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ICT in Initial Teacher Training

Norway

Country report

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Preface

This report is the Norwegian national report for the OECD-project “ICT in initial teacher training”. The OECD study compares 10 countries, and is a project strand within the OECD/CERI project *New Millennium Learners*. The present report is based on a survey conducted at three Norwegian higher education institutions and interviews conducted at two higher education institutions, as a form of case studies.

The institutions that participated in the study were Oslo University College, Sør-Trøndelag University College and Vestfold University College. We are grateful to all respondents that completed the survey and the informants that volunteered their time to participate in individual interviews, group interviews and phone interviews.

The survey was conducted by NIFU STEP, and Nils Henrik Solum had the responsibility for translating and adapting the survey for Norway. The interviews were conducted by researchers at NIFU STEP; Elisabeth Hovdhaugen conducted most of them, with some help from Erika Waagene. Elisabeth Hovdhaugen, Cathrine Tømte and Nils Henrik Solum have all contributed to the report, with the first mentioned as main author. Nils Henrik Solum has written the chapter on the results from the survey. Cathrine Tømte has been project manager, with help from Elisabeth Hovdhaugen. An analysis on the specific questions asked in the Norwegian survey has been conducted by Ove Hatlevik from ITU, and the results are presented in the appendix. Per Hetland and Agnete Vabø from NIFU STEP and Morten Sjøby and Ove Hatlevik from ITU have read and commented on previous versions of the report.

Oslo, December 2009

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ICT IN INITIAL TEACHER TRAINING – NORWAY (COUNTRY REPORT/CASE STUDY)

Cathrine Tømte, Elisabeth Hovdhaugen, Nils Henrik Solum

Introduction

The aim of this report is to describe how student teachers in Norway are prepared to integrate technology in their teaching and to describe this experience from the perspective of teacher trainers, student teachers and mentor teachers. The focus will be on student teachers' own use of ICT, their exposure to ICT through their formal training at a university college and their exposure to ICT during their in-school training at partner schools.

The setting for the report is the OECD-project "ICT in initial teacher training," an OECD study comparing ten countries, which is in turn a project strand within the OECD/CERI project *New Millennium Learners*. The present report is based on a survey conducted at three higher education institutions and interviews at two higher education institutions, in the form of case studies.

Objectives

Each country report addresses a number of core research questions, and for Norway these can be formulated as:

- What are the national frameworks and requirements regarding the use of ICT in initial teacher training in teacher training institutions in Norway?
- What are the institutional frameworks and requirements regarding the use of ICT in initial teacher training in teacher training institutions in Norway?
- To what extent and in what ways is technology used in teacher training institutions in Norway?
- In what ways are student teachers prepared to integrate technology into their teaching in teacher training institutions in Norway?

These objectives will be used to structure the analyses. In addition to the analyses, we will also present a general description of teacher education in Norway and of recent reforms and white papers that influence teacher education. This descriptive part of the report focuses on the first research question, while the other research questions are covered in the analysis of the survey and interview findings.

Structure of the report

The introduction presents the Norwegian higher education system and the overall national context, including the recent reforms in higher education that affect teacher training. The methodology for the study is then presented, followed by the results from the survey and the case studies in the two subsequent

chapters. Finally, the findings from the survey and case studies are brought together in an overall analysis, and conclusions are presented on the key implications of this study for Norwegian teacher training.

The Norwegian higher education system and teacher education

The Norwegian higher education system is binary, with universities and specialized institutions at university level forming one track and university colleges the other (Kyvik 2009). Historically there was a division of labour between these two types of institutions; at a university students could take a general bachelors degree (liberal arts education) or professional education (medicine, law etc), while university colleges taught short-cycle professional degrees such as nursing, engineering and teaching. However, in recent years this division has become blurred, as some university colleges have become universities (Kyvik 2009: 15). The three institutions that are the objects of this study have not changed their status and are still university colleges providing teacher training.

There are several educational tracks in Norway that qualify students to work as a school teacher, and general teacher training programs are offered within universities and at university colleges. However, traditionally most teachers have received training at university colleges. All types of teacher education are regulated under the national curriculum (Norwegian Ministry for Education and Research, 2003). In total, general teacher education is offered at 21 institutions, including two universities and two private colleges in addition to university colleges. Due to changes in admission criteria, the number of students admitted to a general teacher training program declined, from 3 048 students in 2004 to 2 013 in 2007. In 2007 there were 7 662 students registered in the general teacher training program (a four year undergraduate program) (White paper no. 11, 2008-09).

In this report we will focus on general teacher training programs at public university colleges. The main reason for this is that general teacher education produces the majority of teachers who work in primary and lower secondary school (White Paper no. 31, 2007-08). While teachers with further university education may also be qualified to work in upper secondary schools, they are a relatively small group (Turmo & Aamodt 2007).

Recent reforms and white papers related to teacher training

In late 2006 the Norwegian Ministry of Education and Research introduced a new educational reform in Norway, the Knowledge Promotion reform. Among other things this led to the implementation of a new curriculum in compulsory and upper secondary education (1st -13th grade) in 2006. The new curriculum is competency-based and expresses expected learning outcomes as competency goals at the 2nd, 4th, 7th and 10th grades. In upper secondary education there are competency goals for every level. The reform also brought a stronger focus on assessment for a range of different purposes: from assessment for pedagogical and diagnostic purposes to managerial and control purposes. The reform highlights five basic skills¹ that are equally important. One of these skills is being able to use digital tools. As a consequence of this, teachers' ability to provide learning opportunities in digital competences for their pupils has received a great deal more attention.

¹ The five basic skills are as follows (Norwegian Directorate for Education and Training 2006):

- Being able to express oneself orally
- Being able to express oneself in writing
- Being able to read
- Being able to do mathematics
- Being able to use digital tools

Due to this latest reform, the use of ICT in teaching and learning has become more widespread in Norwegian schools. However, recent studies reveal that ICT is generally used as an additional or secondary tool in traditional teaching practices in teacher education, not as a core part of teaching. Moreover, these studies also reveal large discrepancies between institutions, regarding the extent of use, and ways of incorporating ICT into their teacher training (Hetland & Solum, 2008; Wilhelmsen, Ørnes, Kristiansen & Breivik, 2009).

A more recent White Paper on teacher education, entitled “The teacher – the role and the education” (White Paper no. 11, 2008-09), proposes specific actions to further improve the school system and teacher education, including:

- Improving the quality of teacher education
- Increasing recruitment to the teaching profession and to teacher education
- Providing closer follow-up of and support to newly qualified teachers
- Conducting more R&D relevant for initial training and teacher education

The White Paper is recommending a new approach to teacher education, with two programs geared at different levels in school (one for the initial years in primary schooling and one for lower secondary education); it also sets out an improved national curriculum for students in teacher training (White Paper no. 11, 2008-09). This new approach to teacher education will be implemented as of the autumn semester of 2010.

National context, and institutions in the study

There are three institutions in the study: Oslo University College, Sør-Trøndelag University College and Vestfold University College. Oslo University College is the largest university college in Norway and is located in the capital, Oslo. The institution has a total of about 12 000 students, of which well over 3 000 students are in teacher training. Sør-Trøndelag University College is the second largest university college in Norway, and is located in Trondheim, a city in central Norway. The institution has roughly 7 000 students, of which almost 900 are in teacher training. Vestfold University College is a medium sized university college, located about two hours south of Oslo. The institution has a total of about 4 500 students, of which over 2 000 students are in teacher training (meaning 45% of students at this institution are trainee teachers).

At both the Oslo and Vestfold University Colleges, teacher training is the largest department at each institution. In contrast, teacher training is one of the smaller departments at Sør-Trøndelag University College, where the majority of students are studying engineering or nursing. All the institutions have a student-teacher ratio of 16/1, close to the average for university colleges in Norway. At all the institutions around 5% of permanent academic staff are professors, and most have a PhD. The percentage of permanent staff that have a PhD is about 15% at Oslo University College and Vestfold University College, while at Sør-Trøndelag University College 29% of the academic staff have a PhD (see table 1).

Table 1: Academic staff in permanent and temporary positions at the three university colleges

	Oslo		Sør-Trøndelag		Vestfold	
	University College		University College		University College	
	N	% with PhD	N	% with PhD	N	% with PhD
Professor	9	89	4	100	5	100
Associate Professor	55	33	39	49	23	30
Assistant Professor	106	0	37	0	65	2
<i>Sum academic staff</i>	<i>170</i>	<i>15</i>	<i>80</i>	<i>29</i>	<i>93</i>	<i>14</i>
Researcher	6	17		0	5	0
PhD student	9	0	6	0	7	0
<i>Sum temp. positions</i>	<i>15</i>	<i>7</i>	<i>6</i>	<i>0</i>	<i>12</i>	<i>0</i>
Sum personell	185	15	86	27	105	12

Source: Forskerpersonalregisteret

Methodology

Three institutions were selected for the survey: Oslo University College (Høgskolen i Oslo, HiO), Sør-Trøndelag University College (Høgskolen i Sør-Trøndelag, HiST) and Vestfold University College (Høgskolen i Vestfold). The survey was conducted during three weeks in September and one week in October 2009. The links to the different surveys were sent to participating institutions and they were responsible for forwarding these on to the participants. The institutions also handled sending out three reminders to complete the survey.. Due to this approach in distributing the survey, it is not possible to calculate a direct response rate, but it is probably quite low (about 20 %). We received responses from all the program managers for teacher training at the institutions, from 82 teacher trainers, from 87 students and from 29 mentor teachers. The responses from teacher trainers and student teachers cover all the institutions, while we only received responses from mentor teachers at Oslo University College. This is probably due to technical problems with access to the survey amongst mentor teachers at the two other institutions. Table 2 and 3 show gender distribution and mean and median age for the respondents in the surveys.

