ICT skills and preferences of students in bachelor teacher education

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Summary

The purpose of this paper is on one hand to map the ICT familiarity and experience of BA students regarding web 1.0, web 2.0 technologies; on the other hand to gather information about their expectations regarding ICT equipment and web 2.0 applications in teacher education.
In the study over 200 undergraduate students were involved. The instrument of the study was an 80-item-ICT questionnaire. Results show that computers, projectors and overhead projectors are still the most frequently used tools by secondary and higher education teachers. Digital camera, electronic voting system, tablet PC and UMPC belong to the most infrequently applied tools. However, students are everyday users of web 2.0 applications and do not have any experience with them at school. Results show how important and determinative role teachers have in shaping future teachers' attitude, plans and practice even in the field of ICT.

Keywords: teacher training, ICT, web 2.0 applications

Information and communication technologies (ICTs) have brought about rapid changes in today's society. Within the last few years, these tools and applications have fundamentally changed the way people live and communicate. ICTs have changed the nature of work and the types of skills needed in most fields and professions (UNESCO, 2002); therefore, in the 21st century new skills are substantial and these new skills must be taught at school.

The new generation, so called the Net Generation is entering a world that is changing in every field as quickly as never before in history. Their attitudes and expectations significantly differ from the attitudes and expectations of previous generations (Molnar, 2008). In the 21st century it is commonly held that there is a generation gap between the Generation of the 20th century and the Net Generation. The

most differentiating factors are the attitudes towards the Internet (Oblinger and Oblinger, 2005) and their lifestyle (multitasking), which influence their expectations regarding education as well. The Net Generation familiarity with technology and team orientation opens up new opportunities for education (Oblinger and Oblinger, 2005). These differences put new demands on education (Dolence and Norris, 1995), the status of which is changing in the 'knowledge-based' society.

The 'knowledge-based' society requires coping with a huge mass of information and finding and selecting the information relevant to us. To do this effectively the education system needs well trained teachers who have expertise in the field of information technology (Molnar, 2008), who can effectively gain access to knowledge and information, who can teach all of this effectively, and who are involved in the new teaching methods as well.

Thomas Kuhn (1962) argued that the typical developmental pattern of a mature science is the successive transition from one paradigm to another through a process of revolution. Revolutions in science come when the old theories and methods cannot solve new problems and when "a scientist's world is qualitatively transformed [and] quantitatively enriched by fundamental novelties of either fact or theory". He calls these changes in theory and methods a "paradigm shift". In the beginning of the 21st century we are witnessing the evolution of such a paradigm shift. The significant differences between the generations of the 20th century and the Net Generation in the 21st century put such new demands on education that cannot be solved with traditional methods (Dolence and Norris, 1995). Indeed, there is a need for a new kind of school (UNESCO, 2005).

There is no longer doubt that multimedia application design offers new insights into the learning process, gives possibilities to represent information and knowledge in a new and innovative way (Molnar, 2007) and have the potential to transform education. The new ICT tools, web-

based applications provide new opportunities to improve the quality of education and the quality of educational practice. Education systems are under increasing pressure to use ICT to teach students the knowledge and skills they need in the 21st century (UNESCO, 2002). Teacher education institutions must be the catalyst, must take the leading role and must be the key base for transforming and enhancing the teaching-learning process through ICT-enabled teacher education programmes.

Nevertheless, this is not just a recent problem; 10 years ago in the 1998 UNESCO World Education Report (Teachers and Teaching in a Changing World) it was already claimed that "new information and communication technologies have radical implications for conventional teaching and learning". According to UNESCO (2002) „to effectively harness the power of the new information and communication technologies (ICTs) to improve learning, the following essential conditions must be met:
− Students and teachers must have sufficient access to digital technologies and the Internet in their classrooms, schools, and teacher education institutions.
− High quality, meaningful, and culturally responsive digital content must be made available for teachers and learners.
− Teachers must have the knowledge and skills to use the new digital tools and resources to help all students achieve high academic standards."

The first step towards the realization of the above conditions is gathering information about the present status of ICT in teacher education and the experiences and expectations of students in teacher training. However, making courses accessible to students with software and hardware applications in focus, which must be the main focus of teacher education, does not mean that they can implement the acquired knowledge and use it effectively in the classroom later on as teachers. Furthermore, there is additional support, follow-on training, in-service upgrading, updating and renewal of knowledge, skills and capabilities

as high priority needs that have to be met (UNESCO and OECD, 2001).

