TEACHING IT IN THE PRIMARY SCHOOL
Some Aspects of Propaedeutics of Informatics Knowledge

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Abstract: The paper presents some ideas of the authors about teaching informational technologies in the Primary School. Usually we talk only for ICT-skills to be formed in the school. But all the education process in the Primary school, aims in doing propaedeutics of important fundamental scientific knowledge in Math, Nature, Social sciences, Art and so on. Computers and the informational technologies are not only educational tool and environment. Together with ICT skills students should obtain some fundamental knowledge from Informatics on propaedeutics level. Some examples of giving Computer science knowledge in the Primary School are presented.

1 INTRODUCTION

Science and technologies play important role in the contemporary life. We say that they are indivisible parts of a whole. Technologies' development makes the communication between people easier. People live in a society, based on the technologies. The education should correspond to the social needs. Education should prepare students for the future. Together with skills, young people have to obtain knowledge that to help them in the life. Children should be prepared for the changes in their life, and also to be capable to make changes by themselves in the future (Guest and Postlethwaite, 2000).

Children are curious by nature. Their passion for discovery, for new and interesting themes, must be encouraged and developed. Computers give students the opportunity to see a new world. Children become familiar with the new technologies fast – they fill themselves comfortable into this new digital world.

Using ICT in the learning process in the Primary school gives opportunities for:
- Forming habits for research and creative work;
- Increasing the motivation for learning;
- Forming skill for working with information;
- Developing communication skills;
- Active learning;
- Changing the quality of the control of the learning process;
- Connecting students to the social achievements.

Educational goals express the society's expectations and are closely connected with the social educational needs and requirements (Saylor, 1981). The development of the science and the society leads to changes in the curriculums – what and how to study. As technologies take an essential part of the students' live it is very important to determine the role and the place of teaching ICT at school.

2 FORMULATION OF THE PROBLEM

According Duggan and Gott (Duggan, 2002) the school's curriculum are overloaded and this cause problems with students' motivation for learning. One possible decision of the problem is the implementation of some of Dewey's methods like "learning by going". But this could be useful only if goals of the educational process directed to the future are well analyzed and correctly formulated.

Other possibility is the implementation of interdisciplinary approach in the learning process.

Goals that are directed to the future change the learning process now. The first thing, to be thought in curriculum development process, is to determine the curriculum aims (Walker, 1997). Thus, the studies on improvement of the science curriculum may trigger determining future aims of the science teaching. The teaching process has to start from the Primary school with the active interest and participation of the pupils that to provoke active learning instead of passive reproduction. Students have to see the practical aspect of the knowledge, to realize their necessity and importance for the real life. According to Jonane (Jonane, 2005), the change is "from outerdirected, "expert"-driven curriculum and methodologies to more learner-centred, experiences-based, connected ways of acquiring the knowledge, skills, and attitudes required for life in the world".

The process of introduction of IT at school is still unadjusted. It is not based on strong psychological and pedagogical researchers. The use of IT in learning process should correspond to the specific aspects of education and learning. Otherwise, the efficiency of the implementation of technologies at school will decrease and some negative psychological outcomes could arise (Бабева, 1998).

The age of the pupils started to work with IT decreases. In Bulgaria the new curriculum for Primary school from 2003 includes subject named "Informational technologies" as an elective subject. The main point in teaching IT to 7-11 years old pupils is the formation of skills. The assertion is accepted that young pupils can't understand any fundamental informatics knowledge. This fact is common on a world scale.

Now educational goals in teaching ICT are restricted in acquiring ICT skills from the students. Many researchers study the problem of the specificity of interaction between the children and the computers (Коул, 2000, Papert, 1980). According them forming only skills at the beginning leads to continuing and absorption of this tendency in higher grades – students do acts without understanding. This goes in conflict with curriculum in Informatics. There is a lack of interest in obtaining and developing of fundamental knowledge. These researches are not taken under consideration in developing teaching plans and standards, concerning teaching IT in the Primary school. Many factors like idiosyncrasy and the availability of talented children, in context of ICT are not taken into account. In this sense there is a

need of developing of qualitatively new learning process, learning plans and teaching systems. ICT curriculum has to be brought up to date regularly according to the new tendencies in ICT's development.

Certainly, teaching about operational system and computer architecture to $1^{st} – 4^{th}$ grade students is useless. But some ideas of basic computer science knowledge on propaedeutics level have to be formed at this age.

3 EXAMPLES

Pupils can be introduced to some fundamental concepts using interesting examples. Without stating strong definitions some elementary but important ideas can be formed.

From the other hand, giving methodology of realizing propaedeutics of some computer science knowledge in the Primary school is very useful for the primary school teachers that are not specialists in computer science. Usually, in the process of teaching IT and using technologies in their job, teachers encounter problems with terminology and its explanation to student. The development of appropriate semiotics system is very important and it would enrich methodologically teacher's work.

To clear up the idea of form and volume of informatics knowledge to be introduced to pupils, some examples are given bellow. The examples are implemented within the educational system for teaching IT in the primary school in Bulgaria "ITI". The authors are part of the authors' team of the system. "ITI" has been implemented in the practice for two years.

