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ICT in Initial Teacher Training

Sweden

Country report

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Introduction

The aim of the present report is to describe how student teachers in Sweden are prepared to integrate technology in their future teaching. The report is part of the comparative OECD study *ICT in initial teacher training* which has the objectives of providing a detailed picture of how technology is used in initial teacher training in the OECD countries from a comparative perspective, analysing the views of the main stakeholders, and issuing a number of policy recommendations in this domain both for teacher training institutions and governments. The study on ICT in initial teacher training is a project strand within the OECD/CERI project *New Millennium Learners;* it includes an international review of the state of the art and new empirical data collected through surveys and institutional case studies. Countries contributing case studies to this project strand are Austria, Chile, Denmark, Finland, France, Hungary, the Netherlands, Norway, Sweden, the United Kingdom and the United States. Except for the USA, all countries have used the same survey instrument translated into local languages.[1] The present report describes the outcome of the Swedish case study and surveys.

Objectives

Each country report is expected to address the following research questions:

- What are the national frameworks and requirements regarding the use of ICT in initial teacher training in teacher training institutions in OECD countries?

- What are the institutional frameworks and requirements regarding the use of ICT in initial teacher training in teacher training institutions in OECD countries?

- To what extent and in what ways is technology used in teacher training institutions in OECD countries?

- In what ways are student teachers prepared to integrate technology in teaching in teacher training institutions in OECD countries?

- If student teachers are not satisfactorily prepared, what are the main obstacles according to the stakeholders?

- How is policy evaluated?

- Does practice correspond to policy?

Structure of the report

The second section of the report describes the theoretical framework used in the study, drawing on the literature review within the project strand. The third section focuses on the methodology used in the Swedish part of the study, including issues related to sampling and level of non-responses. This is followed in the fourth section by an overview of Swedish initial teacher training including a description of the Swedish context and how teacher training in Sweden is organized in general. Sections five to nine present the findings: these are the national regulations and examples of how they can be organized on a local level through the case studies. The empirical part of the study is structured around the following broad questions: to what extent is ICT used? In what ways is it used? What are the obstacles? And finally what

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[1] With a few exceptions concerning translation and additions.

can increase student teachers' confidence in using it? Section ten discusses the conclusions drawn from the analysis of the findings, while section eleven and twelve present a number of key messages and policy recommendations. The report ends with a section on frequently used acronyms in the report.

Background and theoretical framework

The literature review within the project strand (Enochsson & Rizza, 2009) shows a fairly homogenous picture of ICT use in initial teacher training, in spite of the eleven OECD-countries represented, but the picture is far from complete. There are numerous examples of successful practice, which is defined as a practice that makes the student teachers use technology with their pupils in the classrooms. The problem is that the successful examples do not reach out to all students.

The definition of successful practice is questioned in the research review as is who should define it. In the research articles the concept 'good practice' is used sometimes explicitly and sometimes implicitly and by different stakeholders. For example Kirschner and Davis' (2003) let researchers define 'good practice' and present a list of key competencies including that the teachers should become (a) competent personal users of ICT, (b) competent in making use of ICT as a mind tool, (c) and competent in making use of ICT as a tool for teaching. They should also be able to (d) master a range of educational paradigms that make use of ICT, (e) master a range of assessment paradigms which make use of ICT, and (f) understand the policy dimension of the use of ICT for teaching and learning (ibid.;145) There are also the results from Sweden (Müller, 2004) and Belgium (Valcke, Rots, Verbeke & van Braak, 2007) where teachers and teacher educators do not have those high expectations. Being able to use word-processors in teaching can be considered enough, according to these two studies, but parents in Scandinavia, for example, expect schools to use technology beyond word-processors, like finding and validating information on the Internet (Ramböll Management, 2006).

There is a wide range of concepts used in the articles in the review (Enochsson & Rizza, 2009), sometimes for phenomena that are the same, but the difference also refers to different ways of organizing teacher education. For coherence reasons the same concepts are used in this report: unless it is of importance for the understanding, it is chosen to use *student teacher* for a person studying to become a teacher and without a certificate, *teacher trainer* for teacher educators on campus, *mentor teachers* for teachers in field placements supervising and guiding student teachers, and *field placements* for the student teachers' practical work in classrooms, both short periods during courses and longer periods before earning their degree, as long as they are not working independently.

The review includes a chronological analysis of the development in the area during the period of the articles. Peraya, Lombard and Bétrancourt (2008) carried out a similar analysis in Geneva, Switzerland and they saw three periods with different foci: First there was a period of training centred on technology (1996–1998), which was followed by a period when coherence of technology and student teachers' own production became important (1999-2002), and the last period showed how the transition from product to scenario and technology was implemented in classrooms (later than 2002). Since the articles in the research review (Enochsson & Rizza, 2009) cover the years 2002 to 2009, the review covers the scenario period when theories are put into practice in classrooms according to the Swiss findings. There are many examples of how to integrate technology in classroom teaching, but it is not possible to see any significant development, either in research or in practice, based on the reviewed articles. None of the studies in the review cover the use of simultaneous online communication or mobile devices, common occurrences in many young people's lives in the OECD countries today. Most studies lack a view on ethics, which is also an important issue in relation to digital communication. In the most developed competence frameworks supported by national policies, ethics is pointed out as an aspect of ICT use in initial teacher training

(Rizza, forthcoming[2]). According to the research review it seems like teacher training is still struggling on a very basic level: to use technology in education at *any* level instead of not at all. However, it should be remembered that the development within this area is very rapid.

A model used in an earlier OECD-study (OECD, 2009) has been used to structure the findings on an actor's level. The model, first introduced by Viherä and Nurmela (2001), focuses on **A**ccess (to digital equipment), **C**ompetence (in using software, and applying it for teaching purposes) and **M**otivation (gauged through the attitude that using ICT results in significant benefits), and is called the ACM model. Reasons for not using ICT in teacher training to a great extent, according to the research review, can easily fit into this model. Research reports lack of all three components. There is lack of updated and/or adequate equipment as well as restricted access in different ways, lack of competence and confidence in basic computer skills as well as in pedagogical use, and there is lack of incentives, e.g. integration of ICT is not requested. The absence of representations of the potential of ICT in teaching and learning and the tools available at schools do not fit into a professional identity that aims towards a student-centred way of teaching.

There are a number of reasons for not using technology to a great extent, but the responsibility for creating good working conditions must be supported by a local and a national policy on a management level. A few studies show that a possible way of working is a combination of interacting implementations on different levels. In the above-mentioned OECD-report (2009) the concepts *drivers* and *enablers* are used. In short, drivers can be seen as motivation and enablers how to create conditions for carrying out the work. The concepts *drivers* and *enablers* are positive compared to most research results, which focus on a lack of something, and are therefore more interesting to use, but the limit between the two is not always clear; what is an enabler on a management level can, for example, become a driver on an actor's level.

According to the research review, the following is needed:

- Policy level: Define clear expectations, carry out evaluations (drivers), and give room for enough flexibility for the changing field (enabler).

- Management level: Offer career possibilities, relevant incentives (drivers), suitable equipment (enablers), and dedicated time (enabler), define clear expectations on cooperating schools and mentor teachers in addition to what is already mentioned for a policy level (drivers).

- Local actors level (teacher trainers, mentor teachers and student teachers): Ensure basic technological skills (driver/enabler); integrate technology as a natural part of subject courses as well as internships (driver/enabler); and learn about pupils' technological worlds (driver). The actors need dedicated time (driver/enabler)

Some of the articles in the review (Enochsson & Rizza, 2009) show that technology use has increased after inventions, but it is not always obvious what kind of use. Statistics show that many courses – both for student teachers and young pupils – concern basic computer training only. Policy documents are often not very clear in this respect, which leaves it to the teacher or teacher educator to decide the level of use. The effect of national policies on ICT in initial teacher training is not very well represented in the articles. There is, however, an example from Quebec of how policy was implemented in a way where ICT was not seen as a pedagogical tool, even when the policy seemed quite clear on this point (Karsenti, Raby & Villeneuve, 2008). In the report on national policies, which is also carried out within this project strand of *New Millennium Learners*, it is shown that there is a correlation between the use of computers at school and the implementation of a national policy for teacher training. What is not possible to see is which comes

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[2] Presented orally at CERI expert meeting on ICT and Initial Teacher Training, 23-24 February 2009

first. We do not know for sure how a policy best can be formulated in this field; one of the researchers in the review (Williams, 2005) claims that policies have to be flexible enough to reflect the rapid changes within the field.

What is mentioned in many articles is that technology integration should support learning. It can support learning directly, but also indirectly, through making administration, communication or managing easier. A first step is of course basic computer training, but this is definitely not enough. It is known that certain groups in society have less access to technology than other, more privileged groups. Integrating technology in teaching is therefore also one step in bridging this gap. Student-oriented perspectives on learning are often mentioned, and learning-theories in this field claim that it is important to connect to the learners' own world. Several authors claim that a constructivist or student-oriented perspective on learning is necessary for the use of technology. No empirical data in the research review shows this, but in the UK for example, the equipment in general does not support a constructivist way of teaching (Peraya, Lombard & Bétrancourt, 2008).

An area, which is not covered by the reviewed articles, is a field only mentioned by Judge and O'Bannon (2007). It is the expectations on mentor teachers, which Judge and O'Bannon suspected not to be explicit enough. None of the articles selected for this review mention what is supposed to be collaboration where all three actors (student teachers, teacher trainers and mentor teachers) are involved. Pratt (2008) studies the use of e-conferencing between students, teacher trainers and mentor teachers to facilitate the communication between the three, a lot of obstacles were experienced, but there is also a potential. His study does not concern integrating ICT in the classroom, but he claims what Judge and O'Bannon touch on, that guidance for field placement schools has to be clarified.

The findings and conclusions from the research review including the above-mentioned model were used as a starting point when creating the instruments for the surveys and the case studies. They have also been used as tools when analyzing qualitative data. We have seen that the role of national policies is not studied to a great extent in this area. The impact of national policies on meso and micro levels will be explored and analyzed.

Methodology

The overall methodology in the study on *ICT and initial teacher training* combines desktop research, surveys and case studies. The national study focuses mainly on the surveys and the case studies, but also uses findings concerning the specific country from the research review (Enochsson & Rizza, 2009) and the review of national policies (Rizza, forthcoming). The combination of different components and sources works as triangulation; not only one stakeholder's view will be represented. The study has mixed methods and there are analyses of observations, documents, interviews as well as data from questionnaires. The analyses cover a range from grounded theory to multiple regression analysis. Interview transcriptions, documents and comments in questionnaires have been read over and over to see emerging themes. In the present section, the survey and the case study methodology will be described as well as a selection of samples and cases.

