Teacher Training on ICT Application in Education: Situation Analysis and Proposals for Improvement

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The article is aimed to analyse the existing study programmes on the teachers ICT competencies in Lithuanian Universities and Colleges, the future teachers' self-evaluation of their educational ICT competencies, to compare these results with the requirements of the course on the teachers' educational ICT literacy based on the existing Lithuanian requirements for teachers' educational ICT literacy programmes. The article is based on the data of the research report "Teachers Training on ICT Application in Education" booked by the Centre for Information Technologies in Education. The research is representative. The conclusions and recommendations of the research are proposed to implement while planning and implementing all level studies and teachers' in-service training programmes as well as teachers' certification. The main aim of the paper is to present and summarise the research conclusions and recommendations.

Methodology of the Research

The problems of the teachers' educational ICT competence as well as the content and teaching and assessment methods of the teacher training programmes are very relevant to education worldwide. In order to analyse these problems in Lithuania the Centre for Information Technologies in Education under the Ministry of Education and Science of Lithuania has booked the scientific research "Teachers Training on ICT Application in Education" which was performed by the research scientists of Institute Mathematics and Informatics (IMI) in September – December 2008. While performing this research, the IMI scientists have prepared the research report (Pedagogų…, 2008) where they have provided the summarised data and valid scientific conclusions. Before presenting the research results let, us outline the research methodology.

The following main scientific research methods were used by the IMI scientists while performing the research: (1) processing of the origins, data analysis (incl. the analysis of ICT-related study programmes in Lithuanian Universities and Colleges), generalisation of the main propositions; (2) a written questionnaire-based survey of educational speciality students in Lithuanian Universities and Colleges. The research methodology consists of the closed and half-closed questions; (3) statistical analysis of the data using SPSS 12 (*Statistical Package for Social Sciences)* software package; (4) insight – formulation of conclusions and recommendations based on the qualitative data analysis.

The structure of research attributes in the questionnaire to measure the teacher's ICT competency was as follows: (1) socio-demographic questions – 5; (2) ICT literacy (technological, informational, social) – 27; (3) the content of the teachers training programmes: learning objects (LO) and virtual learning environments (VLE) application issues – 23–28; (4) ICT application competency teaching and assessment methods – 26; (5) the direct conformity of ICT competencies with the skills indicated in the approved requirements for teachers computer literacy programmes – 16; (6) integral educational ICT competency (pedagogical and managerial) – 34. The total number of the analysed attributes and questions is 131–136. 16 Lithuanian higher education institutions were selected for the research. All these institutions have been training students of the pedagogical study trend (bachelor and master degree, and special pedagogical studies). 648 last year education trend students have been examined during the research. The number of the examined students has been chosen pro rata to the number of the students of the pedagogical trend studies in the higher schools. The research sample is purposive, stochastic and criteria-based. The respondents (students) had to fill in the comprehensive questionnaire consisting of 23 questions where they have been asked to choose one or several versions of the answers proposed by the researchers.

General Data

Socio-Demographic Survey Data

84% of women and 16% of men have participated in the research. In conformity with the survey results 49% of the respondents plan to work as teachers at schools, 23% do not plan, and 27% have not decided yet. 81% of the respondents have a laptop or desktop computer at home. The majority of the respondents have not heard or are not sure whether they have heard about the approved requirements for the teachers computer literacy programmes (Reikalavimai..., 2007). Only 31% of the respondents have heard about these requirements.

The Existing Study Programmes on the Teachers ICT Competencies

190 University and 39 College pedagogical study programmes were analysed during the research. Usually only 2 or 3 credits are scheduled for ICT-based learning (excl. Informatics study programmes). This is an obviously insufficient number. Almost all the programmes are similar to the other (non-pedagogical) speciality students, i.e., the students are trained the general skills how to use computer and application software. Only a few of the study programmes have been prepared the courses, especially for ICT application in education considering the topic particularity, didactical attitudes, teaching methods and methodology. The majority of the study programmes are quite obsolete and not renewable.

