Education of Primary and Secondary School Teachers in Informatics Supported by Digital Technologies

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Abstract

Informatics is a young subject taught at primary and secondary schools in Slovakia. Based on the new school reform, it has been taught compulsory since 2008. Lifelong education of the teachers of informatics subjects at primary and secondary schools is therefore a must. The teachers have to respond flexibly to the changes in the field of information and communication technologies and to use modern methods in the educational process. Learning to learn and ability to use modern information and communication technologies effectively are becoming the most important competences nowadays. The implementation of the school reform pointed out the lack of qualified teachers suitable to teach Informatics and Informatics Education. That was the reason why national project aimed at further education for primary and secondary school teachers in informatics financed from European structural funds was prepared. A strategic objective of the project was to design, prepare and realize modern further education supported by digital technologies. Direct education was broaden by e-learning support via LMS Moodle. Communication, assignment submission and/or testing were thus mostly conducted online. Some time after the successful completion of the project we conducted a questionnaire investigation the main purpose of which was to explore the opinions of the teachers participating in the project. The questionnaire was aimed not only at the area of acquired knowledge and abilities. We were particularly interested in the usefulness of the methods as well as study materials presented during the education – mainly whether the teachers use them in their teaching practice.

Keywords


Introduction

The need to increase the qualification is closely connected with the term lifelong learning (Baran, 2011). LLL comprises all phases of learning, from pre-school to post-retirement, and covers the whole spectrum of formal, non-formal and informal learning. It means that learning as a process occurs at all times in all places. It should be a process of continuous learning directed towards not only providing the individual needs, but should also be relevant to the community (Laal, 2011).
Several key competences were formulated to enable the creation of the system that would reflect the needs of modern society. Ability to use modern information and communication technology (ICT) effectively is one of them. However, it is not only the students who should be able to work with ICT. If the teachers want to teach new things, they first need to know them and be able to use them in real life as well as for educational purposes (Mesárošová and Cápay, 2011).

In comparison with the teachers of other subjects, the lifelong education of informatics teachers is remarkably different mainly due to the quickly developing requirements on their subject. The teachers of informatics subjects prepare their students for reality that will be noticeably different in the time when they finish their studies. Teachers must give students the opportunity to learn how to learn and help them to succeed in the process. Informatics is a young subject taught at primary and secondary schools in Slovakia. In 2008 a new school reform was introduced into practice. It included also informatics teaching strengthening into primary and secondary education and in this way, it replies to a process of society informatization and digital technologies dissemination into all parts of life. (Lovászová, 2011).

Many of informatics teachers do not have formal university education in the field “Informatics Teaching”. The problem of the lack of qualified teachers can be systematically resolved by a formally accredited study. For these reasons national project of further education for primary and secondary school teachers in informatics financed from European structural funds was prepared and executed in 2008 - 2011. After the end of the project, we conducted an investigation on the satisfaction with the project – the results of the investigation are described in the last chapter of the paper.

Possibilities of the development of ICT abilities and knowledge of primary and secondary school teachers

The term lifelong learning (LLL) can be seen as general as well as vocational education and preparation within the student’s life (Meerah, 2011; European Commission Directorate – General for Education and Culture, 2002), while the result is the development of abilities, knowledge and competences from the personal or professional point of view. (Murdoch-Eaton, 2012). Fostering LLL is a topic of high relevance for current educational policy. School lays the cornerstone for the key components of LLL, specifically persistent motivation to learn and self-regulated learning behaviour. LLL is a central socio-political concern and has been a focus of European educational policies since 2000 (Lüftenegger et al., 2012). Nowadays, due to the decision of European Parliament in the field of LLL development the programme named “Lifelong Learning Programme” is being executed. Its aim for the period of 2007-2013 is to develop particular existing educational systems and systems of professional preparation within the European Union, so that they will become the world quality standard.