Objectives

The present study intends to investigate the actual use of technology in initial teacher training in Hungary, at the University of Szeged with the aims of:
− Mapping the experience of BA students with ICT tools, mainly focusing on web 1.0, web 2.0 technologies.
− Providing a detailed picture of how technology (e.g. whiteboards, mobile devices, personal computers and different kinds of software) is used in initial teacher training, from a comparative perspective, paying particular attention to the reasons that can eventually explain why the use of technology is low in teacher training institutions and related to this in regular classrooms.
− Getting information about the different ways of using technology (e.g. own planning, presentations, communication) to enhance learning.
− Gathering information about students' expectations regarding ICT equipment and web 2.0 applications in teacher education for the future.
The long term goal of the project is to improve teacher training activities in ICT using the information gathered in this survey.

Methods

Participants

The sample for the study (N=203) was drawn from BA students of the University of Szeged, who are interested in educational sciences. Most of them take part in the pre-teacher training program of the Institute of Education. They study at four different faculties of the University: Faculty of Arts, Faculty of Natural Sciences and Informatics, Faculty

of Teacher Training College and the Academy of Music. 86.4 percent of the students attend one, the remainder attend two faculties. The proportion of correspondence students in the sample is 37.8 percent and the proportion of males is 32.2 percent. 66.2 percent of the students attended secondary grammar school and 73.2 percent of the students plan and want to teach after graduating from the university.

Instrument and procedure

The experience, habits and preferences of BA students regarding ICT tools was measured with a paper-pencil questionnaire. The 80-item-ICT questionnaire contained questions on one hand on students' background (e.g. gender, type of secondary school, computer and internet experience); on the other hand it concentrated on (1) familiarity with web 1.0 and web 2.0 applications (2) level of students' ICT skills (3) how frequently their teachers in secondary and higher education applied older or newer ICT tools (overhead projector, interactive white board, tablet PC, electronic voting system, etc.) (4) student's preferences on learning the usage of different ICT tools during the teacher training program (5) preferences of learning web-based applications in teacher training. Most of the questions used a four-point Likert response scale. Data collection took part in December 2008 and January 2009.

Results

Reliability

The first test-level characteristic that is of importance is test reliability. Cronbach's alpha was used for analyzing the reliability of the questionnaire. The reliability index of the ICT questionnaire in the three main areas (level of students' ICT skills; experiences with ICT-tools and finally preferences and expectations regarding teacher training in this field) is .83, .81 and .89, respectively (see Table 1).

[Take in Tables 1 about here]

Student's familiarity with web applications and level of ICT skills

Students in the sample are skilled PC and Internet users. 97.0 percent of the students have used PC for more than three years and 95.5 percent of them surf on the internet minimum three or four times a week.

We made aggregate indices from the primary data with factor analysis, which are needed to explore the correlation between the ICT activities included in the questionnaire. The variable system is suitable to perform a factor analysis (KMO=.77), the variance is explained by the model in 61.58 percent. According to the results the different ICT skills are divided into six factors (see Table 2), which significantly differ from each other.

(1) Low-level or basic ICT skills (e-mail writing and reading; word processing). Students need to use these skills during their study almost every day or several times a week and they use these ICT skills in their private life quite often as well. They can perform these operations on their own, without any help.

(2) Medium-level ICT skills (preparing presentations; making charts and diagrams; working with excel). Probably, these ICT skills are superfluous in students' private life; they need these skills for their studies or only for special courses. Therefore they are not as skilled in this field (t=11.94, p<.05) as students with low-level ICT skills. According to the answers some of the students can solve these kinds of tasks only with help.

(3) High-level ICT skills (making media materials such as: film and/or music, picture, digital curriculum, web-pages). All of these high-level ICT skills must be considered as basic skills in future teacher training. These skills are inevitable to prepare multimedia projects for education.

(4) Web 1.0 application (Information searching on the Internet; Downloading files). This read only internet usage is relatively common among students. According to the results almost every student can perform these operations on their own. However, there are significant differences ($M_1=1.04$, $M_2=2.15$, $t=19.8$, $p<.05$) in using Web 1.0 and Web 2.0 applications with one single exception. Social sites (e.g. iwiw, facebook) are as often used by students as web 1.0 applications; accordingly students have the same level of experience with this kind of web 2.0 use.

