

Methodological problems in integrating information and communication technologies in elementary school

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Abstract: One of the main aspects of educational reform in Bulgaria is the introduction of information and communication technologies to educational process. This article discusses issues associated with the usage of new technologies in primary school. Management of pedagogical process of students from first to fourth grade has its own specifics, and working with information and communication technologies increases the ability of the teachers to expand and enrich their pedagogical methods and tools to achieve effective results at the end of the learning process. The article gives a brief overview of some of the latest technologies offered to primary teachers, such as multipoint technology with software ‘Envision’ and ‘Mouse Mischief’, and Kinect technology creating the new type of interaction between man and computer. It also brings up the need to develop a new methodology of working with information and communication technologies. Multipoint technology has a huge impact on the acquisition of non-technological skills. Methodological training of teachers should focus on the possibility to combine the appropriate use of multipoint technology in the construction of non-technological skills. Such methodological development would be a significant achievement in modern Bulgarian primary education.

Key words: ICT, multipoint technology, methods of education, primary school education

1. Innovative technologies in the pedagogical process

Information and communication technologies (ICT) are one of the basic building blocks of modern society. Many countries place them in their educational cores along with basic literacy skills of reading, writing, numeracy. They integrate them with the development of transversal communication skills and social inclusion necessary for students and teachers to effectively interact in today’s society. In Bulgarian primary school these trends have strong impact, due to social and community development. Information and communication technology (ICT) literacy accompany the students of the first grade and help them to develop cognitive

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skills up to the fourth grade. Primary school emerged as conductor of innovative, interactive, computer technology, associated with different organization of the learning environment, increasing motivation and performance in the learning process. The main objective of this effort for effective use of modern information technology is raising the quality of education, as well as enrichment of curricula, development of quality of new learning skills. The choice of primary teachers to actively bring in pedagogical process, helping to use information and communication technologies and interactive platforms, is not accidental. Statistical data (Petrova and Vasileva, 2013, p. 70) of several years show, there is a serious decline in literacy of Bulgarian students, and problems with developing skills for active social interaction (Eurydice network, 2012, p. 5). These negative trends in Bulgarian school teachers prove there is a need to develop educational content through new, modern interactive methods, including use of information and communication technologies. In this way students acquire knowledge and develop skills according to principle—‘learning by doing’ or ‘learning experience’. Working with ICT at an early stage has emerged in several levels (or stages):

- Computer-Based Learning: using computer as a key component of the educational environment—computers in the classroom and specifically structured learning environment;
- Computer-Based Training: performing special educational tasks through various programmes—in Bulgarian schools for early stage work on the learning platform;
- Comenius logo, proektobazirano training; interactive tutorials developed by Sirma Media;
- Web-Based Training: using a web browser with interactive techniques such as chat, discussion boards—in Bulgarian schools adequate and affordable platforms using Web 2.0.

Each level of working with computer technology has its own specifics. This puts them under common denominator—the pedagogical aspect of administration and high educational interactivity.

2. ICT educational process in Bulgarian schools

Establishment of ICT in school practice of primary school is accompanied by the introduction of a new type of interactive multipoint platforms. These platforms can be seen as next stage of the application of information and communication technologies. The problem that arises is that teachers should be supported in planning lessons and integration of goals, objectives and contents. Multipoint platforms that rapidly enter the classrooms require to offer a clear methodological formulation to achieve quality education by them. In this part of the paper we present the technical parameters of the software used in elementary school. Knowledge of technical capabilities is a prerequisite for the development of methodological setting for interactive platforms. The aim of the presentation is to provide general parameters that serve for the development of a Bulgarian model for interactive platforms, so as to achieve effective results at the end of the learning process.

Multipoint technology—in Bulgarian educational space two interactive platforms for the development of multipoint technology are known: Envision and Mouse Mischief. Both provide interactive learning environment. Identical parameters facilitate the possibility of struc-

turing the methodology in implementing multipoint technology. (Subject of the report is not working with an interactive whiteboard.)

Envision—acquired its relevance and applicability in 2009. The software product *Envision* implies the development of new methods of teaching based on multipoint technology. It was created for the purpose of primary education by a team of graduate students from the Technical University in Sofia who represented Bulgaria at the world finals of the Imagine Cup Competition 2009. Teachers who probed the new platform are nominated by the European Forum innovative teachers in Berlin, Germany in March 2010 and the World Forum of innovative teachers Cape Town, 2010.¹ *Envision* is a technological interactive learning platform where all students have mice associated with single computer and projector (multimedia). The cursor of each child is displayed on the screen with a different colour and image. Students perform their mouse assigned tasks and give the correct answer to questions differently. The results of each child are recorded automatically by the software and classified after completion of the task. The advantage of such a system is that it attracts the attention of students—they are becoming pro-active part in the learning process.

Mouse Mischief (Bad Mouse) is integrated in Microsoft Power Point 2007/2010, it is an interactive plug-in for this software, which allows teachers to create content which can be implemented as an active interaction with students—either individually or as a team. In this platform, students can also participate actively in lessons by using their own mice. Participation in the learning process and fun encourages creative thinking. In this sense, it successfully develops skills with computer technology as a tool, not a goal.