Table 2: Gender distribution in survey

	Total	Men	Women	Missing
Teacher trainers	82	33 (40%)	48 (59%)	1 (1%)
Student teachers	87	16 (18%)	71 (82%)	-
Mentor teachers	29	6 (21%)	22 (76%)	1 (2%)

Table 3

	Total	Mean age	Median age
Teacher trainers	82	50	54
Student teachers	87	25	24
Mentor teachers	29	43	42

Two of the institutions in the survey were selected as sites for case studies. The rationale for the selection was based on the recommendations on the overall design in the ICT for the Initial Teacher Training project, specifically to include one teacher training institution well known for its focus on ICT (Oslo University College), and one generally well-regarded teacher training institution that has not been profiled as particularly innovative in the field of ICT (Sør-Trøndelag University College). The interviews at these institutions were conducted in September 2009. Interviews with students were conducted as group-interviews, and the teacher trainers at Sør-Trøndelag University College were also interviewed as a group. However, due to time constraints and difficulty in recruiting a significant number of teacher trainers at Oslo University College, the teacher trainer interviews at this institution were carried out as phone-interviews. In total we interviewed two program managers for teacher training, nine teacher trainers, 14 students at Sør-Trøndelag University College, ten students at Oslo University College and six mentor teachers. Overall we included a good range of disciplines among the teacher trainers and a good range of subject combinations among the students interviewed.

A note on the number of respondents in the present study

The number of respondents in the survey is lower than desirable, especially among students in teacher training programs and mentor teachers. No specific explanation for the low response rate among students is clear, but it is possible that it is more difficult to recruit respondents at the beginning of the semester when students are still getting organized for the school year. However, it was also a challenge to get student respondents for the interviews, which might be an indication that the general interest in participating in studies, or in this specific study, was low. When we tried to recruit students for the interviews they often asked if they had to have considerable knowledge of ICT to participate, suggesting that some believed they had to be experienced or expert in ICT in order to take part. This may have put off some potential respondents. At one of the institutions we had to offer students a gift-card for the campus book shop in order to recruit enough respondents.

It was also challenging to find mentor teachers who were willing to participate in interviews: we had to inform them personally about the project at a meeting then try to recruit informants immediately afterwards. As mentioned above, few mentor teachers filled out the survey, which may have been partly due to technical problems they had in accessing the survey. However, the difficulties in recruiting participants might also indicate a low level of interest in participation, possibly due to research fatigue.

The number of interviews conducted within the case studies might be considered low, and is certainly lower than was planned based on the indications in the OECD manual for the project. There are several reasons for this. One central aspect is that the present study was conducted immediately after two other quite large studies, which also included questions on the use of ICT in higher education, and one of which also focused on teacher training institutions (Hetland & Solum, 2008; Wilhelmsen et al, 2009). The low response rate in the survey may therefore reflect a degree of research fatigue amongst relevant respondents to surveys on ICT, after several studies in a short period. Another possible reason is that teacher trainers and mentor teachers are simply too busy to make time to participate in interviews. Due to an unforeseen delay in the project we had a very tight schedule for conducting the interviews in order to keep the overall project deadlines. These factors, and the limited interest in participation in such a study at the institutions, resulted in fewer interviewees being conducted than initially proposed. It is also important to note a possible self-selection amongst interviewees, as most of the teacher trainers and mentor teachers interviewed are active users of ICT in their own teaching. This might also apply to survey respondents: those most interested in answering the survey may also be more able and/or frequent users of ICT.

Nevertheless, while the existing data sets might appear somewhat scarce, the data are largely in line with findings from other national studies, as referred to above. We therefore include findings from these two related studies where they are relevant in the report at hand.

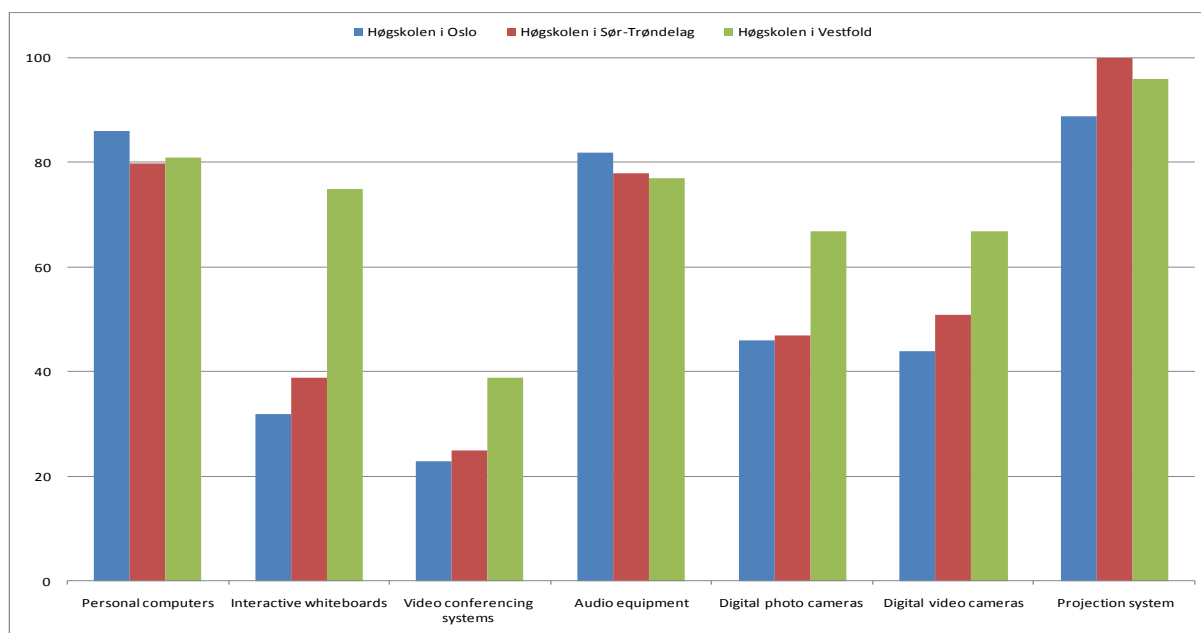
Findings from the survey

Even though the response rate for the survey was low, the findings still indicate how students, teacher trainers and mentor teachers are using ICT. However, we have to keep in mind that the response rate among students was quite low, and that responses from the mentor teachers only came from Oslo University College.

Teacher trainers

In general, access to ICT equipment is good in Norwegian higher education institutions (Wilhelmsen et al 2009). However, having access to ICT is not the same as using or mastering that technology. The results from this survey confirm those in previous studies, that “basic” equipment, such as computers and projector systems, is generally accessible; while videoconferencing and interactive whiteboards are more sparsely available (see Figure 1).

Figure 1: Survey results – ICT equipment availability



The figure also illustrates some marked differences between Vestfold University College and the two other university colleges; generally, Vestfold University College seems to be better equipped than the two other university colleges. Vestfold University College and Oslo University College are both aiming towards integrating digital competence in the regular education of student teachers (Hetland & Solum 2008). In light of this, one would expect Oslo University College to be similar to Vestfold University College's scores, but they appear to be less well equipped.

Amongst teacher trainers, 72% have engaged personally in a project aimed at using ICT in new and innovative ways. This rate may seem high, but if we compare the results with the figure below, they may include those taking part in projects that teach the use of personal computers and projectors.

Figure 2: Teaching the use of technological devices to students (teacher trainer)

