ICT competencies for the next generation of teachers

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This paper focuses on teachers and their ICT-competencies. It is primarily based on a PhD-research project where "digital competent teachers" in upper secondary schools are interviewed and asked to what extent their ICT-education has been useful. The paper discusses teachers' thoughts and reflections concerning pedagogical use of ICT, the intentions in the new national educational reform and what kind of digital competence that is needed to stay the course described.

Keywords teachers' competencies; in-service training; digital competencies; educational reforms; ICT

1. Introduction

Norway aims to be among the best in the world by 2008 when it comes to developing and using ICT in teaching and learning. As a consequence of this plan we have got a new educational reform, *The Knowledge Promotion* [1], where digital competence (digital literacy) is implemented as one of the five basic competencies. ICT shall be integrated in all subjects in elementary and secondary schools. The Knowledge Promotion creates possibilities, challenges and dilemmas in the teachers' everyday practice.

In-service courses in *ICT in learning* for teachers have been developed and distributed from Stord/Haugesund University College (SHUC) since the end of 1980's. SHUC was also involved in planning and developing the national Norwegian programme TeacherICT.

However, 20 years of previous ICT-efforts have revealed that implementation of ICT in the Norwegian context has been more strongly anchored rhetorically, than in practice. Even if there has been systematically focus on in-service courses in different formats. The teacher has the most important role in implementation of ICT in learning and teaching. But several studies indicate that the teachers' focus on ICT does not correlate to the national ICT-strategies [2,3].

Consequently, this paper focuses on how teachers perceive this new obligatory, digital competence, and what kind of pedagogical strategies they use when they attempt to integrate ICT in their subjects. And as a result of this; to what extent has their ICT-education been useful?

2. Background

In order to understand the statements from the teachers a brief description of the Norwegian conditions is necessary.

2.1 25 years of ICT-priority in Norway

Over the last 25 years, there have been a number of national initiatives and plans focusing on the increased and systematic use of IT in education. Since 1983, the Ministry of Education, Research and Church Affairs has issued a number of documents discussing the development of ICT in the educational sector. The first White Paper released in 1983 was named "IT in schools". This paper was followed and replaced by new White Papers and annual plans. These papers were traditionally formulated and titled more or less the same; "IT in schools". From 2003 we can see a shift in this tradition. The ministry is leaving traditional White Papers and is presenting a new "programme". The title of the programme indicates also a change; "Programme for Digital Competence 2004-2008" [4].

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There are three important aspects to integrating ICT in education: the use of ICT as a pedagogical tool, ICT as a stand-alone subject at different levels, and ICT as a tool used in other subjects and areas [5]. The latest plans have focused primarily on the use of ICT as a pedagogical tool. The mentioned White Papers and plans were all recommendations from the Ministry of Education and Research (MER). Until this year the schools have committed to the term saying "ICT shall be used in subjects which is suitable". Now we have got a new educational reform established by law where digital competence is implemented as one of the five basic competencies.

2.2 ICT and the new Norwegian educational reform – going from "IT" to "Digital literacy"

As the first country in the world, Norway has defined and implemented use of ICT as a basic competence equally to i.e. reading, writing. Working with digital development in education has led to new words and concepts. *Computing* and *information technology* (IT) is replaced by *digital literacy*. In this paper we are using MERs definition of digital literacy. This notion focuses on digital literacy as skills, knowledge, creativity and attitudes which are necessary in order to cope with learning and teaching with digital media in a knowledge society. This notion is derived from five main arguments: 1) Innovation, 2) Democracy and participation, 3) Culture of media, 4) Modernizing the public sector, 5) Learning and teaching.

Summarizing these arguments, we got a strong statement of the importance of digital literacy in school. All these arguments are therefore relevant for how the competence building for the teachers must be developed. The learning-argument in this list has been focused and constitutes the core of recent discussions among teachers. A preliminary conclusion of available research is that measuring the effect *of* or *with* ICT in learning is rather difficult, if possible at all.

The new Norwegian curriculum declares no specific teaching methods but requires measurable goal formulations. This will probably lead to a new situation for teachers. ICT is a new tool which may enrich the teacher's pedagogical repertoire. We know that textbooks have an essential place in a teachers work and these books have been dominated by demands, goals and competencies in the national curriculum. This is an altering situation. We "see the contours of a situation where more technology is tied to the curriculum, syllabus and assessment-forms" [6]. There is no longer certificate of acceptance to textbooks and the teacher himself has to choose different textbooks which support his way of teaching. Teachers are now intended a professional and emphasized role [7]. Teachers were expected to reach their goals through their own solutions and methods, instead of carrying out national developed proposals. ICT is intended a role in that work.

