

PROFESSIONAL DEVELOPMENT FOR ICT-BASED TEACHING

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Using information and communications technologies (ICT) in the classroom requires new skills on the part of educators. We have elicited current best practices for professional development of educators from the participants in this workshop, what knowledge teachers need and how it is best imparted. We found that even given their different starting points, teachers in different regions are often feeling unsure about how to use ICT in a pedagogical context, and there is no clear consensus on how to best train teachers in this use, but that the digitalisation of schools will require a long-term commitment from school management and political leadership.

Keywords: Teacher Professional Development, ICT Enhanced Teaching and Learning, Technology in Education and Training

INTRODUCTION

The increased use of information and communications technologies (ICT) in the classroom to support students' learning places new demands on teachers at all levels, from pre-school to graduate school. This in turn increases the expectations on the teachers' abilities to develop their own proficiency of using this technology: internationally, such proficiency is commonly referred to as *digital literacy*, while within the Scandinavian educational context the term *digital competence* is more common (Hanell, 2018; Ilomäki et al., 2016; Krumsvik, 2008). Digital competence refers here to a holistic perspective incorporating proficiency with pedagogical judgement and with the focus on pedagogy and subject matter. In other words, digital competence is knowledge about how digital tools affect our everyday life, and how to use digital tools to support critical thinking, creativity, and innovation.

Teachers are now required to have a working understanding of:

- hardware, in the various forms of computers, mobile phones, and electronic tablets, but possibly also peripherals such as network routers, digital projectors, and printers;
- software, from word processors and drawing programs to specialised educational software, and learning management systems;
- the limitations of computer systems, being able to critically evaluate claims of current and future functionality, the impact of social media on rumors, social unrest, and political events.

For most teachers, having these skills is not a goal in itself, but a prerequisite for developing new learning situations. Many are uncertain of how to best use digital systems for best effect on students' learning or may even be uncertain whether they are helped at all by digital systems. In many cases, there might also be a considerable learning effort required simply to start using

a digital tool, and often enough, the actual use requires some skill and effort. These issues may make such tools less suitable for use in the educational situation by students, but also divert time from the actual teaching effort. The use of technology is also limited by personal factors such as teaching vision and understanding of the technology's influence on teaching (Hylén, 2013). Still, the digital competence of teachers is required and we need to find ways to develop digital skills in teacher education and in-service training to meet the goals regarding digitalisation in the curriculum. These ways should be based on the priorities of teachers, we thus need to elicit information on what knowledge teachers feel they lack and how they would prefer to address this.

Despite governmental expectations of increased digital competence among teachers, there is still much to do to assist teachers with accessing knowledge on what might enhance their practice. The purpose of this workshop was therefore to address teachers' professional development by encouraging the sharing of knowledge among teachers (Ertmer et al., 2012) and to address both local and global settings (Albion et al., 2015).

BACKGROUND AND PREVIOUS RESEARCH

Previous studies show that digital tools, defined as word processors, spreadsheet programs, drawing programs, programming environments, etc., develop creativity, problem solving and critical thinking (Albion et al., 2015). Various aspects of digitization and digital tools have therefore been integrated into the school curriculum in most countries in the Western world. According to the curriculum in for example Sweden, students are to develop an understanding of how digitalisation affects individuals and society, develop the ability to use and understand digital systems and services, relate to media and information in a critical and responsible way, and solve problems and translate ideas into action in a creative way (Skolverket, 2017). Digital tools are already used to varying degrees in primary school education, and there is a great deal of research on learning and digital tools that shows both the educational potential of digital tools (Newhouse, 2017), as well as the new challenges that teachers face when tools are to be integrated into practical teaching situations (European Schoolnet, 2017; Skolverket, 2019). In the STEM subjects, ICT has been reported to enhance engagement, motivation, and learning by stimulating inquiry-based learning, and enhance communication between students and teachers (Newhouse, 2017). In addition, it has been demonstrated that ICT lets students investigate subjects relevant to their lives and control their own learning (European Schoolnet, 2017).

In line with the previous studies, the Erasmus+ project Functional Information and Communication Technology Instruction On the Net (FICTION) investigates how science teachers in primary and secondary schools currently use digital tools in their teaching practice, how they can be supported in their choice of digital tools within their teaching practice, as well as what additional professional training they need in order to be able to use these tools. Further, the project aims to develop guidelines for what type of tools that are most useful within the teaching practice of STEM education and how to best acquire the requisite skills in using these tools. The FICTION project partners come from three countries: Södertörn University and the Ronna school from Sweden, Limerick Institute of Technology and Coláiste Mhuire Co-Ed from

Ireland, and the University of Genoa, Liceo statale Niccolò Machiavelli Firenze, and Pixel from Italy.

Initial results by the Swedish partners have shown that schools have invested in infrastructure and equipment to support ICT and the use of digital tools for teaching. However, there are still obstacles of administrative character such as scheduling, lack of time, insufficient competence development, and lack of choice on what platforms and systems to work with (Josefsson et al., 2019). Swedish public school teachers are required to use digital tools in their teaching, however there is a lack of knowledge among teachers on how to use digital tools that needs to be taken into account when promoting the use of digital tools in teaching (Josefsson et al., 2019). In line with these findings and based on previous research on digitization and digital competence (Albion et al., 2015; Ertmer et al., 2012; Hanell, 2018; Ilomäki et al., 2016; Krumsvik, 2008) the purpose of this workshop was to address teachers' professional development by encouraging the sharing of knowledge among teachers (Ertmer et al., 2012), and to address settings other than the ones involved in the FICTION project. To interpret the participants' statements and reasoning during the workshop we mainly draw on the previous research presented and the initial findings from the FICTION project.