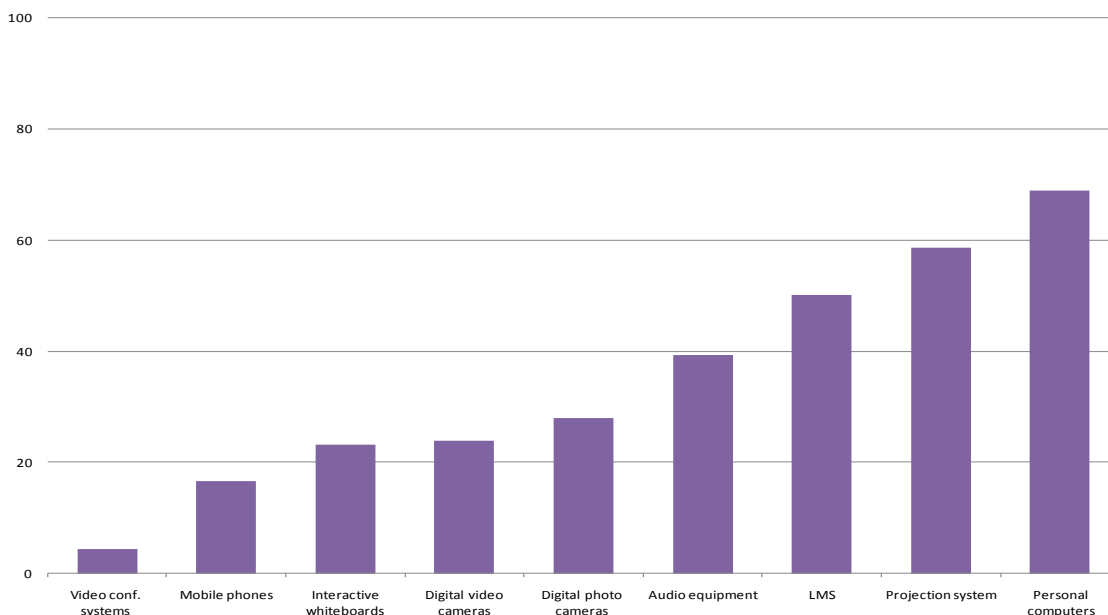
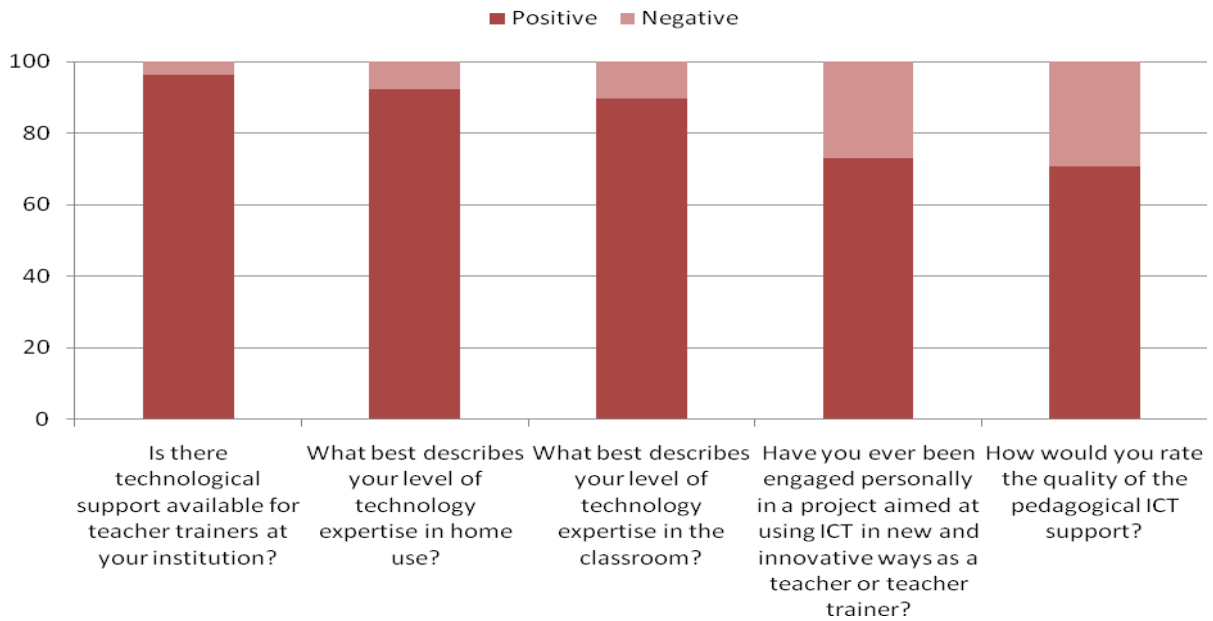


Figure 2 presents the proportion of teacher trainers that have taught certain technologies, at least sporadically. One trainer could have used all types of devices, or just one type, but most of them have only used a few, and PC and projection systems are the most common types used. This may well illustrate practices that imply a rather traditional and instrumental view of ICT as a “mode of knowledge distribution,” more than interest in innovative use of ICT in education. However, a more targeted study must be done in order to clarify this result.

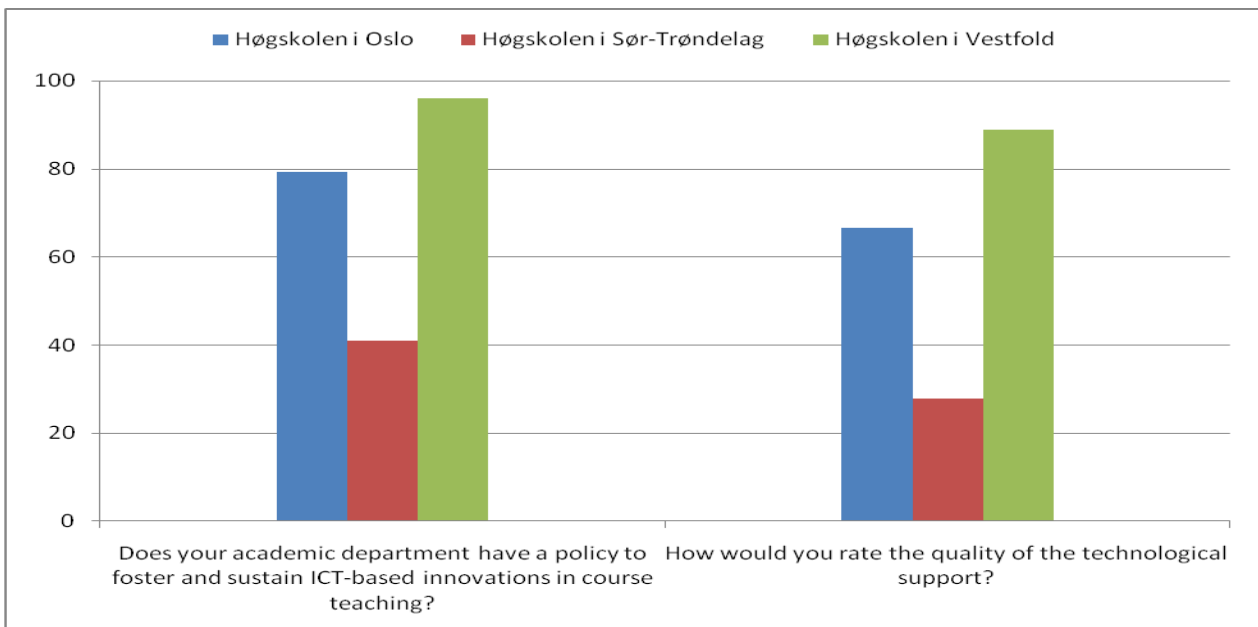
The next group of questions concerned institutional and personal ICT competence. In general (across all institutions) there is a positive appraisal of capabilities amongst both institutions and teacher trainers. As the figures show, nearly all (90% or more) of respondents have high confidence in their own ICT capabilities, both at home and in the classroom.

Figure 3: ICT capabilities



Within this theme, there were two aspects that showed substantial differences between institutions. While pedagogical ICT support was valued positively overall, the quality of *technological* support and ratings for the implementation of ICT policy vary substantially between the institutions, as can be seen in figure 4.

Figure 4: ICT policy and positive ratings on support



Across other survey results, there were no significant differences between the institutions, and results are therefore presented for the total of all respondents.

Table 4: To what extent do you think the use of technology described below is important for a student teacher to acquire? (percentages)

	Important	Not so important
Use of technology for communicating and/or networking with...		
...their pupils	91	9
...parents	80	20
...school management and educational administrations	92	8
Use of technology for student teachers' own development and learning	93	7
Use of technology as a management tool...		
...for organising their work and keep records	97	3
...for preparing lessons	84	16
...for finding digital learning resources	99	1
...for designing and producing their own learning resources	89	11
Student teachers' future integration of technology to...		
... facilitate teaching specific concepts or skills	89	11
... support various student learning styles and to personalise learning	84	16
... facilitate teaching pupils with disabilities (cognitive, physical, behavioural)	95	5
... support activities that facilitate higher-order thinking	70	30
... support creativity	73	27
... foster pupils' ability to use technology in their own learning	97	3

In general the immediate interpretation of the table might be that *all respondents think every use is important*. Unfortunately, these results reflect a general problem in terms of survey design: more open questions, for example asking respondents to evaluate the importance of the different topics without introducing any weighing or limitations to the responses, tend to reflect “good intentions” more than real world experiences or views. This interpretation is supported by the observation that many respondents do

not prioritise between the various uses. In retrospect, the question perhaps should have asked respondents to select the three most important aspects, or order the topics according to their importance. Based on the existing question not many detailed conclusions can be drawn.

Table 5: What importance do you attach to the following suggestions to help teacher trainers increase the integration of technology in their courses?

	Important	Not so important
Better access to technological equipment	87	13
Reliability of equipment	95	5
Availability of high quality equipment	83	17
Training/courses in pedagogical use of ICT	86	14
Pedagogical ICT support (e g "hotline")	82	18
Technological hands-on training/courses	78	22
Technological support (e g "hotline")	84	16
Policies on using ICT across curriculum	73	27
Time to prepare, explore and develop	95	5
Task related incentives (salary, promotion, etc)	32	68
Better access to technological equipment	87	13
Reliability of equipment	95	5

Again, results are very stable across the institutions and unfortunately follow the same pattern and reflect the same problems as the questions described previously, with one notable exception: while all of the suggested efforts were clearly deemed to be important, the *task related incentives* were seen as of no or little importance. This might reflect an inherent scepticism towards practices that measure and reward individual efforts or behaviours among Norwegian teachers, as was recently exemplified by the Norwegian teacher unions' negative appraisal of similar policy suggestions².