2.3 Technical infrastructure

80 % of the computers in the Norwegian school system have a broadband connection to Internet (Skoleporten[*]). Over 90 % of the country's inhabitants have their own broadband connection at home. The lack of broadband and better technical infrastructure was teachers' opposition to the external pressure from the MER and from the school owners. And teachers were right; they can neither teach computer skills nor integrate ICT into curricula without having at their disposal computers that work. But times have changed and technical infrastructure is a diminishing problem. Many schools have provided laptops to every student and are prepared to meet ICT as a natural part of the learning environment.

2.4 Status for developing teachers' competence

A successful introduction of ICT in the education system is totally dependent on adequate teacher expertise. According to the new framework for teacher training, student teachers must receive training in the pedagogical use of ICT for use in their subsequent careers. Stord/Haugesund University College (SHUC) is among several offerers of in-service courses to increase the expertise of experienced teachers. The content and teaching model for these courses have changed from being a traditional campus based educa-

[*] Skoleporten (www.skoleporten.no) is a website that provides data from primary and secondary schools in Norway.

tion to netbased teaching and blended solutions. Such courses have been voluntary for teachers and generally 2-3 teachers in each Norwegian school has been through that kind of credited in-service course in ICT. The national Norwegian programme, TeacherICT, was developed for the purpose of all Norwegian teachers. The main goal for TeacherICT was to inspire teachers to use ICT both in their own teaching, and as administrative tool in their daily work. Essential in TeacherICT is "the double didactical perspective". It contains an expectation that the participants are changing their attitudes concerning ICT, increasing their knowledge and skills related to the use of ICT while using ICT in their own teaching.

Until now the Ministry of Education and Research (MER) and the universities have been offering courses and defined premises of the content. In a new strategy MER wants the school owners to be responsible and order courses which suit their own needs. Documents from *The Knowledge Promotion* states that school owners shall develop local plans for developing competence in the local and regional government. These plans will frame a basis for developing national initiatives. This represents a unique shift in way of thinking of developing competence related to a national curriculum. Distributing responsibility and local control in such a bottom-up-perspective challenge school owners and teachers in new ways. It will ensure a more targeted upgrading of skills. Crucial to this will be if the teachers are able to point out how they can develop necessary competencies.

3. Method

The methodological underpinnings in this project are based on a qualitative approach with semi-structured interviews with a selection of teachers as a methodical entry point. The expression "Digital competent teachers" is used as a gateway to understand their pedagogical use of ICT. The teachers are working in upper secondary schools. Our "digital competent teacher" has:

- appropriated formal ICT-competence. TeacherICT or other education.
- participated in PILOT* or other extensive ICT-project.
- worked as teacher minimum 5 years and used ICT in his employment

The argumentation of using teachers within this definition is that this kind of teachers which have experiences from using ICT over a long period. During their participation in ICT-projects they also have knowledge about their colleagues' encounters with ICT. The data collection for this article is also based on analysis of recent evaluation reports of TeacherICT.

The teacher's work in classroom is constructed from continuous exposure, experience, routine and ritual and is embedded within a set of personal strategies and values. Competence building and strategies for continuing developing of teachers is a challenging and much discussed effort. How to enrich teachers' digital competence is a part of that discussion. Here are some of the research questions formulated to the interviews:

- What do you think about the TeacherICT?
- Has your ICT-education been useful?
- From your point of view, how do you think the digital competence among your colleagues is?
- How could we enhance the teacher's digital competence?

4. Discussion

The preliminary data collection contains interesting findings to discuss. Our selected "digital competent teachers" are relaxed concerning the demands to use ICT in the new Knowledge Promotion. They define their competence as good enough but are willing to learn more if the right and inspiring courses emerge. Some technical skills and a good attitude have been of vital importance and have led them to where they are today.

More than 20.000 teachers have participated in TeacherICT and it is one of the most significant initiatives in adult education in Norway. Our teachers participated or had been through earlier courses which were equivalent to TeacherICT. The following expression is repeated from several teachers:

* PILOT (Project: Innovation, Learning and Organization), an extensive ICT-project initiated by MER 1999-2003.

It was all right. I didn't learn anything new. We were 4 colleagues in a group and divided the tasks be tween us. Everybody didn't need to do everything. It was also important to find out what our tutor wanted us to do. That was the first code to break.

TeacherICT was based on process-oriented writing, dialogues and collaboration in groups of teachers, preferably from the same school. Five modules and belonging assignments should be worked out and sent to a tutor. The tutors were teachers themselves and worked in the same type of school as the participants. In the assignments they described teaching plans and gave concrete examples of how teachers and pupils could use ICT in the classroom. What is good use of ICT in classroom and what is not? The course participants did not always agree with the tutor and his definition of good practice, but had to follow his advice in order to pass the exams.

