Abstract:

ICT and learning- and teaching-friendly environment in contemporary Czech school

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The contribution is another output of a three-year research project called Information and Communication Technologies (ICT) and School Culture (Towards the Role of ICT in the Development of Czech School Culture, Czech Science Foundation, grant #406/03/P119).
The author presents some results of this empirical research stage, addressing the key domain of school functioning – "the learning- and teaching-friendly environment" – in detail at two levels. He first shows at a general level which elements of learning-friendly environment are most influenced by ICT, how ICT integration into the process of creation of learning- and teaching friendly environment may be enhanced, and conversely, which barriers to ICT implementation there can be. In another part of the paper, the author analyzes the responses of the headmasters relating to the situation at their respective school, e.g. how they feel they have been successful at exploiting ICT to create a learning- and teaching-friendly environment or where they perceive scope for ICT use improvement.

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Introduction

Modern information and communication technologies have recently been experiencing enormous development. The number of computers, especially computers connected to the internet, has increased dramatically, there has been progress in software and computer peripheries development, and mobile technologies have also established themselves as an important trend. Besides that, information and communication technologies[1] entered the sphere of education. Concepts of ICT integration into education have been developed at the level of educational policies of individual countries or at the EU level (such as eEurope 2003 or the State Information Policy for Education in the Czech Republic) (Selwyn, Brown, 2000). The implementation of the individual concepts in formal education has been allocated a relatively big amount of finance, specifically for equipping schools with modern technological tools, for teacher education, for ICT integration into school curricula, for multimedia

[1] I use the term "information and communication technologies (ICT)" in this paper to refer to computers, operating systems, the internet, e-mail, multimedia (educational) software, office software (school administration) etc. I use the expressions "modern technologies", "new technologies" and "modern media" as synonyms to the concept of information and communication technologies.

educational software development and other so-called support activities (IKT@Europe.edu, 2001). One of the main objectives of a majority of national and supranational policies has been enhancement of quality and efficiency of the teaching and learning process. Research findings however suggest that modern technologies have become neither an entirely natural part of life in all or most schools nor an integral part of work for the individual subjects participating in formal education (compare Ertmer, 1999; Learning, 2001; Mumtaz, 2000; Selwyn, 1999).

ICT and formal education: innovation and/or tradition

The reserve characterizing the attitude of schools towards innovations associated with ICT implementation seems to have a number of causes. The OECD report "Learning to Change" (2001) points out one noteworthy aspect of the attitude of institutions providing formal education to innovation. Work routines and expectations in formal education are often compared to the digital technologies and medical industries. Comparative analysis however reveals that schools traditionally assign relatively little weight to innovation, broad cooperation and continuing education as aspects of their professional culture. Unlike perhaps any other social institution, schools seem to be characterized by a permanent conflicting attitude to innovation and tradition, adaptation and constancy, reformist efforts and necessary stability (Bruck, 2000). Another cause of the reserved attitude of schools towards change may be the "traditional" failure to use the existing didactic technologies (VCR, television) in the learning/teaching process. Dalin even suggests that the failure to use didactic technologies may be regarded as one of the principles of formal education (Dalin, 1999; quoted in Breiter, 2001). Formal education is even more strictly critiqued by Papert (Learning, 2001), who claims that contemporary school, especially as to the teaching content and teaching methods, is a product of educational technologies of the end of the 19th and the beginning of the 20th century. Formal education tends to use modern technologies not as a tool for radical change, but rather to support its past achievements. In the learning/teaching process ICT play the role of the so-called additive technologies, complementing the existing processes and procedures (an example of additive technology or equipment in the narrower sense of the word is e.g. the overhead projector), rather than the role of "transformative" technologies, i.e. technologies with a potential to contribute to a change of the learning/teaching process in a significant way.

