The possibilities of ICT application in technology lessons at Lithuanian general education schools

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Abstract: The paper considers a new dimension of skill development opportunities of information and communication technology (ICT) in Lithuanian general education schools. The paper aims to investigate how much and how ICT competences are determined by the schools' material base, the headmasters' and leaders' approach to the application of ICT, their competences to use ICT in classrooms and development possibilities. The research methods: analysis of literature and documents, empirical research, statistical data analysis, graphical analysis, correlation analysis. The research was carried out in 2011 – 2012 school year. The research included 215 headmasters from 22 schools of the country's regions and 112 technology teachers. Headmasters say that the introduction of ICT in Lithuanian schools has begun a long time ago and is going quite successfully. Headmasters' and technology teachers' skills in computer technology are sufficient, they have some kind of documents that evidence this. The greatest impact on ICT skill development is determined by director and teachers' attitudes, willingness to develop these competences, ability to use modern technologies and new programs, continuous development of ICT skills.

Keywords: ICT, technology teachers, ICT competences.

Introduction

The field of information and communication technologies (ICT) is constantly changing and improving: it is the coming of the second generation of wed technologies (web 2.0), the rise of social networks, lines capacity, mobility and continuous access, cheap and free cloud computing services, the rapid integration and possibilities to apply them for personal needs. These changes force to view and modify the educational process. Educational experts see the students' need not only to use computer programs in various fields but also to know how to create digital content, apply and experiment in different areas (Dagienė, Kurilovas, 2012; Informatikos ir informacinių…, 2012).

Many researchers in the field of education (Joseph, Nacu, 2003; Aleven, Stahl, 2003; Paladino, 2008) have been investigating various aspects of the impact technology-rich teaching environment has on the learners. Learners appreciate the opportunity to choose from a variety of learning environment, and the use of ICT promotes interest in the subject, the need to attend classes, collaborate with teachers, participate in school activities and develop the basic competences. Students have to learn how to work, be inventive, be able to master ICT tools and methods, to process different types of information, adapt it to their needs, and improve continuously (Plowman, McPake, Stephen, 2010; Dagienė, Kurilovas, 2009).

The schools in the European Union willingly use ICT tools in the teaching process, the number of computers and high-speed Internet access increase every year, however the level of ICT usage and skills is very unequal. An integrated approach to the use of ICT at schools is necessary, i.e. we need to invest not only to infrastructure but also to pay more attention to teachers' training, to create the positions of ICT coordinators (Dagienė, Kurilovas, 2009).

One of the problems of ICT application in teaching process is the experience of students and teachers, the differences in opinions about these technologies, but only the teacher can decide to what extent and for what purposes ICT will be used in the educational process. Therefore, the teachers' lack of competences in ICT has a significant impact on students' abilities to use new learning tools. This conclusion is supported by the results of the study of International ICT application in education (Informacinės technologijos…, 2010; Dagienė, Kurilovas, 2009).

The analysis of researches shows that the Lithuanian schools, compared with the OECD average, are particularly poorly equipped with audio-visual equipment and software for learning (Mokymosi aplinka…, 2012). For the successful development of information skills using ICT, the schools must constantly update normative public documents (general programs, special programs), material resources (computers, Internet, intranet, educational programs) and improve teachers' qualifications (qualified teachers ready for the job, administration).

A number of foreign and Lithuanian scholars research the fields of ICT implementation and dissemination, development of information skills at schools: R. Krumsvik (2008); V. Dagienė, E. Kurilovas (2009); V. Brazdeikis (2009), P. Pečiuliauskienė (2010), T. Petkus, K. Nekrašaitė (2009), J.Galkauskas (2007), E. Britton, B. De Long-Cotty, T.Levenson (2005); J. K. Galkauskas (2007); B. Žygaitienė (2011); D. Pendergast, S. L. T. McGregor & K. Turkki (2012).

A number of studies and international projects related to the introduction of information technology and development of information skills at schools have been carried out in the country: from 2004 a general computer literacy tests have been conducted every year, a lot of scientific, methodological, reference works, reports that are intended to convey information about the experience of technologies application in education have been prepared. Since the topic of the development of ICT skills in technology lessons has a little research, it is necessary to investigate the possibilities to apply ICT in the classrooms.