DESIGN OF THE WORKSHOP

The workshop started with a ten-minute presentation of the organisers and the FICTION project by the moderator. The introduction was followed by an outline of the questions to be addressed during the workshop and why these were of interest to discuss.

The participants were divided into three groups and were asked to discuss the following issues during the workshop:

- What is the current approach to teaching digital competence in your region? What are the driving forces?
- What are your personal experiences of using digital tools in schools? What works, what does not?
- What do teachers feel they need in order to perform well?

There was in total seventeen participants, mainly teachers and researchers at university level. As such, the participants were not necessarily directly involved in teaching at a primary or secondary school level, but had an interest in the questions that the workshop concerned. The workshop participants were associated with universities in Australia, Finland, Germany, Japan, South Africa, Spain, and Sweden.

The discussion lasted for one hour and during that time the two attending organisers circulated among the groups and took part and notes in the discussions. Any errors in our notes are fully our responsibility.

RESULTS OF THE WORKSHOP

Our assumption, as noted in the introduction, that there is a strong need for additional training, in particular for in-service teachers, was confirmed by the participants. Not only was training in the technology itself perceived as important, but also time to practice using it and working

out how to best fit it into everyday teaching practices. The benefits for the students have to be the primary focus. Working out all this requires contact with other teachers for exchanging experiences on best practice. The time required to do this should not be underestimated, as it encompasses multiple stages: learning practical ICT skills, understanding the purpose of ICT in teaching and finally changing teaching styles and examination methods to make effective use of ICT. There are large individual variations in attitudes among teachers—it was noted that pre-service teachers tend to be more open to the use of ICT for teaching and might eventually work as catalysts for the introduction of ICT at their respective schools. An important point is that since technology is in constant flux, periodic retraining is necessary. The necessary resources for training and reflection require the long-term commitment of school management and school politicians. It must be understood that digitalisation is a tool for improving teaching, and should not be used as an excuse for cutting down on resources for schools—teachers are still necessary. Indeed, a suggestion was made that future teaching teams may need to be interdisciplinary, with both technology and pedagogy experts.

The discussion made clear that there is a wide variation in access to technology in different regions. Almost all schools in Australia and Sweden were reported to have Internet access, and digital competence written into the national curricula. In contrast, Internet access and resources varies a lot among schools in South Africa depending on socio-economic differences: from well-equipped schools to those with hardly any digital technology. An estimated 60% of South African schools have Internet access. A complication is that while the technology may be present, it is not always available for use: in one school, for example, the computers were locked up in a special room to which most of the teachers did not have access. The result was that the computers were unused and eventually not up to date.

Teacher skills vary from those who are competent in computer use to those “who do not know how to switch on the computer”. A comment was made that many in-service teachers might not even be interested in using computers, not from lack of exposure to them, but from the attitude that computers will not contribute to teaching, something which has been noted in previous research as well (Blackwell et al., 2013; Drossel et al., 2017; Prestridge, 2012; Young, 2016).

In Spain, the main use of digital tools by in-service teachers is indicated to be the use of interactive smartboards for presentations, which does not necessarily imply changing or improving existing teaching practice. Rather, it was reported that many teachers use their smartboards simply as projectors. Making use of the full potential of the smartboard requires designing the learning situation accordingly (Simó et al., 2018). In order to help teachers understand how to organise their teaching around ICT tools, our Spanish participant’s team had formulated guidelines for in-service teachers to increase the use of digital tools, with an emphasis on a deeper understanding of production tools. Summer courses have also been provided to in-service teachers to enhance their digital competence.

The situation in Germany is described as lacking a systematic approach: schools have received money to invest and buy technology, but no instructions for teachers on how to use potential tools. Specifically schools in Southern Germany were described as passive, waiting for others to take the lead and supply ready recipes for digitalisation. There is a feeling that Germany has

fallen behind and lacks infrastructure, maybe only 50% of schools have Internet access. Teachers are uncertain and sometimes fearful of technology. In order to alleviate those fears there have been local efforts at staging "impulse" workshops for teachers (Institut für Qualitätsentwicklung an Schulen Schleswig-Holstein, 2020), showing what can be done with digital tools in the classroom. As the technology becomes more familiar, teachers develop pedagogical creativity.

One of the participants reflected on why some teachers change their teaching practices and integrate ICT, while some do not, and summed up their thoughts on whether it is the teachers' views or the access to technology that drives the change. In the beginning, they stated, "I was thinking exposure was the problem."—if teachers were only given the opportunity to try different ICT tools, they would see new opportunities and integrate the new tools into their teaching. However, today they have changed their mind on the issue and emphasize the importance of teachers' attitudes towards technology. That said, they still do not deny the importance of exposure to ICT tools.

CONCLUSION

The consensus was that (strategic investments in) professional development were considered important in enhancing teachers' digital skills. The workshop participants agreed that this will continue to be important as these technologies will be constantly changing, hence teachers will have to constantly develop their teaching practice to respond to these changes. The participants also agreed that one of the big benefits with this investment was that digitalisation has the potential to empower students to work more effectively, giving them more control over how to learn a subject. This said, it should be taken into account that both Internet access and resources vary a lot among schools. The same applies to the teachers' knowledge and attitudes towards technology integration and the support from school management and school politicians. All these are important components if we aim to use ICT in classrooms to its full potential.

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