions, and concluding remarks.

ICT IN EDUCATION AND DIGITAL COMPETENCE

ICT in education comprises diverse topics, spanning from organizational approaches, the situation of technical equipment and user perspectives including competences toward the use of various digital tools and digital technologies. As for the last, the term Digital Competence emerges. For years, research has elaborated on what constitutes Digital Competence (Buckingham, 2006; Gentikow, 2007; Lankshear & Knobel 2006; Punie & Ala-Mutka, 2007). What seems to be a major concern is that the notion itself is a moving target in the sense that it evolves rapidly and in line with the appearances of new technologies. One approach, which derived from merging and updating previous studies, suggests the following definition:

Digital Competence is the set of knowledge, skills, attitudes (thus including abilities, strategies, values and awareness) that are required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socializing, consuming, and empowerment. (Ferrari, 2012, p. 3)

This understanding of digital competence appears rather broad and it includes skill development, ability to use tools along with other competences deriving from many arenas. Still, it corresponds to what has been the dominant understanding of digital competence in Norway, as communicated as early as in 2005 by National Network of ICT in Education: “Skills, knowledge, creativity and attitudes required to be able to use digital tools in learning and living in a knowledge society” (ITU, 2005). This approach has been updated when the

Norwegian Ministry of Education and Research founded the National Centre for ICT in Education:

Digital literacy can be defined as a set of knowledge, skills and attitudes. These are required as a prerequisite for being able to use digital tools, media and resources appropriate and prudent to solve practical problems, communicate, gather and process information and create digital products. Developing digital judgment by acquiring knowledge and good strategies for online use is an important part of digital competence (iktsenteret.no; downloaded 6.9.2012)

This understanding is also mirrored by the competence aims on digital competence described in the Knowledge Promotion reform. Another possibility would be to consider the importance of ICT as educational discipline and as pedagogical tools in developing effective educational services. In this respect ICT represents not merely tools, ICT also informs and shapes our modes of communication, and the processes of our thinking and our creativity. Granberg rephrases this as a shift in focus moving from learning about ICT to learning through ICT (Granberg, 2011).

To analyze the adoption of Digital Competence in education, a broad approach covering a set of multiple skills and competences in seven broad arenas is suggested by Ferrari (2012). The arenas derive from a study of a set of frameworks on ICT in education. In this work, the author realized that many of the competence arenas remained focused on technical operations. Figure 1 shows a balanced approach, where each competence areas is developed equally.



Figure 1. Competence areas (Ferrari, 2012, p. 4)

The competence arenas as described in figure 1, include technical aspects along with skills and competences that are more likely to be associated with ways of teaching and learning, and thinking and behaving with and through technology. This gives the notion digital competence a rather broad approach.

In this study, we explore how teacher-training institutions report on digital competence within their institutional curricula and how this might correspond to national teacher-training curricula.

Moreover, we elaborate on how teachers and student-teachers cope with the ICT issue and with digital competence in teacher education. In this, issues related to technical equipment and teaching and learning about and with ICT emerge.

NATIONAL CURRICULA FOR TEACHER EDUCATION

Several educational tracks qualify for working as a teacher in Norway. Common for all types of teacher education is that it is regulated in a national curriculum (Norwegian Ministry for Education and Research, 2003). Based on this national curriculum, local curricula are stated in an institutional document specific to each higher education institution, in an institutional curriculum contract. In the national curriculum for initial teacher training, running from 2003–2010, ICT was mentioned only vaguely, and digital competence was hardly mentioned at all.

Not surprisingly, many higher education institutions referred rather generally in their own institutional documents to the ICT-issue in teacher education in this period. Hetland & Solum found substantial variations in the amount of detail the institutions gave about ICT in their documents: some hardly mentioned ICT while others revealed an extensive understanding of digital competences, both as a tool and in terms of integrating ICT into their teaching and learning (Hetland & Solum, 2008, pp 42–45).

The national curriculum was renewed in 2010 when National Curriculum Regulations for Differentiated Teacher Education Programs for Years 1–7 and Years 5–10 were introduced. Compared with the previous national curricula as of 2003, National Curriculum Regulations for Differentiated Teacher Education Programs appear to be more concise regarding ICT, for example by including the competence aims deriving from the Knowledge promotion reform.