Continuous education

Today’s world is characterized by continuous education (Volodina, 2011). Continuous education is closely connected to lifelong education. Its name implies the education that is continuing, ongoing, therefore postgradual. It represents the education assigned to the teachers who work as pedagogues at schools. Therefore it is focused on modernisation and innovation of everyday educational process in primary, secondary or tertiary schools environment. An example of continuous education within lifelong education aimed at development of knowledge and abilities in the area of implementation and active usage of ICT in education was project DVUI (Ďalšie vzdělávanie učiteľov základných škôl a stredných škôl v predmete informatika – Further education of the teachers of primary and secondary
schools in the subject of Informatics) realised in 2008-2011. The project began as a respond to direct assignment and operational program learning announcement (no. OPV/K/RKZ/NP/2008-2) of the Ministry of Education SR.

Similar projects have been executed since 2007 throughout the whole European Union. For instance, in Czech Republic the Operational Programme Education for Competitiveness was established in 2007, being a part of long-term thematic operational programmes category. It is aimed mainly at enhancement and modernisation of the systems of initial, tertiary and further education, their interconnection into complex system of lifelong education and at improvement of the conditions in research and development. The list of all operational programmes, that were accepted by European Commission at the beginning of the programme period (namely 2007-2013), is available at the http://ec.europa.eu/regional_policy/country/prordn/index_sk.cfm website. Particular programmes are aimed at the area of regional politics, but they enable cooperation and development among the member countries of the European Union as well.

Qualified informatics teachers at primary and secondary schools

Informatics is a young subject taught at primary and secondary schools in Slovakia. In 2008 a new school reform was introduced into practice. Based on objectives of school reform, content of informatics subjects in primary and secondary education is divided into five themes:

1. Information around us,
2. Communication by means of ICT,
3. Procedures, problem solving, algorithmic thinking,
4. Principles of ICT functioning,
5. Information society.

As we have already mentioned above, there is a lack of qualified teachers of informatics subjects, while they do not have formal university education in the field “Informatics Teaching”. For these reasons, the national project “Further education for primary and secondary school teachers in Informatics” financed from European structural funds was prepared. An investigator of the project was National Institute for Education. The execution of the project started in October 2008. A strategic objective of the project was to design, prepare and realize modern further education for informatics teachers at primary and secondary schools supported by digital technologies. The project was realised during 36 months. Its specific objectives were (DVUI, 2009):

- to prepare and realize accredited study programs for three target groups of informatics teachers in primary and secondary education,
- to equip education participants with digital technologies needed for their effective education which they can consequently use in a teaching process.

The education was conducted at five Slovak universities which prepare future informatics teachers: Comenius University in Bratislava, Pavol Jozef Šafárik University in Košice, Constantine the Philosopher University in Nitra, Matej Bel University in Banská Bystrica and University of Žilina. In cooperation of these universities, under the supervision of the main expert supervisor of the project prof. Ivan Kalaš from Comenius University in Bratislava, a concept of three study programs for three target groups of teachers was created (DVUI, 2009):

- the first target group (1TG): specialized study for teachers in primary education,
the second target group (2TG): qualification study for teachers in lower and higher secondary education without qualification for informatics teaching,

- the third target group (3TG): specialized study for qualified informatics teachers in lower and higher secondary education.

Purpose of all three study programs was to provide the participants with modern, actual and attractive education which pursues four content lines (Lovászová, 2011; DVUI, 2009):

- digital literacy of a teacher – the objective of education in this line was to obtain and develop knowledge and skills for productive, creative and safe use of digital technologies in ensuring professional and personal needs of a teacher,
- modern school - the objective of education in this line is to get participants familiar with modern cognitive theories and with new views on school as a space for reflection, research, communication and cooperative learning, with new forms of cognitive process organization, modern forms for pupils’ motivation and evaluation, alternative educational systems, and to present a vision of a modern school that uses digital technologies for the key competences development of pupils,
- informatics – is a core of a training for education participants. This line content was thematically and professionally drawn up to be suitable for each target group needs,
- didactics of informatics – the objective of education in this line is to get participants familiar with objectives, content and methodology of informatics teaching.