Survey

The aim of the survey was to collect quantitative data about the actual use of technology in initial teacher training as well as about the main stakeholder's views on the role of technology in teaching. There were 4 different questionnaires – all web based and developed in the web tool Checkbox Survey. The first questionnaire was aimed mainly at the management of teacher training institutions with questions about policies and curricula, organisation, infrastructure and equipment. Some information required preparation (number of programmes, number of students etc.) and a document with the questions, in addition to the

web-link (http://korta.nu/sweinst[3]), was attached. The contact person at the institution was encouraged to engage several persons in answering the questionnaire. The three other questionnaires were aimed at teacher trainers (http://korta.nu/swetrainer[4]), student teachers (http://korta.nu/swestudent[5]) and mentor teachers (http://korta.nu/swementor[6]) respectively. The questions were mainly about frequency of use, approaches to train student teachers in or with ICT, drivers and barriers for use. In all questionnaires, the respondents could add comments. There was also a fifth questionnaire to new teachers, who had worked less than five years after teacher education. The questions were a combination of questions from the mentor teachers' and student teachers' questionnaires. The data from this questionnaire were not analysed, since only five new teachers responded to the questionnaire.

In Sweden there are 26 teacher-training institutions, and in March 2009 they were all invited to participate through contact persons already active in The Knowledge Foundation's network for ICT in teacher training. They were asked to answer the overall institution questionnaire and to provide the OECD with e-mail addresses to a sample of at least 100 last-year student teachers, 15 teacher trainers and, if possible, 15 mentor teachers in field placements and recently certified teachers from each institution. We suggested random sampling or systematic sampling (Nth name selection technique), and asked for a variety in programs and subjects.

Most of the institutions train different kinds of teachers for compulsory school, with a few exceptions being those which only educate secondary teachers in specialities like music, health and sports or arts. Twenty-one institutions responded in a different manner; some only by answering the institution questionnaire and others with both the institution questionnaire and e-mail addresses for all three groups. The number of final-year students at the institutions, which provided the OECD with e-mail addresses, varied between 49 and 183. All those had a call to complete a web questionnaire. Sixteen institutions made a selection of teacher trainers. The largest institution provided the OECD with 32 e-mail addresses and from an institution in two parts there were eight e-mail addresses from each. Eight institutions provided e-mail addresses to between five and sixteen mentor teachers working in partnership with their institution. These data are available in Table 1. Two teacher-training institutions provided the OECD with addresses to 45 recently graduated teachers. Only five of these answered the call and these data are not included. The institutions did not know for certain if their former students still used the addresses, and this is a possible reason for the very low response rate.

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[3] The English version can be found at http://korta.nu/enginst

[4] The English version can be found at http://korta.nu/engtrainer

[5] The English version can be found at http://korta.nu/engstudent

[6] The English version can be found at http://korta.nu/engmentor

Table 1 shows to what extent the institutions participated and the return rate of the four different questionnaires.

Institutions	Teacher trainers			Student teachers			Mentor teachers		
Responded	Sent	Responded	Return rate	Sent	Responded	Return rate	Sent	Responded	Return rate
A	15	1	6.7 %	123	17	13.8 %	5	1	20.0 %
B				159	41	25.8 %			
C	15	4	26.7 %	145	14	9.7 %	16	5	31.3 %
	17	4	23.5 %						
	16	4	25.0 %						
F	15	7	46.7 %	96	19	19.8 %			
G	15	5	33.3 %	181	40	22.1 %	14	5	35.7 %
H	16	4	25.0 %	163	33	20.2 %			
I	15	5	33.3%	34	6	17.6 %			
J									
K									
	8	2.5	31.3 %	49	8.5	17.3 %	8	4	50.0 %
M	15	4	26.7 %	123	20	16.3 %	16	7	43.8 %
N	21	5	23.8 %	143	23	16.1 %			
	8	2.5	31.3 %	95	14.5	15.3 %	8	5	62.5 %
P	17	9	52.9 %	170	32	18.8 %	9	2	22.2 %
	32	14	43.8 %	180	16	8.9 %	12	8	66.7 %
R									
S	15	2	13.3 %	116	17	14.7 %			
T	18	4	22.2 %	183	34	18.6 %			
U									
Other or no		6			12			1	

inst.									
16	258	83	32.2 %	1960	347	17.7 %	88	38	43.2 %

The questionnaires to student teachers, teacher trainers and mentor teachers were sent out in Sweden during a period from mid-April to mid-June from the OECD web survey system and to teacher training institutions by e-mail to a contact person at each university. The survey closed on 30 June.

Return rate

Sixteen institutions answered the overall questionnaire and the response rate for the sample of 258 teacher trainers was 32.2 %, for the 1,960 last-year student teachers 17,7 % and for the 88 mentor teachers 43.2 %. Details can be seen in table 1 above. A few persons returned the e-mails saying that they were not working as teacher trainers or were not studying anymore. It is not possible to tell how many persons in the samples were in the same situation.

Available statistics[7] show that less than one third of student teachers in Sweden are men. The majority of those men want to work with teenagers. The median age[8] for starting studies to become a teacher in Sweden is currently 23 years. Like in nurse education the students are generally older than the average university student and are the first generation in the family attending higher education (Furusten, 2008) Student teachers study more often than the average student close to where they grew up, and more student teachers have their own children (Ibid.). The median age of the student teachers answering the questionnaire is 27 years, which corresponds to a starting age of 23 years, which is also the national median age, but there are only 14 % men in the student sample compared to 30 % nationally. According to available statistics there are more student teachers that intend to work with very young children responding to the questionnaire than there are in-service teachers for those ages. Tables 2, 3 and 4 show details of the teaching level, subjects and the age of respondents to the questionnaires. All programs and levels are covered.

Table 2 shows the gender and age of the respondents. The average age did not differ between genders.

Group	Men	Women	Average age
Teacher trainers	35 (42.2 %)	48 (57.8 %)	51,8
Student teachers	50 (14.4 %)	297 (85.6 %)	30,0
Mentor teachers	6 (15.8 %)	32 (84.2 %)	50,5

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[7] Available at http://www.hsv.se (Swedish National Agency for Higher Education)

[8] Note that this is median and cannot easily be compared with other information, which usually use average age, but it gives an indication that student teachers start their education quite late compared to other students.

Table 3 shows the distribution of subjects

	Teacher trainers	Student teachers	Mentor teachers
Educational sciences	48*		
Mathematics	5	181	21
Swedish	11	214	22
Foreign language	4	69	10
Social sciences	7	102	21
Natural sciences	7	88	17
ICT	12**	51	6
Other	20	104	13
Total number of responses:	83	346	34

*) 22 of these also ticked off other subjects

**) 10 of these also ticked off other subjects

Table 4 shows what ages student teachers intend to teach and what ages mentor teachers teach.

Teach ages	Student teachers	Mentor teachers
$\approx 0 - 6$	148 (43.1 %)	8 (21.1 %)
$\approx 6 - 12$	160 (46.6 %)	15 (39.5 %)
$\approx 12 - 16$	96 (28.0 %)	9 (23.7 %)
$\approx 16 - 19$	109 (31.8 %)	8 (21.1 %)
Adults	14 (4.1 %)	1 (2.6 %)
Number:	343	38

Skewness in gender as well as a low response rate can be problematic when it comes to generalisation. Recent studies have shown that low response rates do not necessarily mean less accuracy (E.g. Holbrook, Krosnick, & Pfent, 2007; Visser, Krosnick, Marquette & Curtin, 1996). There is of course a higher risk for less accuracy with a low response rate. A web questionnaire distributed by e-mail asking about technology use is also problematic. Students without their own personal computers or without any

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interest in the issue might not answer. To overcome this shortage there were interviews face-to-face during the case study visits, but they were also voluntary and, although the interview mode was different, the subject was still technology use. The samples of teacher trainers and mentor teachers are small although the response rate is higher from these groups. What strengthens the results in this study is that interviewees also give a general picture of their impression of how and to what extent ICT is used – in courses as well as in field placements. The overall picture from interviews and comments in the questionnaire is not contradictory where hard facts are concerned. Any contradictions in this study are rather a result of groups comprising different discourses and/or different foci. All together the results can be seen as well-founded indications, and whatever interpretation the reader may have, they are nevertheless indications we can learn from.

Case studies

The aim of the case studies was to complement the quantitative data collected by the web questionnaires. Two case study visits were carried out in Sweden; at the teacher educations at Umeå University in Umeå 22–24 April 2009 and at Karlstad University in Karlstad 27 and 29-30 April 2009. Visiting researcher was Ann-Britt Enochsson, and the contact persons Dag Österlund in Umeå and Annelie Bodén in Karlstad. The case studies included individual interviews, group interviews, observations and analyses of policies, regulations, course documents and web sites.

There were two criteria to be met in the study for the selection of case studies. There should be:

- A teacher training institution which is publicly recognised as advanced or innovative for the use they make of technology for teaching and learning purposes in initial teacher training programmes.

- A teacher training institution which is publicly recognised as a quality provider of initial teacher training, irrespective of its use of technology.

The Knowledge Foundation in Sweden has started to build a national network of teacher training institutions on ICT in initial teacher training. Representatives from almost all 26 teacher-training institutions have been engaging actively in meetings, and the discussions regarding which teacher-training institution to choose took place informally at these meetings. The representatives were teacher trainers, researchers or deans from the different teacher training institutions and were considered as well-informed about the situation. There were several institutions to choose from, but for the first criterion, Umeå seemed to be the best option. The teacher training institution in Umeå has been actively engaged in implementing ICT in teacher education for many years, and when the decision was made about the case study, there was still a dedicated academic department for ICT in teacher training which had produced research, including doctoral degrees, in the area.

For the second criterion, Karlstad was chosen among other possible institutions. Sweden does not have any ranking system for education, but for a long time it has been well known among teacher recruiters which institutions provide the educational system with good teachers, and Karlstad is one of several. Students are also often satisfied with their studies in Karlstad. However, at an evaluation done by the Swedish National Agency for Higher Education published in 2008, teacher training in Karlstad was one of eight (out of 26) teacher educations criticized for not having enough teacher trainers with a doctoral degree, 40 % was considered as a minimum. At the time of the visit, the percentage of teacher trainers with

a doctoral degree had increased to a satisfactory level since the evaluation, which actually took place in 2006[9].