(5) Web 2.0 applications (used rarely). This relatively new kind of internet usage does not form an integral part of an average student' everyday life yet. Students have less experience in most of the web 2.0 applications, e.g. blogging ($M=2.55$, $SD=1.37$), editing wiki pages ($M=2.67$, $SD=1.32$) or using social bookmarking ($M=2.65$, $SD=1.32$; 1=I can perform it on my own; …; 4=I have never tried it).

(6) Web 2.0 applications (used quite often): social sites (see above).

[Take in Tables 2 about here]

We also used the aggregate variables generated from the factor analysis for the sub-sample analyses. However, the responses of first-year (N=25) and third-year-students (N=128) taking part in the teacher training module suggest that BA students' use of new ICT tools does not improve, that is, they do not feel more confident about making use of ICT applications.

The results of the pilot study show that familiarity with ICT tool use is not significant between first and third-year students. However, for instance, first-year students are significantly more confident about designing websites ($M_1=2.2$, $M_3=3.0$, $t=3.93$, $p<.05$) and editing wikis ($M_1=2.2$, $M_3=2.9$, $t=2.65$, $p<.05$).

Other background variables - such as type of secondary school (vocational, grammar school), intention to teach - do not show a significant difference in the ICT familiarity of sub-samples. Regarding gender, a significant difference can only be observed in case of other rarely used web 2.0 applications ($M_{male}=1.91$, SD=.84; $M_{female}=2.26$, SD=.79, t=2.8; p<.05).

Studying students' individual experiences – Use of ICT tools in the classroom

According to students' experiences (see Figure 1) 55.5 percent of the secondary school and higher education teachers use PC, 54.3 percent use a projector and 50.8 percent uses overhead projectors during lessons. However, this does not mean they use it in every lesson. The latest ICT tools, like interactive white board (14.2%), digital camera (4.6%), voting system (3.1%), tablet PC (3.6%) and UMPC (2.6%) have a significantly smaller role at school ($M_1=3.35$, $M_2=1.46$, t=26.6, p<.05).

[Take in Figure 1 about here]

Most of the students are members of the Net Generation. They welcome learning with PC. In contrast with this, their teachers ignore this attitude and they do not use educational softwares and web applications during the lessons (see Table 3). A majority of the surveyed students have never come across with wikis (78.6%), blogs (91.4%), digital register (87.2%), and the materials of Sulinet Digital Knowledge Base (72.3%), and had no experience in the school application of educational softwares available on CD/DVD, or on the Internet (52.8%).

[Take in Tables 3 about here]

Expectations regarding teacher education – the impact of individual experiences on expectations

Students' expectation on teacher education gets a great emphasis in the questionnaire. We identified the ICT tool related activities that future teachers consider useful or unreasonable. According to students, among the activities carried out in the administration (word processing, making diagrams, charts), in the classroom (making presentations) and during the preparation for the lessons (image, video and music editing, editing digital curriculum, making websites), the least essential is image editing (73.8% of them considers it important) and digital video editing (73.3%). The most important is making presentations (90.4%), designing and producing digital curriculum/material (88.2%). The reason for this might be that most of the teachers in higher education use power point slides to make it easier for students to follow their lectures and students only rarely meet digital curriculum/materials/resources. They are aware that it would be important to learn how to use them but most of them do not know that most of the time it requires photo and film editing and these activities are quite inseparable.

Table 4 shows the percentage of students who do not consider it vital to acquire knowledge on the different applications that can be used in teaching. The percentage of students rejecting the importance of the use of online computer games (75.7%) is striking. However, they can be used to develop skills, for example developing eye-hand coordination, or cooperation skills in online environment. Making these games (educational serious gaming) and analyzing the data collected during „playing" requires an efficient cooperation of teachers and ICT experts.