The new national curricula included competence aims deriving from the Knowledge promotion reform, which comprised the aim of digital competence, and made some explicit formulations on the use of digital tools as well as understanding of societal perspectives related to technology.

Nonetheless, these formulations have become more precise, and it would be interesting to see how they are incorporated in local frameworks within teacher education institutions. In this paper, we look at this in our third case, which is based on data after the implementation of the new national curriculum.

DATA AND METHODS

To address the research questions, a multiple case study design (Yin, 2009) informs the empirical work, which comprises three cases. Each case includes individual teacher education institution's uptake of the use of ICT in teacher education. This way, the multiple case-study design includes three different teacher education institutions. Moreover, two case studies derive from the period covering the previous Initial Teacher Training Education Program; one case study springs from the new National Curriculum for Differentiated Primary and Lower Secondary Teacher Education Programs. The multiple case-design gives some indication of how one particular teacher-training institution handles the *new* curricula regarding the use of ICT, and how two teacher-training institutions interpreted and implemented the *former* initial teacher-training curricula on ICT. However, the case study design will not inform us if there are any developments within the teacher-training institutions. Nonetheless, findings from these three cases might give us new insights on how teacher trainers and student-teachers handle and think about the use of ICT in education, across teacher-training institutions and teacher-training programs and curricula. Each case includes document analysis and interviews with management, teacher trainers and student-teachers at three teacher-training institutions, along with observations from online instruction at one teacher-training institution (case 3).

The selection of cases 1 and 2 was mainly based on the fact that these cases had employed two very distinct approaches towards ICT: one was selected because of its reputation for being particularly good at integrating ICT in teacher education, whereas the other was less accustomed to use ICT in training, but was nonetheless acknowledged to be a solid teacher education institution.³ Case 3 was selected because it offers an online version of the new differentiated teacher education program.

Cases 1 and 2 were completed in 2009⁴. Case 3 derives from a study where the new teacher education curricula had been recently introduced (in 2010; 1–7 grade; in 2011; 5–10 grade).⁵

Interviews from cases 1 and 2 were conducted before the introduction of the new national teacher education curriculum regulations for Differentiated Teacher Education Programs 1–7 and 5–10, and case 3 shortly after the introduction. All interviews were semi-structured, and included various topics on

3. These were part of the Norwegian national report to the OECD-project "ICT in initial teacher training". The OECD study comprised ten countries, and was a project strand within the OECD/CERI project *New Millennium Learners* (2008–2010). This particular selection was also a common guideline for all participating countries within the abovementioned OECD-study. Nonetheless, such an approach also corresponds to the two approaches to integrating digital competences or ICT that Hetland & Solum (2008) describe as approaches like "using ICT as a tool" and those "integrating ICT".
4. Tømte, Hovdhaugen & Solum. (2009) *ICT in Initial Teacher Training. Norway. Country report*. Paris, OECD
5. In the third case, the entire study is not yet completed.

ICT and teacher education. From cases 1 and 2 a preliminary draft of the final report was sent for validation to a selection of key informants; for case 3, a midterm report including key findings was discussed and validated by a group of informants. Considering that the two cases based on Initial teacher education (cases 1 and 2) were part of one study and the last case (case 3) belonged to another study, some of the interview-questions regarding ICT and digital competence varied from cases 1 and 2 to case 3. Still, the overall issue of ICT and digital competence was treated equally in all cases. Topics addressed in all cases were “plans and strategies regarding ICT in teacher education”; “access to ICT equipment for teaching and learning”; “teacher training on ICT and learning”; “pedagogical use of ICT in the teaching profession” and “mastery of ICT software and tools”.

We interviewed the program manager responsible for teacher training, teachers and student-teachers within all three institutions. In cases 1 and 2 teacher trainers were interviewed in groups; or in individual telephone-interviews. In case 3 all interviews were group interviews. In case 3, we also observed online instruction. Table 1 informs on the groups of informants.