The Level of Students' Essential Technologic ICT Literacy

In accordance with the requirements (Reikalavimai..., 2007) before running the course on ICT application in the education programme, the pedagogues have to run the course on ICT literacy essentials.

In accordance with the research results, the future pedagogues have mastered different parts of the course on ICT essentials knowledge and skills in a different way. The results are as follows: (1) the respondents are skilled in the general ICT notions (90%), ICT in everyday life (76%) and computer networks (74%) notions. The worst indicator refers to the authors' (intellectual property) rights notions – 43% only; (2) the respondents are quite skilled in the working environment (90%), file processing (87%), desktop (85%) and printing (82%). The worst indicator refers to the knowledge about the viruses – 66%; (3) the best indicators deal with the general activities (92%) and text processing (84%); as well as (4) the internet (90%), communication (88%) and e-mail (86%) knowledge and skills.

Requirements and the Course on the Teachers' Educational ICT Literacy

In accordance with the approved requirements (Reikalavimai…, 2007), an ICT literate teacher, while participating in the teaching and learning process and using modern technologies should know and be able to:

(1) creatively individualise their subject's teaching and learning content;

(2) purposefully use ICT tools;

(3) systematically and reasonably apply teaching and learning methods.

An ICT literate teacher while organising ICT application should know and be able to:

(4) plan the use of these technologies;

(5) organise the technologic resource management in the teaching and learning process;

(6) evaluate and reflect on topics regarding the use of ICT.

The teachers' educational ICT competency should have 3-level assessment: (1) the teachers know ICT tools and are able to use them in order to enrich the traditional educational process – level I; (2) the teachers purposefully plan, organise and evaluate their own activities while applying ICT, improving the educational process by purposefully using ICT, pay much attention to computer networks and a constructivist learning paradigm (integrated learning, project-based learning, collaborative learning) – level II; (3) he teachers help their colleagues and actively participate in dissemination of the experience on ICT application in education at their schools, towns, regions and country – level III. In order to approve the teachers' educational ICT competence, the teachers are proposed to prepare their own electronic portfolio (e-portfolio) where they should collect the activities documents confirming ICT application experience.

To train these competencies, a special distance learning course has been prepared for Lithuanian teachers by the researchers of the IMI in 2007. This course consists of three main components: (1) the content (themes); (2) learning activities (teaching, learning and assessment methods); (3) competences (goals).

The following section is aimed to analyse the survey respondents' opinion on the implementation of these three main components in the teachers' educational ICT competency development programmes in their Universities and Colleges.

Teachers Training for ICT Programs Content, Methodology and Competences

Content of the Programmes

In the authors' opinion, the main parts of the teachers educational ICT competency development programmes should be the topics on the e-learning content and services systems and their components (i.e., learning objects – LOs, their repositories and virtual learning environments – VLEs) application in the teaching and learning process (Dagiene and Kurilovas, 2008; Dagiene and Kurilovas, 2007; Kurilovas and Dagiene, 2008; Kurilovas and Kubilinskiene, 2008; Kurilovas, 2007).

While analysing the completed survey questionnaires, the authors have estimated that the respondents (future teachers) have not obtained enough knowledge on: (1) what the LOs, repositories and VLEs are; (2) what the main educational ICT tools are; (3) what Web 2.0 (or 'Semantic Web' – weblogs, wiki, e-portfolio, etc.) technologies are.

The majority of the higher education schools have introduced ICT modules in their study programmes, but, in the authors opinion, they are too short (usually 2–3 credits only), and their content does not quite correspond the requirements for training of the teachers educational ICT competencies.

These modules pay insufficient attention to LOs, LOs repositories, LOs searching, integration and application in the teaching and learning process. There are also practically no modules on the modern Web 2.0 technologies, which are already wide used abroad and, in many researchers opinion, should change the usual education software packages (such as VLEs) in the nearest future.