School management and modern technologies

School management plays a key role in introduction of new technologies into the process of education. Its role concerns especially decisions on supplying the school with technologies and their distribution within the school, which ,in its turn, determines the availability of technological infrastructure for teachers, but students, too, which is one of the basic prerequisites of successful ICT implementation into the school life (Venezky, Davis, 2002). Headmasters have a crucial say in the process, being thus able to prevent the process of equipping the school with technologies from becoming an exclusively technological project with no regard to efficient use of new technologies in the learning/teaching process and focusing on "computer and software purchasing and increasing computer connectivity" only. Efforts of this kind result in creating a "technocratic culture" permeating more or less the whole school, which is then characterized by an emphasis on as complete mastery of using modern technological tools as possible among both teachers and students. The means and the goals of modern technology implementation are confused for each other in the process and attempts to resolve educational-didactic problems with the help of purely technological or technical means occur. The subjects involved in the process of formal education can therefore use ICT to a degree of perfection without being able to use them in a meaningful and above all efficient way in learning situations and to use their potential to bring innovation into the learning/teaching process.

Teachers – the key subjects in ICT integration into school life

It is primarily teachers who, apart from school management, bring about change in formal education (Dooley, 1999). The role of teachers in ICT implementation in schools is crucial and irreplaceable since their negative or positive attitude affects the overall results of integration of modern technologies into school life, especially in the key area concerning the very essence of formal education – the learning/teaching process. The model of education centred around the teacher has gradually been shifting towards one with the learning subject at its centre while the teacher is playing the role of an advisor and a guide. The teacher has ceased to be the single source of learning while modern technologies have become another important source and mediator of learning, forcing thus the teacher reconsider her/his concept of teaching, her/his ideas on education and/or her/his self-education, school operation and a number of other – for some still unshakable – values. ICT implementation may be perceived in some respects as a source of "insecurity" for teachers, which may breed even resistance to technological innovation. Overcoming these barriers is demanding in terms of time and energy on the part of individual teachers and requires also support from school management as well as subjects outside the school itself.

Focus of the paper

In this paper[2] I want to focus on the area of school operation which I will call learning/teaching-friendly environment and which is, as headmasters claim, most affected by ITC (Zounek, 2004). I will discuss this area at two levels: I will use the general level[3] to analyze which factors in the given area have the greatest impact on ICT, how ICT integration into the process of creation of learning/teaching-friendly environment can be enhanced, and which, on the other hand, are the barriers to ICT implementation in formal education. I will use the second level to analyze utterances of headmasters regarding the respective situations in their schools, namely to which extent they are able to use ICT to create learning/teaching-friendly environment, which achievements they have recently recorded in their schools and where reserves in ICT use in the given area can be identified according to them.
I believe that understanding the relation between ICT and the area closely related to the essence of formal education is of great significance for understanding the relation between modern technologies and school culture.

Methods and sample population
I used the findings of the pilot research (Zounek, 2004) to prepare a questionnaire survey designed to obtain deeper and better-structured information on the relation between ICT and the key areas of operation of Czech primary school. The questionnaire was prepared both in a printed and electronic form (e-mail attachment) and distributed to 800 randomly selected headmasters of full-scale primary schools in the Czech Republic. Headmasters were chosen as an expert population as it is precisely them who have the key influence on school operation and school culture while bearing the responsibility for its development. The two-stage questionnaire survey was launched at the end of November 2004 and the deadline was at the end of January 2005. The first stage involved sending 400 printed questionnaires supplemented with a stamped addressed envelope to randomly selected full-scale primary schools and the second stage consisted in sending 400 electronic questionnaires (e-mail attachments with instructions how to use the questionnaire) to another 400 randomly selected primary schools in the Czech Republic. The return was 114 printed questionnaires (return rate 28.5%) and 21 e-mail questionnaires (return rate 5.2%).

