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## COMMENTS UPON THE RESEARCH REVIEW DRAFT AND THE RESEARCH DESIGN: STUDENTS' AND TEACHER EDUCATORS' ICT COMPETENCIES

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I have written these comments based on the OECD/CERI documents "*ICT and Initial teacher training - Project description*" and "*ICT and initial teacher training – Research review draft*". My comments are strongly influenced by my work as a teacher educator and by my research experience. I have been working in initial teacher education for last 25 years as a university teacher and as a director of the subject teacher education programme at the University of Helsinki. During my career, I have organised or participated in several ICT strategy and staff development projects. One of my research interests has been the use of ICT in education.

### Comments upon the *project description* and *research review draft*

The project description document, the *OECD Project on the New Millennium Learners* raises several paradoxes based on the research literature considering the use of ICT in education as follows:

- students have rich experiences of use of technology outside of school but do not use technology for learning at school;
- there exists lack of availability of technology in schools no longer, but teachers' (and student teachers') belief about teaching and learning (e.g., the belief about good practice in school) is not supportive to the use of technology in school;
- teachers are amongst the most skilled technology users, but they are unable to take advantage of their competence and to apply it to the way they teach in school.

At least one paradoxical issue could be added to the list. In many countries the national level ICT-strategies, their implementation plan, and national curriculum guidelines for ICT use have been prepared without almost any influence for the use of ICT in education in practice.

The *Project description* and *Research review draft* give a number of reasons based on research literature for the weak use of ICT in education (focusing teacher education) as follows:

- the absence of appropriate incentives for the use technology in the classroom;
- the dominant culture in the teaching profession, which does not rely much on research-based evidence to identify good teaching methodologies and strategies;
- teachers lack of the vision and the personal experience of what a technology-enhanced instruction could be;
- teachers' attitudes towards technology and resistance to change;
- during teacher education, focus is typically placed on the student teachers' own information needs and not for guiding school students in ICT use

The *Research review draft* analyses research articles in three areas which are important regarding implementing of ICT in teacher education. Analysis done in these areas is used at the end when the authors describe general points regarding the implementation of the ICT use in initial teacher education: The three areas are:

- Student teachers' competence in using computers and their attitudes towards using them – both for personal use and instructional uses.
- Faculty members' use of technology in their teaching and how theoretical knowledge is discussed.
- Student teachers' field experiences during teacher education, mentors as role models, and the their' own possibilities to practice.

In general, the review of the research literature was done with holistic and in-depth perspective. The authors of the *Research review draft* have found appropriate references and they have made their review

with careful structure. A good example is the idea to have a look for the use of ICT in the student teachers' own learning and the use of ICT in teaching practice. Their important conclusion based on review, presented in the *Project description* document, is: "in most OECD countries teacher training institutions are not doing well at providing student teachers, not only with the vision, but, what is even more important, the required hands-on experience of learning with technology".

However, a framework, presented in the chapter "A theoretical framework", at page 10 is probably not an appropriate framework for the research project. More links to research on teacher knowledge and teacher education programmes, and to research on the adoption of innovations might be required for organising the output of review of research literature and for development of research design and instruments. In such frameworks, it might be easier to describe reasons why teacher training institutions are not performing well in providing ICT competence for student teachers. Moreover, a separate review on the pedagogy of ICT use in education or more specifically in teacher education might be also useful. I will figure out some advantageous to these broad perspectives from the point of view of the output of review of research literature.

### *Pedagogy and ICT use in education*

According to the *Research review draft*, many teacher educators, mentors, school teachers and student teachers have been examined not to use ICT in education in a versatile way. ICT can not be simply implanted to teaching and learning activities, because the goals for learning activities will probably change when ICT is used in education. Consequently, it can not be assumed that the use of ICT could enhance every types of education. Therefore, another short review on learning with ICT might be useful. For example, according to the book "How People learn: Brain, Mind, Experience, and School" (Bransford, Brown & Cocking, 2000) meaningful learning engages students in tackling the topic to be learnt in such a way that they create meaningful and understandable knowledge structures on the basis of goals of learning. Therefore, the *Research review draft* could include a review in learning with a focus on ICT use. Use of ICT in learning could emphasise activity, intention, contextualization, construction, collaboration, interaction, reflection, and transfer. This review could also give a clear structure for developing the questionnaires and interviews.