Both institutions are quite large according to Swedish measures and educate teachers for all parts of the educational system with a few exceptions at each institution. From the start there was an aim in the present study to focus on compulsory school, and this is well covered in both institutions. Both Umeå and Karlstad have a long tradition of teacher education, from the old 'seminarium' in the 19th century to today's university degrees for teachers. The two cities are considered as middle sized in Sweden (50.000 – 200.000 inhabitants). Umeå is surrounded by municipalities with sparsely populated areas and Karlstad by small municipalities where people commute to Karlstad to a great extent. Except for teacher education in the three largest cities in Sweden, this is how the demography usually looks around the teacher education institutions. It is also known that student teachers, to a larger extent than other students, are recruited from families without academic background, many of them from small towns or the countryside. Historically, this was also an aim and a reason why teacher-training institutions are spread all over the country.

At the time of the visit, Karlstad ranked as the fifth largest teacher training institution in Sweden with about 2.000 students[10] in initial teacher training. The whole university has 7.600 students, so teacher education is a large part of the university. The scale of teacher education is about the same in Umeå as in Karlstad, but the university is larger with its 15.500 students in total. Since January 2009 Umeå University has a new organization and Umeå School of Education organizes teacher education. Teacher education has had its own technological department until December 2008, which was part of the academic *Department of Interactive Media and Learning (IML)*. IML has included everything from pedagogical courses and research in education to their own computer labs and technology support for teacher trainers and student teachers, but as of May 2009 the technological part was transferred to the central IT-unit at the university and is no longer dedicated to teacher training. The responsibility for the pedagogical part is left for individual teacher trainers.

Interviews

Interviews in Karlstad were held with the dean, the program leader for the distance education programs, four teams of teacher trainers and three students. The teacher trainer groups worked at different faculties and with different subjects. Two of the groups worked with educational science in the basic three-semester-program which is included in all teacher-training programs. They worked with the same course, but one group worked on-campus and one off-campus with the distance program students. The other two groups consisted of teacher trainers in Swedish and media & communication respectively. Altogether, there were ten teacher trainers interviewed. More than 100 student teachers were invited to participate, but only two students accepted. The third student happened to be in a teacher trainer's office at the time of the visit and agreed to be interviewed. Two student teachers answered a call from the students' association afterwards, and one of those students was interviewed via instant messaging and the other one did not show up on the instant messaging application for the appointment. Altogether only four students were interviewed in Karlstad.

In Umeå interviews were held with the dean, the pro-dean, a doctoral student in the field of ICT and teacher training, a technician at the IT centre, teacher trainers, and two groups of students. There were also

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[9] In August 2009, Karlstad has 44 % teacher trainers with a doctoral degree and the National Agency for Higher Education also says that the way Karlstad University has been working to strengthen research connected to teacher education is exemplary.

[10] The numbers of students are all full year equivalents, which means that two students studying half time for one year is counted as 1 and one student finishing before summer holidays and another one starting after summer is also counted as 1.

informal talks during coffee breaks, lunches and in evenings. The teacher trainers taught different subjects and represented different fields of teaching such as pre-school, primary, secondary and after-school instruction. Seven teacher trainers were interviewed individually and the rest in a group of three. There was the same problem with finding students to interview as in Karlstad, but the contact person had gathered two groups of altogether nine students. They were future teachers in pre-school, primary school and secondary school, and their subjects were social sciences, psychology, natural sciences, mathematics, physical education, English and sloyd[11]. One student teacher was interviewed afterwards via MSN messenger and telephone[12].

After the visit, there was also a phone interview with one of the responsible persons from the pedagogical support centre in Karlstad, and there was e-mailing with technological support staff at the same institution to get clarifications. It was not possible to find any mentors through the universities. We tried to send e-mails to the contact persons who were in charge of organizing mentor schools, but there was no answer after several tries.

Altogether, fourteen students were interviewed in both institutions. The teacher trainers in Karlstad feared there was a trend in students who did not have any interest in engaging in anything more than what was required to get their degree. They had seen a tendency towards less voluntary contributions lately but hoped it was only temporarily. The representative from the student association was not surprised at all. Her experience was that it had been difficult for several years to have students engaged in work for the students' association. However, the student teachers from Karlstad told similar stories and so did the Umeå students. This can be seen as an indication that certain issues are more important at each institution. In addition to the interviews, there were more than 60 relatively extensive comments in the questionnaires supporting and complementing the picture from the case study visits. The findings show quantitative as well as qualitative data, and for the reader to be able to evaluate the findings this will be clearly indicated.

Initial teacher training in Sweden

To become a teacher in Sweden, the main path is to follow what is generally called the *long teacher-training program*. The program has a great flexibility in content, and students who aim at working with younger children from the age of 1 to about 12 usually study 3,5 years, and students who aim at working with older children/teenagers usually study 4,5 years. The length also depends on the subjects studied, and many students choose to complement and study for five or even six years. Each institution offers different *directions*[13] within the program. The directions can be related to specialities at the institutions but are also general like *English* or *Pre-school*. There are three semesters which are the same for all student teachers. In Swedish these three semesters are called *Allmänt utbildnings-område,*[14] shortened to *AUO*, which will be used in this report. It is also possible to apply directly for AUO if the subject knowledge is well documented. This is generally called *the short teacher-training program.* There is a great flexibility in the system, and the student teachers are not kept together in classes throughout their education. Flexibility means that institutions are free within certain limits to organize teacher education. It also means that it can be problematic for students who want to change institutions. Their documented knowledge has to be validated at the receiving institution and it can mean several semesters of extra work for the student.

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[11] Sloyd is a Swedish subject in compulsory school, also known as Educational sloyd, which mainly contains wood work and sewing (e.g., http://en.wikipedia.org/wiki/Sloyd)

[12] The reason there were two modes of interviewing was that the Internet connection stopped halfway through the interview.

[13] Inriktningar

[14] A translation can be something like General teacher knowledge.

There is a well-developed flexibility in time and space. It is possible to study an entire program by distance. However, field placements must be carried out in regular schools. A few students negotiate the timing of the placement with their schools in order to be able to keep up a part time job for financial reasons. There is no difference in course content and studying on-campus or off-campus is considered to be the same quality of education, only the means differ. The majority of distance courses within initial teacher training are full-time courses and well organized, although differently at different institutions. In Karlstad, which has a more than 20-year long history of distance courses in teacher training, student teachers gather once or twice a week in study centers in small towns. An interesting thing is that students in the distance programs, which were meant to have a greater degree of flexibility in one sense, still seem to form some sort of classes because of their regular meetings.

The study centers co-operating with Karlstad University have a videoconference studio through which the students meet teachers and lecturers from the university. There is also technological support available during office hours and most students claim in course evaluations that they appreciate this. The distance students can sit at home and study at any time the rest of the week, but they are also welcome to sit at the study center. This year a third studio was inaugurated at the university, and there is also a portable video conferencing studio in addition to the three fixed ones.

Teacher education in Umeå has organized distance education somewhat differently. The institution offers distance courses as well as whole decentralized programs in four small campuses. The one furthest away is 285 km from Umeå. In these four small campuses the courses offered are a mix of campus and distance courses – *blended learning*. In Karlstad there is an aim for the future to use the concept of *blended learning* for all student teachers also on campus. More and more students ask for the flexibility that distance education and *blended learning* gives. About one third of student teachers in Karlstad are distance students. The percentage of distance students is constantly increasing and during the last semester 42 % of the beginners started in distance programs. In Karlstad it is more difficult to enter teacher education through distance programs than by attending on-campus programs. Today, distance courses aimed directly at student teachers are usually within a distance program, but some student teachers study the subject separately, and there are no statistics available on the frequency of this.

The flexibility also concerns what ages to teach. The Swedish teacher training programs today are neither totally equivalent to pre-school, primary and secondary teachers' levels, nor to the older Swedish teacher educations in which their mentors have studied. Because of the flexible education there was a question in the student questionnaire about what ages they *intend* to teach.

Frameworks and regulations

National frameworks and requirements

The Swedish institutions are responsible for awarding teacher degrees under the supervision of the National Agency for Higher Education (HSV). On a national policy level the System of Qualification from HSV mentions ICT in initial teacher education in only one sentence: "To obtain a teacher's degree, the student teacher has to show the ability to use information technology in teaching and the pedagogical development and realize the role of mass media in this respect"[15]. HSV evaluate the Swedish teacher educations regularly and the institutions take these evaluations very seriously since they can lose their right to certify new teachers if they do not meet the standards. Part of this was mentioned above regarding teacher trainers' doctoral degrees. However, there are different foci in the evaluations, and ICT has not yet

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[15] För att få lärarexamen skall den studerande visa förmåga att använda informationsteknik i undervisningen och den pedagogiska utvecklingen samt inse betydelsen av massmediers roll för denna. (HSV, 2007. Examensordningen)

been in focus of an evaluation. There is no other national accreditation that requires student teachers to demonstrate their pedagogical competence related to ICT. The teacher training institutions are responsible for educating teachers with this competence.

Within the national framework, the institutions are free to organize and offer courses. The basic three-semester program, AUO, can look different at different institutions, although there is a content that has to be covered. There is a new proposition expected to be accepted by the government which suggests that ICT be one of four overall perspectives throughout education, but this can only become a reality by autumn 2011 at the earliest. The change concerns mainly a change towards a system with a clearer difference among categories of teachers and also would give more weight to subject knowledge. The investigator of the proposal was also assigned to suggest overall perspectives[16], and this is how technology fits in.

Institutional frameworks and interpretations

Ideas and decisions

Over the years the two institutions have worked differently regarding the development of their ICT policies respectively. IML in Umeå had been working on a local policy document including the philosophy behind as well as the vision. The document stresses the importance of an ongoing process, which is future-oriented and based on research within the field of ICT and learning. It also claims the need to have an approach where it is taken into account that this is a living system with human beings involved and not only a technological system which responds to changes in a predictable way. The document is well developed theoretically and includes proposals for action, which cover infrastructure, learning environments, teaching and working practices and assessment practices. The policy suggestion also had a time plan for action. It was developed during 2008 and should have been accepted by the faculty board in February 2009, but with the organizational change this last issue was not possible.

