

Attitudes of Teachers Concerning the Use of ICT Equipment in Education

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Abstract

Although the personalities, attitudes of students and the material conditions of schools are continuously changing, several studies have proved that it is the quality of the teacher's work that most affects student performance. In the past few decades we could observe the development and gaining ground of information and communication technologies (ICT), which process, of course, has an impact on the activity of teachers, as well. Studies (e.g. STEPS, Töt, 2001) have proved that the change and development of infrastructure in itself do not precipitate profound and significant changes in the practice of teaching and its results. The spread of technology in the environment is but for nothing, it is primarily the attitudes, willingness, and activity of teachers that cause changes. There are some that cannot imagine their lessons without the new technology, but there are others who totally reject the use of computers in schools. The new devices provide today's teachers with several possibilities, but the realization of these is determined by countless factors.

This study analyzes the attitudes of pedagogues in the Hungarian public education to ICT devices and their use in the lesson. We present some findings of our Nationwide ICT research carried out in early 2009, by way of an online questionnaire, during which 1146 primary or secondary school teachers from nearly 400 towns or villages answered our questions.

The replies showed that the principles advocated by interviewees and their daily practice differ, while in several cases the replies were polarized according to sex or age. We also analyzed what advantages or disadvantages our interviewees pointed out in the use of computers in schools, and closely related to this, we also examined what changes the pedagogues deem necessary in order to make the use of ICT devices in the lesson more intensive.

Key words: Impact of ICT, Attitude Study, Classroom Management, Teacher Education, Hardware

Everyone is aware of the fact that the level of qualification significantly influences the job they pursue, as well as their social status. Basic level qualification usually allows for the applicant to hold some badly-paid jobs, and they are not really in the position to be picky, since it is rather difficult to find employment. On the other hand – due merely to their work– the majority of society has a low opinion about such people's personalities, while the same persons attribute almost only positive features to, say, a company manager, simply on account of the position of these. Obviously, in an ideal situation everyone could hold the position that best suits their individual skills, industriousness, and ambitions, but, of course, it is seldom the case. This discrepancy is a failure not only for a given person but for society as well, which in turn wastes opportunities embedded in people (Sági, 2006). Thus the question of how to maximize children's academic achievements is of key importance. To increase efficiency conditions related to personnel, materials, subject-matter, and changes have to be analyzed. This is exactly why numerous experts have examined, in numerous ways, the factors that determine the quality of education. Long lines of analyses have proved that, among different educational factors, (such as

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school management, teachers, students' activities, personalities, attitudes, and tangible assets) it is the quality of the teachers' work that best influences students' academic achievements. Rosenthal and Jacobson's article on the Pygmalion-effect (Rosenthal & Jacobson, 1968) showed as early as the 1960s that a student's positive or negative assessment alone results in measurable differences as for achievement. Students with bad results that achieved bad results at the start-of-term test, but which were known by the pedagogue to be talented and in for intellectual liberation, achieved better results at the end-of-year cognitive test than those that proved more gifted at the beginning of the year but were more unfavorably assessed by teachers. This effect, the "self-fulfilling prophecy", does not necessarily function in a direct way; teachers are generally not even aware of how greatly they may influence their students' behaviors and achievements.

Teachers' personalities

If we ask someone to tell us about their school years, teachers with great influence – either positive or negative– will surely be part of this recollection. Similarly, if teachers or teacher-candidates are asked to confess what made them choose this profession, most of them will first mention one or two of their teachers that have somehow determined their choice. This is why profession-related personality traits have been in the focus of teacher training and researches on teachers.