The first example presents an idea of how to give pre-knowledge about operational system to students from 2nd grade (8 years old pupils).

Figure 1: Introducing the Operational System.

Analogy between operational system and the carpenter's tools box is done. The mechanic, the

carpenter, and all craftsmen have their chests with instruments. They use them to do their job. In the same way there is one "most important" program (the Operational system) in the computer and it starts automatically when the computer is switched on. This program "opens" its tools-chest and orders all its instruments on the working plot (the Desktop). The instruments of the program are not hammers and turn-screws but programs and documents. Actually the chest is not big enough to collect all programs and documents – only the most important or most often used items are placed inside. During the talk with students teacher doesn't introduce the term "Operational system". In the book is only stated "To use the computer we are helped by a special program. When we switch on the computer, this program "opens" its tools-box on the screen. In it instead of hammers and saws there are icons – small pictures that help us to start different programs." (Manev, 2009, IT 2 grade)

In this way we can form the understanding of the existence and the need of the operational system. Later, usually in the Secondary school, students will be given the term "Operational system" and more detailed information about it.

The next example is about the introduction of the file system to 3rd grade students (9 years old pupils).
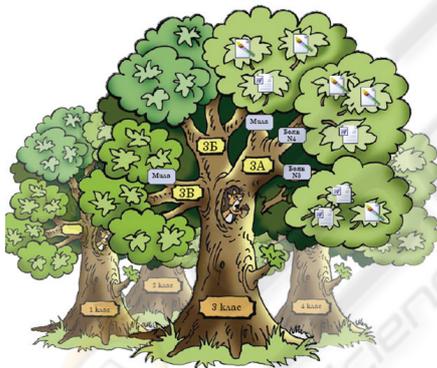
Figure 2: Introducing the File System.

In computer science data are organized in hierarchical or dendriform system. At school students are divided in grades, according their age. Students from the same age are divided in different classes. The following analogy can be made: The school is a park of trees. Every tree in the park corresponds to a grade – we have a tree for the first grade students, another tree for the second grade students and so on. Every tree has 3, 4, or more branches – these are the different classes. A lot of twigs start from every branch – one per each student.

On every twig there are leafs – the documents, created by the particular student.

The idea of file's names can be clarified on an illustration like that shown on Figure 3.
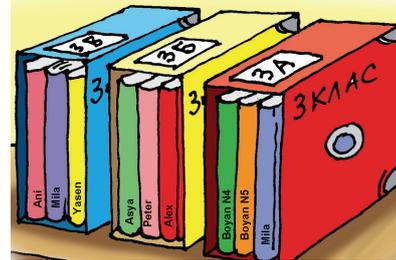
Figure 3: Introducing the rules about file's and folders' names.

The 3rd grade (it depends on the concrete national educational system) is appropriate time for the introduction of the terms "file", "folder" and "file system". In the student's book it is stated: "We use programs to rule the computer. With some programs we create computer documents. Programs and documents are stored into the computer as files. Files are ordered into folders. Every folder can contain files or other folders. The files and folders are ordered in dendriform system, called File system." (Manev, 2009, IT 3 grade).

After the introduction of the file system, students start to solve more complicated computer based school problems with higher level of understanding.

The last example is about the propaedeutics of the clipboard to the 4th grade students.

Two of the main skills that students acquire are to do copy and paste, working with text and graphics. On the next level it is important students to understand in general the way the mechanism works. This will give them knowledge how to use this mechanism in more innovative way and will lead them later to the need to obtain more detailed information about it.

The main element of the process of creating copies or moving objects is the clipboard. It is a complicated mechanism of the operational system. To create a basic knowledge about the clipboard to the pupils it is appropriate some simplification of the process to be made. The clipboard can be presented as a part of the computer memory where one can put temporarily some item, or copy of an item, to use it later. It is important that students to understand that the clipboard is a common feature for all programs. Every item put there during the process of working with one program can be used by the same program or by another program. The second accent has to be put on the understanding that the replaced item

remains in the clipboard until putting another item in the box – every new item deletes the item that was in the clipboard. The item that is put in the clipboard can be used multiple times by different programs.

Figure 4: Explanation of the command Cut.

The illustration of Figure 4 presents the way of execution of the Cut command. The girl cuts the grape cluster and puts it into the crate.

Figure 5: Explanation of the command Copy.

Figure 5 illustrates the Copy command. There is a magic in this act – after the execution of the command, the grape cluster is still on the vine, but there is one more in the crate as well. That's why the boy is presented as a magician.

Figure 6: Explanation of the command Paste.

On the last illustration (Figure 6) the grandmother takes the grape cluster from the crate, no care if the grape is real or not, and puts it into the plate. In all tree pictures the crate symbolizes the clipboard.

After giving the students this basic knowledge about making copies or moving objects, their skills can be enriched, applying Copy, Cut and Paste commands not only for text and graphic but for files and folder as well.

4 CONCLUSIONS

The main accent in teaching the young students to work with the informational technologies is primarily on the formation of the ICT skills. Even that, it is of substantial importance to give them basic knowledge of some fundamental process and objects from Informatics.

The curiosity about the nature of the things in the world that is typical for the pupils must be support, intensify and develop.

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