

*Wojciech Walat
Department of Technology and IT Didactics
Institute of Technology University of Rzeszow*

EDUCATION CHANGES IN CONTEXT DEVELOPING INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

Introduction

A contemporary information civilisation is based upon information and communication technologies (ICTs) which are the basic and indispensable tools to gain and process information resulting in the creation of knowledge.

1. Tomorrow's school – civilizationally developed school

The results of the most recent research enable a better understanding of functions of the ICTs in didactic processes, however occasionally, researchers focusing on pedagogical problems had neglected those related to possibilities of the ICTs. Research results indicate new links between education and the outside world (socio-cultural environment). Students grow up in an environment of information technology, and that type of environment is also expected at school. Due to the ICTs, space-time barriers disappear (e.g. on-line connections with any place on Earth), supracultural (and cross-cultural) cooperation is established and a new context is created: everything is a virtual world that enables further unending exploration.

Closer analyses of educational changes that have taken place within the last 20 years indicate that they have been related to the following issues:

1) redefining of terminological convention related to educational phenomena, including the term of education itself, which is to be recognised as all of the phenomena in which learning of processes of conscious and organised use of information in order to create new knowledge takes place;

2) resignation from transferring knowledge by a teacher in favour of constructing knowledge by each student individually – in this dimension learning processes become crucial, whereas a teacher resigning from the previous "authority" assumes the role of an advisor, student's partner, or in extreme cases even a student (!?).

3) emphasising active role of students in learning processes depending on their own needs and interests – here student's intellectual activity will manifest in search for new information, creating knowledge, work on research projects and in transfer of intellectual skills for new contexts and situations; students will be responsible for "their" learning whereas the teacher will be responsible for its direction (scope and thoroughness).

4) greater significance of modern information technologies at school – it is expected that a computer connected to the network (along with necessary software) would no longer be only a learning tool, but it would also contribute to easy, effective and friendly education – it would be present in all basic processes of learning and teaching;

5) the notion of student will change; a student will be any man who needs support in realised learning processes (regardless of age, experience, etc.);

6) learning in a peer group supported by a teacher and other adults with whom students will establish good contact with the help of computer networks (experts, outstanding scientists, researchers, travellers...) – a particularly interesting solution is the "virtual teacher" (an educational adviser... the so-called chatterbot)¹.

7) replacing competition in learning processes and the resulting

¹ The so-called chatterbot technology enables communication between a user and the Internet service, store or any computer application in a natural language. The user conducts a dialogue with the chatterbot and asks questions in their natural language, while the system replies having regarded the context and its knowledge base (so-called Turing Machine Test). This technology can be used:

- in order to make a website more attractive and to reduce hotline movement,
- to create interactive services, e.g. technical support,

pressure on school marks – in favour of cooperation, collaboration and correlation of a learning peer group – attitude towards development of cooperation skills totally changes the character of a class – students negotiate solutions for problems and referring to their sources, they settle their standpoints.

Changes in education that lead to building a new educational system totally modify the student's position, any student will be able to manipulate with gathered information freely (mainly with the use of computer), remember necessary facts, notions, structures, and also process and use them as their own knowledge – which will require self-controlled studying and cooperation with peers.

However some weak points appear in this model, namely the learning taken up by students does not harmonise with static (traditional) curricula. However relying on dynamic (flexible) curricula, which indicate directions of development of student's mental properties and not mastering a given scope of knowledge, activate students in using information technologies, stimulate to realisation of research projects and even teach teachers (e.g. in the scope of the ICTs themselves).

Re-orientation of the role of the teacher occurs here, mainly due to imperfections of information processing programs, hypermedia networks, Internet browsers in access to knowledge (information). The teacher is – should be – an expert, exactly, in knowledge management.

Because of the introduction of many ICT devices to schools, it can be supposed that the school itself would be more creative due to actions taken by students (research, experiments, etc.).

The role of parents in education of children will increase because of their close contact with school by means of remote consultation and various forms of supporting education. The ability of fast accommodation to new situations, new technologies and the ability of processing vast amounts of information are important features of a developed personality of a 21st century man. In order to make it possible, school must be recognised as an important culture-creating factor for any local society (as it used to be treated in industrial society and even earlier in agrarian society).

2. How much do the ICTs increase effectiveness of education?

Several recent years related to intensive computerisation of school show a simple truth which says that technology alone does not lead to significant improvement of didactic processes. At this point we should reject the opinion that the ICTs are a culturally indifferent (neutral) phenomenon, and their influence on education is limited only to classroom use and is a new tool available to the teacher². In 1991 M. W. Apple (1991) wrote that the ICT is not only a set of machines and software, but it also includes a certain specific type of thinking, which makes it possible to be oriented in the world in a specific and characteristic way (virtual).