The analysis of the completed survey questionnaires shows that the respondents think that the impact of LOs and VLEs on their learning activity is positive (27% think that this impact is very positive and 37% – positive). In the opinion of the most respondents, the usage of LOs and VLEs can significantly increase their skills (36%), knowledge (29%) and motivation (17%).

The majority of the respondents state that the demand to use LOs in their higher school is met only partly. The analysis shows that the reason for this is the lack of methodologies for LOs usage in teaching and learning, there are almost no high quality foreign localised LOs as well as Lithuanian ones, and there is a lack of information on the high quality foreign LOs.

The majority of the respondents think that the main LOs shortages are their insufficient quality, discrepancies with the study programmes and the lack of the convenient internet-based LOs search, comment and assessment system. The survey analysis shows that the respondents would like the following modules to be included into their study programmes: (1) Web 2.0 technologies – weblogs, wikis, e-portfolio etc.; (2) LOs and structured methodical material (learning activities), their search in the repositories.

Teaching, Learning, and Assessment Methods

The researchers have estimated that the following teaching and learning methods are mainly used in Lithuanian higher schools: (1) the word-based methods (67%) *vs* visual-based methods (regarding the source of information); (2) theoretical methods (65%) *vs* practice-based methods (regarding the theory and practice ratio); (3) active learning methods (68%) *vs* passive learning methods (regarding the teacher and students activity relationship); (4) programme-oriented methods (66%) *vs* student-oriented methods (regarding authoritarianism and humanity relationships); (5) creative methods (62 proc.) *vs* reproductive methods (regarding the creativity level of students' activity); (6) abstraction and generalisation (58%) and analysis-based (50%)

learning methods (related to the students' reasoning operation relationships with the logical forms and shapes).

The research results show that the exam (81%) and colloquium (71%) methods for ICT assessing application in education competencies are mainly used in Lithuanian higher schools. The tests (63%) and practical assignment (61%) methods are less used, and the credits (37%) and creative assignment (36%) methods are least used.

Educational ICT Competencies

The researchers have estimated that the majority (59%) of the future teachers have seen the examples of ICT application in teaching and learning during their pedagogical practice. In opinion of 54% of the respondents, their study programmes have paid enough attention to ICT application in teaching and learning, and 58% of respondents think that their essential computer literacy level is enough to work at school.

The researchers have also estimated that 30% of the respondents evaluate their educational ICT competency level very high, 34% – high, 30% – average, 4% – insufficient, and 2% – low.

In the respondents' opinion, they have obtained a high competency level during their study: (1) to creatively individualise their subject's teaching and learning content; (2) to systematically and reasonably apply teaching and learning methods; (3) to evaluate and reflect on topics regarding the use of ICT; (4) to purposefully use ICT tools in the teaching and learning process. They also believe that they have obtained the lowest level of competency: (1) to organise the technologic resource management in the teaching and learning process; and (2) to plan the use of ICT.

The researchers have estimated that the respondents are most able to perform the following jobs after they come to schools: (1) to prepare the presentations containing not only the text, but also multimedia information (77%); (2) to work with the students in the class using their prepared digital lesson plans (68%); (3) to evaluate and reflect using ICT in the teaching

and learning process (57%). It has also been estimated that the respondents are worst able to perform the following jobs after they come to schools: (1) to estimate ICT application shortages and problems, to learn how to avoid these problems and to teach these topics to the colleagues (22%); (2) to manage the class work using Web 2.0 technologies (24%); (3) to help the colleagues to apply ICT in teaching the special needs students (27%).

The respondents believe that the importance rating of ITC application in education competencies for the teachers is as follows: (1) to systematically and reasonably apply teaching and learning methods (80%); (2) to evaluate and reflect on topics regarding the use of ICT (79%); (3) to purposefully use ICT tools in the teaching and learning process (77%); (4) to plan the use of ICT (76%); (5) to creatively individualise their subject's teaching and learning content (75%); (6) to organise the technologic resource management in the teaching and learning process (63%).

