INFORMATION TECHNOLOGY IN THE PROCESS OF EDUCATION

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Abstract: This report deals with qualitative analyses, evaluation of the present situation and utilization of modern information technologies in the process of teaching and is, therefore, based on the conditions of the school system. At the same time the report reacts to the basic results and information gained through various researches that have dealt with the effects of computers on human health and qualitatively analyzes a brief summary of certain negative impacts on the health of computer users. In order to see the matter in a comparative perspective the effect of computers on education and teaching is hereby described from the point of view of both the teacher and student. Such effect appears as significant, proved and continuously progressive. Information technology is all the more appreciated high-quality educational tool. Nowadays a personal computer is considered to be a standard equipment of households and workplaces. Using a personal computer is also very often the main activity in the process of studying. When considering today's knowledge and experience of the practices there is no doubt that mass usage of computers brings along many health problems that are closely related to the frequent usage of computers.

Key words: Information techniques, information technology, computer application, educational tools, didactics, J. A. Komenský, computer game, on-line learning, e-learning.

Introduction – history

By the second half of 1980s the first generation of by-computer-affected children was being brought up. That was all brought about by introducing the first 8-bit personal computers in schools and educational institutions and also by having the possibility of owning a personal computer at home. Due to the financial intensity and for the unavailability of the original programs for these computers the number of children gaining experiences through working on computers was rather insignificant. The main problem was the lack of programs covering practical operations and educational applications that would support the educational process itself. Another problem was the need of having

the ability to create your own computer programs for a specific use, in other words the knowledge of programming in some of the most-spread programming languages as, for example, Basic, Pascal, LOGO and others. The situation was also affected by the availability of hardware equipment. Computers were still rather at the early age of their development and due to the their slow operational speed and unreliability they were used, apart from playing computer games, as a substitute for typewriters having the great advantage of being able to save documents for a later recovery. Their basic vector graphics could by also used to create graphically edited pictures.

However the situation changed after the introduction of new computer technologies. In the early 90s of the last century Apple MacIntosh and, later on after a court trial with the mentioned company, Microsoft came to the market with new operational systems. Such systems radically changed the use of computer technology in general routine jobs. The user`s accessibility to IT itself changed with the introduction of new technologies enabling 16 and later 32-bit computer implementation of more pleasant operational systems called WINDOWS 3.1, 3.11, 97, 98, NT, 2000, Millenium, XP, Vista and others. Until that time the user had been a programmer at the same time. With the operational systems he became a real comfort user having the possibility to use only the given components of operational systems and the application software working through such systems. Apart from the given systems program hardware also played a significant part here as it improved the comfort and general handling of the technology. Nowadays computers are far more faster, printers have gone through a great progress with the outcome quality. That hardware started with the one-jets, which were capable of printing through a copy paper at the speed of one page in a half an hour, and developed through 9-jet, 24-jet, matrix, ink (Bubble Jet) to laser and today`s colour and high-speed printers. Possibly multimedia, input and output devices for saving data, went through the most significant changes, starting with punched cards, going through magnetic tapes, cassettes, floppy disks 8", 5 ¼", 3 ½" all the way to ZIP technology and rewritable CDs and today we even have high-capacity DVDs at the disposal. Other technologies experienced a great deal in development too, such as monitors, hard discs, graphics and sound cards, net components enabling connection among two and more computers and others. All these examples are an evidence for the development in information technologies and at the same time it is a reminder telling us to pay more attention to computing technology in our school system.

What are therefore the basic advantages in the educational process?
1. Computers form a reliable and attractive environment for learning, which is not a menace to children and does not harm them but on the contrary it attracts them and draws them in, and more:
    - computer systems respect the learner`s individual needs, his studying pace and abilities,
    - children that do not like studying can become enthusiastic by computers,
    - "it" talks, quickly displays moving pictures and finds the required information.
2. Computers offer an opportunity to the learner to become successful in areas where he was not before and help him overcome the incurred trauma formed in the past.

3. Computers can become help for children when learning to read, write and speak.
4. Computers can even contribute in teaching children affected by specific disorders.
5. Computers offer a quick access to rich sources of information:
   - training leading to work with information,
   - visual and graphical communication.
6. Computers create an environment for developing learner`s own ways of thinking.
   (Černochová, Komrska, Novák, 1998, s. 10–12)

Extract form an article Washington Post (May 2000). Learning in the Real World is a California-based nonprofit association dealing with the influence ICT has on the studying results. This organization conducts analysis of common factors and focuses on learning the truth about whether computers really contribute to any improvements in studies.