[Take in Tables 4 about here]

Furthermore, a high proportion of students do not consider learning how to write an e-mail or down or upload a file important, which may be attributed to the fact that 99.5% of students can read or send an e-mail on their own, 93.6% of students knows how to download a file and 59.4%

is also confident in uploading a file as well. Learning how to search information is considered essential by 73.6% of students, in spite of the fact that they can do this easily and they are also well aware of the related file operations. Presumably, they expect teacher education programs to familiarize them with curriculum/material and file sharing portals where they can get access to and download relevant materials (e.g. presentations on physics, chemistry experiments, or graphs, pictures complementing the curriculum) that they can resort to in the everyday teaching practice.

In the survey we also included questions aiming at the exploration of the willingness of students to learn how to use modern and old teaching tools. The theoretical model applied in the questionnaire is as follows: students would like to get acquainted with the application of new ICT tools but they do not consider it reasonable to learn about the use of older projection tools (slide-projector, overhead projector). If we compare this model with the structure gained with factor analysis on the basis of the questionnaire data, we can claim that the theoretical model is only partly completed.

Conducting factor analysis was reasonable because the KMO index is .83, and the covariance explained by the model is 74.76%. The factor analysis yielded three factors: the factor of devices used in everyday in most households (PC, TV, CD/DVD, tape recorder, digital camera), the factor of old projection tools (overhead projector, slide-projector) and the factor of modern devices like projector, voting systems, interactive whiteboard, Tablet and UM PC).

The impact of individual experiences is shown by the fact that mostly students who did not have any experience with educational blogs (58.3%), wikis (36.6%), or digital register (16.9%) during classes do not consider it important to learn how to use these tools. Therefore, it is the task of teacher education to familiarize future teachers with the

use, application and potentials of these innovative tools in the everyday teaching process.

As a conclusion, the results show that the undergraduate students are confident in using the World Wide Web and softwares requiring basic ICT skills. But the usage of middle or high-level ICT skills and web 2.0 applications should be developed in the teacher training program.

On the basis of student's experience, computers, projectors and overhead projectors are the most frequently used tools by secondary and higher education teachers. Digital camera, electronic voting system, tablet PC and UMPC belong to the most infrequently applied tools; students in the sample haven't had any experience with many web 2.0 applications, educational softwares in the form of CD/DVD or on the Internet during the school lessons either.

These individual experiences affect students' motivation and preferences as to what they are interested in the teacher education program. Most of the students do not set store by educational gaming or picture designing. Students whose teacher did not use modern web applications or softwares for educational purposes (e.g. weblogs, wikis, or digital school register) do not want to learn about them either.

Consequently teachers play a decisive role in shaping future teachers' attitude, plans and practice even in the field of ICT. To change the prevailing educational practice into a successful teaching-learning process, the teaching program has to teach the use of these tools.

Acknowledgments

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Table 1. Reliability index (Cronbach-α) of the questionnaire

Component	Cronbach-α	Item number
Level of students ICT skills	.83	18
Experiences with ICT tools	.81	18
Preferences and expectations regarding teacher training in this field	.89	34

Table 2. Results of the factor analysis: different components of ICT skills

Operations	Component					
	1	2	3	4	5	6
Low-level ICT skills						
E-mail writing and reading	.17	-.12	.01	-.13	**.78**	-.08
Word processing	-.12	.33	.10	.27	**.61**	.36
Middle-level ICT skills						
Making presentations	.14	.05	**.74**	.08	-.24	.15
Making diagrams, charts	.11	.18	**.78**	-.04	.17	-.13
Working with excel	.04	.35	**.55**	.16	.29	.00
High-level ICT skills						
Editing digital videos and/or music	.43	**.64**	.18	-.01	-.11	-.17
Editing images	.03	**.72**	.02	.27	.17	.02
Constructing Digital curriculum	.28	**.63**	.23	-.06	-.16	.10
Creating web pages	.35	**.57**	.21	-.23	.06	.11
Web 1.0 applications						
Information searching on the Internet	-.05	-.11	.10	**.73**	.06	.24
Download files	.25	.23	.03	**.72**	-.10	-.24
Web 2.0 (high-level) applications						
Upload files	**.71**	.09	-.07	.21	-.07	.11
Using on-line games	**.65**	.00	.25	.12	.19	.07
Blogging	**.60**	.21	.26	-.24	-.06	.32
Editing Wiki pages	**.75**	.28	-.03	-.04	.03	-.02
Using web mapping application	**.46**	.11	.31	.12	.31	-.37
Social bookmarking	**.55**	.31	.16	-.04	.07	.10
Web 2.0 (basic) applications						
Using social networking sites	.30	.06	.01	.07	.03	**.76**

