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Development of ICT competences in the environmental studies subject in Slovenia

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Abstract

Digital literacy is one of eight key competences that were defined by the European Parliament and Council as those that member states should develop as a part of their strategies for lifelong learning (Official Journal of the European Union, 2006, p.11). It would contribute to a more successful life in a knowledge society. The purpose of this paper is to Npresent the results of empirical research on the use of ICT in the lessons of the environmental studies subject in the first triennium of primary schools in the Republic of Slovenia. Data were collected through a questionnaire and according to the protocol. We found that among all of the ICT tools, teachers mostly use the computer. The majority of the teachers use the computer once a week, most often in mathematics and environmental studies subject. In the observed lessons of the environmental studies subject, less than half of teachers use the computer in the lessons. This was followed by the use of computer and the LCD projector, and the interactive whiteboard. Among the obstacles that teachers indicate when they try to include ICT in the learning process are insufficient, out of date equipment, lack of time and lack of their own competence.

Keywords: information and communication technology, primary school, environmental studies subject;

1. INTRODUCTION

The emergence of a knowledge-based society challenges traditional teaching and learning methods. It emphasizes the need to expose students to more complex non-routine problem-solving

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opportunities which go beyond disciplinary knowledge and skills. Learning is therefore seen as a culture of rigorous intellectual work supported by a rich social and affective environment allowing all students to develop a broader spectrum of abilities including learning how to learn, communication, critical thinking, development of a variety of organizational strategies, and technological competencies (New Brunswick Department of Education, 2003). Skills needed for the 21st century will be a blend of information and communication skills, thinking and problem-solving skills, and interpersonal and self-directional skills (Organization for Economic Cooperation and Development, [OECD], 2009).

Education arises from social needs and responds to policies of modern society in which knowledge and its effects are of great importance. Many changes and rapid growth of knowledge require a development of constantly learning society. School should also follow these changes. Schools must emphasise the development of those potentials of an individual that lead towards the ability of continuous learning (Zavod Republike Slovenije za šolstvo, 2006).

The modern educational institution thus strives to an innovative, creative and coordinative function of a responsible expert. The teacher should include modern ways of teaching into his work, where educational technology should be of great help. According to Božnar (2004) modern information and communication technology (ICT) significantly intervenes in the educational process and thus also in the teaching profession. Teachers are no longer the only source of information. Pupils today have a lot of possibilities to quickly come to wanted information with the help of technical and communication means.

Preschool children already take their first steps involving the work with the computer in kindergarten and they manage simple, age appropriate programs (Božnar, 2004, p.1).

Lately an increasing number of studies focus on analysing of ICT tasks. Thus some authors (Jonassen, 1996; Crook, 1996; Markauskaitė, 2000; Zylbergold, 2003; Ross, 2004; taken from Lamanauskas, Vilkonis, 2007) discuss general didactic questions of ICT use, while others (Slabin, 2002; Augustonytė, 2005; Pečiuliauskienė, Rimeika, 2005; Praulite, Trokša, Gedrovics, 2005; taken from Lamanauskas, Vilkonis, 2007) discuss specific didactic questions of ICT use in certain subjects.

1.1. The definition of the term ICT and digital competences

A very general and broad definition of the ICT states that this is both soft- and hardware for the communication with data (computer, fax machine, internet, land and mobile phones) (Lipovšek et al., 2008, p. 390). According to Elston the term ICT does not differ from the term information technology. The word communication was added recently and was accepted mainly by the educational field. According to her the simplest definition of ICT would be that this is the “technology that is used for information management and help with communication”. In the framework of the school environment ICT usually includes: computers (stationary computers, notebooks), printers, scanners, video and DVD players, computer network, digital and video cameras, recording devices and interactive whiteboards (Elston, 2007).