TABLE 1. MATRIX OF INFORMANTS

Teacher education program	Format	Institution	Program manager	Teachers	Teacher students
Initial teacher education (2003–2010)	Campus	Oslo University College: Case 1	1	9	10
	Campus	Sør-Trøndelag University College; Case 2	1	6	14
Differentiated Teacher Education Programs 1–7 and 5– 10 (2010–)	Online	Telemark University College: Case 3	3	12	30

METHODOLOGICAL CONSTRAINTS

As already stated, the three cases vary in that they are based on two versions of national curricula. Consequently data were collected in two different contexts; National curricula for initial teacher training and differentiated teacher-training curricula. In other words, the context in which interviews were conducted varied, even if topics addressed were similar in all three cases. Moreover, case 3 varies from cases 1 and 2 in that campus-based instruction dominates in cases 1 and 2, while instruction is given online in case 3. However, by including these three cases, we are given the opportunity to illuminate how one particular teacher-training institution copes with the new curricula regarding the ICT issue, and how former initial teacher-training curricula on ICT were interpreted and effectuated differently by two teacher-training institutions. Furthermore, together, the sample of three cases gives us important information on how teacher trainers and student-teachers cope with the ICT issue before and after the implementation of the new teacher-training curricula,

across teacher-training institutions. The findings from each case are organized and analyzed in these overall topics, and these are elaborated after a short presentation of the characteristics of each teacher education institution that constitute the three cases.

PRESENTATIONS OF THE CASES

Case 1: Oslo University College

Oslo University College is a large teacher education institution in its number of student-teachers. It is well known for having a long tradition of teaching with ICT and for its research community of ICT and learning. There is a special ICT-unit that teaches ICT to students in teacher education. In 2009 ICT was one of the disciplines that students could specialize in during the last two years of their teacher training. The special ICT-unit teaches all students in their first or second year during specific classes on ICT and the use of ICT in education.

Case 2: Sør-Trøndelag University College

Sør-Trøndelag University College is the largest teacher education provider in Norway, and has had a long tradition for educating students in the teaching profession. Most students are from central Norway. In a national context, teacher education offered from this institution is considered solid and traditional. However, ICT has been reported as just poorly taken care of within the teacher education institution.

Case 3: Telemark University College

Telemark University College represents a small teacher-training institution in the south-east of Norway. Until recently, most students were recruited from the surroundings, but from 2009, online teacher education has been offered. First, as initial teacher education, and from 2010, differentiated teacher education programs. This initiative has widened the recruitment basis; the online program enrolls student-teachers from all over the country. Teachers are trained in teaching through synchronous videoconference systems at fixed times on a weekly basis.

Teaching and learning online might serve as beneficial to students and teachers to become digitally competent, in that they are trained in using diverse ICT as part of their education. Thus, one could expect case 3 to differ considerably from cases 1 and 2 as this group of students and teachers is expected to be well equipped with computers and other ICT devices necessary for online education, and to be well trained in order to master the technology. This aspect will be elaborated in this paper.

FINDINGS FROM THREE TEACHER TRAINING INSTITUTIONS

Institutional curricula and ICT

In 2009, when the two first case studies Oslo University College and Sør-Trøndelag University College were conducted, the Knowledge Promotion reform had been running for three years, and one could expect teacher-training institutions to adjust themselves to the competence aims, such as digital competence, as introduced by this reform. Still, in both cases absence of the ICT issue and digital competence was confirmed in the curricula. Even if Oslo University College reported having had a strong focus on ICT for years, ICT was not covered in its general strategic plan. Sør-Trøndelag University College did not report any institutional focus on ICT in 2009, but indicated that work was being prepared in order to face the changes in the national curriculum for teacher training.

Our third case derives from Telemark University College, a teacher-training institution, and interviews and observations were conducted shortly after the introduction of the new curricula as part of differentiated teacher education programs for compulsory education. The formulations concerning ICT and digital competence from the National Curricula on Differentiated Teacher Education Programs are repeated in Telemark University College's own stated goals for degree programs for years 1–7 and 5–10; this way of echoing the national curricula is also identified in several teacher-training institutions (Følgegruppen, 2011).

Organization

Oslo University College reported in 2009 having a special unit that instructed on ICT to student-teachers. One of the reasons given for organizing ICT training as a special unit, instead of integrating it into all subject fields, was that the subject teachers were not trained well enough to teach ICT alongside their subject. Many required support to integrate ICT into their subject teaching, and the ICT teachers work together with the subject teachers to achieve that. The special ICT unit instructed all student-teachers in their first or second year, by offering specific classes on ICT and the use of ICT in education. The special unit for ICT in teacher training offered students general courses on different software, but did not offer any individual instruction or a help-desk for those students that did not attend the courses.