Still too little is known about how computers impact education to justify the large amount of money spending on technology in schools. Many parents and school officials nationwide assume that computers are a necessary tool for learning basic subjects such as math and reading, even for students of elementary schools. Parents also fear that their children will not be able to compete in later life if they are not exposed to computers at a very young age. The researches demonstrate that "hands-on" learning is more effective than "keyboard" learning during children`s early school years. Still, defenders of educational technology say that computers motivate students at all levels and enable children to visualize abstract concepts in ways that books and lectures cannot match. Many teachers confirm speculations that computers stimulate motivation from an early age, when dealing with mathematical games, all the way to older students, when preparing internet studies. In 1998 Educational Testing Service carried out a study engaging 13,373 pupils. This research is still considered to be the most complex survey that has shown that the right didactics when using a computer enlarge the overall score in mathematical tests whereas computer drill has a significant eliminating effect. School computers improve results in studies if the computers are used well and appropriate didactics are applied. The research examined 6,227 pupils of the fourth grade of an elementary school and 7,146 pupils at the eight level who both had to pass a standard mathematical test. The younger pupils who were using computers for mathematical games reached by 15% better results than the control group. However if they went through training of computer techniques there was no visible difference. The older pupils reached virtually the same results. When using computers for stimulation and mathematical applications, then the score of the tests rose significantly. On the other hand when the computers were used strictly for teaching computer techniques, then the score noticeably dropped.
(http://www.ceskaskola.cz/p-art.asp-id=1497.htm)

Health and computers

Using a computer is a common routine nowadays. We see computers almost everywhere we go; they have become an inseparable part of our lives. School chil-

dren now learn the basics of computer technology and computers have become useful members in many households. Computer I standard equipment in most workplaces and computer operations have become the main job content in many areas. According to the current knowledge and experience there is no doubt about the fact that the mass usage of computers also brings a wide range of health problems. The first notes, both magazine article and professional studies, concerning the impact on health when using a computer appeared in press in 1960s. Many of them awoke worries about possible health damage when working with a computer targeting especially the monitor as the source of electromagnetic field. Since then a lot of attention has been paid to this issue. Later on the findings presented that the original speculations were not well-founded and the danger of possible health damage when working with a computer was partly reduced.

The health issue concerning using computers can be divided into:

1. Problems with the electromagnetic field generated from the display unit
2. Sight difficulties
3. Difficulties with locomotive organs
4. Psychosomatic difficulties

1. Problems with the electromagnetic field generated from the display unit

The dominant part of electromagnetic field generated from the display unit (monitor) is formed by the radiofrequency area of an electromagnetic field.

Other frequency factors of electromagnetic field are rather insignificant, these are such as:

- **optical radiation** - the levels of infrared ultraviolet radiation are very low, their negative impact on health was not proved.
- **X-ray radiation** - the level when using a computer is also very low, it can be compared to the natural background of the environment.

2. Sight difficulties when using a computer

Subjectively sensed sight difficulties, when using display units, were the first area that drew the attention. According to the latest studies almost 75% of computer users complain about the sight difficulties. The main factor causing such problems is the highly demanding sight performance resulting from the constant eye adjustment when observing from a short distance, the effort of muscles controlling the eye lens curve or the axial confluence of both eyes and diverse brightness of different areas that the eye observes.

Sight difficulties occurring when using a computer, as described, vary in character and they occur as both sight and general fatigue accompanied with headaches, increased

eye dryness or dacryops and sore eyes, pressure in eyes or even unclear vision. There is a need to emphasize that there are great individual differences in both the intensity of sight difficulties and the length of working hours preceding their occurrence. Many studies dealing with the problematic impact that display units have on eyesight have been carried out. A research in this area has already been concluded. The reached conclusion is the fact that computer screens do not damage eyesight, but that the problems when using a computer are caused by eye fatigue that fades away after taking a rest.

The most influential factors causing occurrence of sight difficulties:

- **individual eyesight condition** – people affected with eye correction or hidden sight defects experience sight difficulties more often and within a shorter period
- **the length of time spent in front of the computer** – the longer the time is the more frequent the occurrence of difficulties is, according to the latest studies the eyesight fatigue comes after about having two hours spent in front of the screen and is highly felt after four hours.
- **the visual conditions at work** – overall and local conditions at work must provide sufficient visual conditions and a suitable contrast between the screen and background and at the same time concerning the sort of work and the user`s individual sight requirements
- one of the most common causes of sight discomfort is a **frequent changes in the eye focus** as switching between the screen, paper documents and keyboard
- **disturbance by scintillation and reflections** of the computer screen
- **scintillation by light sources** (as windows)
- **unsuitable ergonomic organization** of workplace and seating
- **psychological factors** also play an considerable role (work motivation, social climate, work organization and others)