Instead of the policy, which never was decided on, there were four hearings about ICT and learning for teacher education in May and June 2009. The Umeå School of Education wanted to discuss how the field could be developed to prepare student teachers in the best possible way in this respect. The four hearings covered different perspectives; student, research, teacher trainer and other stakeholders. The outcome will be taken into action autumn 2009.

The management in Umeå considered ICT to be an important issue in initial teacher training and showed a well-founded theoretical view. The dedicated department IML was part of a strategy to build on research and not only to rely on enthusiasm and intuitive associative practice, which can easily be the result. They tried to support the work on the integration of ICT in initial teacher training, but they also stressed that there were many other important issues to deal with. Staff did not experience opposition, but they did not experience any active support either. The management struggled with limited economical resources.

The ICT policy for teacher training in Karlstad is quite well developed. There are specific goals in the local policy (verksamhetsplan) for teacher training but those are on a more pragmatic level than in Umeå. There are ICT objectives in the course plans for AUO, and the faculty board has decided that there should be objectives in all course plans throughout education. The faculty decided some years ago that all teacher-training courses should use the LMS "It's Learning." There are still courses not using it, an estimation made for the questionnaire was about 50 %, but the faculty does not have any means to put a pressure on

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[16] http://www.sweden.gov.se/sb/d/8936/a/85033

the teacher trainers[17]. One of the students interviewed was surprised when she heard about this decision, since she estimated a very low percentage of her campus courses had used it.

In Karlstad there is a special group working on course plans, primarily for the AUO, but also on the subjects of the courses to see what can be done about improving the integration of ICT in order to prepare student teachers for their future task. Members in this group have been teacher trainers or other staff with some kind of relation to teacher training, and there is always at least one student included due to the university policy which requires students' influence. There have been several groups like this over the last 15 years, but due to staff movement and changes in curricula these groups have not been able to survive. One reason may also be the low interest that teacher trainers at the university show in general. People working in these groups think that the progress is too slow, but things happen bit by bit. The faculty board and the special groups focusing on ICT use have also been discussing what digital competence means for teacher training and how it can connect to the scientific progression in the courses. There is still a paper-based portfolio for the student teachers, but there have been many discussions on putting all information on a USB-key instead, but no decision has been made.

In the questionnaire, 11 institutions out of 16 say they have a policy that promotes and/or supports innovative use of ICT. Two of them attached policy documents, and a few others described the most important issues briefly in the comments. According to the results of the questionnaires the teacher trainers working at these institutions are not always aware of the institution's policy (see table 5). However, the overall impression from the case studies and the questionnaires is that the management of Swedish teacher training institutions are aware of the importance of integrating ICT in initial teacher training and that there is ongoing work to try and develop better strategies.

Table 5 shows how institutions and teacher trainers have answered to the question if the institution has a policy that promote or support innovative use of ICT. The numbers in the table shows how many teacher trainers answered yes or no respectively. There are only the answers of the teacher trainers working at the 11 institutions, which answered to this question.

		Institutions	
		Yes (8 inst)	**No** (3 inst)
Teacher trainers	**Yes**	28	8
	No	11	3

Ideas put into practice

- Web pages

The first image that future students get of their education today is often what is presented on the web site. The web site for the Umeå School of Education[18] highlights four strong research areas, of which *ICT, media and learning* is one. Apart from this, ICT was mentioned on only one other page of the web site for teacher education. From the start, there has been a page about the technological support students can get, but since the re-organization also concerns the support it now starts with *The support from IML is closing*

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[17] From autumn semester 2009, 100 % 0f the courses in AUO uses "It's Learning"

[18] www.use.umu.se

down… The rest of the information given to the students on this one page is mostly how not to lose any information during the transfer period. There is also a link to the technological student support for the whole university with its about 15.500 students (UMDAC). UMDAC's web page contains links to a knowledge database with FAQ, a student portal, a computer store for students and other information and services.

Although ICT, media and learning is said to be a strong research area in Umeå, and teacher education has been actively engaged in trying to integrate ICT into teacher training, there is nothing else on the web page pointing to ICT as an important issue. There are no pictures of students with computers, for example[19]. There were very few pictures overall and much of the text is in the form of PDFs. On the page for research there is a picture of an IML researcher standing in front of a traditional whiteboard.

Nowhere on the public Karlstad institution web site,[20] is ICT mentioned. There is a presentation of distance education, but the pictures from the video conferencing studios neither show the technological equipment nor tell anything about it. There is also a 6 minute presentation on what it means to be a student teacher in Karlstad and one section about what the students do, but no technological equipment is visible anywhere. The focus seems to be more on face-to-face collaborations. The web page also says that teacher education has a worldwide net of contacts, but nothing about that technology is necessary or facilitates keeping in touch and nothing is visible in the pictures.

Neither of the web pages shows technology as something ubiquitous or used at all. The message about the close-down is rather depressing. It can be understood by those who know about the present situation in Umeå, but future students might find it strange. This message, though, was temporary. A question to be asked is how these two web pages appeal to future students. Do they preserve a view that technology should not be part of teacher education?

- Physical environment

The teacher trainers in both institutions have their own computers and so do most students. From the answers in the questionnaire, only 1 % of the total sample of student teachers in Sweden does not have their own laptop or desktop computer. Sixteen percent claim they have both. The low response rate can of course cause skewness in this respect since it is more likely that students with computers will answer a web questionnaire distributed by e-mail, but it is also the teacher trainers' view in the interviews that most students have their own computer or at least have access to a family computer. However, there are policies that it should be possible to study without their own personal computer. Until December 2008 the IML department in Umeå had four computer labs for the student teachers only – equipped with Windows as well as MacOS. In the computer labs there were computers, printers, burners and general software. Scanners, web cams, digital cameras, video cameras and headsets are available through the teacher trainers. Altogether there were 200 computers dedicated to the Umeå student teachers until December last year, and this meant a ratio of one computer/less-than-14 students – library computers and computers dedicated to subject departments were not counted. As of January these computers are part of the computers for all students at the university. The current re-organization of teacher education means that all students will have better access to all technological resources at the university. This was seen from different points of view. Some teacher trainers thought it would decrease the access for their students when other students would use resources earlier dedicated to student teachers while the management saw the benefits of student teachers having better access to highly specialized technological resources connected to subject departments.

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[19] In June 2009 a picture showed up with a group of student teachers gathering around a laptop.

[20] www.kau.se/utbildning/larare

The computer resources at Karlstad University are spread out in different departments. No one has a real overview. The library offers 250 computers for the 7.600 students to use. In addition to this, separate faculties and departments have their own computer labs; Media and communication, Music, Computer science, Information systems, and others. There are student teachers in all those departments. One third of the student teachers are distance students, which means that they rarely use the university computers, instead they can use computers at the study centers. There is also other equipment for the student teachers to use, but it seems not to be very frequent, and students do not always know where to find it, according to the questionnaires.

All students at both institutions can use the computers at the university 24/7, what is needed is to register for an account and get a card to get access and register when entering the buildings. There are also free wireless networks for the students to use. There is technical support available during office hours, but messages can be sent at any time, and there is also the FAQ-database in Umeå. All students have their own account with an e-mail address and storage space. All users of the ICT network at Umeå University – students as well as teachers and administrative staff – have to sign a document stating that they have read and understood the university rules. The rules concern legal issues about technology and also issues like harassment. Karlstad has similar rules and administrative processes.

Distance education in Karlstad made it necessary to organize support, technological as well as pedagogical, a long time ago, and there has been some sort of support unit for about 15 years also for students. There has been a constant development according to the changing demands. Today there are different sorts of support units like the technological support to call or e-mail if computers are not working. This unit is responsible for the staff's equipment. Students have a similar support unit. These two units give help during office hours through e-mails and phone hotlines, but much of the information is available on the web sites and e-mails can of course be sent at any hour.

In addition to the technological support in Karlstad there is "Lärstöd" (Learning-support), which focuses mainly on how to use the LMSes *It's Learning*[21] and *First Class*[22] and the videoconference systems. Lärstöd is available for all staff and students – not only teacher education - and the pedagogical support aims at university teachers. The staff at Lärstöd tries to work actively organising workshops on different pedagogical subjects, but the services most sought-after are solutions to urgent problems. The unit tries to cooperate with the unit working with pedagogical courses required for university teachers but so far without any practical result. There is a steady increase in staff and resources due to the increase in distance education and also blended learning, and their services are highly appreciated.

Objectively both institutions are well equipped with computers and technical support. As an answer to the question in the questionnaire about how many computers were available for the students, one institution answered "enough," and when counting computers at Swedish teacher training institutions, there is no reason to believe that the computer/student ratio hinders the use of technology in initial teacher training.

 - Courses

In the questionnaire the answers to the question on whether or not there are objectives regarding ICT in course plans from the different institutions varies a lot. Twelve institutions responded that the student teachers' pedagogical competencies related to ICT are assessed in some courses. Four of these 12 institutions also assess the student teachers' pedagogical ICT-competence in order to complete the program.

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[21] An LMS developed in Norway

[22] An US-based LMS

In order to prepare student teachers in Umeå for using ICT in their future work, the focus has been put on the courses in AUO, which are courses all student teachers have to take. There has been an aim to cover also other courses, but at the Umeå School of Education the main body of courses exceeds 200, and there have not been enough resources for IML to intervene in all of them. The interest from other teacher trainers is varying. However, staff from IML has been available for all those courses. When looking at course plans for AUO in Umeå, only some of them mention ICT. ICT is stated in the objectives for the course as using ICT for own development and learning, and in one course about young people and social conditions, one of the objectives is to analyze and problematize how ICT changes the conditions for identity building, learning and interaction between people. None of the course objectives relate to teaching practice and the integration of ICT in the future classes even if field placements are included in the courses. In Umeå some courses assess the student teachers' pedagogical competence related to ICT.

In an analysis made by two student teachers from Gothenburg in their minor thesis (Eriksson & Löndahl, 2008), the objectives for the courses in AUO in Karlstad cover most of what is mentioned in the fourth key competency for lifelong learning recommended by the European Parliament in December 2006. In comparison with other teacher training institutions in Sweden, Karlstad scores high in the ranking list in their report. Several of the goals mention that the student teachers should learn how to use ICT pedagogically, but they are not assessed according to the response given in the questionnaire by the institution in the present study.