Also at Sør-Trøndelag University College, in 2009, ICT was taught separately in a specific course for students, but only to a limited extent. The main reasons were flagged to be that very little ICT training was offered to teacher trainers, and teacher trainers also judged the ICT equipment situation to be poor, with too many old computers and not enough computers for everyone.

In 2010, Telemark University College (HIT) introduced Teacher Education Program Years 1–7 and in 2011 for years 5–10. Both programs were offered to

campus students, online students and to students affiliated to a study center near their homes. Online students participate from personal computers at home. Students at a study center and online students participate in instruction based on real time videoconferences broadcasted from campus, together with campus students. Still, both these two groups of students are required to participate in three mandatory campus-based meetings per year. Instruction is given through lectures, seminars and tutorials, all in real time videoconferencing, mainly held at fixed times twice a week.⁶

All in all, the ICT equipment side was reported taken well care of by HIT. There was a ICT and learning section with a special responsibility towards online students and students affiliated to study centers. Staff within this section held teacher competence and ICT expertise and played a central role as “translators” between technological opportunities and didactic challenges associated with teaching online. In addition, staff worked closely with the online teacher education programs, both in terms of operations, procurement and ICT technical support to both students and teachers. At the first mandatory session for student-teachers on campus the ICT staff offered extra training in the evening. All in all, most students reported that technical problems did not represent a problem for online instruction.

Learning management systems (LMS) were introduced in Norwegian higher education during the early years of 2000 (The Norwegian Directorate for Education and Training, 2006). All our cases reported using and communicating with the LMS, but their practices seemed to vary to some extent. All institutions reported it as serving as the main tool for information between staff and students, like e-mail messaging and posting papers. For example, teachers were to post course material in the LMS, and to respond to inquiries from students. Moreover the LMS were reportedly used for papers and examinations, where students handed in their work online. In our third case, the LMS also served as a place to log on to the videoconferencing system used to broadcast lectures online. In this case the LMS were used synchronously for chat purposes and asynchronously through the use of digital portfolios, e-mail and open records available to anyone on the course.

Teacher trainers

Teacher trainers at Oslo University College reported few courses and little general training in using ICT. This was explained by management as lack of funding and time to provide classes for teacher trainers in addition to student-teachers. Some teacher trainers attended student classes in the beginning of the project-period, but there had only been a few courses specifically for person-

6. The programs are organized with regular lessons online with usually three to four sessions a week in real time. The sessions are given lectures, seminars, tutoring, and students can work in groups regardless of location. Examinations are organized at home exam / oral online or campus / school exam. This varies from subject to subject. There are three mandatory meetings on campus during the academic year.

nel. Therefore, the subject teacher trainers have had to become fairly self-reliant when they do need to use ICT in their teaching, although they could get support on ICT use when working together with the ICT teacher trainers. Even though Oslo University College has had a relatively long-term focus on the use of ICT, not all teacher trainers were good at using ICT in their teaching. In general, most personnel reported using ICT as (one of many) tools in their teaching, such as PowerPoint, at least occasionally.

At Sør-Trøndelag University College there was limited ICT training for teacher trainers; some of the teacher trainers had tried to teach each other in classes, in non-compulsory classes offered every year, but attendance was poor; teacher trainers also argued that the equipment at Sør-Trøndelag University College was not up to date or adequate, with too many old computers and not enough computers for everyone; finally, it was also suggested that the age of teachers might play a part, as the mean age among teachers at Sør-Trøndelag University College was relatively high. Still, there was no clear link between these problems and staff age, as some of the most eager users of ICT were found amongst older staff.

All in all both at Oslo University College and Sør-Trøndelag University College, most teacher trainers reported rather poor inclusion of ICT for pedagogical purposes, most likely by using PowerPoint for instruction. Nevertheless, at Sør-Trøndelag University College, some teacher trainers reported a degree of wider interest in teaching with digital tools, and they have ended up teaching their colleagues how to make better use of ICT in training. At Oslo University College, teachers affiliated to the special unit for ICT, reported themselves to be rather ICT savvy, in contrast to their teacher training colleagues outside this unit. Nevertheless, mastering technology itself does not necessarily provide student-teachers with new insights into how to teach and learn with ICT or to become digitally competent.