In this situation computer triggers mainly thinking of technical character, while logic based upon technology replaces critical, creative and ethical thinking – which results in the fact that discourse in the classroom concentrates on technical matters and not essential ones (*why* is substituted by *how*). In order to take responsible decisions in this scope, both teachers and “educational politicians” must answer not only the question *how* to introduce the ICTs to schools, but also *why* it should be done.

At this point there is an interesting discussion – in which dimensions the ICTs can influence and influence shaping of educational environment, what are positive and negative changes in this scope. Technology resources are the factors that shape new social environments (so-called social network services: e.g. *naszaklasa*, *YouTube*, *Facebook* ...). In 1964 M. McLuhan gave the name of the age of electronics for the contemporary civilisation, contrary to the verbal and written transfer

-
- information systems for employees or partners of a company,
 - to create advisory services in specified fields,
 - to make computer games more attractive, etc. (<http://www.stanusch.com/> - 3.01.2010).

² There occurs a phenomenon of so-called colonisation of free time on two levels: (1) cognitive, which encompasses relations between the outside world and the inside world, and (2) practical. The media dictate a certain lifestyle, they determine organisation of activities, fulfil a large part.

civilisations. The new era is built upon electronic transfer, and any new means of transfer changes the structure of our life by means of *mental and social consequences as a result of acceleration of the existing processes*.

With these regards, very important is the question about functions of the computer as a hardware base for the ICT in educational changes. Today we can clearly see the utopian M. McLuhan's assumption (1964), which said that while entering the electronic era, people would be evolving towards a society that uses mainly right cerebral hemisphere, which implies that there would occur more holistic perception of reality, and information structures would be created on many paths, with pauses but dynamically. Therefore M. McLuhan and B.R. Powers (1986) drew a mistaken conclusion that: *new education will not be able to formulate any goals*. That assumption means that students are doomed to study endlessly in the search for knowledge, and then such studying can not undergo any evaluation. Of course, costs of educational systems functioning that way would be extremely high whereas effectiveness of studying could not be evaluated.

Another important phenomenon from in view of these considerations is the fact that new resources create their own market, regardless of existence of any real demand. Computers are purchased irrespective of their supposed purpose. Social practice show that if anything can be done (with the help of a given resource), then it should be done. In the 1990s many corporations at the beginning were purchasing computers not knowing their purpose, today computers are the "natural" infosphere that enables using them.

In the case of technological educational systems, the following questions can be listed:

- in what range will the money spent on creating a new educational model based upon the ICTs give expected profit?, are the ICTs cheaper than traditional means of teaching?
- do the ICTs bring school closer to the real educational reform? if so, how it is realised?
- in what way should the ICTs be connected with the curriculum?
- how do the ICTs influence reaching goals of teaching and learning assumed in the curriculum (core curriculum).

Today it is noticeable that computers can significantly participate in improvement of educational systems, however a conscious effort from the party of schools and also teachers is essential to incorporate (integrate) the particular didactic resource in the processes of acquisition of information and constructing knowledge by each student for themselves and on their own (according to their needs and possibilities).

Several following points can indicate the basic principles for rational incorporation of the ICTs in education:

1) Computer equipment can not be placed only in separate classrooms. Classes are held here occasionally and keyboard-mastering practices are useless for students. A good solution is to distribute a couple of computers in several different classrooms or to purchase laptops.

2) Active students who have greater achievements, better use computers than average students, however less capable students thanks too adequately prepared computer educational stands can compensate their dysfunctions – computers are perfect tools for mechanical exercises aimed at improvements of basic skills: reading, writing, counting, drawing, etc. Siemieniecki B., 2001; 2007).

3) Teachers still can not use computers in the classroom (they can not incorporate them effectively in the didactic process). Today practically nothing is left of the previous concerns that computers would replace teachers. However it is commonly assumed that computers are not at all useful for studying if the teacher does not incorporate them consciously (intentionally) in didactic processes. Nevertheless, despite many courses and postgraduate studies, teachers still are not prepared to do this and can not teach information technologies with the help of computers.

4) There should be precisely planned in the educational system how to use computers in the classroom. Though in many schools computers have been installed, their integration with school curricula has never been considered.

5) Computers still are the subject of studying, while they should be treated as tools (a sort of resource or method of teaching and learning). Best results are obtained using computers during a lesson while learning different school subjects: text editors – language learning, spreadsheets – mathematical and natural sciences, graphic editors – artistic education, music editors – music education, etc.