² See; "Godt nytt år - nei til prestasjonsbasert lønn!", ("Happy new year, say no to performance related wages"), an article by leader of the Norwegian Teacher unions regional chapter of Akershus; 7 jan 2008, accessed [online] at <http://www.udf.no/no/Portal/Fylkeslagene/Akershus/Nyheter/2008/Godt-nytt-ar---nei-til-prestasjonsbasert-lonn/>

Student teachers

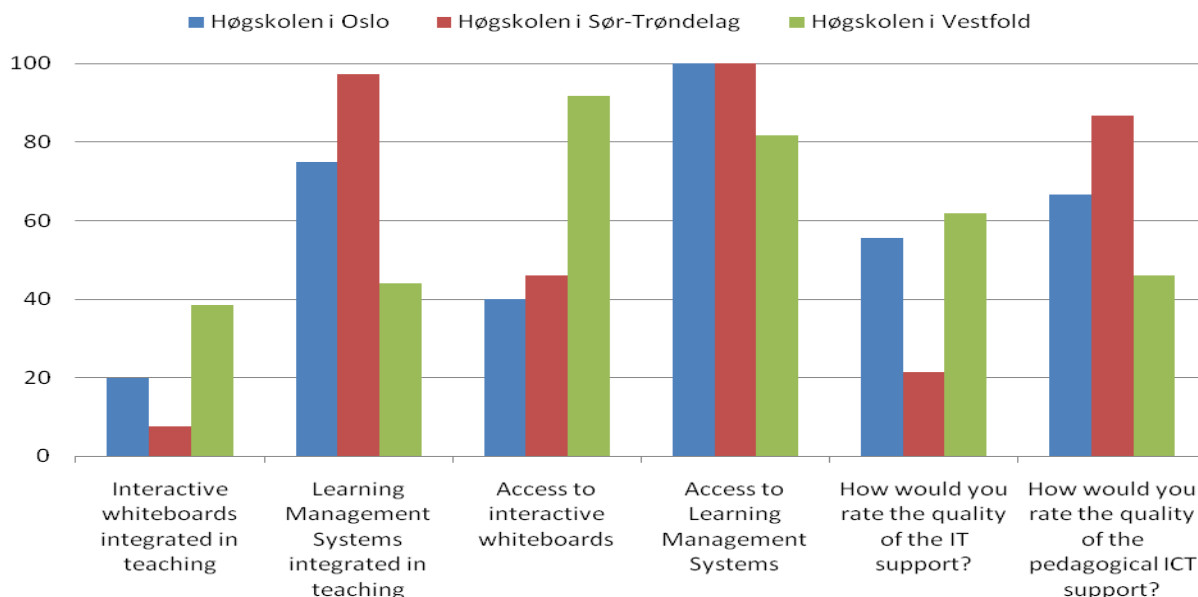
Norwegian student teachers spend approximately one day each week using ICT. Again there are only small differences between the institutions. Of time spent, 40% is on tasks related to studies, while most of the time spent on ICT is for personal use.

Table 6: Weekly hours of use of ICT

Institutions	personal use	related to studies
Høgskolen i Oslo	15	12
Høgskolen i Sør-Trøndelag	17	7
Høgskolen i Vestfold	18	11

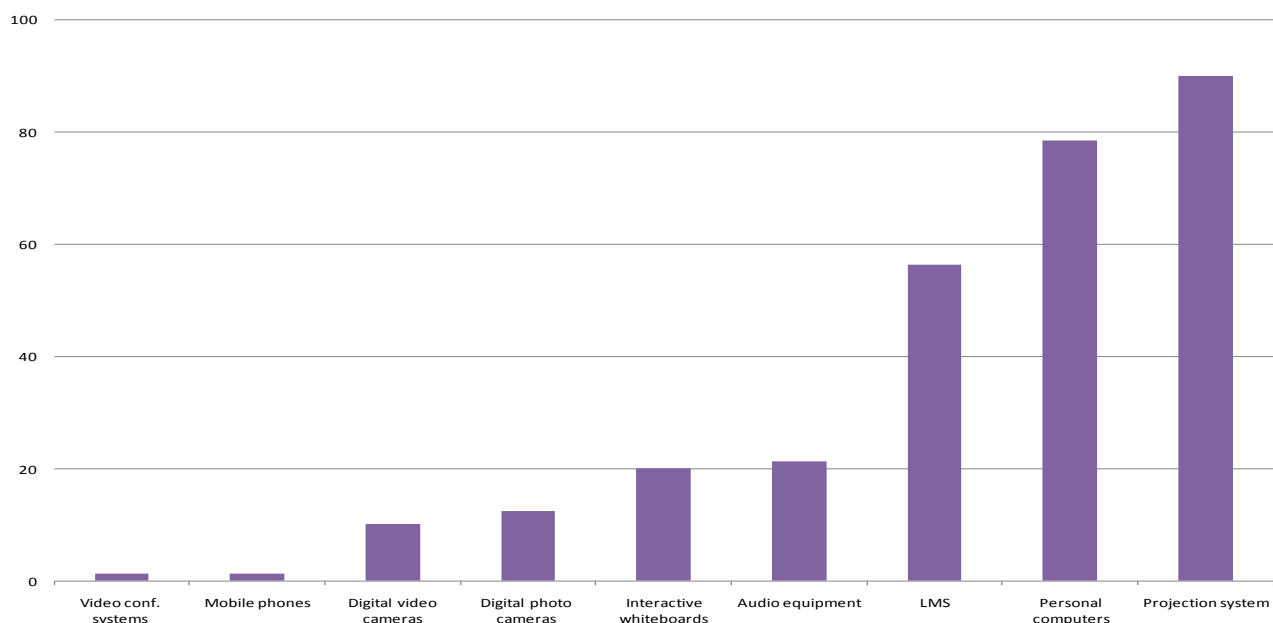
The next figure (figure 5) shows those topics where access to certain types of ICT did vary significantly between the participating institutions. Learning management systems (LMS) are more or less universally accessible, but are used less in Vestfold. While student teachers offer a similar estimation of general and pedagogical ICT support overall, in Trøndelag there is a clear discrepancy between the two kinds of support: IT support receives much lower ratings than pedagogical ICT support. This is consistent with the results found in the case studies and interviews. Both access to, and use of whiteboards vary between institutions, appearing to be more widely integrated in Vestfold, while used to a much lesser extent in the other two colleges.

Figure 5: Student teachers, institutional variations



In Figure 2 we presented experiences of “teaching the use of technological devices to students” from the perspective of teacher trainers. Figure 6 provides the student teachers’ perspective on this issue.

Figure 6: Teaching the use of technological devices to students (student teachers)



Interestingly enough, the figures show that students agree with teacher trainers on the relative distribution (or priority) amongst the different technologies. The proportion of students that have experienced this use is consequently lower than the rate of teachers that claim to teach the use of these devices. One issue in particular needs to be picked up on from these results: while one in five students have had training in the use of interactive whiteboards, only one in every 100 has been taught about video conferencing systems. These responses are not the result of a lack of *access to technologies*, as Figure 1 shows that access to equipment and ICT infrastructure is relatively high, so access is not the decisive factor for the teaching of these devices.

Table 7: To what extent do you think the use of ICT described below has been implemented within your institution?

	Rarely	Sometimes	Often
a) Use of technology for communicating and/or networking	9	23	68
b) Use of technology for your own development and learning	15	43	42
Use of technology as a management tool...			
...for organising their work and keep records	8	33	59
...for preparing lessons	18	42	40
...for finding digital learning resources	21	46	33
...for designing and producing their own learning resources	32	44	24
Integration of technology to...			

... facilitate teaching specific concepts or skills	56	33	11
... support various student learning styles and to personalise learning	68	27	5
... facilitate teaching pupils with disabilities (cognitive, physical, behavioural)	74	23	3
... support activities that facilitate higher-order thinking	61	34	5
... support creativity	56	36	8
... foster pupils' ability to use technology in their own learning	65	32	3

Previous reports, (Hetland & Solum - building on the framework in Arnseth et al 2007:36), organise digital competence into three main groups or levels; first, practice or tools competence (being able to acquire skills in ICT); second, interpretative competence (being able to organise, integrate and evaluate ICT); and third, creative, adaptive and development competence (being able to work with ICT in a creative way to find solutions for unfamiliar problems). These competencies “represent a set of skills and knowledge presented in a sequence that suggests increasing cognitive complexity,” (ETS 2001:3). If one considers the previous table (table 7) as representing the position of ICT use in teacher training, along a scale of complexity, the interpretation would be that most of the efforts taking place are still at the first level and involve the use of ICT as a tool. The same is true for the responses regarding the use of ICT within partner schools.

Mentor teachers

The final group surveyed were mentor teachers. However, the response rate for this group was fairly low, with only 29 respondents in total. We therefore will only present the most interesting or striking findings.