The paper analyses in a new dimension the development of information technology skills in Lithuanian general education schools using ICT. Since in Lithuania this topic has not been widely analyzed, there is a problem – to investigate how much and how a school's material base, the attitude of headmasters and technology teachers to the application of ICT, competences to use ICT in technological education and the possibilities of ICT skills development determine the development of students' information technology skills.

Methodology

According to foreign researchers I. Rockman (2004); M. B. Eisenberg, C. A. Lowe, L. Spitzer (2004), technological literacy will not be effective in the communication world if information literacy skills are not well mastered. There is the need to develop both the information literacy and communication competence that ensures a continuous improvement of the society.

The turning point in Lithuanian schools in respect of application of information technologies in the educational process has not happened yet because the goals of education and classroom activities are still focused on the traditional teaching (Informacinės technologijos…, 2010).

According to the Lithuanian scientists (Brazdeikis, Navickaitė, 2008; Brazdeikis, 2009, Dagienė, Kurilovas, 2009), continuing the computerization of Lithuanian schools the attention is given to a high-speed Internet connection at schools, the installing of computerized working places for students and teachers, the development of a modern and interactive training (learning) material, the creation of learning spaces, the development ICT competence, the curriculum adaptation to work in cyberspace.

In order to clarify the ICT need at schools during technology lessons developing students' ICT skills.

In order to determine the need for ICT in school during technology lessons, developing pupils' ICT skills used the methods:

Theoretical methods – the analysis of scientific literature and educational documents.

Empirical methods – a questionnaire was filled out by the headmasters and teachers in order to determine their approach to the training opportunities of information technology skills in the general schools during information technology lessons.

Statistical – quantitative n=215 headmasters of general schools, n=112 the analysis of questionnaires filled out by technology teachers. The mathematical statistical analysis of the data was carried out using computer program SSPS (Statistical Package for the Social Sciences) 19.0 for Windows, Excel program was used for the graphical representation of the results. A frequency table and graphical

analysis were used for the systematization of data and description of frequency distributions. The correlation analysis was used for the modeling of feature interdependence.

The research was carried out during 2011 – 2012 school year in Lithuanian general education schools.

The questionnaires were sent by e-mail to headmasters and technology teachers. The study included 212 headmasters from 22 schools of the country's regions and 112 technology teachers.

Results and discussion

Seeking to achieve the goal of Lisbon treaty to become a competitive, dynamic and knowledge-based economical space in the world, the EU has not only to change the economy, but also to pose high demands in the fields of social welfare and the modernization of educational system. New basic skills that are included in the Lisbon European Council conclusions are the following: information technologies, foreign languages, technological culture, entrepreneurship and social skills (Mokymosi visą gyvenimą Memorandumas, 2001).

According to A. Glosienė (2006), in the society of information and knowledge we need to understand the variety of information sources and their typology, to be able to recognize and use the opportunities offered by them.

According to M. Castells (2005), ICT is a different level of technology that allows a creation of the world of network culture, which is characterized by a continuous, new knowledge-based innovations and their search. A general education becomes an integral part of ICT use in various areas. The use of ICT opens up new perspectives, and after a full integration of computers into curriculum there is an opportunity to get to know better the environment, cultural differences and similarities, to develop communication skills, it encourages creativity, openness to innovations, and helps to create a flexible and open structure of education (Informatikos ir informacinių…, 2012).

Lithuanian education system corresponds to the European attitudes, defines values and skills, as well as the main competences that need to be developed. The purpose of general education is to provide an individual the basis of socio-cultural and civil maturity, general literacy, the element of technological literacy. The educational organizations are in the forefront of change because students are the most susceptible to the changes in society, they absorb a variety of technological innovations and learn how to use them. ICT has to be used in all school activities, it has to be closed linked to the personal needs , advanced training tools have to be implemented, educational methods and content have to changed, in other words, a school culture of information age has to be created (Mokyklų vadovų…, 2007; Dagienė, Kurilovas, 2009; Brazdeikis, 2009; Žygaitienė, 2011).

Since 1991 Lithuania started to develop the information society, so the introduction of ICT in Lithuanian educational system has become a priority. During the implementation of European educational guidelines a number of Lithuanian Republic documents concerning the implementation of ICT in education have been introduced.