6) Still students use computers sporadically at school (mainly in computer rooms), which results in the fact that they do not use computers while learning at home – it can be expected that manufacturing and improving mobile educational computers will contribute to development of this particular skill.

7) Electronic mail is large and so far unemployed potential in development of synchronic and asynchronous group work skills, it is a perfect way of establishing contacts between students from different regions of the country or the world (language training, cross-cultural education).

8) Internet information resources treated as source materials require not only ability to find them but also evaluation of credibility (quality) as well as respect for intellectual property.

9) Interesting computer classes can prevent “evading” school by students(!).

In fact in all countries in the world the carried out research of ICTs usage in education indicates that introducing them to traditional school is not an easy matter (if possible at all!).

Supporting teachers in overcoming deep antinomies between traditional educational system and that based upon the principles of constructivism needs to be emphasised.

A separate question is evaluation of teaching results in a school where the ICTs are present, in reality they can largely facilitate studying than it is indicated by the research. But still the following question remains topical: *In what ways can the ICTs be used to achieve the most important educational goals, if they can at all (precisely, can those goals be achieved in a traditional way)?* But if the didactic processes were concentrated around interdisciplinary topics considered by students in groups, the ICTs would function perfectly. The realised research projects contribute to development of higher cognitive activities such as: analysis, interpretation, graphic representation. The use of the information ICTs in solving research projects correlated with students’ interests bring satisfying teaching results (precisely students’ learning).

3. School based upon the ICTs and values

An equally interesting research question is also: *why do children and youth use computer so willingly?* Maybe it is a way to recover from the stress and unpleasant impressions related to traditional school, loss of faith in their own capabilities, self-confidence, lack of interest in learning directed by the teacher. In computer learning students become the subject, and often they choose themselves *what, when and how* they want to learn. This is the reason for the statements saying that computer can contribute to the collapse of the school we know.

In the Internet there are websites (educational portals) which are perfectly prepared in substantial and methodological scope. However there are a lot of low quality websites, which contain errors and often insult students and human dignity. Therefore, will preparation of “full” (ready) information that do not require consideration and concentration be accepted by students? (popular slogans “make it easier..”, “free access...”, “don’t try so hard, you have...”, build a false belief that requiring any intellectual effort from students is a malignancy from the party of the teacher, as in fact life and the world are easy and pleasant).

Internet portals and browsers are sponsored by corporations and trading companies, which distort the image of the world – virtual world is full of prizes for one text message or clicking, unlimited access to resources, equipment and financial credits, and somewhere in between there are pieces of the didactic programme. Information which addresses the user is shaped by “predatory” advertising and not by quality, truth and good taste. Today the Internet is treated as an effective tool of distracting attention and filling the mind with unnecessary information. Though the Internet can not be eliminated from everyday life and school. It should not be the basic and the only (self-contained) source of information. Students can not be left alone with the Internet.

It is difficult but necessary at this point to reconcile computer with such values as: respect for law, quality of work, justice, personal culture, good taste. Children left alone with a computer connected to the Internet notice that these values are insignificant. Therefore there is a huge task for the school to realise – students can not freely “surf” in this immeasurable “ocean” and randomly gather information for projects. The Internet requires the same attitude as a vast and rich library. The ability to point out what is valuable and what is an informational waste is one of rates of quality of the “new” good school.

Why there are not any changes in school then? Why is the school one of those institutions in which it seems that time has stopped? Traditional school did not meet the ideas of freedom, entrepreneurship, individuality and rights of the individuals, which define the emerging information society. All the signs indicate that a radical change is needed, but can it be programmed by the educational administration? Certainly, it cannot. We will probably have to deal with a gradual development of culture towards free and open learning. In this scope purchase of a computer with appropriate software and focusing on benefits resulting from using the ICT is not a very good way of resolving the situation. R. Pachociński (2002, pp. 132 – 133) asks rhetorically: *should school become similar to a library where everyone puts whatever they want on shelves, in random order and walls are covered by graffiti and posters?*

Authors of educational websites and multimedia materials make an essential error claiming that the world is developing so fast that nothing can be learnt from social and natural surrounding, while libraries are filled with out-of-date, useless knowledge. That is why didactic materials contain never-ending series of illustrations. Replacing the culture of word with pictorial culture leads to significant pauperisation. In classical libraries exactly, since the beginning of existence, people were trying to find a balance between the collections held, intellectual freedom and control of quality of the collections.