Lately the terms digital literacy or digital competence have been used for the ability of the ICT use. There are many definitions of digital literacy. E.g. "Digital competence means a secure and critical use of information technology in work, leisure activities and communication. A precondition to master this is: the use of computer for acquisition, storage, production, presentation and exchange of data as well as for communication and collaboration via internet through a network." (Cochard and Rogard, 2008).

1.2. ICT in education

According to International society for technology in education (ISTE), a successful cooperation in the 21st century society requires from individuals to become technologically literate. ISTE states that technological literacy already begins in child's early years (ISTE 1998; taken from Robles de Melendez et al., 2000).

With introducing new technologies into the educational process new possibilities open for the teachers as well as for pupils. Technology provides teachers with the means with which they can add new strategies to their teaching repertoire. This is particularly true for the latest interactive inventions that can be brought to class. Technology is an especially valuable source for younger children. Once the materials are carefully selected and used in cooperation and interaction of adults and children, television, computers and cyber communication, they provide an almost infinite number of possibilities that can broaden children's learning experiences (Robles de Melendez et al., 2000).

Technology is a tool that provides children with yet another way of learning and gives meaning to their world. Computers can be applied to development in appropriate ways that are useful for children or they can be wrongly used, just like cubes or any other materials. Just like pencils that cannot be replaced by coloured pencils but can ensure additional means of expression, so the computers or the cameras or any other forms of technology cannot be replaced by any other tools too, but they contribute to a range of tools that are available for the children to explore, create and to communicate. When used in an appropriate manner with qualified teachers, technology can support and extend learning in an important way and can increase educational possibilities for the children. It is essential to find a balance between adjusting the elements for a healthy childhood with the unique capabilities that technology has to offer (Scoter, Ellis, Railsback, 2001).

Grčeva (2010) identified several elements that clearly justify the necessity of technology use in education, such as: student motivation, unique teaching abilities, new teaching approaches (problem solving, cooperative learning, individual work, customized learning) and teachers' productivity (through training in computer skills and methods and helping their students to meet their individual goals).

The teacher's qualification or his digital competence plays a very important role in integrating ICT into the learning process. Krumsvik (2008, p.283) defines it in a following way: Digital competence is the teacher's qualification in ICT use for professional purposes with good teaching assessment and

the awareness of the consequences in learning strategies and in digital enrichment of the pupils. A teacher should not be an uncritical consumer of the technology but should prudently select the tools that enrich and improve the educational process. (Wechtersbach, 1996, in 2007)

1.3. Schools in Slovenia

For long time Slovenia has been keeping up with the most developed countries when it comes to equipping schools with ICT and its use, because since 1994 the Ministry of Education and Sport is systematically helping schools with equipping them with ICT. Čampelj believes that the goal of introducing ICT is technology, internet, training, e-materials itselves, but all of these are just means that help us to get to the real goal. The real goal is in the efficiency of learning and teaching and in providing lifelong learning. ICT can help us to achieve this in different ways: by encouraging every pupil to be active and have a more deepened approach in learning, by encouraging to choose and adapt in new learning ways, by opening new horizons about learning opportunities and consequently interest, with which a pupil gains habits for a lifelong learning (RutarIlc, 2008).

In the teaching process teacher can use the computer and other ICT instruments in different parts of the lesson. He can use it as an instrument for introducing new contents or for consolidating what is already known. According to research status and trends of ICT use in Slovene primary and secondary schools, primary school teachers feel that ICT use has the most positive effect on consolidation and repetition (79%) and the use of the learned(60%) (Gerlič, 2005, taken from Brečko, Vehovar, 2008). In any case the use of ICT requires thoughtful planning, appropriate selection of ICT tools and developing new teaching strategies from the teacher. According to Wardle, “appropriate use of technology in teaching extends, enriches, conducts, individualises, differs and broadens the entire curriculum.”(Wardle, 2002, taken from Phalen, 2004). The Development Strategy for the Information Society – si2010 that was adopted by the government of the Republic of Slovenia in 2007, also points out an important field, it is e-education which is defined as “learning and teaching with the use of modern information and communication technology”. The key factor of a success of this kind of education is the teacher who has to assume the modern ICT. Here it is not about changing or abolishing of the classic teaching but it is about opening new possibilities in the teaching process that make it more effective and interesting (Brečko, Vehovar, 2008, p. 18).