According to A. Otas, E. Telešius, V. Petrauskas (2007), the success of ICT implementation in education is determined by three factors: the quantity and quality of hardware, attractive and understood application programs, the computer literacy of teachers.

In recent years, the number of computers in Lithuanian schools has increased significantly (Table 1), application programs have also become more accessible and cheaper. However, the ratio of students and computers in Lithuanian general education schools is lower than in other developed countries. In OECD countries on the average 100 pupils have 20 computers, meanwhile in Lithuania compared to 2006–2007 year data 100 pupils had 6,5 computers and in 2011–2012 year they had 13,4 computers (Lietuvos statistikos…, 2012).

Table 1

The number of computers at schools, 2006–2012 year (Lietuvos statistikos …, 2012)

Statistical indicators	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011	2011-2012
The number of computers connected to the Internet	36053	39521	45628	48178	56454	63 972
The number of computers	44741	47452	53546	55557	64022	71 320
The number of computers for 100 pupils	6.5	7.2	8.5	9.3	11.3	13.4
Computers used for training	33520	35313	39399	40843	46998	52 866

In order to find out how the school's current development in regard to the implementation and use of information technologies is assessed, the headmasters were asked: "*How do you assess the current school's state in regard to the implementation and use of information technologies?*". the majority of respondents (61,4 percent) said that the introduction of ICT as schools started a long time ago and have been quite successful, and schools are sufficiently supplied with information technology. And only a small percentage of respondents indicated that the school is in a stage of ICT planning and implementation.

Lithuanian headmasters that participated in the survey are certain that the priority area of ICT implementation is the becoming of school libraries to school information centers, so it is important to supply them with the latest hardware and software. The survey results show that (Table 2) that school libraries are sufficiently provided with information-cognitive literature ($\rho = 0{,}504^{**}$ $p < 0{,}0001$), they are information centers and provide information to the school community. The correlation analysis of surveyed headmasters and their attitude about school supply of computers showed that ($\rho = 0{,}543^{**}$ $p < 0{,}0001$) European Structural Funds and targeted use of public funds are very important to the computerization of schools .

Table 2

The correlation analysis of headmasters' opinion about schools' supply

	The school is sufficiently equipped with hardware	**The library is sufficiently equipped with information-cognitive literature**	**The library is information center and provides information to the community**	**School's assessment in respect of ICT implementation and use**	**Technology classrooms equipped in accordance with the requirements**	**Equipped modernized library**	**Finance from European Structural Funds**
The school is sufficiently equipped with hardware				$\rho = 0{,}469^{**}$ $p < 0{,}0001$			
The library is sufficiently equipped with information-cognitive literature			$\rho = 0{,}504^{**}$ $p < 0{,}0001$		$\rho = 0{,}403^{**}$ $p < 0{,}0001$		
The library is information center and provides information to the community		$\rho = 0{,}504^{**}$ $p < 0{,}0001$				$\rho = 0{,}417^{**}$ $p < 0{,}0001$	
School's assessment in respect of ICT implementation and use	$\rho = 0{,}469^{**}$ $p < 0{,}0001$						
Targeted state funding							$\rho = 0{,}543^{**}$ $p < 0{,}0001$

***when coefficient of correlation ρ = 0,4–0,6, the relation is essential;*

TIMSS and PIRLS surveys seek to determine the impact ICT has on students' learning. In 2006 the international study of ICT implementation in education SITES showed that a high percentage of teachers (41 percent) did not use computers in the teaching process. 78 percent of them said that the lack of computers were the main reason why they did not use computers in the teaching process. Other reasons, such as the lack of adequate teaching materials or lack of skills, were identified by teachers as less important. The difference from the EU average is very high, but positive because Lithuanian teachers identify technical supply as the main reason. Only 7 percent (EU average 16 percent) of Lithuanian teachers see no sense in using computers in the education process and only 3 percent (EU average 9 percent) do not want to apply them. The researches show that improving the supply of computers and other information technologies, and improving teachers' competence in ICT, the use of ICT in education increases (Brazdeikis, Navickaitė, 2008, Informacinės technologijos…, 2010).