For example, by employing the Internet in a learning activity, students could have access to meaningful information on the topic. When looking up information in varied sources, students at the same time actively structure the flow of information they encounter into meaningful entities in order to be able to complete tasks. Similarly, this exploration of information in varied sources forces students to evaluate the reliability of both the information and the sources they use.

### *Research on teacher knowledge and teacher education programmes*

Several suggestions, e.g., how ICT competence among teacher educators, mentors and student teachers is developed, could be given based on the *Research review draft*. Traditionally, it has been discussed about adding of technology onto or integration of technology into teacher education programmes. Another view could be a total change in teaching style or change in access to information. Regardless of how use of the ICT approaches to education, it is useful to have a look for different views on teacher knowledge and teacher education programmes when it is discussed how the use of ICT in education could be increased in teacher education.

Discussion on structural models of teacher knowledge, like pedagogical content knowledge, has been at the focus of research on teacher education for a number of years (e.g. Shulman 1986 & 1987; Carlsen, 1999; Hashweh, 2005). Although the cognitions of teachers, such as the ability to make pedagogical decisions, like decisions on use of ICT use, have not been not addressed enough in the structural models, the structural model is of use for designing teacher education programmes and for clarifying the knowledge base for the teaching profession. Because of this structural model tradition, it is difficult to discuss about the use of ICT in education and about the decisions needed before the use of it. Another example of areas which are not emphasised in the original knowledge categories introduced by Shulman (1986, 1987) are the basic academic competences, such as research skills. However, in teacher education programmes at least the viewpoint of the consumer of educational research should be emphasised. As a consumer of educational research the teacher students could analyse themselves advantageous of the ICT use in education. Consequently, some comments about the structure of teacher knowledge and current teacher education programmes which support building this knowledge should be written in the *Research review draft*.

Another perspective to teacher knowledge could be found through the analysis of the epistemological features of teacher knowledge (Hiebert et al., 2002). In this perspective, teacher knowledge is connected to the dilemma of 'way of knowing'. The concepts of practical and professional knowledge as the ends of the continuum describing teacher knowledge could be used. The *Research review draft* emphasises learning of ICT use from teaching practice. However, the analysis of optimal combination of practical and professional knowledge could offer more solid background for analysis of learning of ICT competence within teacher education.

#### *Research on adoption of innovations*

The *Research review draft* makes it clear that there have been difficulties of helping student teachers to become familiar with the versatile use of ICT in education, and moreover, of guiding them to use ICT in education during their teaching practice. One important reason for this situation is because of the current practices in teacher education institutes. Different approaches have been suggested helping teacher educators and teacher education institutes to change current habits and to adopt new versatile ways of use ICT in education: by educational policy, curriculum/teacher education programme design, staff development and the development of pedagogical study materials, any of which would emphasise the adoption ICT use in education. Consequently, there are two critical concepts, "an innovation" and "an adaptation of innovation", which are important when we discuss about current situation of the use of ICT in teacher education and possibilities to help teacher education institutes to increase the use of ICT in teacher education. In the following, I will present some definitions and possibilities to organise the factors which could have an effect on adaptation of versatile use of ICT in teacher education.

Rogers (2003) defines 'adoption' as an individual's mental process through which he or she passes from the first hearing about an innovation to final adoption or rejection. Teacher educators and students who are adopting the innovation can be categorized into five adopter categories: innovators, early adopters, early majority, late majority, and laggards. Rogers analyses also in his book the process of adoption. According to Rogers, the adoption process can be divided into five stages: awareness, interest, evaluation, trial, and adoption. Based on Roger's book two ideas could be discussed. Firstly, it might be possible to define the level of ICT competence (adopter categories) of teacher educators and student teachers (see later an example of an item). There are not two types of adopters: users and non-users. Secondly, it might be useful to define an adoption process of student teachers in the case of versatile ICT use in education.