Table 8: General situation as reported by mentor teachers

Is there technological support available for teachers at your school?	96% yes
What best describes your level of technology expertise in the classroom?	85% comfortable
Is there support available for teachers regarding pedagogical use of ICT at your school?	58% yes
How would you rate the quality of the pedagogical ICT support?	93% good

The high proportion of respondents who are comfortable with their level of expertise suggest a possible bias amongst participants towards those who are more digitally literate. This theory is strengthened by the results shown in the next table (table 9). As far as we have been able to ascertain, no other studies would support the finding that ICT is used to “analyze student achievement/performance data” in a systematic way by nearly all (95%) of Norwegian teachers. Whether this is due to factors in the selection process for mentor teachers, or due to more competent mentors being the most willing to respond is not known, but these are typical problems when analysing data from self-recruited samples.

Table 9: How often is the use of technology described below present in your teaching?

	Never
Personal computers	0,0%
To support various student learning styles and to personalise learning	4,3%
To support creativity	4,3%
To foster pupils' ability to use technology in their learning	4,5%
To facilitate teaching pupils with disabilities (cognitive, physical, behavioural)	8,7%
To support activities that facilitate higher-order thinking	8,7%
To facilitate teaching specific concepts or skills	9,1%
Audio equipment (including software)	13,0%
Digital photo cameras (including editing software)	17,4%
Projection system	22,7%
Interactive whiteboards	34,8%
Mobile phones	43,5%
Digital video cameras (including editing software)	45,5%
Learning management systems/VLE (WebCT, Moodle, etc)	59,1%
Video conferencing systems	87,0%

This final table (table 9) is included despite these reservations, as it is nonetheless an interesting picture about what one can assume is an unusually digitally literate groups' assessment of the importance of various technologies. Even within this group, videoconferencing systems are never used by most (87%) of the mentor teachers, while PCs are universally used by all respondents.

Case study – Oslo University College & Sør-Trøndelag University College

Two institutions were selected as case studies: Oslo University College (HiO) and Sør-Trøndelag University College (HiST). The cases are presented below.

According to the national curriculum, digital competences are now a part of the skills that are to be taught in school (White paper no. 31, 2007-08). This has implications for teacher training. All training institutions are supposed to integrate digital competences into their teacher training, as set out in the white paper from 2008-09 (White paper no. 11, 2008-09). The institutional awareness of this issue is also high: comments were made about this issue on several occasions by interviewees at both institutions. A new national curriculum for teacher training will be implemented in 2010, replacing the current curriculum that has been in place since 2003 (Norwegian Ministry for Education and Research, 2003).

Based on the new national curriculum for teacher training, all institutions have to prepare an institutional curriculum contract, stating, among other things, how digital competences should be built into training. Hetland and Solum (2008) found that there are great variations in these contracts; most focus on access and practical use of ICT, but some institutions show signs of further understanding of how ICT and digital competence can be linked to learning processes. Few of the institutions focus on digital competences in relation to practical training in partner schools (Hetland and Solum 2008: 43). However, while the institutional curriculum contract may still be variable and insubstantial in some cases, the introduction of such a contract may help students who are not content with the ICT training they receive to complain and demand change (Hetland and Solum 2008: 41). As yet, it is unclear to what extent this actually is taking place.

Oslo University College

Oslo University College is an institution that has had a strong focus on ICT for several years. They launched a specific strategy for e-learning as far back as 2003 (HiO, 2003). However, ICT is not an issue covered in the current or former overall strategic plans for Oslo University College (HiO, 2004; 2007). This may be due to the fact that ICT is perceived as already having been dealt with in other specific documents, or in the interest of keeping Oslo University College's general strategic plan relatively short and concise. Oslo University College also has an institutional curriculum contract.

There is a special unit that teaches ICT to students in teacher training at Oslo University College, and ICT is also one of the disciplines that students can choose to 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. In these classes, ICT teacher trainers try to work in pairs with subject teachers; such classes involve two teacher trainers in one educational setting, one subject teacher and one teacher trainer focused on integrating ICT.

The current teaching scheme for ICT has been in effect at Oslo University College since 2003. However, projects on ICT in teacher education had already started in 1999 and were increased in 2000. The current scheme was started with the implementation of the new national curriculum in 2003. The special unit for ICT in teacher education has been evaluated every semester, until recently when they switched to conducting more thorough annual evaluations.

In these ways, Oslo University College has been focusing on ICT in teacher education for quite a while. One of the reasons given for organizing ICT training as a special unit, instead of integrating it into all subject fields, is that the subject teachers are not trained well enough to teach ICT alongside their subject. Many require support to integrate ICT into their subject teaching, and the ICT teachers work together with the subject teachers to achieve that. There have been few courses and little general training in using ICT for the teacher trainers, the reasons being a 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 have only been a few courses specifically for

personnel. Due to this, the subject teacher trainers have had to become fairly self-reliant when they do need to use ICT in their teaching, while they can 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 are good at using ICT in their teaching. In general most personnel are using ICT as (one of many) tools in their teaching, using programmes such as PowerPoint at least occasionally. Previous findings have also pointed out discrepancies between the strategic and pedagogic role intended in ICT strategies or plans and the actual practices in the auditoriums and class rooms (Hetland & Solum 2008). Nevertheless, some teacher trainers at Oslo University College have shown more interest, and over time have become so competent and confident in using ICT that they are now teaching their colleagues how to make better use of ICT in training.

Oslo University College implemented their LMS several years ago and all teachers and students have to use the LMS: most key information is distributed in that way. Students are supposed to check the LMS for messages at least once a day and usually do so more often. The LMS is also used for papers and exams where students hand in their work online. In this way the LMS is used more for organizational purposes and not so much as an instrument for developing digital competencies or pedagogic competence.

The students at Oslo University College are not very content with the ICT training they receive. They report that they have only had some general courses, mainly on how to handle different computer programs, and that these courses have not been compulsory since some students already are familiar with these programmes. However, students with little knowledge of ICT before entering teacher training claim that these technical courses on how to handle different programs have been helpful. The special unit for ICT in teacher training states that they offer students general courses on different programs, but they do not offer a help-desk for students that did not attend these courses. Therefore, if students miss the training in a specific program they have to learn it themselves, the special unit for ICT does not have the resources to give individual instruction.

Students also complained about the technical equipment at Oslo University College. They consider the equipment to be of a poor standard. While there are projectors and a computer in every classroom, this technology does not always work. There is supposed to be a wireless network all over campus, but it does not always work well, at least not in the Department for Teacher Training. Several students also comment that there is no interactive whiteboard at Oslo University College, despite there being one in the ICT section, but this is apparently only used when teaching students that major in ICT (special unit on ICT in teacher education).

The students argue that they get most of their practical training in using ICT in teaching while they are in training at a school. Some of the students have tried interactive whiteboard during this school-based training. However, it seems as if these opportunities to try out ICT during training at schools vary considerably depending on the partner school they attend. Students cannot choose which school they are sent to, and this variation in ICT experience can seem random and unfair, as some students get the opportunity to try out different teaching methods using ICT, and some do not. Overall, though, students seem to think that the quality of the technical equipment is better at most primary and secondary schools than it is at Oslo University College.

Mentor teachers in schools are generally unimpressed with students' knowledge of ICT; they do not think that they enter schools with a lot of training in how to use ICT in their teaching. Schools are often the first ones to introduce students to interactive whiteboards, not Oslo University College. Most of the mentor teachers argued that they usually end up teaching students about the use of ICT in a pedagogic setting because neither the students' previous knowledge nor their experience is good enough when they enter their training school.

Sør-Trøndelag University College

Sør-Trøndelag University College has until recently lacked any institutional focus on ICT. The current strategic plan does not include anything specific on ICT (HiST, 2005), but the plan that will be in effect from 2010 does (HiST, 2009). This can be seen as a result of the coming changes in the national curriculum and the white paper from 2008-2009 (White paper no. 11, 2008-09). Teacher trainers that actively use ICT in their teaching already, mainly do so as a result of personal interest or engagement. For example, one teacher trainer mentioned that only two of the eight teacher trainers in his subject field use ICT in their teaching regularly. Whether students will be exposed to ICT in their training therefore seems to be quite random: it all depends on the teachers they get. There is no institutional strategy on use of ICT in teacher training, but as ICT now is one of the general competences in education, more focus will be put on that in the future (see coming strategic plan; HiST, 2009). It is also included in the institutional curriculum contract.

At Sør-Trøndelag University College, ICT used to be taught separately in a specific course for students, but is now supposed to be integrated across all subjects. However, this is only being done to a limited extent. There are several reasons for this; there is no, or only very little, ICT training for teacher trainers; some of the teacher trainers have tried to teach each other in classes, in non-compulsory classes offered every year, but attendance is poor; teacher trainers also argue that the equipment at Sør-Trøndelag University College is not up to date or is inadequate, with too many old computers and not enough computers for everyone; finally, it was also suggested that the age of trainers might play a part, as the mean age among teacher trainers at Sør-Trøndelag University College is relatively high, but there is no clear link between these problems and staff age, as some of the most eager users of ICT were found amongst older staff.

All teacher trainers have to use the LMS and e-mail when at work, and some also use PowerPoint, online discussions, filmmaking or videos in their teaching. There are projectors and computers in most classrooms, but they do not always work properly. The interviews with teacher trainers indicated that there is a divide among teacher trainers: you either use ICT in your training quite regularly or not at all. Not all teacher trainers are confident using ICT in their teaching, but those who are using ICT seem very engaged in the topic and argue that ICT offers many benefits when teaching student teachers.