Each of these lines in all three study programs consisted of modules as the basic study units (study unit represents 6 or 8 lessons depending on target group).

Proper education was preceded by preparation of study programs, study materials, e-learning education environment and by training of lecturers.

The professionals from five universities and the teachers from practice took part in this preparation. The result of their cooperation is a series of about 100 textbooks and some original teaching software. Printed study materials for participants of education were created too and were supported also by e-learning courses which contain materials and software necessary for studying and enable participants to communicate electronically with lecturers and also the other participants.

The teachers in all target groups elaborated their final paperworks under supervision of the experienced lecturers. They finished up the education by its presentation and discussion about the subject of study. Their final paperworks were mostly focused on preparing original methodology materials for teachers and learning materials for pupils or creating of didactic software applications and e-learning courses.

A strategic objective of the project was to provide education for 1500 informatics teachers from all parts of Slovakia. The education was conducted by five universities from June 2009 to June 2011. The specialization study within the project was finished up by 350 teachers in primary education (the 1st target group) and 300 qualified teachers in secondary education (the 3rd target group) in June 2010. The same number of teachers completed further education in the second year of the project duration. New qualification for informatics teaching was obtained by 200 teachers in a two-year qualification study (the 2nd target group) (Lovászová, 2011).

At Constantine the Philosopher University in Nitra education was provided by Department of Computer Science for teachers from Nitra and Trnava regions and was finished up by 160 teachers in the 1st target group, 42 teachers in the 2nd target group and 120 teachers in the 3rd target group. Teaching was provided by 17 lecturers.
The investigation of the satisfaction with the DVUI education

The investigation was conducted some time after the end of the project (1.5 a year after the first run, 0.5 year for the second) among teachers from Nitra and Trnava regions. The teachers therefore had enough time to evaluate the relevance of the project from the point of view of their pedagogical practice. The objective of the investigation was to find out how the pedagogists evaluated our methods of teaching within DVUI project and to point out the problem items in the assessment of the teaching methods. Moreover, we wished to find out whether the teachers of Informatics and Informatics Education use acquired knowledge and abilities, as well as study materials in their own teaching. The questionnaire was also designed to show the existence of greater differences in evaluation of quality and educational method of individual participants of DVUI education, and whether the participants actively implement the knowledge and skills acquired during the education in their current work in educational institutions. We were thus interested mostly in the area of implementation and use of ICT, whether on primary or secondary schools, or active use of acquired innovative approaches and methods in education.

The investigation was conducted by means of electronic questionnaire in the course of January and February 2012. We mostly used closed type of questions with five-point scale of agreement or disagreement. The respondents were able to give their opinion in open questions.

General data of the respondents

211 participants took part in the evaluation altogether, 48 male and 163 female. 66% of the respondents were from primary schools and 14% from eight-year gymnaziums. The rest of the respondents were from business academies or specialised schools. Only 14 teachers completed continual education based on their employer’s instruction. The rest stated that their participating was based on their own initiative. Most of the respondents, on top of teaching informatics subjects, also teach other subjects or are in charge of computer administration (Figure 1). 12 respondents stated they are head masters of educational institution. All of the respondents consider their relationship towards long-term education very good or good.

![Figure 1: Work position of respondents.](image)

We get interesting results when we compare the length of teaching practice and the length of teaching of informatics subjects practice. As many as 36% of the respondents have teaching practice longer than twenty years (Table 1). Some of the respondents were university graduates at the time of...
the project execution. Almost 60% of the respondents, however, have teaching of informatics subject practice shorter than 5 years (Table 1).