At Telemark University College, teacher trainers that instructed online were recruited from among the most motivated of the teaching staff. These underwent a systematic training program. The training appeared to be mainly concerned with mastering various tools and devices for online instruction and to identify the relevant ICT tools suitable for every discipline. Teachers themselves pointed out that teaching online gives many opportunities for innovative use of digital resources and to exploit the fact of the students being geographically dispersed. For example, we witnessed how the students in the social sciences under the theme farmland were told by the teacher to submit photos from their local community to a public directory in order to illustrate geographic variations. This can also be implemented in the here and now perspective for online students, while the campus student would have spent much more time working (getting pictures from home, taking them to the lecture, prepare for sharing, etc.). On the web all students seamlessly survey the geographical variations based on where the students are. This example from case 3 illuminates some of the potential of online education. There are many opportunities for

innovative use of digital resources and the exploitation of the students being geographically dispersed. We believe that developing this potential will probably also benefit campus students in the long term.

Student-teachers' experiences regarding the ICT equipment situation

In 2009, students considered the technical equipment to be of poor standard at their teacher training institutions Oslo University College and Sør-Trøndelag University College. At Oslo University College, the projectors and computers that were installed in every classroom often failed to work. In addition, the campus-wide wireless network did not work within the Department for Teacher Training. Several students also commented on the absence of interactive whiteboards; there was one in the ICT section, but that was booked for teaching students who majored in ICT. Moreover, students reported that the quality of the technical equipment was better at most of the partner schools.

Online students and students participating from a study center close to their homes to teacher training at Telemark University College reported in 2011 the equipment situation and the ICT standard to be sufficient. The main reason for this is based on the organization of the ICT equipment situation; the online students had to bring their own computers to the first mandatory meeting at campus, for technical upgrading, which made them capable of participation in online videoconference-based instruction. If students participating from study centers reported problems with the ICT equipment, local communities were responsible for taking care of the situation, as this was included in their partnership agreement with Telemark University College.

Student-teachers' experiences on the mastery of software and ICT tools

In 2009, students reported ICT training insufficient; they were mainly provided with courses on how to handle different software. Students' general opinion on ICT was that they did not receive enough ICT training. Like Oslo University College, students at Sør-Trøndelag University College experienced more hands-on, practical training when using ICT at training schools compared to their teacher-training institution. Furthermore, students reported teacher trainers' lack of confidence and skills when using ICT, or even excluding ICT in their teaching. Even if some teachers at Oslo University College were more confident in the use of ICT in teaching and had better facilities and equipment, students were not more content with the ICT training than those at Sør-Trøndelag University College. Previous findings in the Norwegian context confirm these observations; Hetland & Solum (2008) found that no teacher training institutions in Norway would be able to report that all teachers were confident in using ICT in their teaching (Hetland & Solum, 2008, p. 39). Moreover, Wilhelmsen et al. (2009) found that in Norway, four out of ten students

in all teacher-training institutions reported to be insufficiently educated in using ICT.

Being an online student at Telemark University College was stressed to have strengthened both confidence and skills when it came to using various digital tools and media that may be relevant in their own teaching. Some of the online students thought it easier to put themselves into the pupils' situation later – which they thought would be characterized by a large element of digital tools. Some highlighted, for example, that they had become more conscious of the need “to develop self-discipline so that you do not end up with another digital activity than was intended”, as one put it. Still, there seems to be less awareness of other aspects of digital competence among the student-teachers. Bearing this in mind, one could assume that teachers who teach online, and the student-teachers who attend online classes, would be more aware of the ICT issue and digital competence than campus students at Sør-Trøndelag University Campus and Oslo University College. Moreover, since case 3 was more recent, one could expect these students to be more confident with ICT, as we know that the general ICT competence in Norway has improved over the years. Furthermore, since this case derives from after the implementation of the new curricula in teacher education, there is reason to expect these students to be aware of issues relating to digital competence. Still, our findings might call this into question. Even if teachers at this teacher-training institution are good in bringing in new ways of teaching and learning with digital tools, there still seems to be a lack of awareness of instruction on digital competence as including issues related to information management, creation of content and knowledge, ethics and responsibility, to mention some key words from Ferrari's model. Even if teachers provided students with innovative use of ICT in their instructional practice, students themselves did not seem to be aware of how they should teach through ICT and to instruct on digital competence in their own teacher profession. Some students report that they prefer the use of interactive whiteboards: some have seen them and some have used them at the schools where they have been in practice, or associated with, but they seem to have little overview of opportunities that come with interactive whiteboards and they exhibit little reflection on digital learning resources as an alternative to the textbook. Students also expressed uncertainty about how to use computers and the Internet in their own instruction. As one claims, “we know how easy it is to lose focus when you are out on the web, so how can we expect pupils to manage it? Perhaps it is best to prohibit the use of the Internet in class?”