All teacher trainers and students have to use the LMS; most key information is distributed that way. Students are supposed to check the LMS for messages at least once a day, and usually do so more often. The LMS is also used for papers and exams, where students hand in their work online. The LMS seems to be well integrated at the university college.

Students' general opinion on ICT seems to be that they do not receive enough ICT training. There have been few courses offered on the use of ICT and they feel they largely have to figure out these skills for themselves. To illustrate this point, even though students were offered a course in how to create a website, many students struggle to hand in their final exam electronically via the website, and had to get help from fellow students with more general ICT knowledge. There is also a lack of equipment at Sør-Trøndelag University College: there are not enough computers in the computer lab, and there is only one interactive whiteboard, which is hardly ever used. The interactive whiteboard is located in the back of a classroom, not hooked up to a computer. However, a course in the use of interactive whiteboards was offered shortly after the interviews were conducted.

Students feel that they get more hands-on, practical training in using ICT, while they are at their training school. Some students have tried using interactive whiteboards in their teaching when at a school. However, the amount of ICT training students get at training schools differs considerably from school to school. Students believe it is quite random if they receive any such ICT training when in schools.

The mentor teachers in training schools are generally unimpressed with students' knowledge of ICT; they do not think that they enter schools with a lot of training in how to use ICT in their teaching. Mentor teachers usually end up teaching students about the use of ICT in a pedagogic setting. But in some cases, where students end up in a school, or working with a mentor teacher, that does not use ICT in their teaching; they report they sometimes get the feeling that they know more about ICT than their mentor teacher does. In these cases, the student can even end up teaching their mentor teacher how to use ICT in teaching.

Overall analysis

In this section we will bring together the findings from the case studies and the survey data. The two institutions in the case study were chosen because one had a reputation of being particularly good at integrating ICT in teacher education, while the other institution was less accustomed to using ICT in training. This corresponds to the two approaches to integrating digital competences or ICT that Hetland & Solum (2008) describe: as approaches "using ICT as a tool" and those "integrating ICT". In the first case, ICT is only used as one of several tools, whereas integration involves using digital technology to change strategies for learning (Hetland & Solum 2008:37). In terms of these approaches, the two institutions seem initially to be quite alike, at least from the students' perspective; at both institutions students argue that they do not receive enough ICT training, and are taught how to use ICT in a pedagogical setting. These observations are also supported by the survey data. Students' opinions on the level and general quality of ICT teaching at their college are very similar at both institutions, and this finding is also supported by results from the survey. The picture the students give is that some teacher trainers lack confidence and skills when using ICT, or simply do not use ICT in their teaching. Only a few of the teacher trainers seem able to act as good role models for using ICT in a pedagogic setting. This is in line with some previous findings: in their study, Hetland & Solum (2008) found that no teacher training institutions in Norway can claim that all their teachers are confident in using ICT in their teaching (Hetland & Solum 2008:39).

Based on the interviews it seems that, even though some teachers at Oslo University College are more confident in the use of ICT in teaching and have better facilities and equipment, their students are no more content with the ICT training they receive than those at Sør-Trøndelag University College. It seems then, that the distance between the institutional self-image and the reality the students face, is somewhat greater at the Oslo University College than at Sør-Trøndelag University College. While students at both institutions feel training are insufficient, the different reputations of the institutions do not seem to be reflected in significantly different practices.

In addition, the survey shows that most teacher trainers only use a few ICT tools, the most commonly used being personal computers and projectors. These two devices are also the most commonly available at the university colleges, and those that students report having been exposed to most. Based on these findings, most students are exposed to a very limited range of ICT tools through the teaching they receive.

However, students do report that they have to use an LMS frequently since most information is distributed in this way and the LMS is also used to hand in assignments and exams. In the survey, most students report having access to an LMS and at both case study institutions the LMS seems to be integrated into teaching. Wilhelmsen et al (2009) found that students in teacher training institutions use ICT to a similar extent to other groups of students, but that they are using some types of ICTs relatively often, in particular ICT for digital portfolio assessment, in LMS sites and for films and computer games.

In line with their concerns about low exposure to ICT, students are not very content with the training they get in pedagogical use of ICT in teacher training programs. Wilhelmsen et al (2009) found that 4 out of 10 students in teacher training think that they are not being sufficiently educated in using ICT. There are a few exceptions to these patterns in this study; both at Oslo University College and Sør-Trøndelag University College students generally feel that they do not get enough courses on

pedagogical use of ICT, and feel that their teacher trainers do not function as positive role models. However, in the survey results there are some differences between the institutions. Students from Sør-Trøndelag University College appear to be more content with the quality of the pedagogical ICT support they receive. Oslo University College, on the other hand, seems to be providing more courses for students, especially in the use of different programs. At both institutions, most practical or technical ICT courses for students are non-compulsory. Students that already know some ICT do not generally take part in these courses, but students with little previous knowledge of ICT can find them helpful. These findings correspond well with previous studies, such as Hetland & Solum (2008) who state that the digital competence of the teacher trainers is unevenly distributed and there seem to be a need for more courses for training personnel (Hetland & Solum 2008:51).

The problem of a general lack of competence in pedagogical use of ICT amongst student teachers is also brought up by the mentor teachers, who generally think that student teachers have not received sufficient training in ICT at their university college. The mentor teachers therefore often have to teach student teachers how to make use of ICT as a pedagogical tool. Access to ICT equipment is also often better in primary and secondary schools, compared to the university colleges. For example, in Oslo most primary and secondary schools have at least one interactive whiteboard, and many schools have them in all classrooms. Oslo University College only have one interactive whiteboard and only the teachers that teach specific ICT-training get to use it. In Hetland & Solum (2008) it is suggested that there are benefits for a university college being able to select their partner schools: if a teacher training institution has enough partner schools, they can choose to cooperate with the ones that also provide opportunities for teaching the pedagogical use of ICT to student teachers (Hetland & Solum 2008:28). However, not all institutions have the luxury of having enough partner schools to choose freely which ones to use, based on ICT capacity.

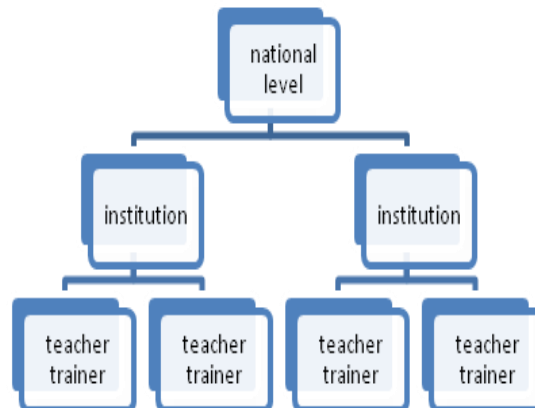
The kinds of variations found between student and staff perspectives, on how well digital competence are included in training, have also been detected in another recent national study on the issue, that include a larger number of teacher training institutions. This study indicates that there is an overall difference between student and staff, in most teacher training institutions in Norway, when it comes to expectations about the role of ICT (Wilhelmsen et al 2009). Both students and staff agree that ICT is crucial in teacher training education; the question raised is therefore how to ensure that ICT elements are integrated in teacher training, and such steps to implement policy on ICT might prove to be the key to this puzzle, at least in Norway.

All institutions are supposed to integrate digital competences into their teacher training (White paper no. 11, 2008-09). The national framework and policies are already in place. In general, institutional awareness on this issue of ICT in teacher training is high, and has generated action on the part of the institutions, at least in terms of new policies or plans. The national policies on integration of ICT in teacher training have increased the focus on this issue within institutions, and in many cases also inspired institutions without ICT policies to create them. However, these new policies are clearly not fully implemented as yet, as shown in Hetland & Solum (2008).

Teacher training in Norway is governed by a national curriculum, hence all institutions should teach the same, or at least a similar, curriculum. The actual design of the curriculum is stated in an institutional document specific to each higher education institution, in an institutional curriculum contract. Hetland & Solum (2008) conducted an analysis of how digital competence is presented in these institutional documents, and found substantial variations in how detailed the institutions were in describing ICT in their documents; some hardly mention ICT while other institutions have an extensive understanding of digital competences, both as a tool and in terms of integrating ICT into their teaching and learning (Hetland & Solum 2008:42-45). However, with these contracts in hand, students may well be better placed to take action if they feel that they do not receive the training they should have (Hetland & Solum 2008:41). The question that remains to be answered is whether they will take such action.

Figure 7 is a visual summary of the main finding in this study, describing the flow of change in ICT use through the various levels and institutions. First, policy on ICT integration in teacher training is introduced at the national level, and this step has already taken place. This policy trickles down to the institutions, which then incorporate it into their institutional policies, and institutional curriculum contracts. The idea is that from this institutional level, the focus and interest in ICT will spill over to the individual level, but this seems to be taking more time, and is very inconsistent at present.