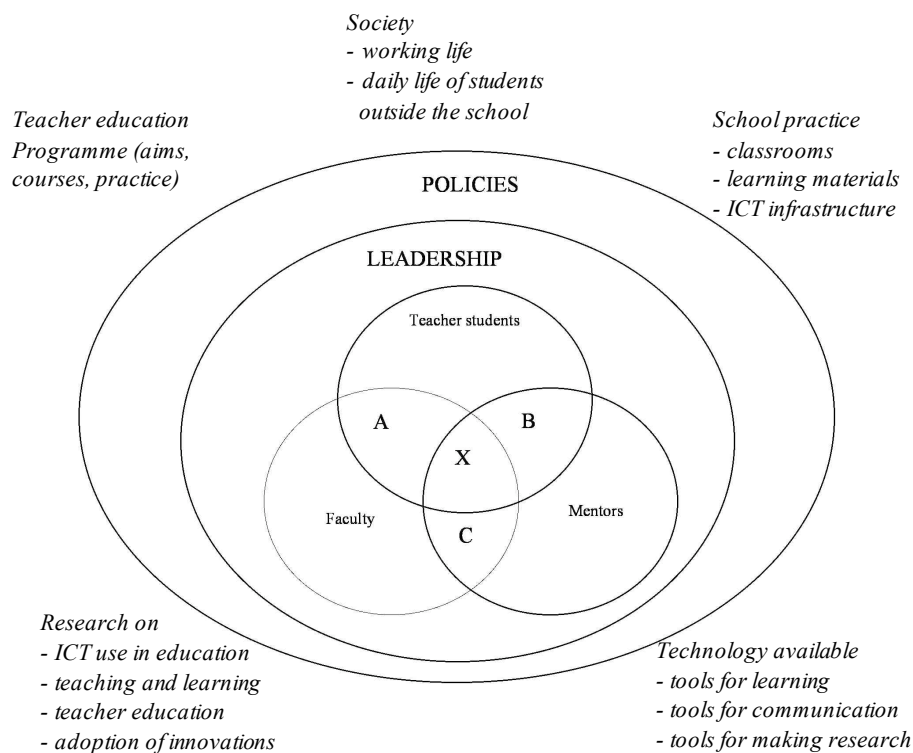
Fullan (2007) categorised the properties of educational innovations that affect their adoption/acceptance into three classes. Firstly, there are the properties of the innovation; in this case, the properties of the 'ICT use in teacher education' itself (different uses of both hardware and software, and the usability of ICT, etc.). Use of ICT could be categorized, for example, into tool applications and ICT in teaching and learning (learning through ICT). ODL solutions or web based teaching, for example, course management systems belongs to previous ones. Second category is local (teacher education institute) characteristics. These include the teacher educators', mentors' and student teachers' pedagogical orientation and beliefs about the use of educational technology, the availability of ICT tools, the administrative leadership and support available to teacher educators. In addition, teacher educators' mentors' and student teachers' prior ICT knowledge and skills could have effects on the adoption of ICT use in teacher education. Thirdly, the external factors like a national ICT strategy and other different strategies could have an effect on the adoption of the innovation. National level curriculum and school textbooks and other support materials available to schools and teacher education have certainly influence on the adoption of ICT in education. The influence of textbooks to ICT use in a classroom was not discussed in the *Research review draft*. It is known that it is hard for a teacher or a student teacher to create own learning material. Finally, different kinds of networking like co-operation between institutes, other departments and universities, may foster the integration of ICT into teacher education as well as with working life in general. Based on the ideas of Fullan, one new perspective to discussion in *Research review draft* document could be obtained. Issues which support and prevent the versatile use of ICT in teacher education could be discussed in the framework of properties of educational innovations.

The properties of versatile use of ICT in teacher education that could affect its acceptance or adoption could be discussed, for example, in four groups:

- Properties of innovation: categories of the ICT use in teacher education; pedagogy used with the ICT use; complexity of the ICT use, newness, research based knowledge about use of the ICT in education; ...
- Local characteristics: beliefs and competencies of teacher educators, mentors and student teachers, head of the department/dean/headmaster; characteristics of classrooms and ICT infrastructure, allocation of *local money* to adoption; use of textbooks, local projects/ action research; ...
- External factors: the national strategy/education policy and allocation of *national money*; staff development and training available; learning materials available; ...
- Networking: inside institute, between institute and schools, between institutes, between teacher educators, mentors and experts/researchers, nationally, internationally, ...