To what extent is ICT used?

Student teachers' use of technology during training is quite low

From the questionnaire, the average number of hours per week that Swedish student teachers report they use ICT for studies (including classes) varies between 0 and 80 hours. Both extremes seem implausible but not totally unrealistic. Since there are extremes in both directions, all values are counted. The median is 10 hours and the mean 14.8 hours. There is a considerable difference between institutions in some cases, but the variation is very large within institutions, and the samples are quite small. However, comparing the use of ICT for studies between distance students (n=48) and campus students (n=241) shows what could be expected; that distance students use ICT 23.3 hours/week and campus students 13.0 hours/week in average for studies. Looking closer at what kind of devices make the difference, it shows in the questionnaire that distance students use Learning Management Systems, videoconference systems, audio equipment and projection systems to a greater measurable extent. When it comes to personal computers, digital cameras and mobile phones the use is equal. The average for self-reported computer use in courses is 5.1 for all students (5=used more than half the time) on a scale where 6 is maximum (used almost always), and the average for cameras and phones does not exceed 2 (used rarely). Interactive whiteboards score the lowest, and according to the answers, to a great extent they do not even exist.

In general the students found the issue of interactive whiteboards to be problematic. A few of them had seen them while on their field placements, and others had heard of them, but none seemed to know how to use them since they were very rare or absent at the institutions. Several of the students with a somewhat reluctant attitude towards technological equipment in general expressed in the interviews that they thought interactive whiteboards seemed interesting to use. The impression from the interviews and comments is that they had the impression of being more in control with the whiteboard than with other technological devices.

Own use vs. use with future pupils

The interviews and comments show that in general students use personal computers for writing reports and communicating with their teacher trainers. ICT is not used as much in class, but for self-

studies. There are examples of discussions in blogs where the student teachers reflect on technology integration and how a development of the students' thoughts and attitudes easily can be seen and also challenged, but it is rarely mentioned compared to writing reports. The most frequent learning with the help of technology rather seems to be a side effect of using ICT for practical reasons (e.g. flexibility in time and space) and is not used much for active reflection and learning benefits. There are very few examples on the use if ICT as an active learning tool for student teachers themselves.

From the questions in the questionnaire asking student teachers about how ICT has been used for different purposes, two indexes each were created for course and field placements respectively. The decision on which indexes to create was made through factor analysis. The first is *Student teachers' own use* and includes 6 variables using ICT as a communication and management tool and student teachers' own learning and organisation of their studies as well as preparing lessons in field placements. The second is *Use with future pupils* and includes the 6 variables about integration of technology when teaching future pupils for different purposes. Each question was rated from 0 (never used) to 5 (almost always) and an average was calculated between 0 and 5. *Student teachers' own use* in courses score highest (median 2 – "less than half the time") while *Use with future pupils* has the median 1 corresponding to "rarely" in both courses and field placements, although there is a small difference. Details are showed in Table 6.

Table 6 shows to what extent student teachers report they use ICT in courses and field placements respectively.

	Courses		Field placements	
	Student teacher's own use	Use with future pupils	Student teacher's own use	Use with future pupils
N	317	316	330	331
Mean	**2.34**	**1.27**	**2.09**	**1.45**
Median	2.00	1.00	2.00	1.00
Std. Dev	1.33	1.13	1.37	1.23
Variance	1.77	1.27	1.89	1.51

Most students interviewed in Umeå said that they had no practical experience in using technology to do administrative work at schools, because they were not allowed to get accounts in the systems at their field placements, but, in general, Swedish student teachers feel confident using technology for future administrative purposes, according to the questionnaire. At the university in Umeå there is a system with digital portfolio for student teachers, but it is not used consequently throughout the education and because of this the interviewed students felt they did not know how to use a similar system very well with pupils. On the other hand, none of them seemed worried about communication with pupils and parents, at least not where technology is concerned.

It is a myth that teachers who want to work with young pupils do not want to use technology

Both teacher trainers and student teachers claimed in interviews and comments that student teachers that wanted to work with younger children were more reluctant to integration of ICT in education since

they were more concentrated on working with the children than teaching a subject. The only future primary teacher interviewed in Karlstad had a positive attitude towards ICT use in the classroom but was a bit hesitant to use the Internet among younger children because of the upsetting content they could stumble upon. She knew this issue could possibly be solved by using passwords and restricted access. She also had experience from guiding younger siblings, and she found it a bit difficult to know exactly how to deal with this problem but wanted to find a solution because of the benefits. From the questionnaires there is no evidence regarding differences in interest in or use of ICT in relation to neither age of student nor future teaching level.

Teacher trainers working with future pre-school teachers and primary teachers gave more examples of the innovative use of ICT they would like to develop if they had the time and financial resources than teacher trainers working with future secondary teachers. One of the teacher trainers in Karlstad referred to a recent report (Berginge, Löfdahl & Pérez Prieto, 2008) showing that 85% of the Swedish pre-schools in the study have their own web-sites today, which he claimed was an indication of pre-school teachers' interest and competence. The aim of most of these web sites is to show to parents and families what is happening at the pre-school. There are recent, updated pictures from the daily life and information about meetings and excursions. Normally there is no administrator at a Swedish pre-school, and the teachers have to do all the current work with the web sites themselves.

A later comment on this result showed that teacher trainers in Karlstad had experienced a rapid change during the last couple of years towards a less reluctant view among student teachers working with young pupils.

In what ways is technology used?

There are good examples everywhere…

The teacher trainers interviewed at Umeå University all expressed an awareness of the practical use and the necessity for student teachers to learn how to integrate technology in teaching, even if they rated the importance of ICT in education differently. Several of the teacher trainers talked in political terms and explained their visions and expressed the necessity of working on a political level to change the common view of ICT and learning.

The students interviewed gave good examples of ICT use by teacher trainers at the universities. One of the students had discovered that there were voluntary courses offered by Lärstöd in Karlstad that were very useful, but you had to find them yourself and very few students attended these courses. One teacher trainer in Karlstad brought the class to a service where teachers can borrow pedagogical games and other software for free, and this was considered as good, but the student teacher explaining this did not think it was enough just to be aware of this service. She wanted to use the service during her field placement, which she was not able to do since it was not a requirement and the mentor teacher was not interested.

A course in Umeå, which was described as a good example both from subject teachers', IML staff's and students' perspective, was a course in social sciences. The students had to prepare thematic studies in groups, where each group were responsible for each a theme. They were asked to find resources on the Internet that could be used in their classes together with the young teenagers. The result was a plan for a thematic study with Internet resources from each group. The plans were documented on a CD and all student teachers each had a copy. The students were not obliged to use the plans during their field placements in the course, but many of them did and found them very useful.

…but scarce…

According to both students and teacher trainers in interviews and comments, the good examples disappeared in an ocean of courses. A problem often mentioned was that computer training is not integrated well enough in subject courses and the students can never see how technology can be used in subject teaching. A few of the interviewed subject teacher trainers in AUO from Umeå thought the co-operation with the IML teacher trainers worked well and that they have found a way to integrate technology, while others expressed difficulties with, for example, finding the time to really co-operate, and the result is two teachers working in parallel. According to one of the trainers, there had also been negative remarks from the national Agency of Higher Education on this way of organizing.. Both teacher groups were confident in the other group so this did not seem to be an issue. The new organisation may solve part of this problem, but many were doubtful but still hopeful.

Several of the interviewed students from Umeå claimed that there are other values in life that are more important than technology, but also those with an ICT reluctant attitude towards ICT agreed that they had not been well-enough prepared.

…and the majority of courses do not integrate technology in a relevant way

All students interviewed could easily give examples of technology use in courses that were not relevant to the assignment but were put in the courses so that the university could tick off another example of technology use. One of the students feared that more ICT use in the university courses could result in more similar experiences, or in what she called nonsense, because there were a lot of "old fossils" in the faculty. She added, though, that there were also many teacher trainers who did a good job in this regard. PowerPoint presentations popped up in two student interviews in Karlstad as an example of ICT used in a way that was not relevant to the subject studied. In the classroom the students could imagine using presentations to show images to the pupils, but in university courses the presentations had been out of context. What they did could have been done better by way of other means. Also the teacher trainers talked about useless PowerPoint assignments, but as long as nobody comes up with a better solution that can be easily implemented, it is still there.

However, there is no lack of ideas…

Most of the students interviewed could see great advantages in being able to enhance their teaching with films and sounds to explain subject-related phenomena or just to get pupils interested in a subject. The students who aimed at teaching in practical subjects could all see the benefits of using technology. Not explicitly when carrying out practical things, but communication and documentation were mentioned as obvious areas of use. For sloyd, the future teachers absolutely wanted a computer in the workshop/studio for the pupils to use to look for ideas. Programs for design and highly computerized tools are often very expensive and most of the time it is not worth paying for its limited use at schools. In physical education there are many small devices like pedometers that can be very useful.

Teacher trainers and student teachers could all see and give numerous examples on how they thought ICT could be used in the classroom. When talking about the future and what could be done to improve initial teacher training in Umeå regarding ICT, there were many ideas, both practical and visionary, but there was a lack of resources. A long-term goal should be to insure that every single teacher trainer be good enough in general ICT skills. When the student teachers have been training a certain skill in one course, all teacher trainers have to make use of this specific skill in their courses. Like when students learn how to write summaries, all subjects benefit from this and make use of this acquired skill. It should be the same with ICT skills. There is also a need to write down specific issues in course plans, because, according to several of the interviewed persons, there are too many students and trainers thinking that school should

be computer-free zone. At the same time, though, there is a need for a deeper understanding of what it means to use ICT, and we cannot just tick off practical skills. There must always be content connected to the use, and we must always ask the question "how can this be done in the best manner?" to avoid the uncritical use of ICT. According to the interviewed teacher trainers, the courses should be designed so that the use of technology comes automatically, but there is also a need to teach details in software, for example.

Not only direct classroom use was important according to the interviewed students. They thought it was important to be up to date with what children and young people do in their leisure time to be able to meet and challenge this. They also talked about administrative issues, in which some of them had no training at all. Overall they saw a need for general training, to become confident users themselves. They thought this would make it easier to find solutions in the classroom. The teacher trainers want the students to have challenges, but the most important thing is that the student teachers become stable personalities and grown-ups. This latter statement goes hand in hand with another recurrent remark made by the students interviewed in Karlstad; they claimed they were well prepared in managing unexpected situations. They are trained regarding self-development and how to rely on their own creativity, which they valued very much.