Developing students' information skills an important factor is the attitude of headmasters and teachers. According to the headmasters' point of view, technology teachers in order to convey the new material in a more flexible and interesting way have to improve constantly, this proposition is correct (Table 3) and you can see an essential connection (ρ=0,570; p<0,0001). Correlation relations between headmasters claim have been detected. If the teachers are flexible and can convey the new material in an interesting way, the students learn how to look for literature and this is reflected in students' information skills development (ρ=0,534; p<0,0001) they are as well acquainted with the latest technology and computer programs (ρ= 0,649; p<0,0001). The use of ICT helps to personalize education (essential relation $\rho=0,453^{**}p< 0,0001$),increases students' motivation (essential relation $\rho=0,468^{**}p<0,0001$, strengthens students' general skills (communication, interaction), and this encourages them to improve themselves (essential relation $\rho = 0,450^{**}p < 0,0001$).

Table 3

Headmasters' opinion about the importance of IT use in classrooms, correlation analysis

	Helps to individualize training (learning)	**Helps to convey new material in a more flexible and interesting way**	**Increases students' motivation**	**Strengthens students' basic skills (cooperation, communi-cation)**	**Students learn how to look for literature**	**Students become familiar with the latest techniques, applications**	**Encourages teachers to improve**
Helps to individualize training (learning)		$\rho=0,453^{**}$ p 0,0001					$\rho = 0,450^{**}$ $p < 0,0001$
Helps to convey new material in a more flexible and interesting way	$\rho=0,453^{**}$ $p< 0,0001$		$\rho=0,468^{**}$ $p<0,0001$		$\rho=0,534^{**}$ $p<0,0001$	$\rho=0,649^{**}$ $p<0,0001$	$\rho=0,570^{**}$ $p<0,0001$
Increases students' motivation		$\rho=0,468^{**}$ $p<0,0001$					
Strengthens students' basic skills (cooperation, communication)					$\rho=0,464^{**}$ $p<0,0001$	$\rho=0,400^{**}$ $p<0,0001$	$\rho=0,400^{**}$ $p<0,0001$
Students learn how to look for literature		$\rho=0,534^{**}$ $p<0,0001$		$\rho=0,464^{**}$ $p<0,0001$		$\rho=0,525^{**}$ $p<0,0001$	$\rho=0,525^{**}$ $p<0,0001$
Students become familiar with the latest techniques, applications		$\rho=0,649^{**}$ $p<0,0001$		$\rho=0,400^{**}$ $p<0,0001$	$\rho=0,525^{**}$ $p<0,0001$		$\rho=0,498^{**}$ $p<0,0001$
Encourages teachers to improve	$\rho=0,450^{**}$ $p<0,0001$	$\rho=0,570^{**}$ $p<0,0001$		$\rho=0,400^{**}$ $p<0,0001$	$\rho=0,525^{**}$ $p<0,0001$	$\rho=0,498^{**}$ $p<0,0001$	

***when coefficient of correlation ρ = 0,4–0,6, the relation is essential; ***when coefficient of correlation is ρ = 0,6–0,8, the relation is strong;*

The research groups of respondents were asked a question what benefits ICT use in technology classes for 5-8 graders bring. From the technology teachers point of view, the use of electronic learning tools during technology lessons develops information and technical skills of students from 5-8 grades, partially develops critical thinking, motivation and creativity. 43.3 percent of technology teachers and 59.1 of headmasters indicated that the use of ICT in education process helps to increase achievements during technology classes of students that learn in 5-8 grades.

The computer literacy of a headmaster reveals his or her ability to use technologies for school management. When planning a school teachers' professional development, it is important to take into account individual needs of each teacher, their professional and technological readiness. The professional development is not an onetime participation in computer literacy courses: teachers need to update their knowledge constantly, participate in various events, to communicate (Pedagogų rengimas…, 2006; *Moderni informacijos…*,2006).

The aim of our study was to find out headmasters' and teachers' lever of computer literacy. The data show (Figure 1) that 89,7 percent of headmasters have literacy supporting documents and a very small percentage of them (9,8 percent) have a very good computer skills, but no documents. 0,9 percent of headmasters are not satisfied with their IT literacy. The majority (74,0 percent) of technology teachers have computer literacy supporting documents. Others indicated that they are proficient in using IT, but do not have documents that prove this (23,2 percent) and a very low percentage (1,8 percent) indicated that their knowledge in the field of IT is weak. The presented data show that the European computer literacy certificate (ECLC) belongs to more technology teachers (55,4 percent) than headmasters (31,2 percent). However, 58,1 percent of headmasters claim to have a different kind of computer literacy document, meanwhile only 19,6. percent of technology teachers have different kind of IT literacy certificates.