CONCLUDING REMARKS

In the national curriculum for initial teacher training, running from 2003–2010, the ICT issue was only vaguely mentioned, and uneven treatment of digital competence was absent. Cases 1 and 2, which derive from this period, confirm nonappearance of ICT and digital competence in local institutional curricula. In the third case, based on the new national curricula on teacher edu-

cation, the teacher-training institutions' curricula formulations on digital competence correspond with the national curricula.

Findings revealed from cases 1 and 2 show that even if these institutions seem to have different approaches towards the ICT issue within their teacher-training programs, the similarities are striking; in both cases students report expecting more substance related to ICT in teaching and learning than they are actually are obtaining. Moreover, both institutions reported lack of organizational support, insufficient technological equipment; insufficient ICT competence and outdated perspectives on how to use ICT in teaching. Even if the institutional awareness on this issue was high in our study, we found little action from the management side of the institutions related to this. Also student-teachers approached the ICT training issue within their educational contexts quite randomly. In case 3, the situation was different in that the ICT situation as it related to infrastructure and technical competence was well taken care of. Teachers were well informed on how to use ICT for instruction. Still, critical aspects regarding digital competence remained unsolved. This aspect is to some extent highlighted by Haugerud (2011) who underpins the importance of being aware of two different scopes for ICT and education; technical proficiency does not result in digital competence and knowing how to use ICT in a learning context. In our case, the situation is that even if teacher trainers demonstrate innovative ways of using ICT for pedagogical purposes, students do not seem to recognize these efforts very consciously. It might look as if they take this way of instruction for granted, which is not very surprising, since they depend on technology as part of being online students. Still, what is interesting is that they demonstrate such little awareness of how to use digital tools in their own teaching practice, and even of how to teach on digital competence-related issues themselves.

These findings are interesting as Norway claims to be at the front of the field of ICT and education in an international context. Several steps have been taken from the policymaking side: the national curriculum for compulsory education and teacher education has been renewed, including notions regarding the ICT issue as it relates to digital competence. Teacher-training institutions are required to integrate digital competences into their teacher training, as set out as guidelines from the Knowledge promotion reform from 2006, in the white paper from 2008–09, and in the National Curricula for Differentiated Teacher Education Programs. However, as shown, the process seems to be slow and inadequate. Haugsbakk (2011) explains this by claiming that the overall investment in ICT seems to have been founded on misleading premises enhancing ICT in teaching and learning, without considering the complexity that also follows the inclusion of ICT in these practices. As a result, the existing plans from the authorities suffer from shortcomings and are inadequate to meet the challenges for schools and teacher education institutions. These perspectives are confirmed in cases 1 and 2 in our study. Moreover, other studies point to the same direction; in 2008 Hetland and Solum found that there are great variations in the existing contracts within teacher training institutions;

most of them were focused on access and practical use of ICT, even if some institutions showed signs of further understanding of how ICT and digital competence could be linked to learning processes. Few of the institutions included digital competences in relation to practical training in partner schools (Hetland and Solum, 2008, p. 43). The new national curricula for Differentiated Teacher Education included some issues regarding digital competence. Still, as shown, it takes a while to implement these in teacher training practices. Our study based on case 3 somehow confirmed this. A similar finding is reported by the research group that follows the reform of the differentiated teacher education program; it revealed that student-teachers scored lowest on questions about the students' basic skills in ICT (Følgegruppen for lærerutdanningsreformen, 2011, pp. 69–71). The present paper opened by asking whether we are educating teachers for the new millennium, and called this into question by asking how teacher trainers and student-teachers are coping with the ICT issue in teacher education, with a certain eye on what constitutes digital competence. As shown in our three cases, teacher training institutions' institutional documents (institutional curricula) correspond with national curricula on teacher education. Moreover, as for teachers, they appear to have become more aware of how to use ICT for educational purposes in 2011, as demonstrated in the third case, as compared with cases from 2009. Student-teachers have yet to be sufficiently well prepared on how to use ICT for pedagogical purposes, and even what constitutes digital competence, even if their technical skills appear to have improved over the years.