ICT and learning/teaching-friendly environment: a general perspective
At the general level, school headmasters considered the relation between modern technologies and learning/teaching-friendly environment in schools from the point of view of the educational system. In the first question the respondents were asked to use a provided scale to assess ***the importance of ICT for creation of such environment***. Modern technologies were perceived as of importance for this area, namely as of great importance by 33% of respondents and as rather important by 63% of respondents; only 4% of respondents perceived ICT as of little importance. Learning/teaching-friendly environment may involve a wide range of factors and activities. I was therefore interested in ***what*** in particular it is that ***modern technologies affect to the greatest extent***. I therefore presented the respondents with a relatively comprehensive list offering the most important factors of school operation from which they were to choose up to 5 options which, in their opinion, affect ICT to the greatest extent.[4]

Table 1: What do ICT affect to the greatest extent within the area of learning/teaching-friendly environment? (5 most frequently selected options)

Factor	Number of respondents who selected the factor	%
Student motivation	109	81.3
Student activity	95	70.9
Teaching methods	60	44.8
Interaction in class	59	44.0

[2] The paper is one of the outputs of a research project called “Information and Communication Technologies and School Culture” (the post-doctoral grant project is supported from the Czech Science Foundation Grant No. 406/03/P119).
[3] The general level refers to formal education as a whole, not the specific school where the respondent works.
[4] The headmaster population was presented with a list of 19 items from which they were to choose 5 most important ones while they were permitted to add items of their own choice. The items on the list were the following: student motivation, interaction in class, learning content (curriculum), student activity, assessment and evaluation methods, teaching process organization, management activities of the teacher in class, atmosphere of trust and equality, teaching methods, teacher creativity, cooperation with parents, rules and regulations governing the teaching process, cooperation among teachers, learning/teaching objectives, teacher preparation for classes, homework, student responsibility for their education, student performance.

Teacher creativity	58	43.3

The table suggests that headmasters identify the greatest effect of modern technologies in student learning, namely student motivation, empowering us thus to view ICT as a relatively new external means for developing internal motivation in students, which may have to do with the fast development of modern technologies and their current attraction to students. ICT may have an effect on student activities in the teaching learning process, too – rather than being mere passive "recipients", students may use technologies to support or assist their active involvement. The choice of items by the respondents also suggests that modern technologies may also bring about change in the work of teachers, primarily directly in class (teaching methods), but also affect teacher creativity. The opportunity for "interaction in class" may then be perceived as a kind of intersection of the two aspects mentioned above. It is interesting to note that headmasters see ICT as having less effect on e.g. teaching content (curriculum), learning/teaching objectives, student performance or management activities of the teacher in class.

In the next question the headmasters were asked ***in which ways ICT integration into the process of creation of learning/teaching-friendly environment can be supported***. Content-level analysis of the free answers given by the headmasters revealed several ways of providing support. The most frequently mentioned option was "providing the school with infrastructure" (establishing a computer room, equipping each classroom with a computer, buying a data projector). Another way of providing support is, according to the headmasters, "human resource development in the school" (especially continuing education and self-education of teachers, educational courses focused on ICT-aided theory of instruction, model lessons). The third position was occupied by "computer software" (e.g. purchasing, demonstrations of high-quality software, use of internet resources). The last important category that was identified was "change in instruction" (integration of new methods, ICT implementation in individual subjects, greater use of student skills, ICT in electives etc.).

The last question of the first section of the questionnaire was designed to identify the causes of ***why ICT are not necessarily always fully used to create learning/teaching-friendly environment in schools***. The respondents were asked to express the degree to which they agree or disagree with seven proposed statements using a scale. Three statements concerned barriers to ICT implementation which have to do with the people involved in formal education. A majority of the headmasters agreed with the opinion that people involved in formal education still lack sufficient knowledge and skills needed for computer operation and also with the opinion that teachers are reluctant to change established and proved concepts of teaching. When the respondents were to express to which extent they agree with the opinion that people involved in formal education are afraid of ICT-related change, they divided into two groups, with a slight majority disagreeing with the statement. The next statements concerned school infrastructure. The headmasters agreed that schools are not sufficiently equipped with computers and internet connectivity, but believed that schools had enough adequate educational software and electronic materials. Besides that, headmasters do not perceive ICT as an element foreign to formal education and disagreed with the opinion that schools prefer other educational principles and policies in the long run. The respondents however missed adequate methodological support on the part of relevant subjects (e.g. the Ministry of Education etc.).