Figure 7: Policy principles and implementation



The practical implementation of the national ICT policy varies between institutions, as shown in previous studies. However, the national strategy, while not consistently reflected in institutional integration of ICT in school policy, may now be on its way to being adapted for use more universally within institutional policies, and is certainly used to a higher degree than previously. In addition it is being implemented through the institutional curriculum contracts. Nonetheless, the main obstacle that remains in terms of the implementation of school policy is the motivation of and incentives for each and every stakeholder, especially academic staff in teacher institutions, to engage in ICT use. The figure illustrates the situation; even though there seems to be more coherence within the institutional framework, the problem of how to operationalize ICT policy in a way that includes academic staff (teachers) *within* each institution, is still not solved. Regarding the three types of digital competences, of skills (1), interpretative competence (2) and creative competence (3), the interpretation must be that while the *policies in principle* are geared towards all three types, most of the policies that are *actually implemented* still belong firmly within type 1, and represent implementation of ICT as a tool.

Another obstacle is that institutional plans and strategies are not always followed; the extent to which teacher trainers actually utilize ICT in their teaching varies a lot from person to person. This also corresponds to earlier findings (see for example Hetland & Solum 2008). There are also discrepancies in how ICT is integrated at different institutions, and within different fields of study. It seems as if the level of integration of ICT in teacher training is, to some extent, left to the individual teacher trainer, and as a result students attending the same institutions can receive very different levels of ICT training depending on the individual teachers they have or courses they take. This variation within institutions means that not only are students from different teacher training institutions differently educated when it comes to ICT skills and competences, but that differences can also be expected between students from the same institution.

This in turn reflects the span between the desired institutional practice, and the experiences as reported by the students. There are too few factors that provide a link between the institutional ambition of developing ICT as an integrated competence, and the requirements of the day-to-day working life of teacher trainers. The university colleges do not seem to be in a position to require or to motivate unwilling teacher trainers to implement their institutional strategies, if there is one. This is also expressed as a key obstacle in the interviews with program managers for teacher training.

The mentor teachers, while not very visible in the process of integrating ICT in teacher training, may potentially have a very important role. The results from this study indicates that mentor teachers are generally quite well prepared to teach student teachers pedagogic use of ICT, and in some cases the ICT-infrastructure at schools is also better than at the teacher training institution. If these cases are typical, mentor teachers may be an under-utilized asset for integrating ICT into teacher education. However, for this approach to work well would require teacher training institution to have a close relationship with their partner schools, where they know what type of training the student teacher can actually expect to receive at each partner school.

Conclusions

On a formal level, Norway already has *the national and institutional framework* in place to integrate ICT in initial teacher training. The recent reform in education, the Knowledge Promotion reform, puts digital competence on an equal footing with other basic skills (along with ability to express oneself verbally, reading, writing and mathematics). This has generally generated a stronger focus at teacher training institutions on preparing student teachers to make use of ICT in their teaching, as expressed through strategic documents and plans at teacher training institutions.

The use of ICT can therefore be argued to have been integrated into in teacher training policy on the national level and, in most cases, at the institutional level. However, these ideas have not yet reached the individual or practice level, and this will probably require more time and possibly more effort from the part of the teacher training institutions. In addition to this, one cannot automatically assume that changes in policies and practices at one institution will ‘spill over’ to other institutions (Ludvigsen & Rasmussen 2006). Sharing of institutional practices might function to inspire institutions more widely, but there is no quick fix that will make institutions arrive on an equal footing when it comes to the integration of ICT.

However, the process of change has clearly started: institutions are picking up the signals from national policy and recreating their own policies and strategies, as well as introducing institutional curriculum contracts. These institutional curriculum contracts specify what students are supposed to receive in terms of ICT teaching, and how ICT should be involved in their teacher training. With such a contract in hand, students could take more action if they are not content with the training they receive, although this has not yet been done. It seems likely that changes in institutional policies will eventually reach the individual level, and gradually change individual practices.

ICT use can be seen in several ways. While the *policies in principle* are geared towards all three types of digital competences (skills, interpretative and creative competences), most of the policies that are *actually implemented* still belong to implementation of ICT as a tool. The main techniques involve the use of computers and projection systems. In order to implement more pedagogic and embedded use of ICT both policies and practices have to move beyond basic ICT skills and use of ICT as a tool, to find ways of building the interpretive and creative potential of ICT into teacher training.

One of the institutions in the study was selected based on its reputation as being more up-to-date and better prepared to meet the new requirements for teaching digital competences, but this does not seem to be the reality students describe. This might indicate that while the approach used at this institution, of a dedicated ICT centre, can in some cases function as a catalyst for integrating ICT in teacher training, it may also provide an excuse for doing little to encourage wider use of ICT across the institution, allowing other teacher trainers at that institution to engage less in ICT integration than they otherwise would have to. This might also lead to problems in terms of a disconnect between institutional self-perception and students’ experiences: the institution believing it is a leader in ICT use, and the students believing it is not as good at integrating ICT.

Furthermore, there are discrepancies in how ICT is included within the various teacher training institutions, and also within the different disciplines. One explanation for this might be that there is a lack of practical training in using ICT among teacher trainers at certain institutions, or that there is a

lack of agreement about the division of labour between the teacher training institutions and the mentor schools. As a result, students from different teacher training institutions get different types of education in ICT skills and competences. This is a potential problem, as schools that hire newly educated teachers cannot be confident that they have received satisfactory training in pedagogic use of ICT.

One potential way of addressing this problem of inconsistency is to make more use of the mentor teachers' skills. Most mentor teachers that participated in this study express confidence in using ICT, and most schools are better, or at least as well-equipped with digital devices, than teacher training institutions. Mentor teachers often teach student teacher pedagogic use of ICT, and many student teachers report that they did not see good pedagogic use of ICT until they were in training at a partner school. It seems as if the education in pedagogic use of ICT is already, to some extent at least, taking part in the partner schools rather than at the teacher training institutions. If this was better coordinated between the teacher training institution and the partner school, mentor teachers could probably play a major part in passing on skills for the pedagogic use of ICT.

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APPENDIX: ADDITIONAL QUESTIONS IN THE STUDENT SURVEY

Preliminary analysis of data from ITU's extra questions in the student teacher survey

ICT IN INITIAL TEACHER TRAINING – NORWAY

Additional questions

This part of the report addresses issues from the part of the questionnaire added by ITU (National Network for IT-Research and Competence in Education)³ in the student questionnaire. The questions were on frequency of use, and also included a quiz, to investigate student knowledge of ICT, and ICT-related issues.

The student teachers were:

- asked how often they (in a typical school week) use computers when writing text, when reading text and when presenting
- asked how often they (in a typical school week) as part of their learning activities chat online, use e-mail and use web communities
- asked how often they (in a typical school week) use Learning Management Systems
- given four multiple choice questions (with four different options)

There are 87 student teachers are participating in the survey, and 60 student teachers have answered the additional questions on how often they use computers.

The student teachers were asked how frequently they use computers when writing text, when reading text and when presenting. The corresponding results are presented in Table A1, below.

Table A1: Percentage of student teachers who report use of computers when writing text, when reading text and when presenting

	Monthly	Weekly	Daily
Presenting	36	31	5
Writing	18	58	23
Reading	18	57	17

³ From 1 January 2010 ITU is a part of the National Centre for ICT in Education.

All students use computers monthly or more often in writing (23 % daily and 58% weekly) and more than 90% of the students use computers monthly or more frequently in reading (17% daily and 57% weekly). Over 70% of the students use computers in presentation monthly or more often (5% daily and 35% weekly).

Further, the student teachers were asked how often they (in a typical school week) chat online, use e-mail, and use online communities as part of their learning activities. The findings (figure y) show that e-mail is frequently used by student teachers: 36% of the students use e-mail daily and 41% of the students use e-mail weekly. Student teachers have less frequent use of chat and online communities compared with their use of e-mail. The answers show that 24% of the students use chat daily and 19% of the students use chat weekly. Whereas, 27% of the students use online communities daily and 15 % of the students use them weekly.

These questions (about chat, e-mail and online communities) were also presented to schoolteachers in the ITU Monitor survey¹ conducted in the winter of 2009. When comparing student teachers with schoolteachers, the results reveal that their use of e-mail in school is quite similar. However, student teachers report more often use of chat and online communities at school compared with the school teachers. E.g. over 40% of the student teachers report use of online communities weekly or more often at school, whereas none of the school teachers report use online communities this often in school activities.

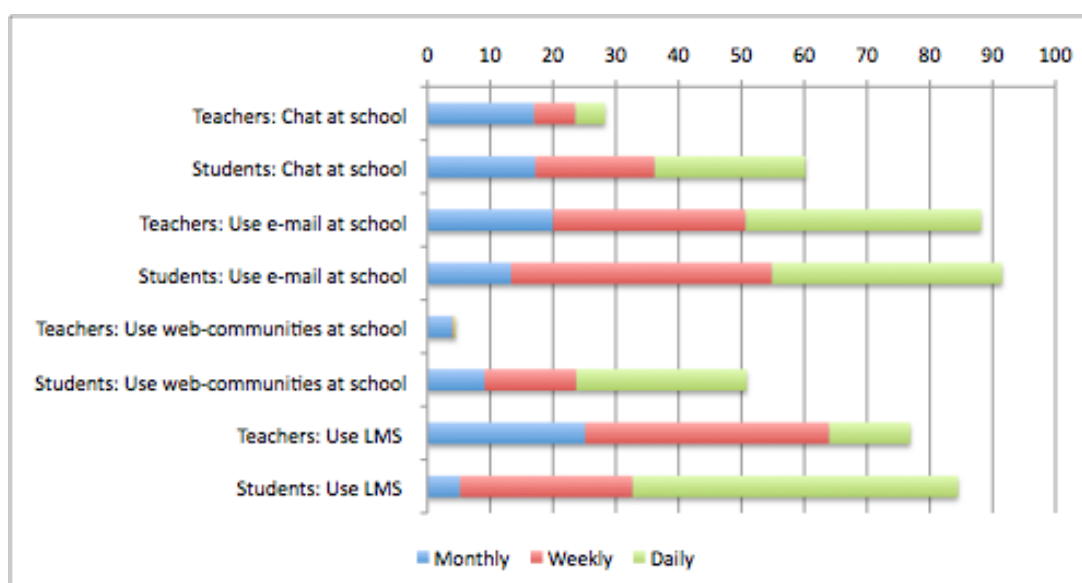


Figure A1: Teachers and teachers students report on how often they as part of their learning activities chat online, use e-mail, use web communities and use Learning Management Systems (in a typical school week)

We also have answers from student teachers and schoolteachers about their use of Learning Management Systems (abbreviated LMSs). Over 80% of the student teachers use LMS monthly or more often; more than 50% of the students use LMS every day, and 28% use LMS weekly.