...but all ideas are not realized.

Teacher trainers responded to a question on what technology use they think is important for new teachers to acquire. The questions were similar to what the students responded to regarding confidence (see further down). The trainers scored, on average, between quite great importance and very great importance to all items, but it seems that they are not able to work as they would like to in this respect. The mentors were asked to what extent they used technology in similar ways. Their responses could be "never", "a few times a year", "monthly" or "weekly". Most teaching items scored between "a few times a year" and "monthly", and only "Foster pupils' ability to use technology in their learning" scored higher (between monthly and weekly). However, communication with pupils, parents, colleagues and administration also scored between "monthly" and "weekly". See further details in table 7 and 8.

Table 7 shows how teacher trainers rate the importance of different technology use. The choices given were from 1 (no importance at all) to 4 (very important). The table shows average scores on each item. The highest score first.

To what extent do you think the use of technology described below is important for a student teacher to acquire?	Mean score (1-4)
Use of technology for student teachers' own development and learning	3.84
Organising work and keep records	3.80
Communicating and/or networking with their pupils	3.78
To foster pupils' ability to use technology in their own learning	3.74
Finding digital learning resources	3.68
Communicating and/or networking with school management and educational administrations	3.56
Preparing lessons	3.53
To facilitate teaching pupils with disabilities (cognitive, physical, behavioral)	3.53
Designing and producing their own digital learning resources	3.51
To support various student learning styles and to personalise learning	3.46
To support creativity	3.46
Communicating and/or networking with parents	3.45
To facilitate teaching specific concepts or skills	3.44
To support activities that facilitate higher-order thinking	3.39

Table 8 shows how often mentors claim they use different kinds of technology use in their work. The responses varied from 1 (never) to 4 (weekly). The most frequent use first.

How often is the use of technology described below present in your work/teaching?	Mean	Median
To communicate with colleagues	3.76	4
To communicate with school management and educational administrations	3.66	4
To organise and manage your work	3.39	4
To foster pupils' ability to use technology in their learning	3.17	3.5
To prepare lessons	3.13	4
To support various student learning styles and to personalise learning	2.97	3
To facilitate teaching specific concepts or skills	2.92	3
To communicate with parents	2.84	3
To analyze student achievement/ performance data	2.83	3
To find digital learning resources	2.74	3
To support creativity	2.64	3
To communicate with your pupils	2.58	3
To support activities that facilitate higher-order thinking	2.50	2
To facilitate teaching pupils with disabilities (cognitive, physical, behavioural)	2.46	3
To design and produce your own digital learning resources	2.32	2

What are the obstacles?

Organization with lectures in large groups oppose students' individual training needs

In interviews and comments to the questionnaire there is a recurrent statement saying that what the students learned regarding ICT at the university is on a very basic level, and it does not cover their needs at all. They have learned more technological use elsewhere. Technology is not adjusted to the students' different competence levels. The fact that many students need basic training leads to other students getting bored because of the low level of technology use. The system with lectures in large groups at the university does not promote individually adjusted ICT use. The issue with students' different levels of general digital competences was also raised by several of the interviewed teacher trainers.

The students also asked for more subject-specific ICT knowledge, which they thought could be best carried out in, for example, small workshops where they could try things out themselves and also to be shown how digital resources can be used in lessons.

Reliable equipment wanted – but there is no need for high quality equipment

In the questionnaires, teacher trainers, student teachers and mentor teachers rate the importance of different kinds of support from 1 (No importance at all) to 4 (very great importance). The suggestions are listed in Table 6. In the Swedish translation, *incentives* were clearly related to benefits or compensations received *after* doing a good job. This means that the prerequisites for doing the same job are not included, since, for example, preparation time and technological support were separate suggestions.

All suggestions except for "Task related incentives" (which was not in the students' questionnaire) score between 3 and 4 on average, which indicates a real need for support. All three groups rate the "Reliability of equipment" the highest. There is also an agreement among the groups that "Availability of high quality equipment" is less important. The differences among the three groups are quite small, but teacher trainers put "Dedicated time in courses to prepare, explore and develop" as second, students want "Training/courses in pedagogical use of ICT" and mentors ask for "Pedagogical ICT-support."

Table 9 shows the importance teacher trainers, student teachers and mentor teachers attach a set of suggestions for helping future teachers to increase the integration of technology in their teaching. The responses could vary from 1 (no importance at all) to 4 (very great importance). The numbers in the columns are average scores for the different groups.

Suggestion	Teacher trainers	Student teachers	Mentor teachers
Reliability of equipment	3.8 (1)	3.65 (1)	3.92 (1)
Dedicated time in courses to prepare, explore and develop	3.72 (2)	3.43	3.73
Technological support (e.g. "hotline")	3.68	3.43	3.72
Pedagogical ICT-support (e.g. "hotline")	3.64	3.49	3.81 (2)
Better access to technological equipment	3.52	3.49	3.68
Training/courses in pedagogical use of ICT	3.43	3.59 (2)	3.54
Technological hands-on training/courses	3.33	3.17	3.3
Policies on using ICT across curriculum	3.29	3.19	3.44
Availability of high quality equipment	3.25 (9)	3.16 (9)	3.38 (8)

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| Task related incentives | 2.61 (10) | | 2.81 (10) |

As mentioned above, a personal computer is the technology most frequently used. One third of the teacher trainers report in the questionnaires that personal computers and projection systems are available in all of the classrooms they use. Projection systems and audio equipment are the most likely technologies found, either in classrooms or upon request and personal computers are the second most used. The equipment least likely to be found in a teacher training institution in Sweden is interactive whiteboards and mobile phones. Interactive whiteboards are not available in most places, even upon request.

Access in theory is not the same as access in practice

All students interviewed could give examples of the difficulties they encountered with the equipment available in schools, which was about outdated equipment as well as restricted access. There were also written comments about this problem. Equipment must be booked in advance, carried to the classroom and/or connected. Even if you are an experienced user and the equipment is there, you will not necessarily succeed in using it. Preparing and checking takes so much time, so it was questioned if it was worth all effort put into it. An important issue would be to be trained in fixing the technical problems. They all had experience of well-working support, both at the university and at schools, but you could not count on support staff to come immediately when the lesson was about to start and all the pupils were sitting there waiting. Having confidence in how to fix small problems is necessary, or you dare not use the devices if there should be any technological problem.

Teacher trainers report the same problem. In a general classroom in Karlstad for example, there is no technological equipment, so planning in advance is a necessity. This affects spontaneity. In the videoconference rooms used for distance education in Karlstad, there are computers, interactive whiteboards and a device where you can display pages in books or any paper on the wall for everybody to see. There is also a well-trained person at hand during the sessions. When the equipment is already there and connected, it is possible to follow-up on students' questions and discussions in a way that is not possible in a general classroom where it is not even possible to play a CD or a DVD without thorough planning. Teacher trainers working in both modes could easily compare and point at this problem.

Umeå trainers report that booking in advance and carrying around equipment is part of the daily life if you want to use technology in class. You cannot even be sure it will work. Those times it doesn't work make you avoid using it. Nothing really hinders a development in the area, but there is no real support either. There is technological support that works well in some respects, but it is not enough. Or rather: there has been support until now. The new organisation makes the trainers fear the support and access will be less, at least for the student teachers. Several of the teacher trainers claim that all student teachers do not have their own computer and that availability of computers at the university is necessary for their training.

When a teacher trainer in Karlstad wants to use the Internet in a classroom there is the possibility of bringing a laptop, including cables, to a classroom after ordering a connection from the IT-unit. This is part of the security rules set up by the central IT-unit so that access to the internal network is restricted, but at the same time it makes it more complicated to use the technology in a flexible way.

Role models are needed

The students interviewed in Umeå suggested that IML work harder on integrating technology in subject courses instead of focusing on AUO. Those who had learnt something about integrating technology in teaching had learnt this during field placements, but it was dependent on the mentor teacher's own

interest. A few courses, though, have succeeded in integrating work in field placements. There was also a suggestion from the students that staff from IML be invited to workshops showing different applications and how they could be used in subject teaching – as a sort of inspiration. Each course has its own budget and can organize the work as they want, in theory, but organizing a workshop consumes more resources than lectures, and there is not enough time to meet each student's needs. The economical limitations decide the pedagogy.

Courses vs. field placements

Teacher training in general is "patchy," according to several interviewed teacher trainers, not only regarding technology; the courses are too short and teacher trainers do not meet the students again to follow up on what they did last semester, for example. In the next course, there is a new context and the students do not use the knowledge they already have. There is little or no connection to the students' field placements. Some of the trainers say that the practice periods are anonymous to them. There are usually assignments to hand in after the period. Earlier, teacher educators discussed learning resources at the teacher training college. The same material was available there as in schools, and there were teacher trainers who were experienced teachers who could scrutinize the learning resources together with the student teachers. Today, teacher training is organized differently; teacher trainers do not visit schools to the same extent as they did before, since mentor teachers have a greater responsibility in assessing student teachers during their field placements. Mentor teachers are also the ones responsible for discussing learning resources. Because of this teacher trainers at the universities do not know what kinds of resources are available in schools. They do not even know which schools the students attend, since the contracts are not between the university and specific schools, but with school areas, and the local administration is responsible for finding mentor teachers. A big challenge for the university, according to the dean in Karlstad, is to work with field placements. One problem is that the schools involved do not use the same communication platforms (i.e. LMS) and this is something that has to be solved.

Only two institutions out of 16 respond in the questionnaire that they have formal requirements on contracted partner schools for integrating ICT during student teachers' field placements, another responds that it is coming and one responds that they encourage it. Two institutions have formal requirements of mentor teachers for integrating ICT during student teachers' field placements, and two say there are requirements in certain cases.

In the interviews the student teachers claimed there is theory at the university and practice at schools and very little connection in between. Their experience was that schools did not use technology to a great extent, so they wanted the university to show how it could work, and they wanted to see examples of innovative use.

What can increase student teachers' confidence in integrating ICT?

Student teachers' confidence in integrating ICT in their future work was self-reported in a question containing 15 items. Each item was rated from 1 (not confident at all) to 4 (very confident). A principal component analysis (PCA) resulted in three factors. There are similarities with the two factors presented earlier concerning the use in courses and field placements, but there is one big difference. ICT as a communication tool with pupils and their parents stood out clearly as separate here. Communication with school administration, though, is related to other use on their own. The three factors are:

Confidence in communication – The factor includes the two items about confidence in communicating "with pupils" and "their parents".