Natural User Interface (NUI). This is new idea of software companies tied to education—the introduction of Kinect in classrooms. Using Kinect for educational purposes can be viewed as an interactive process that requires organizing the learning course in a special way. Kinect as an opportunity for a new type of interaction with technology—natural user interface (NUI)—outlines a new global research component in modern vision of education. NUI (physical interface) is an interaction between man and computer—a user performs actions related to natural behaviour and through them controls the computer. The use of NUI is facilitated by a design that gives a user the feeling that his/ her actions are perceived by the machine and always successfully read. Audio and video information from the sensors is used as a command to interact with digital content in games or software programmes. Kinect combines a video camera, microphone and some sensors depth with which the controller can recognize people, understand gestures and movements to recognize voice and put the user in active gaming action. Kinect is often defined as a revolution in communication technology. Since Kinect can actively track users, teachers and students can control study materials through their body and voice without being bothered by wired and wireless devices. Therefore, Kinect provides a variety of physical and interactive activities. Today there are many developments (free and paid) with the potential of Kinect to create more interactive environment in the classroom, better conditions of learning for disabled children with autism to be engaged in productive time spending. This encourages professionals to assess the capabilities of the device in the field of education.

¹ Some of the nominated team and the author of the paper.

3. Methodological problems and aspects

In Bulgarian primary school there have already been drawn many lessons which integrate computer technology. Teachers develop shared virtual space for their practice patterns as learning content—<http://www.nimero.com/lessons>; <http://bglog.net/nachobrazovanie/>. Adaptation of new information and communication technologies (ICT) to the specific activity and level of cognitive development of children is not an easy task. When it comes to kids, web-based, computer-assisted and electronic learning/ learning and e-testing must be subject to the specifics of psychophysiological level of their development. Only in this context the use of modern technology increases the ability of teachers to expand and enrich their pedagogical methods and tools and bring them outside the physical boundaries of the classroom. In this sense, teachers need to be supported with an organized and systematic conceptual and methodological system for integrating knowledge from different scientific fields.

The use of innovative IT technology in education is associated with several stages:

- a) the creation of educational software;
- b) approbation (and input) in the school environment, creating lesson based on methodological literature;
- c) preparation of lesson models (numbers);
- d) training of pilot groups;
- e) statistical models for comparability of results and student performance;
- f) correction models, shaping the book for the teacher to work with technology.

Experience shows that even at the second stage—the introduction of innovative IT technologies—teachers have difficulties in methodological aspects. A number of conferences, forums and meetings with a description of best practices observed description of good teaching practice as innovation, training and didactic process as technology, etc. Developed methodological units in option complete computer tutorial, which deforms the idea of integrative function of IT technology in learning. Very often electronic resource is discussed as an electronic lesson in its part of the process layout, and not the integrity of its goals, objectives, methodology.

Integration of knowledge presupposes detailed identification and systematization of information areas that will be addressed. In preparation for the integration of modern IC technologies in the learning process it is necessary to comply with the supporting points of the standards of educational content; identify areas and topics that allow the integration in different directions; outline and justify didactic technologies. Preparation of individual lessons from the position of integration of ICT in education is associated with very carefully reconsidering the goals and objectives as integrated goals and objectives, as well as integrated visibility, etc. In lesson models the main educational tasks directly relate to the expected learning outcomes for the subject, and the active use of ICT can be defined as an additional task.

The active role of scientific experts in constructing a taxonomy of educational objectives helps to provide systematic and ordered, practically useful empirical experience. So far they did not submit complete cycle of approbation with valuable educational resources for use by pedagogical college. Following gaps identified several significant problems in terms of number of pedagogical principles and methodological concepts of quality of educational content;

contextual conceptual system; methodology in training IT—integrated process. In this sense, the approach to the introduction and implementation of IT—integrated education—could focus on creating a symbiosis between new technologies, fundamental IT pedagogical framework of the basic concepts and teaching methods—to create, develop and improve quality of actions new methodology. Such conceptual and methodological evolution would be a significant achievement for the development of ICT in school education methodology.

4. Scientific and practical Thesaurus

It is commonly known that teachers have the option to select methods and formulate teaching objectives, which are reflected in the question that while not being familiar with the methodology of teaching or not confident in your knowledge, you will find it difficult to create a ‘productive learning environment in the room.’² It is therefore necessary to propose constructs leading concepts as a basis for educational integrative taxonomy. Guiding principle in this taxonomy is the symbiosis between traditional, innovative, interactive and technological training.