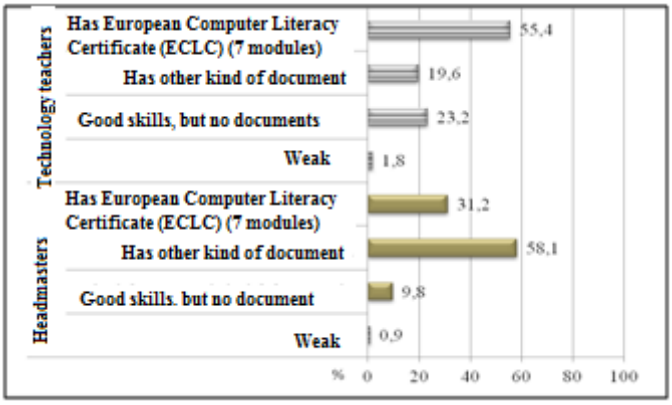

Figure 1. Data on respondents' computer literacy.

The data of the study "The objectives of ICT access and use in European schools in 2006" show that 48,4 percent of Lithuanian teachers claim to have good computer skills, 19,9 percent claim to have very good computer skills. 39 percent indicate that they are able to work very well with word processing programs (EU average– 65 percent), 30 percent believe that they have a very good computer presentation skills (EU average – 34 percent), and 47,9 percent of teachers claim that they know how to use e-mail very well (EU average – 65,9 percent) (Brazdeikis, Navickaitė, 2008; Dagienė, Kurilovas 2009).

Teachers continuously improve their qualification and this is noted by both headmasters and technology teachers. The respondents' attitudes about the importance of ICT skills in educational process are illustrated by the gained computer literacy documents as well as the disposition to improve and update ICT skills. The technology teachers' claims show significant relations between responses, as well as in the survey of headmasters. The correlation analysis shows (Table 4) a strong relationship between MES organized information skills training courses, training for teachers and universities (χ^2=0,539; p<0,0001) and courses prepared by the EDC center (χ^2=0,628; p<0,0001). The propositions of technology teachers confirm that the international projects' services are used the least.

Table 4

Technology teachers' claims about training courses, correlation analysis

	In the international projects	MES organized courses	Education Development Center (EDC)	University courses	Remotely in (LieDM) website
In the international projects		*0,165*	*-0,006*	*-0,192**	*-0,128*
MES organized courses	*0,165*		*r=0,628*** *p<0,0001*	*r=0,539*** *p<0,0001*	*r=0,451*** *p<0,0001*
Education Development Center (EDC)	*-0,006*	*r=0,628*** *p<0,0001*		*r=0,643*** *p<0,0001*	*r=0,608*** *p<0,0001*
University courses	*-0,192**	*r=0,539*** *p<0,0001*	*r=0,643*** *p<0,0001*		*r=0,583*** *p<0,0001*
Remotely in (LieDM) website	*-0,128*	*r=0,451*** *p<0,0001*	*r=0,608*** *p<0,0001*	*r=0,583*** *p<0,0001*	

*** when coefficient of correlation ρ = 0,6–0,9, the relation is strong;*

The second picture shows in what IT areas technology teachers would like to improve their skills. The study showed that technology teachers would like to get more knowledge working with multimedia and hypertexts (78,1 percent) working with programs for technology education (76,6 percent). Teachers would like to learn the most how to use distance learning programs (20,6 percent).(Figure 2).