The researchers have estimated that the respondents have learned during their study: (1) to creatively individualise their subject's teaching and learning content (56%); (2) to systematically and reasonably apply teaching and learning methods (50%); (3) to evaluate and reflect on topics regarding the use of ICT (50%); (4) to purposefully use ICT tools in the teaching and learning process (50%); (5) to organise the technologic resources management in teaching and learning process (38%); (6) to plan the use of ICT (38%).

The respondents believe that: (1) the level of their knowledge on ICT application in the teaching and learning process is enough to work at school (58%); (2) educational ICT training programmes in their higher schools are of high quality (46%); (3) they know enough about the main ICT application in education methods (44%); (4) they know enough about LOs, their repositories and VLEs (39%); (5) they know enough about the main ICT tools and software (38%); (6) they know well what the Semantic Web technologies are (36%).

Recommendations

Teacher Training Programmes

The researchers recommend the higher schools:
- To introduce additional modules on ICT application in education into the study programmes or to expand the existing modules to no less than 4 credits.
- To pay much more attention to the improvement of quality of the used learning objects, to their conformance with the study programs, and to the implementation of their user-friendly system (repository) for the search on the internet, comment and assessment.

The researchers recommend the creators of ICT application in education study programmes:
- To prepare programmes mainly based on the use of e-learning systems and their components (learning objects, repositories, and virtual learning environments) in the teaching and learning process.
- To introduce additional modules on Semantic Web technologies (weblogs, wikis, e-portfolios) as well as on the search of learning objects and structured digital learning activities in the repositories.

Teaching and Learning Methodologies and Assessment

- The researchers recommend the creators of ICT application in education study programmes to clearly schedule teaching and learning methods suitable to be used in the study programmes. It is recommended to mainly use the visual multimedia-based methods *vs* word-based methods; practice-based methods *vs* theoretical methods; active learning methods *vs* passive learning methods; student-oriented methods *vs* programme-oriented methods; and creative methods *vs* reproductive methods.
- The researchers recommend the higher schools to use more practical assignments, credits and especially creative assignment assessment methods in ICT application in the education competency assessment.

Educational ICT Competencies of Teachers

The researchers recommend the higher schools:

- to organise ICT application in education programmes so that the future teachers after coming to schools would be able to:
- estimate ICT application shortages and problems, learn how to avoid these problems and to teach the colleagues on these topics;
- manage the class work using Web 2.0 technologies;

- help the colleagues to apply ICT in teaching the special needs students.

The researchers also recommend to pay more attention to the following teachers' ICT competencies:

- to creatively individualise their subject's teaching and learning content;
- to purposefully use ICT tools in the teaching and learning process;
- to plan the use of ICT;
- to organise the technologic resources management in the teaching and learning process.

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PEDAGOGŲ RENGIMAS INFORMACINIŲ IR KOMUNIKACINIŲ TECHNOLOGIJŲ TAIKYMO ASPEKTU: PADĖTIES ANALIZĖ IR TOBULINIMO SIŪLYMAI

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S a n t r a u k a

Straipsnyje analizuojamos pedagogų informacinių ir komunikacinių technologijų (IKT) kompetenciją ugdančių studijų Lietuvos universitetuose ir kolegijose programos, būsimų pedagogų IKT kompetencijų vertinimas. Šie rezultatai lyginami su pedagogų edukacinės IKT kompetencijos kurso reikalavimais, kurie nusakyti Lietuvos mokytojų kompiuterinio raštingumo programoms. Straipsnis grindžiamas duomenimis, sukauptais atlikus Švietimo informacinių technologijų centro užsakytą mokslinį tyrimą „Pedagogų rengimas IKT taikymo aspektu". Tyrimas reprezentatyvus šalies mastu. Šio tyrimo išvadomis ir rekomendacijomis numatoma vadovautis sudarant ir įgyvendinant visų lygių mokytojų rengimo ir perkvalifikavimo studijų, kvalifikacijos tobulinimo programas ir mokytojų atestaciją. Pagrindinis straipsnio tikslas yra pristatyti ir apibendrinti svarbiausias šio tyrimo išvadas ir rezultatus.