We have demonstrated that learning about ICT and the use of ICT as part of a discipline or profession constitutes part of teaching practice at the teacher-training institutions. We have also witnessed that the third objective, to learn about ICT as part of a learning process, is to some extent present among teacher trainers in case 3. Moreover, the new curriculum requires that the student-teacher when graduating should be able to understand the societal perspectives related to technology and media development (safe use, privacy, freedom of speech) and help ensure that children and young people develop a reflective attitude to digital arenas. Furthermore, the curriculum stressed that the candidate ought to provide change and development expertise as the basis for meeting future school needs. Conclusions from the third case remain preliminary, as these student-teachers have not yet graduated. Time will show if they are being sufficiently prepared for our millennium, as it relates to technology and digital competence.

REFERENCES

- Adamy, P. H., & Boulmetis, J. (2006). The impact of modeling technology integration on pre-service teachers' technology confidence. *Journal of Computing in Higher Education*, 17(2), 100–120.
- Adamy, P. H., & Heinecke, W. F. (2005). The Influence of organizational culture on technology integration in teacher education. *Journal of Technology and Teacher Education*, 13 (2), 233–255.

- Biagi, F. & Loi, M. (2012) ICT and Learning. Results from PISA 2009. JRC Report, European Union, Luxembourg: Publications Office of the European Union, 2012 <http://ftp.jrc.es/EURdoc/JRC76061.pdf> Downloaded March 2013
- Buckingham, D. (2006). Defining digital literacy. *Nordic Journal of Digital Literacy*, 4 (1), 263–276. Egeberg, G., Gudmundsdóttir, G. B., Hatlevik, O. E., Ottestad, G., Skaug, J., & Tømte, K. (2011). *Monitor 2011. Skolens digitale tilstand*. Oslo: Senter for IKT i utdanningen
- Erstad, O. & Hauge, T., E. (eds.) (2011). *Skoleutvikling og digitale medier. Kompleksitet, mangfold og ekspansiv læring*. Oslo: Gyldendal Akademisk
- Ferrari, A. (2012). *Digital Competence in Practice: An Analysis of Frameworks*. JRC Technical Reports, Institute for Prospective Technological Studies, European Union
- Følgjegruppa for lærerutdanningsreforma (2011). *Frå allmennlærer til grunnskolelærer. Innfasing og oppstart av nye grunnskolelærerutdanninger*. Rapport frå Følgjegruppa til Kunnskapsdepartementet. Rapport nr. 1, 2011. Følgjegruppa for lærerutdanningsreforma (<http://ffl.uis.no/>)
- Gentikow, B. (2007). The role of Media in developing literacies and cultural techniques. *Nordic Journal of Digital Literacy* 2 (2), 78–96.
- Granberg, C. (2011). ICT and learning in teacher education: The social construction of pedagogical ICT discourse and design. Umeå universitet, Samhällsvetenskapliga fakulteten, Institutionen för tillämpad utbildningsvetenskap, Interaktiva medier och lärande (IML) <http://urn.kb.se/resolve?urn=urn:nbn:se:umu:diva-43489>
- Hatlevik, O. et al. (2011) *Monitor 2010. Samtaler om IKT i skolen*. Oslo, Senter for IKT i utdanningen
- Haugerud, T. (2011). Student Teachers Learning to Teach: The Mastery and Appropriation of Digital Technology. *Nordic Journal of Digital Literacy*, 4(6), 226–239.
- Haugsbakk, G. (2011). How Political Ambitions Replace Teacher Involvement: Some Critical Perspectives on the Introduction of ICT in Norwegian Schools. *Nordic Journal of Digital Literacy*, 4 (6), 239–256.
- Hetland P. & N. H. Solum (2008). *Digital kompetanse i norsk lærerutdanning*. Oslo; Nifu Step Rapport 28/2008.
- ITU (2005). *Digital skole hver dag. Mot en helhetlig utvikling av digital kompetanse i grunnsopplæringen*. Oslo: ITU
- Judge, S., & O'Bannon, B. (2008). Faculty integration of technology in teacher preparation: outcomes of a development model. *Technology, Pedagogy and Education*, 17(1), 17–28.
- Lankshear, C., & Knobel, M. (2006). Digital Literacy and Digital Literacies: Policy, Pedagogy and Research considerations for Education. *Nordic Journal of Digital Literacy*, 1 (1), 12–24.
- Norwegian Directorate for Education and Training (2006). Knowledge Promotion – Kunnskapsløftet http://www.udir.no/Artikler/_Lareplaner/_english/Knowledge-promotion---Kunnskapsloftet/
- Norwegian Ministry for Education and Research (2003). Rammeplan for lærerutdanning http://www.regjeringen.no/upload/KD/Vedlegg/UH/Rammeplaner/L%C3%A6rer/Rammeplan_2003_allmennlaererutd.pdf
- Norwegian Ministry for Education and Research (2010). National Curriculum Regulations for Differentiated Primary and Lower Secondary Teacher Education Programmes for Years 1–7 and Years 5–10 http://www.regjeringen.no/upload/KD/Vedlegg/UH/forskrifter/National_Curriculum_Differentiated_Teacher_Education.pdf
- OECD (2010). Are the New Millennium Learners Making the Grade? Technology use and educational performance in PISA 2006. Paris: OECD/CERI.
- OECD (2012). Connected Minds. Technology and Today's Learners. Educational Research and Innovation. OECD Publishing.