Prevention:

- ergonomic arrangements of the work area
- keeping the principles of visual ergonomics, principles for good vision and sight comfort, relevant lighting
- when facing the screen having a window behind is not suitable, windows should be equipped with adjustable blinds
- using screen filters, suitable visual screen parameters
- large enough desk giving low reflection, sufficient distance from the screen and the correct placing of the monitor
- good work organization as time restrictions with set breaks when working in front of the screen
- medical eyesight check-ups
- paying attention to workload especially psychological when organizing work
- having enough room for placing documents, we recommend placing them either in one way between the monitor and the keyboard or in a stand exactly next to the monitor

3. Difficulties with locomotive organs

The work on a computer is done when sitting. It is stated that 60 to 80% of people who experience unremitting sitting suffer from backaches. This concerns especially pain in spine, mainly its lumbar and cervical parts, and also sore hands, arms affected by quick finger movements or by an excessive use of a mouse. Even though the incidence of difficulties with locomotive organs, especially spine, is great it cannot be marked as a specific problem for work with a computer as these problems occur with most sedentary activities occurring in office jobs or various economic sectors.

Difficulties with locomotive organs are caused by:
- long-term sitting in a still position often connected with excessive pressure on intervertebral discs in the area of lumbar spine named kyphotic sitting position (incorrect bent of lumbar spine) and constant head bending over
- unsuitable ergonomic work-place arrangements (monitor and keyboard settings often connected with head turn or leaning the head forward or backward, unsuitable height of the work surface, lack of working space on the desk and others)
- unsuitable office chair type and often its wrong settings
- unsuitable keyboard settings are also an important cause of difficulties with arms as in such way minor muscle units of wrist and hand are strained monotonously and in a long term, too fast pace when working on the keyboard without breaks, long-term local pressure when leaning the wrist against a sharp edge of the keyboard or desk
- it has been proved that with the growing length of time the number of people affected rises

Prevention:
- ergonomic work area settings, individual settings of the work sitting place, using ergonomic tools (leg support, documentation holder, wrist pads and others)
- suitable placing of the monitor (top part of the monitor should be at the eye level and there should be 50 to 70 cm distance between them), keyboard and documents
- the height of the operational surface is very important, the keyboard is placed there (forearm and upper arm should have 89° angle)
- a good quality office chair is also very important, it should offer individual setting
- having enough desk room and a suitable top settings according to the character of work
- when sitting there is a need to apply principles of so called dynamic sitting – changing positions
- doing compensatory exercises to prevent the possible problems
- intervention through back training
- suitable work organization (breaks every two hours for 5 to 10 minutes, the total volume of working hours should not exceed 6 hours)
- reducing the neuro-psychical strain
- arrangement of the correct visual conditions

4. Mental strain when using a computer

Introduction of computers at work has registered, when compared to the traditional activities, a radical change in the volume of work and work conditions. There are higher requirements for mental proceedings such as thinking, making decisions, imagination and others. Mental strain when using a computer at work is influenced, apart from the common factors, by mental work strain as time pressure, social climate, stimulating factors and others.

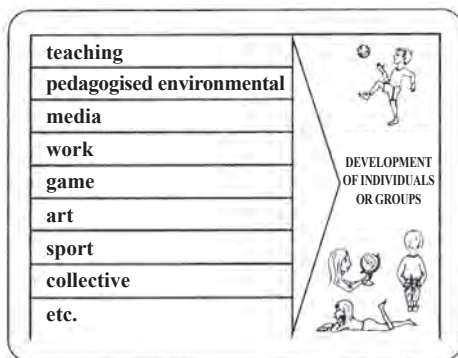(http://www1.szu.cz/chpnp/?page=computers - MUDr. Jana Hlávková)

Computers and computer applications from teachers` point of view

Education is carried out with the help of various means that work both intentionally and functionally, they mutually support and complement each other. The fundamental and traditional tool of intentional education is teaching.

According to Bližíkovský we can put the following among the educational methods:

1. set of educational-teaching agents
2. set of educational-teaching volumes
3. set of educational-teaching methods and sources
4. educational environment

The following scheme describes a set of educational means affecting the evolution of an individual or a group.

| teaching |
| pedagogised environmental |
| media |
| work |
| game |
| art |
| sport |
| collective |
| etc. |

DEVELOPMENT OF INDIVIDUALS OR GROUPS

(Jůva J., Jůva S., 1997, s. 70)

Information technology in education and teaching is a complex topic that is being investigated by teams of specialists. That has been happening especially due to the expansion and massive introduction of IT to the school system. There is not only a one-way use of information technology in teacher`s common practice in order to make his job easier as a lecturer passing new information though information technology. These

issues are more complicated and they require careful examination in order to understand and appreciate the value of IT in present school environment, family and the health of every individual.

