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Computers and teaching mathematics

Abstract. It looks as if the school shut eyes to progress. The computers help everywhere, but schools are short of them. The computers would be the most effective teaching aid. The school does not react to pupils' knowledge reached out of school by changes of the teaching contents. Teaching mathematics could be more effective.

Introduction

In spite of the fact that only about twenty years have passed from the invention of a computer of really high quality and reasonable cost, the computers are influencing almost all human activities nowadays. For instance, the work in administration, stocks, production or trade is hardly imaginable without computers these days. The variety of programs provides the user with comfortable, reliable and very effective ways of handling the great number of data. The computer's memory is infallible and all necessary information is given to the user in a desirable form.

1. A small research project in education

The following three conditions are inevitable for carrying out successfully a teaching process with the aid of computers:

1. To provide schools with enough computers.
2. To prepare teachers for the work with computers.
3. To prepare enough didactic software for particular subjects.

How are these conditions fulfilled from my point of view?
First condition: I have been teaching the subject Informatics to students of social work in the distant forms of studies. These students usually work in administration. During the last two years I have been teaching and statistically worked out data concerning 223 students. Out of them, 44,6% have a reasonably good computer at home, 55,8% have their computer in the office. A complementary information that has been gained says that the computers were preferably given to older people and people in higher positions while my

students (as mainly young people) remained at the end of the queue. Consequently, the equipment of the staff in administration by computers is in fact higher than the mentioned 55,8%.

In the distant form of studies I also teach students who are preparing to become teachers in elementary schools. Here, I statistically worked out data obtained from 121 students. Out of them, 36,4% have a good computer at home, but only 7,4% have their computer in the office (school); in the latter case, it is mostly used for administration. In neither case the computer is used in the teaching process. According to the previous research carried out in [2], the use of computers in teaching is very rare.

Some primary schools equipped their computer rooms with second hand computers. These computers are mainly used in after school programmes, sometimes also in complementing the teaching process. Their use in Mathematics of elementary school is seldom.

It looks as if the school did not catch the outbreak of new technologies and its use in teaching. The equipment of schools with computers is not sufficient. Many computers used in schools are out of date, others are not used for plenty of different reasons, and usually the computer of the highest quality is used for administrative purposes. The project Infovek deals with equipping schools with computers, however, this is carried out very slowly [9].

Second condition: In her diploma thesis (defended at Pedagogical faculty in Banska Bystrica in 2002), J. Zimanová [10] found out, based on the sample of 36 teachers, that 53% of them do not have confidence to perform teaching with aid of computers because they are unable to work with a computer. Out of them, 56% think that the pupils should work with computers already at the elementary school, the remaining 44% suggest to use computers from the second grade of primary school.

The research has been carried out on a sample of teachers of which one half is over 40. The situation is gradually improving with the arrival of young graduates of pedagogic faculties. These graduates have undertaken courses with computers so it is assumed that their computer skills are sufficient. A certain risk is due to the fact that knowledge regarding computers is quickly becoming obsolate; new developments regarding the hardware and software of computers are being applied very promptly.

Third condition: The absence of didactics computer programs has significantly contributed to the critical situation. There are several programs available for the second grade of primary schools and the secondary schools; many of them focus on mathematics. However, the esthetic and commercial aspects often prevail didactic ones [2], [4], [6].

The students of Pedagogic faculty in Banska Bystrica have created six didactics programs during the last 10 years and partly verified their applicability in teaching mathematics in the first four grades. They have been pleased by approaches of pupils toward the programs. However, such programs cannot serve

as replacements of professionally developed programs of high quality.

I am dealing mainly with prospects of the use of computers at the elementary school. Out of 21 students of distant studies nobody knows a computer program suitable for teaching mathematics at the elementary level.

2. Teaching with the aid of computers

The first aspect of the contribution of computers in teaching is motivation. When carrying out experiments with the aid of computers many pupils turned out to be so enthusiastic about computers that they went on working on them during the breaks and tried to persuade us to allow them to work on computers also after the classes.

The students of the first grade practiced addition of numbers up to 20. A similar level of interest has been shown by pupils of the fourth grade working with fractions. If the class is equipped with at least one computer (the same with 2,3,...), one can already perform individual activities. The pupil working with computer does not require attention of a teacher who is released for other teaching activities. The teacher can devote his time to other pupils. The pupils as a form of award understand the work with computer.

A simple didactics program gives the pupils tasks from a selected set, checks their correctness, and according to the pre-programmed instructions reacts to correct or incorrect answers.

One can achieve a higher effectiveness of teaching by composed didactic programs in which case the computer, in addition to teaching, provides (via a simple program) a statistics on performance and mistakes of pupils. Based on these data the teacher can decide on proposing subsequent tasks.

I shall give the following example: the pupil can strengthen and automatize the multiplication facts. Firstly, the computer randomly chooses tasks from a determined set. If the pupil answers some tasks incorrectly, the computer will offer the same task after some period. It keeps the task in memory until receiving several (the number is pre-determined) correct answers. The effectiveness of teaching is increased by the fact that the computer does not spend time by working out known facts.

The increase of the pupils' learning rate is problematic because it can lead to stress and thus to worsening the performance of the pupils. However, the computer can make timing without "chasing" the pupils, only for the needs of the teacher. The teacher can use this information for his complex evaluation of pupils' achievements as an important pointer towards the further teaching process.

The work with computer is more interesting if each pair of pupils can be given one computer. Then a work in pairs is possible. Although even this situation is not ideal, such an equipment of schools would be fantastic these

days.

From different sources (e.g. from television) we know that each of the Japanese students has his or her own computer in school. It is even hard to dream of about such situation here these days.

3. Out of school information

The pupils are influenced by many impulses already before entering school. These are above all TV, radio, ... Many households are equipped with personal computers. Children who have an access to computer usually gain a broad knowledge from their parents before entering school. For example, they know letters and figures from the keyboard of the computer, but they often learn to work with numbers at least up to 20, they are able to do partial reading or they can write down something on the keyboard. They can better concentrate on their activities. It is certainly an advantage that they have at least partial computer skills. These influences together with an intelligent family environment cause acceleration in gaining the knowledge. The school ignores these facts. Moreover, there was a reduction of the primary school curriculum while the period of primary education increased from eight to nine years. The situation is analyzed in more details in [1]. As a consequence of this, the working rate of pupils decreased considerably.

Conclusion

If the school should prepare for life it is certainly necessary to look at the society we live in. Our society is based on competition. Successful are those who are better prepared, faster, more skilful ...

Not only the process of equipment of schools with computers is neglected, but there are other factors negatively influencing the quality of education. We particularly mean the increase of pupils' number in classes, prolongation of teachers' office hours and the unsatisfactory use of the acceleration of growing knowledge of pupils.

The teachers should also draw attention of the authorities to these problems in order to improve the situation.

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