Table 1: Frequencies of respondents’ teaching practice

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<th>Teaching of informatics subjects practice interval (years)</th>
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Source: own research

Ergo, the teachers with long-time pedagogical practice started to teach another subject. We can only conclude that before the execution of the project, these were the teachers who did not complete formal preparation; however, the educational reform did not speak about teachers’ qualification. The reform was primarily aimed at the content of education. The numbers only confirm the fact that informatics is truly a new subject. We were also surprised by the fact that among the respondents there were teachers who have been teaching informatics for more than 20 years, when the people did not even consider this kind of global impact of modern technologies.

Results

The questionnaire method allowed the respondents to express their agreement or disagreement with a particular statement (1 – I completely agree, 5 – I completely disagree). The results are presented in groups of graphs logically related to each other.

The answers show that during the continuous education, most of the teachers acquired information suitable for their current needs (Figure 2a). Many of the project participants were creators of a school educational program, directors of subject committees, administrators of school websites, school’s webmasters or administrators of technicalities. This is the reason for them to find the content of some of the modules familiar. There was no teacher who would find all of the presented information completely new (Figure 2c). Despite this fact, most of the teachers had the opportunity to be inspired by the demonstrations in practical exercises and discussions (Figure 2b), which they could consequently utilize in further teaching practice. According to 72% of the respondents, the education was sufficiently interactive, which means they had the chance to try the work with individual environments in practice, participate in discussions etc.
a) Information I acquired during the education are suitable for my current needs.
b) Practical parts and discussions conducted by the lecturers provided me with sufficient amount of demonstrations and inspirations utilizable in my further teaching practice.
c) What percentage of the education’s content was completely new information to you?

Figure 2: Frequencies of respondents’ scaled answer.

After some time, it is appropriate to think also about the benefit of the provided materials and technology, acquired by each of the participants, to the teachers. The acquisition of digital technology (laptop and data projector) for the purposes of enhancing the educational process was considered very important. The technology stays at schools, letting the school save their own financial resources, while the teacher gets a new universal teaching aid. 87 specialized publications were developed as a part of the project (18 - 1TG, 47 – 2TG, 22 – 3TG); they were specially developed for each of the modules, taking account of the needs of the particular target group. These materials, together with additional materials in the framework of e-learning support, were the basis for the education. It is therefore interesting that not all of the participants used the materials during the education (Figure 3a). After finishing the project, the utilization of the materials deteriorated even more (Figure 3b).

Figure 3: Frequencies of respondents’ scaled answer.

The method of the education was adapted to current situations, modules and also target groups. In some situations, the groups were joint (a discussion was conducted), in others, activation methods were used or, in addition to the main lecturer, assistant lecturers were available. This was the reason for 74% of the respondents to state they had a chance to exchange experiences with lecturers and also other participants during the education.

The lectures and exercises in the framework of the education enabled the respondents to acquire or broaden their skills, or to develop their intellectual and cognitive skills while using and implementing ICT to the educational process (Figure 4a). Getting familiar with individual
environments and ways of work during customization of media elements (pictures, animations, video, sound) was not perceived sufficiently (Figure 4b). Didactics of programming had the worst results in the evaluation (Figure 4c).

![Figure 4: Frequencies of respondents’ scaled answer. Description in the paragraph above.](image)

Modules were divided into four areas (described above). Their structure was not considered definitely good by the participants (only 46% of the respondents). Our ambition was to preserve the logical progression of education, from the general knowledge to the specific, which, from the point of view of the respondents, could have led to inappropriate timing of module in the education. Problem solving and programming was, together with Digital literacy, considered to be the most valuable topic (33 %).

## Conclusion

The National project of further education for primary and secondary school teachers of informatics can be considered a successful pilot project. Within the project, a unique set of study materials was created, and is a high quality study literature for practising informatics teachers as well as for future informatics teachers (Lovászová, 2011). In case of future conducting of such a project, 70% of the investigation’s respondents would surely like to participate again. Participation in the project was a contribution not only for the participants, but also for their lecturers, who had the opportunity to confront their teaching methods and materials with other lecturers and the teachers, and cooperate with their colleagues during preparation of education modules and study materials.

## References