The technique lies in understanding the medium as a tool for passing information onto children and students, no matter in what form as they could be didactic equipment as projectors, data projectors or complicated multifunctional net systems with the possibility of communication via internet. Education though technology should not be, according to the specialists, the aim of teaching but only the filling gap between the teacher and his effort for visual presentations of the educational problems on one side and the student on the other. It is important to realize that computer, as one of the main modern material sources, is not only a silly typewriter but it can communicate, pass information in both ways. Computer is an ideal tool expressing almost all teaching principals that were already set by J. A. Komenský, who wrote: *"Let for the teacher be a golden rule to translate all to all senses, if that is possible, so the thing the eyes can see, ears can hear, nose can smell, tongue can taste, hand can touch. And if you can sense something through more senses so may it be that way. There is nothing in the wisdom that the senses have not experienced. Why should not the beginning of teaching be done with illustration rather than through a word?"* (J. A. Komenský, Velká Didaktika)

Although the present computers are not able to comply with the requests that J. A. Komensky expressed in his principles, presently they are not able to offer "things that the nose can smell and the mouth can taste, it will not take long and even such expectation will be meet in terms of teaching. However today the technology of virtual reality can already offer senses the fingers can touch.

Education of people is facing a qualitative change presented by science-technical revolution, multimedia programs, virtual reality and mental thinking boosters. Education and teaching have faced an unbelievable human ignorance and unwillingness for self-realization, in other words unwillingness to do something with "ourselves".

On the contrary new technologies bring incredible possibilities for our children to become familiar with many facts of reality much faster than it can be achieved in a common way. The concern however lies in a question: "Can we expect the same educational effects from beforehand prepared programmed pedagogical situation that are represented by computers or will such situation bring lower or opposite effects in comparison with the reality?"

According to the studies – reality demonstrates the same – the truth lies somewhere in between. Therefore there is a need for a compromise. These problems are examined through some given cases in the following section.

The problem in implementating information technology into the educational process is connected with three significant questions:

1st question – the conception of solving the system of computerized teaching and education,
2nd question – used technologies – hardware,
3rd question – used programming equipment – software.

It is clear that using the educational means that information technology offers is much more complex and we could come up with at least three other questions connected with such issue. For example there are economical and financial questions concerning integration of IT into the educational process.

Conclusion:

The concept of education and life-time training brings along social necessities that prompt the ability to deal with new activities occurring in everyday life. This concerns, for example, the compact usage of information technologies within all age groups.

The issue is being solved in a dominant way through technical professions of various school levels and institutions that organize training courses. However such problem is not being adequately solved on the pedagogical and psychological level. Reality shows that gaining of social authorities is significantly determined by the ability of information technology use.

The aim to implement computing technology into the educational system as an educational mean is done especially for the purpose of producing the quality, speed and efficiency of the learnt and reached results of human investigations.

Teacher, in the context of life-time education, appears as a "special" social worker. Especially his social competence, authority and social role of educational provider in the area of work and education with the help of information technologies are emphasized here.

Hence information technologies appear as a significant part and tool in the system of educational.

INFORMAČNÍ TECHNOLOGIE V EDUKAČNÍM PROCESU

Abstrakt: Příspěvek se zabývá kvalitativní analýzou, zhodnocením současného stavu a využitím moderních informačních technologií v procesu učení a vychází tedy z podmínek školy. Zároveň ovšem reaguje na základní výsledky získané v oblasti výzkumu vlivu počítačů na lidské zdraví a kvalitativně analyzuje stručný přehled konkrétních negativních dopadů na zdraví uživatelů informačních technologií. Z komparativního hlediska je vliv počítačů na výuku a učení popsán z pohledu učitele a žáka. Tento vliv se jeví jako významný, prokázaný a stále progresivnější. Informační technika je stále více uznávaným plnohodnotným výchovně vzdělávacím prostředkem. Počítač dnes patří ke standardnímu vybavení většiny domácností a pracovišť a práce s počítačem je velmi často v procesu učení hlavní pracovní náplní. Podle dnešních znalostí a zkušeností prakticky nelze pochybovat o tom, že masové používání počítačů s sebou přináší i řadu zdravotních potíží, které s prací s počítačem souvisejí.

Klíčová slova: Informační technika, informační technologie, počítačová aplikace, výchovně vzdělávací prostředek, didaktika, J. A. Komenský, počítačová hra, on-line learning, e-learning