The purpose of our research was limited to determining the use of ICT in lessons in the first triennium of primary school, specifically in environmental studies subject lesson (ES). We wanted to know:

- How often do teachers use the computer?
- In which subjects do teachers use the computer most frequently?
- What hinders the teachers in more frequent inclusion of the computer into the learning process?
- Did the teachers use ICT instruments during the observed lessons?
- Which ICT instruments did the teachers use in the observed ES lessons?
- Which interactive learning material did the teachers use in the observed ES lessons?

2. METHODOLOGY

The content of the research is based on the descriptive and non-experimental - causal method of the empirical pedagogical research.

Class level (1st Period) teachers that teach in the first three grades of primary school (95) and where the students of the Faculty of Education Maribor were carrying out the teaching practice during the school year 2008/2009 were randomly included into the research sample.

Data were collected through a questionnaire and according to the protocol. The questionnaires were filled out by the teachers during the teaching practice. Using the protocol the students were recording the ICT use during their observation hours at a randomly selected ES lesson.

Quantitative and qualitative data processing procedures were used in the research. Some correlations between variables were tested with the chi-square test

3. THE RESULTS OF THE RESEARCH

First of all we present the teachers' results that are related to the general computer use in the learning process (chapter 3.1 to 3.4), and later on the results of the observed lessons are presented (chapter 3.5).

3.1. The frequency of teacher's computer use

We established that the teachers' computer use of at least once a week (23). This answer was on the top of the scale of the computer use frequency in lessons. Answers "rarely" (17) and "once to twice a month" (16) follow. If we would combine these two and link everything with the category where the teachers do not even use the computer, we would determine that the computer use in Slovene schools is still very under-represented. There are significantly less teachers (10) that use the computer more often (every day, three or more times a week). This is a piece of information that can indicate the situation in schools Slovene because we asked the teachers about the general computer use in lessons.

3.2. The representation of computer use in particular subjects

Computer is a didactic means that can be used in all subjects. In the research framework we wanted to check the representation of computer use in particular subjects or more specifically we wanted to know which place the environmental studies (ES) subject takes.

Table 1.: The representation of computer use in particular subjects

RANK	SUBJECT	NUMBER (f)
1	mathematics	55
2	environmental studies	50
3	Slovene	43
4	arts	17
5	music	10
6	in all subjects	9

We can see from the table that the teachers use the computer more in subjects where the cognitive component is in the forefront (gaining knowledge, skills, abilities) rather than educational (artistic). From the table we can also see that environmental studies subject is quite high, in the second place. This means that the subject itself contains such contents that the teachers can complement with a computer and the possibilities it has to offer as well as that the teachers use this quite often.

3.3. Obstacles in the computer integration into the learning process

According to the teachers the biggest obstacle for (larger) computer integration into the learning process is in the deficient equipment (22), in the overcrowded computer classrooms (19) and in inadequate (out of date) equipment (12). They also listed following obstacles: lack of computers 12), lack of time (10), no computer in the classroom 10), lack of knowledge on the ICT use (8), more preparations (6), lack of internet access (5), and inadequate content (5), being accustomed to the classic way of work (2), moving to the computer classroom (2). Only a minority of teachers (10) have no problems in integrating a computer into the learning process. If we compare the acquired data with the data of the research The Use of Internet in Slovenia (2003), we can find that the situation in this field has not improved significantly (Brečko, Vehovar, 2008).