1. **Digital competence** is defined as a skillful and proper use of electronic means in work, leisure and communication purpose; logical and precise thinking; processing large amounts of information; the use of multimedia technology in order to retrieve, assess, store, create, present and exchange information.
2. **New educational media**—interactive means of access to knowledge and dissemination of know-how and best practices in all aspects of education. Essentially, new media transform model of education ‘one to many’ to ‘many to many’ and prove an effective tool to improve the learning environment.
3. **Technological integration** seen in four aspects, depending on the tools that students handle school: content consumption, cooperation, communications, creation. Identifying these four steps leads to a significant increase in the level of integration of ICT in schools. Adaptation of new technologies to the specific activity and the level of cognitive development of children is not an easy task. When it comes to kids, web-based, computer-assisted e-learning and e-testing should be subject to the specifics of psychophysiological level of development. Only in this context the use of modern technology increases the ability of the teacher to expand and enrich their pedagogical methods and tools and brings them outside the physical boundaries of the classroom.
4. **IT and media literacy**—the ability to acquire, understand, evaluate and create media content; ability to interpret and create personal meaning from a variety of verbal and visual symbols; skill critical perception of media messages.
5. **Innovation**. Today, innovation is the ‘key’ to change. It could be argued that innovation as a concept was philosophically, culturally, psychologically and pedagogically loaded. Ongoing time: as early as 1967 predicted the advance of the fifth revolution in education related to the use of computer technology. For A. Ellis and D. Fouts (1993) computerization is innovation in education; according to J. Katz (1997), in the digital age our children conquer new kind of cultural space. It is therefore necessary to trans-

² From a report by Simon Black.

form education by developing new strategies effectively and improving the learning process. McKeachie and Svinick (2006) distinguished four main components in learning through computers: teachers, students, course content and technical equipment. In pedagogical science and practice ‘most innovation processes as a way of thinking, especially by action exerted in technology. This is immense scope for creativity educator as a teacher and an educator.’ The presence of innovative element in pedagogical practice can be observed. They indicate the formation of the whole methodology of modern innovations (innovation) in education. It is seen as a new scientific theory and practical field due to educational reforms in the last two decades, ‘also as a product of the “third wave” of a transformational pedagogy aimed at improving the quality of education as a new priority’ (Stefanova, 2005). In the construction of a methodology for working with multipoint systems deduced concepts are included as discursive. They are used to describe the methodology leading to the definitions: skills ICT enhanced, information skills, presentation skills, ability to work on the project; ability to work in team. The distinction of this type of skills stems from the fact that they are associated with the use and application of ICT in the context of different subjects. The modern training is increasingly based on the methods in which the pupil is central. Associated with this activity are the so called non-technological skills (soft skills). They refer to the adequate performance of academic tasks, which can be regarded as milestones in a particular school project. The acquisition of non-technological skills in this context is a trend caused by increased demand for such skills. Multipoint technology has a huge impact on the acquisition of non-technological skills by their very existence, so we should not neglect how to utilize these skills. Attention and methodological training of teachers should focus on the possibility to combine the appropriate use of multipoint technology in the construction of non-technological skills.

5. Conclusions

The output of the education market of a number of technologies such as multipoint technology software solutions for tablet Kinect from leading companies and organizations, multimedia and electronic lessons poses to the teacher about how, where, and when to use this product. For a self-serving, poorly integrated learning tool sooner or later makes its negative effect. The new type of training seems practically easy to implement, but a deeper look shows a rather complicated technique whose realization requires considerable time to achieve the efficiency and appropriate standard by a new methodology in the learning process. The determination of the group of non-technological skills base can be developed through multipoint technology that supports teacher working with integrated learning content. It directs him/ her to a certain systematics in planning, building and development of non-technological skills, accessible and achievable for students in elementary school. As a short conclusion after profile issues it can only be added that computers make it possible to increase the scientific value of the material taught only through the development of computer tutorials on high methodological and substantive level.

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Wykorzystanie technologii informacyjno-komunikacyjnych w procesie edukacji wczesnoszkolnej. Problemy metodologiczne

Abstrakt: Jednym z głównych kierunków reformy edukacyjnej w Bułgarii jest wprowadzenie do procesu edukacyjnego technologii informacyjno-komunikacyjnych. W artykule omówiono zagadnienia związane z wykorzystaniem tych technologii w procesie nauczania w początkowych klasach szkoły podstawowej. Zarządzanie procesem dydaktycznym na pierwszym poziomie edukacyjnym ma swoją specyfikę, a praca z nowoczesnymi technologiami informacyjno-komunikacyjnymi daje nauczycielowi nowe narzędzia pozwalające na zwiększenie efektywności procesu dydaktycznego. Artykuł zawiera krótki przegląd niektórych z oferowanych nauczycielom szkół podstawowych nowoczesnych technologii, takich jak Multipoint z oprogramowaniem „Envision” i „Mysz

Mischief”, a także kinetyki umożliwiające nowy rodzaj interakcji człowieka z komputerem.

Zwrócono też uwagę na konieczność stworzenia metodologii pracy z nowymi technologiami informacyjno-komunikacyjnymi. Technologia Multipoint ma ogromny wpływ na nabywanie przez dzieci umiejętności nietechnicznych. Kształcenie metodyczne nauczycieli powinno koncentrować się wokół właściwego doboru technologii informacyjno-komunikacyjnych, umożliwiającego rozwój tych właśnie umiejętności. Wypracowanie nowych rozwiązań metodologicznych stanowiłoby znaczące osiągnięcie w nowoczesnej edukacji w bułgarskich szkołach podstawowych.

Słowa kluczowe: technologia informacyjno-komunikacyjna, technologia Multipoint, metody nauczania, edukacja wczesnoszkolna