ICT and learning/teaching-friendly environment – state of art in contemporary school

I will use the following paragraph to describe the state of art in concrete schools as viewed by their headmasters. The headmasters were to answer three questions in this section. The first one asked them to say ***to which extent*** they feel ***they had been successful in using ICT to create learning/teaching-friendly environment***. The respondents were to mark the answer on an axis where 100% characterized the situation they viewed as ideal. The headmasters in the analyzed sample of population were successful to 50%, the reported minimum being 0% and the reported maximum 80%. I used the next question to ask ***what the*** particular ***school had recently achieved in the given area***. Content-level analysis of the free answers helped me to identify several achievement "categories". The most frequently mentioned category was "availability and integrating technologies into activities of both teachers and students" (continuous availability of computers, students use the internet in class and outside it). The respondents mentioned as their achievements also "availability of computer software", "establishing or finalizing the equipment of a computer room" and also "continuing teacher education" in ICT. The last question sought information about where the headmasters identify ***utilisable reserves*** in the given area with respect to school. In the same manner as with the preceding question several categories were identified. It is the "availability of modern technologies in the school" that the headmasters regarded as the greatest reserve. The categories that followed were: "teachers" (e.g. knowledge, skills, fears that students might surpass them, change in thinking etc.), "educational software" (unavailability of software directly in classrooms, low use of software) and "use of ICT by teachers in class" (cooperation between teachers of various subjects, mastery of methodological processes etc.)

Discussion and conclusions

The answers suggest that headmasters have a relatively integrated idea of the role of modern technologies in school life and can reflect on the process of their implementation including in the situation when they, as the key subjects in the process of school operation, lack almost any specific support focused on new technologies

(continuing education, various kinds of maintenance service provided for school managements etc.). Our analysis of the answers allows us to conclude that headmasters perceive ICT as a very significant means of creation of learning/teaching-friendly environment, which is an area generally regarded as one of enormous and even key significance for school operation and development (Pol et al., 2004). Headmasters are inclined to believe that in the process of creation of learning/teaching-friendly environment, ICT have an effect especially on teaching methods and teacher creativity; they regard modern technologies as a means for motivating students and enhancing their active involvement, which may, in its consequence, have an effect on the course of instruction (the item "interaction in class"). It is worth noticing that e.g. the effect of ICT on the curriculum or learning/teaching objectives was not assigned much significance. The main ways of ICT integration into learning/teaching-friendly environment are, according to headmasters, especially building and development of infrastructure and continuing education of teachers. It is here that the national project concerning ICT integration in schools, whose initial stages were markedly oriented on availability of ICT in schools (or at least this aspect was most discussed by the media), can play a role here. It is hardly surprising that headmasters identify the reluctance of teachers to change as a certain barrier to ICT use (teacher training in computer skills has been running for several years). On the other hand, one positive finding may be that headmasters do not regard ICT as something extraneous to formal education which cannot be coordinated with principles as yet preferred and established in formal education. Another positive outcome of the study is that people involved in formal education are not afraid of the change associated with integration of modern technologies and also that educational software and other electronic materials are not unavailable in schools.

The insight into the specific situation in individual schools is useful. The achievements and reserves of schools concern the same or similar areas (equipment, teacher education etc.) whose contents however differ. This may be explained by the observation that headmasters have a relatively clear idea of where they should focus their efforts (which is also influenced by local conditions and situation in the educational system) that have been characterized by some achievements so far, while being aware that they are facing more challenges within the same area. As far as individual schools are concerned, the technological level is a relatively strong topic, with the educational-didactic aspects following only after it.

When considering ICT and their impact on learning/teaching-friendly environment in the light of empirical evidence, the above-mentioned observations must not be viewed as generally valid for every school. The above-discussed findings nevertheless contain an important message regarding the prevailing trends in the culture of the process closely related to the very reason of existence of formal education. In the future stages of the research, these findings will be compared with results of analysis of other key areas of school operation and with findings arrived at with the help of qualitative research methods (case studies), which will be of crucial importance for understanding the relation between ICT and school culture.

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