There have been attempts at identifying personality traits that enhance efficient tutorial work and, in order to do so, various "wish lists" (traits list) based on demand surveys were compiled. This type of survey has been favored up to this day because through varied data collection methods it is relatively easy to answer the question of what makes a good or even ideal teacher tick. The question may be examined by different methods and through different groups: students, parents, educational politicians, or teachers themselves may be interviewed but, as school is compulsory, everyone has some kind of opinion on the topic. According to Judit Szivák, this type of survey dates back to 1896, when Kratz interviewed students on the characteristics of an efficient teacher (Szivák, 2002). Some decades later, at the beginning of the 1930s, Hart asked 10,000 students to characterize the teachers they favored, that is, those tutors from whom they had learnt the most. Popular teachers were identified by attributes such as fair grading, an understanding behavior, good pedagogical skills, an unbiased attitude, friendliness, and benevolence. However, those that had been the most influential and had been thought to be efficient were described in a slightly different way. They received the following line of features: a demanding attitude towards students, excellent expertise, good classroom management, discipline, and diverse methodological repertory (Hart, 1934). The difference between the two lists shows the difficulty of this problem, for even the teachers differentiated between the two aspects and formulated two types of requirement against teachers. If we try to unify these two lists, that is, to prescribe what teachers should do to be popular and efficient at the same time, they would have to face rather incongruous pairs of traits. For example, a friendly and understanding teacher might consider the tiredness of students to the maximum, that is, their current troubles; however, this might as well lead to the decrease of discipline and/or level of expectation. As opposed to controversies, overt or covert problems, traits did not cease to be collected, though these later surveys were not as popular (according to Barr & Emans, up to 1930 over 200 wish lists had been compiled. Qtd. in Harrell, 2004).

We also have to keep in mind that the research results were greatly affected by the type of school, the country, and the social and political environment in which the examinations had been carried out. For instance, Wright & Alley (1977) in the USA of the 1970s found that the requirement for an ideal teacher is to be fair and helpful. This teacher does not differentiate among students, but is friendly and maintains discipline and order in the classroom. Strangely enough, however, the documents of the Fifth Congress on Education held in Hungary in 1970 listed the following necessary pedagogical skills: "observational skills, imagination, striving for

perfection, tact, organizational skills, ability to form community and public opinion, and the ability to subordinate own individual ideas to the unified pedagogical processes formulated by the teaching community” (Boros, 1979, p. 139). The difference in requirements well portrays the spirit of the age, as well as the fact that emphasis had gradually shifted to the description of skills and systems of skills in the wish lists.

Éva Sallai designates seven skills that facilitate a teacher’s work: communicational skills, varied and flexible behavioral patterns, quick adaptation to situations and constructive shaping of situations, violence-free and constructive conflict resolution methods, the ability to co-operate, the ability to analyze pedagogical situations and phenomena, and mental health (Sallai, 1994). Although the areas listed cannot really be ranked, we think that the most important condition for teachers to achieve efficient work is to have a varied and flexible behavioral pattern. It is essential that a teacher be able to choose the most efficient solution out of several behavioral patterns by flexibly adapting to the given situation. If the teacher fails to do so and applies only few habitual solutions, their work becomes a mere routine and neither of the partners will find pleasure in their collaboration. Nevertheless, diverse behavioral repertory itself is insufficient; teachers can efficiently use it only if they possess the ability to quickly adapt to situations and constructively shape situations. “A teacher has to have a good grip of the situation, the possible ways to change, and the consequences of them” (Falus, 1998, p. 102). To a great extent, it is due to the partial lack of these skills and abilities that many teachers avoid using ICT equipment in the classroom. The failures of these devices, to identify the type of failure and to remedy them, were many times problematic for teachers even some years back. (It will suffice to think of the task of connecting and tuning a VCR and a TV set.) Today, when computers and their accessories are used, problems of this type occur more frequently. In such cases, teachers have to act in seconds to remedy the problems or change the original idea and turn the lesson in a totally different direction.

Although in the last decade the analysis of different competencies became the center of researches², the listing of teachers’ traits has not ended. The committee established at the Lisbon negotiations of the European Council – held in March 2000– also compiled such a list that characterizes the ideal teacher, according to the members: “adaptability, flexibility, creativity, intuition, endurance, ability to cooperate, communication skills, problem-solving attitude, inclination to take risk, the ability to make decisions, motivation, strength, enthusiasm, intellectual curiosity, positive attitude, abundance in resources, systematic character, organization, determination, perseverance” (Kárpáti & Hunya, 2009, pp. 86-87). In today’s shifting social, economic, and political environment, experts found that only such a diverse list of traits can properly describe the optimal traits of teachers that are able to successfully accept and overcome the challenges involved in the appearance of ICT equipment in schools. It has never been doubted, not for a moment, that these new devices would dramatically shape the everyday practice of teachers.