The results indicate that a lower percentage of the teachers are using LMS weekly or daily compared with the student teachers. Almost 80% of the student teachers use LMS monthly or more often; 13% of the teachers use LMS daily, and 39% of the teachers use LMS on a weekly basis. A report from 2009² shows that students are satisfied with LMS when they use it to read messages, find learning material from others and when used to deliver assignments.

The students were challenged to solve 4 multiple choice questions (abbreviated MCQ), and on each question the students have to choose between four alternative answers. The student teachers answers are mirrored against school teacher's answers from ITU Monitor 2009³.

- MCQ 1 on information which not is useful to verify a web-site. Over 70% of the teachers students answered correct and over 90% of the school teacher answered correct on this question. Correct answer is to choose the alternative 'the number of visitors on a site'; high traffic of a site does not mean the site is trustworthy.

- MCQ 2 on how to use videos as part of a presentation. Over 80% of the teachers students answered correct and over 70% of the school teacher answered correct on this question; claiming that it is legal to use a video given the producers has accepted this.

- MCQ 3 on publishing pictures of others in a web community: almost all the school teachers answered correct and almost 90% of the student teachers answered correct; they had to ask permission to publish pictures of other people.

- MCQ 4 on how to replace two words with each other: Over 30 % of the school teachers and over 40 % of the teacher students got the correct answer on this question.

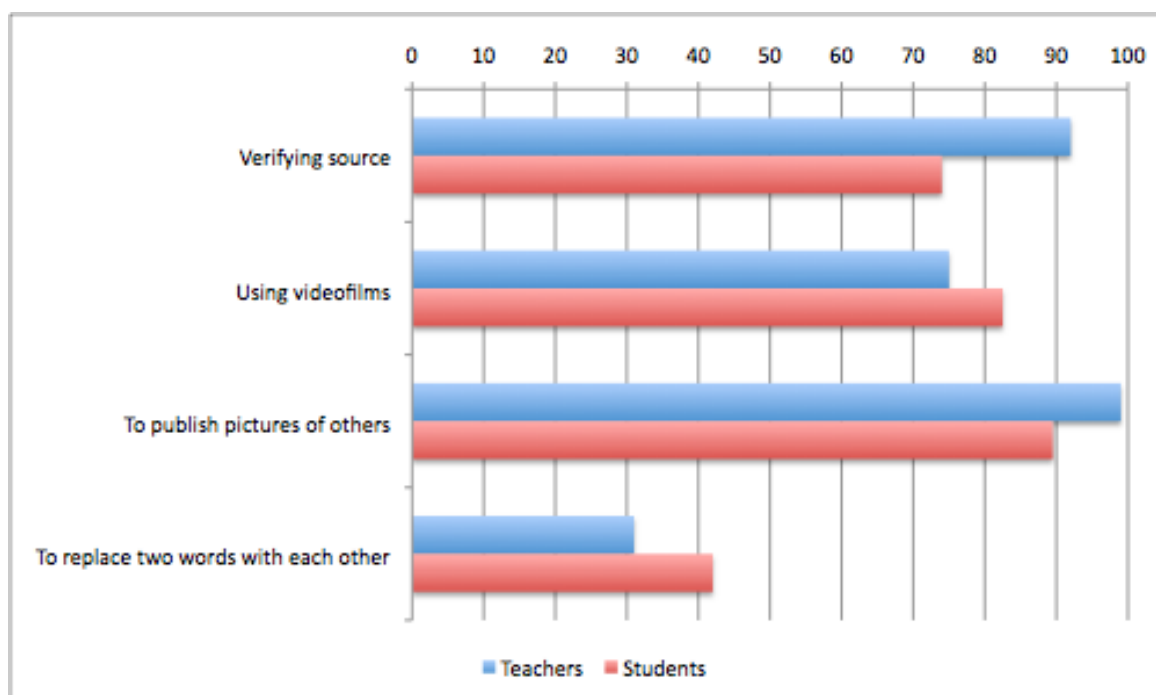


Figure A2: The percentage of teachers and teachers students answering correct on four MCQs

There are not any consistent and systematical findings from the MCQs. It seems that student teachers are performing better than teachers on two questions, whereas the school teachers are performing slightly better than teacher students on the two remaining questions.

Discussion and conclusion

We find that most student teachers use computers in reading and writing on a weekly or daily basis during their teacher training. However, approximately 26 % of the student teachers use computers in reading and approximately 18 % of the student teachers use computers in writing on a monthly basis. It seems to be a digital divide among the students in how often they use computers in reading and writing⁴. What can the institutions of teacher training do to prevent digital divide and to achieve the competence goals in the curriculum? It is important that the institutions are able to facilitate and support the students' development of digital competence and self-confidence in educational use of ICT.

Student teachers use different kinds of digital tools as part of their own learning activities, both e-mail and LMS are frequently used by a large number of students. The findings show that digital competence does not have any positive relationship with frequent use of LMS at school. One reason for this result can be that LMS are almost mandatory in teacher training, and almost all students are using them to find information (from teachers and from other students) or to submit projects and assignments. Further, we do not find any significant linear relationship between the use of ICT and how student teachers perform on the questions about digital competence. One possible explanation of this result can be that the frequency of how often ICT is used does not provide any information about the quality of the learning activities. We need more information about how students are using LMS in their learning process.

Compared with the school teachers, it seems that student teachers are more familiar with the use of web 2.0 technologies (e.g. online-communities and chat) at school. The findings show that digital competence does not have any positive relationship with frequent use of web 2.0 communities. One reason for this can be that the web 2.0 communities are mostly used to publish shorter messages about what the members are doing now, what are feeling about their studies or what they are expecting. However we need more research on if and how web 2.0 technologies can be used to support and scaffold the student teachers in their learning activities.

Overall, we do not find any significant linear relationship between the use of ICT and how student teachers perform on the questions about digital competence. One explanation of this can be related to the importance of how ICT is used and for what purposes ICT is used, whereas the frequency of use does not reveal the quality of use and learning. Therefore we need more information about how student teachers are using computers and are participating in ICT-related activities in Initial Teacher Training.

Several studies⁵ show that teachers prefer trial-and-error or in-house training (e.g. collaboration with colleges) when developing their own digital knowledge and understanding. According to teachers, they are not provided with external or internal courses to meet their demands and needs.

One key strategy to renew and develop the school system is to make student teachers up to date on core knowledge necessary for all teachers. Ideally, this would also apply to digital literacy. New "generations" of teachers would then pass important knowledge about the use of digital tools and other aspects of digital literacy on to their more experienced colleagues. However, the findings in this report suggest that the idea of using newly graduated teachers as instruments for innovation in digital literacy in schools is unrealistic. Bearing in mind the way use of digital tools is defined as a core competence in the Norwegian curriculum for the compulsory education, it's questionable if teacher training institutions are able to prepare their students adequately in this respect before entering the profession. Teacher training institutions need to take action on several levels and in all parts of their organizations to be able to provide the student teachers with sufficient digital competence. New regulations for the teacher training institutions are in effect as of the autumn of 2010. This may result in more emphasis on digital competence.

¹ Berge, O., Hatlevik, O., Kløvstad, V., Ottestad, G. & Skaug, J. H. (2009) *ITU Monitor 2009*. Oslo: Forsknings- og kompetansenettverk for IT i utdanning (ITU)

² Wilhelmsen, J., Ørnes, H., Kristiansen, T., & Breivik J. (2009) *Digitale utfordringer i høyere utdanning*. Norgesuniversitetets IKT-Monitor. Norgesuniversitetets skriftserie 1/2009 Tromsø: Norgesuniversitetet, p. 44

³ Berge, O., Hatlevik, O., Kløvstad, V., Ottestad, G. & Skaug, J. H. (2009) *ITU Monitor 2009*. Oslo: Forsknings- og kompetansenettverk for IT i utdanning (ITU)

⁴ Pedró, F. (2007). The New Millennium Learners: Challenging our Views on Digital Technologies and Learning. *Nordic journal of digital literacy (Digital kompetanse)*, 4, 43–60.

⁵ Cuban, L. (2001). *Oversold and underused. Computers in the Classroom*. Harvard University Press: Cambridge, MA

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