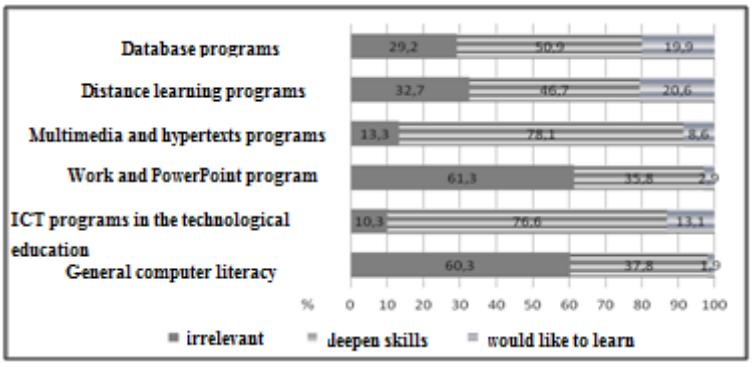

Figure 2. IT areas that can be improved by technology teachers.

The headmasters involved in the study are planning on raising school rating in all fields and seek for good results in the implementation of information technology, developing students' information skills (Figure 3). Headmasters believe that it is important to train teachers: 88,6 percent of respondents noted that this is done regularly and only (8,7 percent) plan on doing this. The update of software and license programs is also very important (56,3 percent). Almost half of headmasters constantly update technology classrooms (48,4 percent), one third of respondents (31,6 percent) intend to do this in the near future. Almost half of the surveyed headmasters cooperate with schools that have good experience, and with other educational partners.

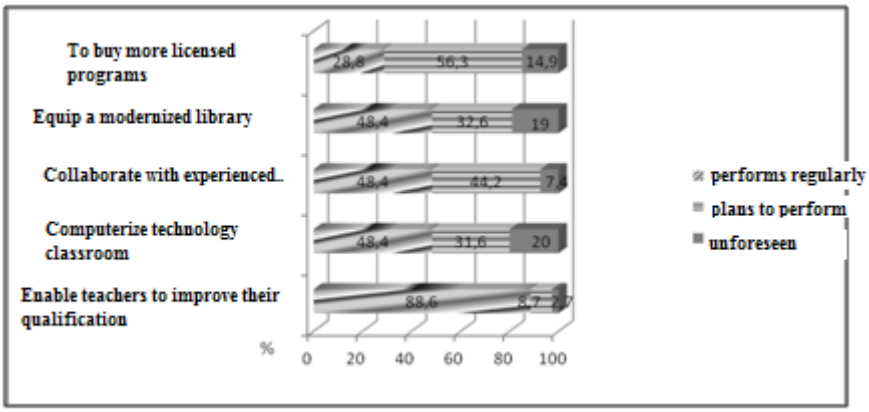

Figure 3 Improvement perspectives of information technology at schools

The strength of Lithuanian teachers is their positive attitude towards the use ICT in educational process. 93.8 percent of teachers strongly supports the view that the use of ICT in educational process will help them to increase students' motivation and achievements. According to this indicator only Portugal (95,2 percent) and Cyprus (95,1 percent) are ahead of Lithuania. The same strong motivation teachers also have in Great Britain (93,8 percent) (Mokymosi aplinka…, 2012).

Conclusions

- Responding to the European educational guides, the documents regulating information technologies in education and training have been introduced in the Republic of Lithuania. The implementation is funded by state and local government budgets, business and European Union structural funds. In the near future Lithuania should catch up with the European average in the field of computerization. A quantity of hardware at schools in 2006 – 2012 years has increased by more than a half, applications are becoming more accessible and cheaper. School libraries have been equipped with the latest hardware and software and they have become information centers of the schools.
- The majority of Lithuanian headmasters (61,4 percent) define ICT implementation at schools as quite successful. Only one fifth of headmasters are satisfied with ICT supply at schools, and the majority is willing to use ICT more widely. Headmasters say that the use of ICT in educational process helps students to look for literature, get acquainted with the latest technology and computer programs. The use of ICT motivates teachers to develop, helps to convey new material in an interesting and flexible way, stimulates students' basic skills and increases students' motivation.
- The attitudes about ICT use in educational process of both headmasters and teachers are illustrated by the documents that evidence their computer literacy: most of headmasters and teachers have some kind of documents that evidence computer literacy.
- Recognizing the rapid change in ICT field, headmasters and technology teachers constantly improve ICT competences: MES, EDC, university courses, training courses and remotely on (LieDM) website. The study has showed that technology teachers are planning on deepening their knowledge working with multimedia and hypertexts, as well as working with programs for technological development. They would like to learn the most how to use distance learning programs.

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