The teacher workload has increased the last years [8] and many teachers feel that they do not have the energy which is necessary to acquire new knowledge. Some of the assignments had to be done in their spare time. In a recent evaluation report of TeacherICT [9] only 44 % responded the survey. One of the reasons was that they thought they had used enough spare time to complete the course and didn't want to use another 30 minutes to answer the survey. This is not acceptable because we are dependent on evaluations from participants to develop new and better courses. It was an aim for TeacherICT that the knowledge gained from the course should fit the teacher's daily work and be applied immediately in the classroom. The feedback shows that it is difficult to develop general courses for a large group of teachers. Individual and tailor made courses are necessary, both for technical skills and courses with pedagogical reflections embedded.

Many principals requested all teachers in their school to join TeacherICT, but for most of them it was voluntary. The following statements support the importance of this voluntariness: *The right to choose courses is important for me*, and *The workload for teachers is a problem. There is so much we want to do. I am dreaming of one year with reading and updating myself.*

Mandatory courses, especially in the evening and in their leisure time are bad received. It must be suitable and practical if there should be learning outcome for the teachers. The teachers were asked to what extent their ICT-education has been useful, and here is one representative answer:

Yes, I think so. Nowadays, it is strange to look back on earlier courses. I remember courses in ICT with programming and slowly working processors. No computers were available at our school. Those were the days…I don't think it was waste of time.

The use of Internet and technology, both in education and in the society, has grown faster and in a more advanced way that anyone could dream of. Therefore, it seems unfair to criticize previous courses but there are some lessons learned. Previous courses have been dominated by technical skills. These technical skills needs to be practiced and developed in the teachers own practice and daily work. Available, updated computers at school and an infrastructure with no downtime are important. Teachers' reflection on use of ICT and appropriation to their own teaching can not occur until the teachers themselves has experienced and been aware of the possibilities ICT gives.

Participants in the interview have also a relatively good overview of the competence situation among their colleagues. The most important initiative to competence development was when all the teachers got their own laptop. New challenges appear frequently, and a culture for learning among teachers, and thus a learning organization is important towards the knowledge society. Ability to try and fail in daily work and situations, a little help from another teacher or students, is an essential step in the process of being a personal ICT-user. When asking for advices to enhance teachers' digital competence, better access and personal laptops to every teacher appears as the most important factor. Most of their learning arises from interactions at the workplace: *I am learning through my colleagues. Everyday I am learning something new,* and *Internal courses. Lectured by teachers in our school or another school. There is much to learn by visiting other schools.*

Our interviewed teachers find it really difficult to give general proposals. But it attracts attention that no one of our informants says explicit that the universities and other teacher training institutions are important for their knowledge building. Billett [10] identified three key contributors to the learning of individuals through everyday work activities: 1) engagement in everyday work tasks, 2) direct guidance from coworkers, and 3) indirect guidance provided by the workplace itself and others in the workplace.

Another study [11] of how teachers learn refers that learning in interaction was reported most frequently, followed by learning by doing.

In upper secondary schools, each subject needs their own courses and ICT seem to be more and more included in assessments, curriculum and learning materials. The explicit ICT-discussion is diminishing. This results in more focus on subjects and ICT is expected to be a part of the pedagogic and didactic in the initial teacher training.

5. Conclusion

ICT and digital literacy have been, and still are, diffuse concepts for many teachers. There have been plans but these plans were not clear enough to define how ICT shall be used in teaching and learning. The new Knowledge Promotion sets a new standard and defines digital literacy as a fifth basic competence. MER aims to be among the best in the world within 2008 when it comes to developing and using ICT in teaching and learning. Our research project indicates that initial teacher education and in-service courses have a work to do if they want to be a part of teachers' knowledge building in pedagogical use of ICT.

Technical skills are the first step to acquire knowledge about ICT. The next step, reflections and appropriation to their own classroom, are contextual and workplace learning is a preferred strategy. New course models must include this perspective. The course model must be related to the context the teacher are working in, the context they want to improve with their increased knowledge. The challenge for the universities is authenticity. Describing learning situations which give motivations and induce lasting skills, knowledge and changes in practice, requires authentic and meaningful learning contexts.

The design of the course models is depending on content and aims for the course. Workplace learning has been increasingly emphasized. It is an uncommon situation for the schools and teachers to demand and define models and content of education. The definition of digital literacy used in the Norwegian Knowledge Promotion is derived from five arguments. These arguments are in short: The aspect of innovation, democracy and participation, culture of media, modernizing of the public sector and at last the aspect of better learning and teaching. Knowledge and understanding of these aspects must be acquired outside of school, through participation in network and the general social society. We suggest that this learning is unintended and occurs informally. Informal learning and the close connection between learning and working make it difficult to distinguish these activities from each other.

The role of the higher education will be to grasp the school context and take part in the reflection processes in the classroom together with teachers.

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