For this reason the Internet should change, maybe reorganise on the principles of a system of public libraries maintaining free access to sources of information but also providing (guarantying) their quality. There can already be noticed first signs of that way, more and more library collections is digitalised (stored as data) and present collections are immediately delivered as digital data. Simultaneously software which enables comfortable use of those collections is being developed. However commercialisation of the Internet market delays this process (actions that bring profit are taken most willingly).

4. Teacher as an entity and subject of technological educational reform

In order to carry out the reform of the traditional school there is required:

- development of a new model of education, significantly different from the previous pedagogical practice,
- occurrence of large social determination (pressure) necessary to carry out changes in the macro scale,
- development of a concept (idea) of changes approved by the society in order to justify and be ready to incur high costs related with the changes,
- gaining support for the proposed changes from the party of the educational administration, teachers, parents, and also students in order to overcome resistance (anxiety of the “new thing”).

The most important factor (component) of changes in the educational system is the teacher. It is the person who will introduce that “new thing” to school. Success of the whole reform of school depends on whether the teacher accepts those changes, and if so, in what ways. Each reform (system, organisational, program, methodical) requires „acquisition” of teachers who will carry it out, which can only be realised by means of additional trainings, improvement and (which is often forgotten) compensation (higher earnings).

Teachers for many years have remained beyond the major stream of intensive computerisation of schools (initially school administration has been computerised and special computer rooms have been created). Thinking about teachers in the context of a school reform, the interest concentrates

on the educational bureaucracy. Often teachers do not know what to do with computers at school (students complain that they learn the same usable programs again and again).

As it has been said previously, additional training of teachers is not an easy issue, experience in this field shows that teachers learn reluctantly, results are not very satisfying, and the main reason is the fact that there are not enough exercises in the scope of using the ICTs in didactic processes in different school subjects. Sometimes incorporating students-enthusiasts in the process of computerisation enables maintaining working infrastructure and helps the teacher indicate those situations in which the ICTs can be used.

Incorporating well-prepared ICTs in didactic processes is extremely effective, yet it requires from the teacher laborious (time-consuming) preparation, there often occur additional difficulties such as failures or unexpected technical problems. Furthermore full preparation of methodological materials by the teacher individually is far more time-consuming than preparation of traditional materials, therefore their enthusiastic attitude towards using the ICTs ends very soon or becomes limited to visual materials (multimedia) that can even contribute to worse studying results when used inappropriately. For that reason functions of computers in education and good practice of using the ICTs in the processes of teaching and learning need to be emphasised currently. Another interesting question remains: *why in many cases and despite a well-prepared course, good methodological preparation of teachers is there still resistance against incorporating computers in education?*

Summary

There is a view that ICTs achieve more than partial breakthrough in education, which causes, however, many difficulties, controversies and dilemmas. One of them regards the teacher: *have or not to have ICTs at school?* This is a wrong question. It is needed to have ICTs in order to be a teacher at contemporary school. But it is also required to effectively and efficiently plan, develop and control didactic processes.

In the world full of ICTs, the teacher has a much more difficult task: he/she is the guide for a student in learning about the world during this existing information confusion. Numerous studies depict that students, while developing even the most spectacular scientific projects without advisory and directed support from the teacher, do not develop cognitive skills and are easily bored with learning, they do not see the point and have terminological chaos in their mind.

Literatura

1. *Apple M. W.* The new technology: Is it part of the solution or part of the problem in education? "Computer in Schools", vol. 8, nr 1-3, 1991.
2. <http://www.stanusch.com/> (15.02.2010).
3. *Lib W.* Technical language as a creator of technical culture and popular culture (in) Journal of technology and information education, Ed. Jiří Dostál, Olomouc 2009.
4. *McLuhan M., Powers B. R.* The global village. Oxford University Press, New York 1986.
5. *McLuhan M.* Understanding media. The extensions of man. McGraw-Hill, New York 1964.
6. *Pachociński R.* Technologia a oświata. IBE, Warszawa 2002.
7. *Siemieniecki B.* Pedagogika medialna. PWN, Warszawa 2007.
8. *Walat W.* Edukacyjne zastosowania hipermediów. UR, Rzeszów 2007.

Wojciech Walat. Education changes in context developing information and communication technologies (ICT)

It is assumed that another technological revolution – known as cognitive – will open schools to the intellectual achievements of mankind in the scope and extent that have not been experienced yet. However, it requires the change of schools themselves as acquiring such great extent of knowledge is based on the experience of applying regulations and principles of dealing with information, profound intellectual sensitivity since learning is a manner of incorporating into culture.

Keywords: *information society, information-communication technology, media education.*