Table 3. Frequency of web application and software usage in the classroom (1 for never; 2 for once a year; 3 for once every half year; 4 for some times a month; 5 for in almost every lesson)

Item	Mean	SD
Educational software	1.95	1.20
Sulinet Digital Knowledge Base	1.44	.83
Blogs	1.16	.62
Wikis	1.41	.93
Digital register	1.20	.64
Curriculum sharing sites	1.72	1.14

Table 4. Students expectations regarding teacher education

| Type of application | Item | It is not important to learn | | Sum (%) |
		Student knows it (%)	Student does not know it (%)	
Web 1.0	E-mailing	52.04	.51	52.55
	Information searching on the Internet	25.91	.52	26.43
	Download files	38.14	1.03	39.17
Web 2.0	Upload files	39.27	5.76	45.03
	Using on-line games	57.14	18.52	75.66
	Blogging	37.37	18.95	56.32
	Editing Wiki pages	24.47	7.45	31.92
	Online map applications	26.80	6.19	32.99
	Social bookmarking	22.88	14.58	36.46
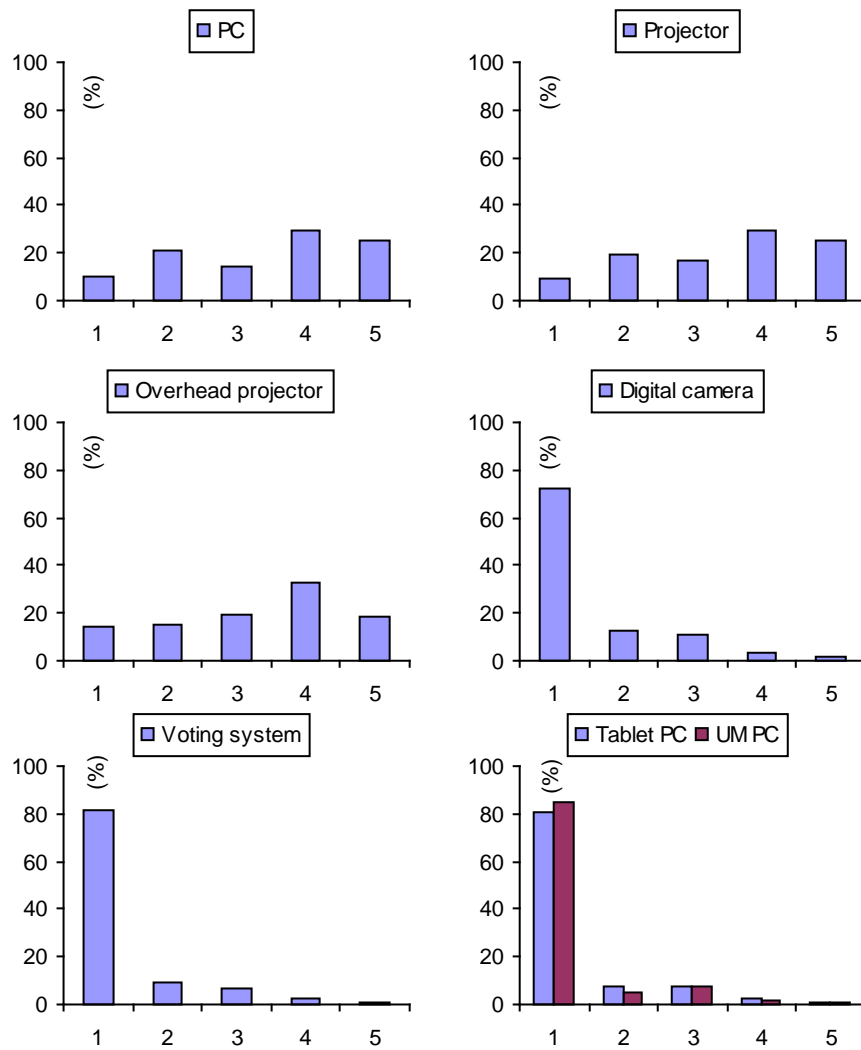
Figure 1. Usage frequency of different ICT tools at school
(1 for never, 2 for once a year, 3 for once a semester, 4 for
some times a month and 5 for in almost every lesson)