3.4. The use of ICT instruments in ES lessons

With the help of data recording during the observation hours of the selected ES lesson we established that more than half of teachers (55.8%) have not used ICT instruments. Among those that used the ICT (44.2%) prevail those that used the computer more often (46.2%), and then followed by the use of LCD projector (30.0%) and interactive whiteboard (23.0%).

3.5. The choice of interactive materials in ES lessons

England and Finney (2002) wrote that interactive media is a digital media, including electronic texts, graphics, moving pictures and sound that enable people an interaction with the data for

corresponding purposes. Digital environment can include internet, telecommunication and interactive digital television (England, Finney, 2002). With the term interactive media we denote a two-way interaction and the exchange of information between the means and the user.

Teachers most often chose interactive material of a web page (40.0%) during the observation hours, which, compared to other materials, means that they chose the internet while other materials were less represented (CD or DVD – 12.0%, computer program (installed on the computer) – 20.0%)).

This kind of result matches with the findings of the Empiric research (2006, taken from Brečko, Vehovar, 2008) which showed that Slovene primary school teachers used the material, taken from the internet, in classes in 69.4% and teachers in EU in 82.7%.

Below we present the use of particular interactive materials according to the grade.

Table 2.: The use of interactive material according to the grade and the calculation of x^2

INTERACTIVE MATERIAL	1ST GRADE		2 ND GRADE		3RD GRADE		X^2	G	P
	f	f %	f	f %	f	f %			
WEB PAGES	2	20	4	40	4	40	0.800	2	0.670
CD OR DVD UNIT	2	66.7	1	33.3	/	/	0.333	1	0.564
COMPUTER PROGRAM	4	57.1	1	14.3	2	28.6	2.000	2	0.368
OTHER	1	20	3	60	1	20	1.600	2	0.449

As we can see from the table teachers in the first grade chose the CD or DVD unit most often (66.7%), and in second and in third the web pages (40%).

The calculation of χ^2- test does not show statistically significant differences among grades according to the use of interactive material.

4. CONCLUSION AND RECOMMENDATIONS

Based on the answers of the surveyed teachers we can conclude that the use of computer among teachers in the first triennium of primary schools is not very encouraging. Teachers otherwise use the computer but they do not include it enough into the learning process itself due to bigger technical and other obstacles. The frequency of computer use in particular subjects indicates a positive trend, at least what concerns environmental studies subject. It is in the second place among all subjects in class level (1st Period). But according to observed lessons of the environmental studies subject (ES) we can see that less than half of the participants in the research used ICT devices during the class observation hours of ES lessons. Teachers that were using ICT devices during students' observation hours most commonly decided for the computer. In the extent that they used any other interactive learning materials during these lessons, results show minor differences which

are however connected to a particular grade. As expected they used CD's or DVD's in the first grade, in the second and third grade they used web pages or in broader sense the internet.

There are many possibilities of using computers in the learning process but the teacher must know when and how it can be included into the learning process. Namely with it he has to achieve the set objectives. It is not needless to highlight again that the purpose of the ICT in school is not to replace the teachers but that ICT is only a support for teaching and learning.

If we want more involvement of the ICT into the learning process of the environmental studies, some important conditions should be ensured:

- Teachers and pupils should have access to digital technology and the Internet in their classes and in school;
- High pedagogical quality, culturally, specific and responsive digital content must be available for teachers and pupils;
- Teachers must have knowledge and skills to use new digital tools and resources.

It is highly recommended that ICT becomes integrated into the National curriculum in every stage of the educational process. At the Environmental studies subject there are a lot of possibilities for the integration of various technologies and information into the educational process itself. In this we can use various tools like the tools for information search, communication, visual information research, topic research, fact, data learning, and intercultural dialogue, etc.

For further research we recommend researches that would be more focused on how to reach more quality lessons with the help of ICT as well as a greater individualization (taking needs and abilities of the pupils into account), a more problem based lessons where creative thinking is required which would stir up the pupils mentally and motivationally.

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