The short analysis I have done above could guide the planning of the questionnaire and interviews. For example, something could be asked about the principles behind the teacher education programme or principles behind the national curriculum from the point of view of the use of ICT in education. The characteristics of learning materials and textbooks from the point of view of the use of ICT in education might be interesting.

Figure 1 “Different actors at different levels as they are presented in the articles reviewed” could be completed and other external factors could be added to the figure.



**Figure 1** – Actors of ICT use in multiple levels.

### Comments upon the research design and instruments

The aim of the research is to investigate the actual use of technology during initial teacher education in OECD countries. The main aim could be broader. The researchers should be interested also in examining the quality of instruction – not only about quantity of the ICT use in education.

According to the research plan, the first aim is to provide a detailed picture of how technology is used during initial teacher education in a comparative perspective. The aim pays particular attention not only to best practices but also to the reasons that can eventually explain why the current use of technology is so extraordinary. It is obvious that there are several reasons for the low use of technology. One of the reasons is attributed to ICT itself. However, broader framework for the analysis of reasons is needed. I have suggested above three additional frameworks: 1) teacher knowledge and teacher education programme, 2) the adoption of educational innovations, and 3) pedagogy used with ICT. What asked in the questionnaires or during the interviews needs to consider this framework.

The second specific aim is to analyse the views of the main stakeholders who plan the use of technology in initial teacher training as well as their expectations on the teachers in school. This is a relevant aim. Results could be analysed in an appropriate framework.

The third specific aim is to suggest a number of policy recommendations both for teacher training institutions and governments in this domain. This is an important output of the research.

After agreeing the aims and framework for analysis, some modifications need to be made also to specific research questions. For example, it might be useful to know in detail the role of different categories to adoption of versatile use of ICT in teacher education. In other words, it might be useful to know more about constrains and needs that the teacher educators have when they adopt ICT in teacher education as well as more about competences of teacher educators, mentors and student teachers.

The research methodology developed in the research is appropriate. The research project will include research review, surveys to representative samples (teacher educators, mentors, and student teachers) in teacher training institutions over each OECD country. Moreover, two teacher training institutions in each country will be selected from the criteria 'best practice' and 'regular practice'. I suggest examples of questions which could be included to the surveys.

In order for evaluating all three categories which have influence to adoption of ICT use in education, the following questions could be required:

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How would you describe access to ICT tools (computers and other equipment) for education?

- not at all available (ICT tools are in other classrooms or they are used by other teachers)
- moderately available (If ICT tools are reserved in good time beforehand some ICT tools can be used in science education)
- easily available (If ICT tools are reserved they can be used in science education)
- very easily available (there are enough ICT tools to hand for science education)

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Can you please make a self-evaluation of your own ICT competence.

- 'helpless' (I cannot use ICT at all)
- weak (I can use word processing, Internet browser and e-mail minimally tolerably for personal use)
- good (I can use word processing, presentation graphics, e-mail and an Internet browser satisfactorily for personal use and for education)
- excellent (I can use the previous tools well, make web-pages, can use learning management systems and also know the pedagogical principles of using ICT)

Previous two items are examples. It would be dangerous to decide an individual characteristic only by one item.

For evaluating teachers' and student teachers' views on pedagogy following questions could be asked in surveys or during interviews:

Please indicate your views about each of these statements. (By ICT we mean any and all computer-based technologies.)

	Strongly agree		Strongly disagree	
1. ICT can have a positive effect on learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. The positive effect of ICT on learning is overestimated.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. More ICT resources in schools will result in better learning.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I don't have time to make use of ICT resources in my teaching.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I have skills to make good use of ICT in my teaching.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. ICT has radically changed the way I teach.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. ICT makes learning more contextual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. ICT can increase collaboration (co-operation) between students.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. ICT makes learning more goal-oriented	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. ICT makes learning more constructive (students are actively taking part to the learning process)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. ICT makes learning more situated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. ICT makes learning more active (students are active in planning and learning)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. ICT disturbs the learning process	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. ICT helps students in their self evaluation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
etc...				

Finally, teachers' needs could be clarified by asking their needs and constrains. For example, the responders could be asked their priority for ICT training.