Confidence in management and development – This factor includes six items about "communication with school management and administration," "use of technology for own development and learning", "organizing work and keeping records," "preparing lessons," "finding digital learning resources," "designing and producing own digital learning resources." The reason why own development and learning is part of a factor filled with administration is partly what is mentioned above, that own learning in this sense was rarely talked about as reflection, but rather as collecting information and handing in assignments.

Confidence in teaching – This factor includes six items concerning use to enhance pupils' learning by "facilitating teaching specific concepts or skills," "supporting various student learning styles and personalizing learning," "facilitating teaching pupils with disabilities (cognitive, physical, behavioral)," "supporting activities that facilitate higher-order thinking," "supporting creativity," "fostering pupils' ability to use technology in their learning."

The factor *Confidence in management and development* showed the highest average score (3.14). The factor *Confidence in teaching* showed the lowest average score (2.54) but is still on the confident side.

A multiple regression analysis was carried out. The independent variables were age, gender, different kinds of technology use in courses and field placements and self-reported quality of support. Since there were three dependent factors in the analysis, the significance level was set to 0.01. No independent variable reached this level of significance for the *Confidence in communication* factor, but there was a tendency that male students showed more confidence in this respect. It is known from other research that male respondents show a higher degree of confidence in using technology, so this should not be surprising. There is also a tendency that pedagogical use of computers in field placements correlates with this, but this factor correlated with all kind of use at field placements, which was not tested and should be interpreted with that in mind (details in table 10).

Table 10 – Confidence in Communication – 2 items; communicating with pupils and parents.

Independent variable	Stand. Beta coeff.	Sig.
Female gender	*-.148*	*.014*
Age	.013	.833
Time spent by computer for personal use	-.006	.917
Time spent by computer for studies	.086	.179
Use of PCs, LMS, video conf, projection system in courses	.156	.025
Use of digital cameras, mobile phones,	.070	.292
Quality of technology support	.021	.730
Quality of pedagogical support related to ICT	.134	.026
Use of ICT for administration and own learning in courses	.095	.220
Use of ICT for teaching purposes in courses	-.026	.750
Use of ICT for teaching purposes by mentor teachers	*.157*	*.017*

Regular ICT use results in higher confidence

If the computer was used for administration and course-work and also if time was spent on personal use of the computer, the students scored higher on the *Confidence in management and development* factor and distance students showed significantly higher average than campus students on this factor. This means that using an LMS and offering blended learning, significantly correlates with future teachers confidence in using technology for management and development in different ways (Table 11). It is important to note that it is the same kind of use, and it does not increase the student teachers' confidence in integrating ICT in teaching.

Table 11 – Confidence in Management and Development – 6 items; communicating with school administration, own development and learning and four items for managing schoolwork.

Independent variable	Stand. Beta coeff.	Sig.
Female gender	-.075	.179
Age	-.057	.310
Time spent by computer for personal use	.164	.004
Time spent by computer for studies	-.012	.844

Use of PCs, LMS, video conf, projection system in courses	.117	.071
Use of digital cameras, mobile phones,	.092	.141
Quality of technology support	.013	.815
Quality of pedagogical support related to ICT	.071	.207
Use of ICT for administration and own learning in courses	**.290**	**.000**
Use of ICT for teaching purposes in courses	.019	.808
Use of ICT for teaching purposes by mentor teachers	*.147*	*.018*

Only three institutions out of 16 make use of an LMS as little as in less than half of the courses. Two of these are artistic teacher educations. In Umeå there will be a change regarding what Learning Management System (LMS) to use. Currently *Ping-Pong*[23] and *First Class*[24] are used, but during this year a transition to the open-source software *Sakai* will take place. The economical benefits seem to overshadow all extra work related to the change, since it was never mentioned as a problem. All student teachers and teacher trainers use the platform regularly, because all information is put there. Karlstad had not yet reached 100% use in their campus courses.

Online distance education increases general computer skills

For those teachers working on campus in Karlstad, there is not much time to use technology, and they claim to be lagging behind the students, and they used the word "undernourished" when it comes to technology use. One of the teachers in campus courses says that her technology competence is at a primary school level. Teacher trainers as well as students in distance education get a general training that makes them confident in using technology. They have been dependent on computers every day for several years while working in LMSes, and they have experienced many different problems and learnt how to deal with them. Teacher trainers as well as student teachers rated the trainers' confidence in using technology when teaching. On a scale from 1 to 4, the teacher trainers scored 3.20 on average on their confidence in using ICT at work. Apparently they do not show it in classes, since the students scored only 2.48 on a similar question. It is not possible to compare these questions directly, but an interesting difference is significant between distance students (2.75) and campus students (2.46) rating their trainers respectively, which indicates that not only student teachers, but also teacher trainers benefit in this respect from working on distance courses.

Teacher trainers and mentor teachers play an important role as models

The *Confidence in teaching* factor is correlated with teacher trainers' and mentor teachers' use of computers in teaching situations like teaching specific concepts or skills, supporting various learning styles, teaching pupils with disabilities, supporting higher order thinking, supporting creativity and fostering pupils' ability to use technology in their learning. There was also a significant correlation with time spent on personal use of ICT (Table 12).

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[23] An LMS developed in Sweden

[24] A US-based LMS

Table 12 – Confidence in Teaching – 6 items about using ICT in teaching.

Independent variable	Stand. Beta coeff.	Sig.
Female gender	-.039	.461
Age	-.038	.476
Time spent by computer for personal use	**.146**	**.008**
Time spent by computer for studies	.054	.339
Use of PCs, LMS, video conf, projection system in courses	.090	.137
Use of digital cameras, mobile phones,	.044	.445
Quality of technology support	.014	.792
Quality of pedagogical support related to ICT	.070	.189
Use of ICT for administration and own learning in courses	.015	.822
Use of ICT for teaching purposes in courses	**.334**	**.000**
Use of ICT for teaching purposes by mentor teachers	**.203**	**.001**

Discussion

This report gives a picture of ICT in Swedish initial teacher training with a focus on how new teachers are prepared to integrate technology in teaching. Data comes from a questionnaire answered by management, student teachers, teacher trainers, and mentor teachers at 21 teacher-training institutions as well as from two case study visits. There are many aspects in this area of research, and it is impossible to cover them all in one study. The OECD/CERI-project strand *ICT in initial teacher training* must be seen as a contribution in which this report is just one piece in the puzzle. However, the conclusion is that student teachers' integration of technology in teaching during their training is low. The actual use is mostly writing reports and other self-studies.

On a national level there are requirements for student teachers to be able to integrate ICT in teaching and pedagogical development, but it seems that the teacher training institutions have interpreted the national requirements as weak and do not take them into account. None of the institutions responding to the questionnaire states that there are national requirements, and only four institutions (25%) say they assess the students' pedagogical ICT competence in order to certify them as teachers. Although Swedish teacher training institutions show an awareness of the importance of integrating ICT in teacher education, teacher trainers, student teachers and mentor teachers agree that it does not work very well in practice. One step in the right direction could be to increase the awareness of the actual policy, both on a national and an institutional level.

There are national evaluations of teacher training regularly, and if the results show that the standards are not met, an institution can lose the right to organize teacher training. However, there are different foci in the evaluations, and ICT has not yet been a focus of an evaluation. There is no other national

accreditation that requires student teachers to demonstrate their pedagogical competence related to ICT. The teacher training institutions are responsible for educating teachers in this competence.

There are local policies, though, with different pros and cons. The two approaches used at the case study institutions showed that there could be different reasons for policy and practice not corresponding. Students leaving teacher education in both Karlstad and Umeå express the same level of confidence, but the teacher trainers have different situations and the reasons for students not being well-prepared seem to be different. In Umeå all teacher trainers seemed to be aware of the well-developed policy and described visionary scenarios. The discussions were well anchored in the faculty. In Karlstad the policy was declared on a concrete level, and this was also reflected in the course plans, but teacher trainers who described visions and innovative solutions seemed to have developed the views irrespective of the policy, and other teacher trainers seemed to be excluded. In Karlstad the discussions in the faculty board regarding ICT did not reach everybody, and the faculty board did not have any means to follow up on decisions, which lead to a lame duck policy.

Both institutions had focused on the courses in AUO, and both institutions experienced similar problems with subject courses and worked on strategies to solve them. There seems to be a risk that the ICT use in the general courses in AOU does not become integrated in a relevant way. In Umeå the dean could see advantages when the organization was about to change, since teacher education from now on was going to order courses from other institutions and pay for them. Within the new system it should be possible to make demands on the subject courses. If the institutions do not meet these demands, School of Education is free to buy online courses from any university that could provide teacher education with, for example, ICT integration – not only Umeå. He thought this could put pressure on his own university. In Karlstad one step in a direction to put more pressure on subject courses would be to give the faculty board more control over the budget, which can be seen as a step in the same direction.

There are policies for using technology both in Karlstad and Umeå, but the physical environment does not meet the requirements, according to the teacher trainers, and a common opinion was that, as a teacher trainer at the university, you are not opposed, but you are not supported either. A large number of computers, which means access in theory, does not always mean access in practice. Students often have their own laptops, and in theory there are wireless networks at the universities, but there were different voices to what extent those networks could be reached over the entire university. Teacher trainers who wanted to make use of student teachers' laptops during lectures found it problematic that they did not always work or did not work properly everywhere in the buildings.

There is no empirical evidence in the articles referred to in the research review (Enochsson & Rizza, 2009) that constructivism is necessary for integrating technology in teaching, but the examples from Karlstad in regards to being prepared for unexpected situations shows that a constructivist approach is an advantage when we experience that technology development is running ahead of us. Teacher trainers interviewed from both institutions showed an awareness of the complexity of learning that comes from extensive experience and a profound interest. This was expressed as a constructivist approach, which begins with the student/pupil. One example of this is what is mentioned above about the possibility for spontaneity. Bétrancourt (2007) shows in an example from the UK that the majority of ICT tools support traditional transfer pedagogy, and that the use of ICT is limited to presentations (documents) or evaluations (quizzes). This can be a risk when ICT departments are placed (physically and metaphorically) far away from educational activities. Technicians cannot be expected to comprise a developed view of learning; it is not their profession.