- Punie, Y., & Ala-Mutka, K. (2007). Future Learning Spaces: new ways of learning and new digital skills to learn. *Nordic Journal of Digital Literacy*, 4 (2), 210–225.
- Scheuermann F. & F. Pedró (eds.) (2009). *Assessing the effects of ICT in education. Indicators, criteria and benchmarks for international comparisons*. Paris: OECD/JRC/ European Union.
- So, H-J., Choi, H., Lim, Y. W., & Xiong, Y. (2012). Little experience with ICT: Are they really the Net Generation student teachers? *Computers & Education*, 4 (59), 1234–1245.
- Strudler, N., & Grove, K. (2002). Integrating technology into teacher candidates' field experiences: A two-pronged approach. *Journal of Computing in Teacher Education*, 19(2), 33–39.
- Tømte, C., & Hatlevik, O. E. (2011). Gender-Differences In Self-Efficacy ICT Related To Various ICT-User Profiles In Finland and Norway. How Do Self-Efficacy, Gender And ICT-User Profiles Relate To Findings From Pisa 2006. *Computers & Education*, 57(1), 1416–1424.
- Tømte, C. Hovdhaugen E. & N. H. Solum. (2009). *ICT in Initial Teacher Training. Norway. Country report*. Paris: OECD.
- UNESCO (2011) UNESCO *ICT Competency framework for teachers* <http://unesdoc.unesco.org/images/0021/002134/213475e.pdf> Downloaded March 2013.
- UNESCO (2011) *Transforming Education: The Power of ICT Policies*. <http://unesdoc.unesco.org/images/0021/002118/211842e.pdf> Downloaded March 2013.
- Utdanningsdirektoratet (2012): Rammeverk for grunnleggende ferdigheter. Til bruk for læreplangrupper oppnevnt av Utdanningsdirektoratet. Oslo http://www.udir.no/Upload/larerplaner/lareplangrupper/RAMMEVERK_grf_2012.pdf?epslanguage=no
- Utdanningsdirektoratet (2006) Digital læringsplattformer – en mulig katalysator for digital kompetanse i grunnopplæringen. Om pedagogisk nytteverdi og utviklingstrekk. Oslo: utdanningsdirektoratet <http://www.udir.no/Upload/Rapporter/5/LMS.pdf?epslanguage=no>
- White paper nr 11 (2008–2009) Læreren – rollen og utdanningen <http://www.regjeringen.no/en/dep/kd/press-contacts/Press-releases/2009/white-paper-on-teacher-education-.html?id=545074>
- Whittier, D., & Lara, S. (2006). Preparing Tomorrow's Teachers to use Technology (PT3) at Boston University through faculty development: Assessment of three years of the project. *Technology, Pedagogy and Education*. 15(3), 321–335.
- Wilhelmsen, J., Ørnes, H., Kristiansen T., & Breivik J. (2009). *Digitale utfordringer i høyere utdanning*. Norgesuniversitetets IKT-Monitor. Norgesuniversitetets skriftserie 1/2009 Tromsø: Norgesuniversitetet.
- Yin, R. K. (2009). *Case Study Research: Design and Methods*. Fourth Edition. Thousand Oaks: CA: SAGE Publications.