Another obstacle related to security is that you are not allowed to install any software on your computer yourself, which also makes it more complicated when you want to show or just to try out a special software. The trainers interviewed want to challenge the students, but ICT departments do not

always understand the trainers' needs, and they set rules for the use of ICT which do not fit innovative teaching. Hardware and software are more suitable for administrative purposes. Student teachers talk about the importance of connecting to the learners' worlds by learning about young people's net cultures. It is quite common that technology departments ban certain applications used by young people; still less at the universities than at schools, but there are more and more restrictions also at the universities.

The complaints about access and restrictions were more common in Karlstad than in Umeå, so it seems like the organization with IML where pedagogues and technicians worked in close cooperation was a good solution in this respect. The likelihood for the two groups – technicians and teachers - to understand each other's views and needs increases, and is something to learn from and nourish in order to keep even when the administration of ICT moves. The technological divide described here can be an explanation why teacher trainers, student teachers and mentor teachers say that technology is not available even though the number of devices is quite high. The research review concludes that teachers need to be given more evidence that ICT can make teaching and learning more effective (Shi, Reeder, Slater & Kristjansson, 2004). Research has to demonstrate that the time and energy spent on learning technology along with content is worthwhile. It might be expected that some teacher trainers used some of the above-mentioned obstacles as an excuse not to use ICT, but the complaints came both from enthusiasts and teacher trainers that seemed to attach less importance to ICT. Flexibility was mentioned in the research review as important for policy (Williams, 2005), but also practice needs to be flexible.

A large part of Swedish student teachers study by distance. These are the student teachers that really make practical use of ICT. Karlstad expressed a clear aim to let all student teachers use technology in the same way in the near future, campus students as well. In the Swedish university discourse, the concept e-learning is used in different ways, and for the majority of faculty members it concerns only university students' own learning, and sometimes only the organization of distance education. Although distance education is often seen as a matter of administration, students and trainers get used to technology and get a general computer competence, which is very valuable. Teacher education in Sweden is integrated in universities. Many teacher trainers educate both student teachers and other students. There are no available statistics on how many trainers have their own teacher training, but there is no such requirement for teaching student teachers. It cannot be assumed that all teacher trainers have a clear idea of what it means to prepare future teachers or are able to provide the students with "a clear and comprehensive understanding of technology and its role in instruction" (Schuldman, 2004:336), which is necessary if student teachers themselves will learn how to use ICT in teaching.

To overcome the lack of faculty members' experience of teaching, mentor teachers at field placements are included in teacher training and they are considered as teacher trainers. It is found crucial that student teachers really can see and also try ICT integration in the classroom (Enochsson & Rizza, 2009). A problem mentioned at both institutions in the study is that the contact between the institutions and the field placements does not always work. Not that there are problems, but the communication is not sufficient to integrate theory and practice. A few institutions in the study claim in the questionnaire that they require ICT use from the field schools, and this may be a solution for other institutions as well.

Drivers

Improving an activity often means identifying problems. In the text so far many problems are identified, so there is time to look at the positive outcomes; what actually drives the actors in teacher training to integrate ICT in teaching, and also what enables the integration.

The local actors all would like to do a good job, which means helping young people learn and develop as much as possible. ICT can be useful in several ways to enhance, increase motivation and to provide variety. Possible drivers, according to the research review (Enochsson & Rizza, 2009), are, for example,

the motivational factors: incentives, representations of the potential of ICT in teaching and learning and suitable tools easily accessible. A possible driver could also be a personal technological interest, which makes the teacher want to try certain applications in teaching. The latter have similarities with representations of the potential of ICT. A possible driver can also be demands from management. From the Swedish study there is no support for incentives like salary raises or promotions, but there are two drivers that stand out clearly:

- Representations of the potential of ICT in teaching and learning.

- Suitable tools easy to access

The managements' demands seem to work more as recommendations in the Swedish case. An important note is that all interviewed teacher trainers and student teachers were really enthusiastic and had a lot of ideas how to do "if only…."

Enablers

Motivation can fade if there are too many obstacles. The drivers have to be nourished and supported. In the research review the competence and access factor on the local actor's level concern enabling; general technology competence, pedagogical competence relate to ICT, confidence in technology and pedagogy and access to equipment.

Swedish teachers of all categories seem to be quite confident in using technology in general, but when it comes to how to use it for teaching there are mainly three things they ask for:

- Pedagogical and subject specific courses

- Pedagogical (and technological) support

- Reliable, easily accessible equipment

In the questionnaire to the actors, "policies" had similar scores as "high quality equipment." Although "policies" was ranked quite high, it was far down on the list of priorities. In the interviews policies were not mentioned at all as important. Possible reason for this could be that policies were not evaluated in a clear way.

Key messages

As a summary of the report, a number of key messages follows:

- The integration of technology in teaching is low, and Swedish student teachers report some confidence in integrating ICT in their future teaching, but the level of confidence cannot be considered as satisfactory.

National level

- There are national requirements that student teachers have to know to know how to integrate ICT in teaching, but it has not been the focus of any national evaluation of teacher training programs.

Institutional level

- The management of Swedish teacher training institutions is aware of the importance of integrating ICT in initial teacher training and that there is an ongoing work trying to develop better strategies.

- Focus has mostly been on integrating ICT in the three-semester program in general teacher competence (AUO) and also on the use of LMS but less on how technology can be integrated into subject teaching.

- Swedish teacher training institutions are well equipped with computers and technical support, but the technological environment is very often organized to suit administrative processes and is not always adapted for other needs in teacher education.

- Field schools do not always have satisfactory technical support.

Actors' level

- Teacher trainers, student teachers and mentor teachers report feeling confident with general technology and they use computers for administrative purposes and documentation, but…

  …the student teachers' general computer competence varies a lot.

- The majority of student teachers have their own computer, most of them a laptop.

- Using a digital learning environment increases the general technological skills for students as well as for trainers.

- Student teachers' confidence in integrating ICT in teaching is correlated with their teacher trainers' and mentor teachers' use, i.e. to the extent these two groups act as role models, and…

- …the teacher trainers and the mentor teachers ask for courses in pedagogical use.

- Although there is equipment in the institutions and field schools, teacher trainers, student teachers and mentor teachers report problems with access and reliability. Equipment has to be booked in advance and carried around. This requires time and careful planning and affects spontaneity. Reconnecting devices often causes unwanted problems.

- Student teachers, teacher trainers and mentor teachers have ideas on how to integrate technology but do not think the equipment is reliable enough and that there is sufficient time to prepare, explore and develop their ideas. The development process can sometimes be complicated because of administrative restrictions on hardware for users.

- The teacher trainers want the students to be challenged, and the most important thing is that the student teachers become stable personalities and mature adults – also in relation to ICT. For student teachers this can mean being up to date with what children and young people do in their leisure time to be able to meet and challenge this.

Recommendations for policy making

National level

The National Agency for Higher Education (HSV) does have strong means to have teacher training institutions follow their policies. The regular evaluations are taken very seriously. The institutions can lose the right to certify teachers if they do not meet the requirements of HSV. The problem regarding ICT is that HSV has not focused on ICT in their evaluations, and as long it is not scrutinized the institutions can choose to use their scarce resources for something else. Although the writing is quite clear and strong, the limited space in the text (one sentence) and the lack of evaluations may show the priority HSV gives ICT. Further recommendation for Sweden could be to…

> *…evaluate how policy is interpreted and put in action.*

In the Swedish system the institutions are responsible preparing student teachers, but the responsibility is shared with partner schools for the practical part. The national policy is flexible today and leaves room for many different solutions – which is desirable from many aspects. In the new national policy, which is expected to be accepted during 2009, ICT is one of four overall perspectives, and advocates of technology integration in teaching expect a positive change in attitude from the government.

Institutional level

The study shows that institutions are working seriously on the issue and comprise an awareness of its importance, but there are obstacles. The School of Education in Umeå was looking forward to a model where they could put more pressure on courses, something that was more problematic in Karlstad with the current organisation. Another problem seems to be the technological divide between teachers and technicians. The pedagogical perspective and the technological one have different views on what is important. The technological perspective on security can hinder teachers when they want to develop new things. On an institutional level it is important to…

…assign means (financial as well as organisational) for the follow-up of policy and other decisions

…include mentor teachers and partner schools in the policy

…nourish a dialogue between teacher trainers and technicians to find solutions that suit teacher education's needs and support innovation

…organise equipment so it is easily accessible

…initiate sharing of pedagogical ideas including courses and pedagogical support

…give technological support (which is done and highly appreciated).

The research review also shows that a policy within a rapidly changing field has to be flexible. What can be seen so far in Sweden is that the policies are flexible and quite well developed. Swedish teacher training has problems putting policies into action. One reason is said to be the teacher trainers who are not interested in technology and want school to be a computer free zone. They exist, but according to the study they are not in majority. It seems to be more a problem of discourse; some teacher trainers in the study do not clearly see the critical view of the ICT advocates. An unprejudiced dialogue might help.

Partner schools

Partner schools are part of teacher education in Sweden, but the co-operation with teacher training institutions does not always work well due to the organization of teacher education. Both teacher training institutions and partner schools must be responsible for this. Teacher recruiters say they want new teachers who are able to make use of technology in teaching. This means that schools have to

…provide future teachers with role models.

…provide mentor teachers with the necessary means for this (see institutional level)

Teacher trainers and student teachers have their own computers, but many mentor teachers do not always have them and they ask for pedagogical support, which also can be interpreted as an exchange of ideas. Unlike student teachers, teacher trainers and mentor teachers did not get the question about confidence in pedagogical use of ICT in the questionnaires, but asking for pedagogical support, as mentor teachers do, can be interpreted as they think they do not know enough. All three groups say it is important to have reliable equipment, and there are many stories about trying to connect devices which do not work together. Permanent equipment in classrooms could be a solution.

Acknowledgements

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FUA – Frequently Used Acronyms

ACM-model – Access, Competence and Motivation-model (Viherä & Nurmela)

AUO – Allmänt Utbildnings-område (A three-semester course in general teacher knowledge)

CERI – Centre for Educational Research and Innovation

FAQ – Frequently Asked Questions

HSV – Högskoleverket (National Agency for Higher Education)

ICT – Information and Communication Technology

IML – Institute for Media and Learning (Umeå University)

LMS – Learning Management System (or Virtual Learning Environment)

OECD – Organisation for Economic Co-operation and Development