Impact of ICT on teachers’ activity

The problem is difficult and complex and may be analyzed from several different angles. Some experts think that to change the activities, a transformation of possibilities, mainly environmental conditions, is necessary (Gál & Geritz, 2003). If we accept this argument, the most important task is obviously to develop ICT equipment available in schools. The research called STEPS

² The starting point of the investigations was OECD’s DeSeCo (Definition and Selection of Competencies) program jelentette, which was realized in a collaboration of the Swiss Federal Statistics Office, US Department of Education, and the US Center of Educational Statistics. The program defined competence, on the one hand, as an *ability to successfully tackle complex tasks in a given context*, while, on the other hand, the concept of key competencies was introduced, meaning competencies that are essential for work, life, acquisition of up-to-date education and which are important on an individual, social, and economic level alike.

(Study of the Impact of Technology in Primary Schools) carried out in 27 member states of the European Union and in Liechtenstein, Iceland, and Norway also shows that the conceptions of ICT developed as the Ministries of Education all focus on the development of infrastructure and teachers' digital competence, and not on the pedagogical utilization of the devices³. To make the equipment available is usually national or local governmental responsibility, but these authorities do not deem it their duty to ensure technological and pedagogical sustainability, which causes difficulties. Owing to the campaign-like developments, even technical standard is not maintained, and also rapidly developing ICT devices do not appear in proper quantity in schools. Naturally, this deficiency has an effect on teachers' activities. Apart from this, various researches (see STEPS, Tót, 2001) have proved that developing infrastructure alone does not bring forth profound and significant changes in the practice of teaching and its efficiency. "Change, besides infrastructural potential, depends greatly on the adaptability of the individuals, their willingness, motivation, and activity that are not exclusively generated through the change in the environment's technological level" (Török, 2008, p. 45). This is why it is necessary to examine individual attitudes beyond the development of equipment.

The members of society differ greatly with respect to computer and Internet use, and digital differences are present in every walk of life. Pedagogues also relate differently to opportunities presented by ICT devices. There are those that cannot imagine their lessons without the new technologies, but there are teachers that fully object to the use of computers in schools, moreover, some often have no knowledge of informatics whatsoever. Naturally, teachers do not have to know everything about technology. Nonetheless, as the goal is to create a new, more efficient teaching environment, the integration of ICT devices in different learning situations and in a system of activities more wide-ranging than before is necessary.

The new devices offer several opportunities to today's pedagogues that were unimaginable for earlier generations of teachers, but the realization of these is subject to different factors. The focus of my series of surveys was the following issue: through different samples and by differing methods we examined school activities, pedagogues' activities, and their attitudes to the use of ICT devices in the lesson. One of the most surprising results of my earlier studies (Buda, 2007, 2009) was offered by the questions directed at the technological equipment available in schools. It was found that the majority of pedagogues have rather insufficient knowledge about educational tools available in the school. Despite the fact that we asked about the number of devices, several people, instead of replying, confessed not to know the data, and others belied their lack of awareness by giving unreal figures (such as over 40 interactive boards in one school). Several institutions replied to the question in a "centralized" way by either sending out the real data to all teachers (and having the pedagogues copy those onto the questionnaire) or, in some cases, having an appointed person to fill in the questions on figures. Due to these problems, we excluded these questions from the further stages of the survey, but included questions investigating the advantages and disadvantages of using IT devices in education as well as those on the areas of application of interactive boards. The last stage of surveys was realized at the beginning of 2009, when in the framework of a national research we requested pedagogues in primary and secondary schools to fill in an online questionnaire. In the following, we wish to communicate some data of this survey.

³ Hungary also followed this developmental direction; SULINET programs launched in the 1990 also focused on the development of teaching tools and establishing Internet connection.

Characteristics of the sample

The web address of the online anonymous and voluntary questionnaire compiled by us was sent in the spring of 2009 via email to the Hungarian public education institutions. Our database contained the contact addresses of directors and secretary's offices, and our request was not forwarded in all cases to the pedagogues of the institutions. Thus, in the end, our questionnaire was completed by 1146 primary or secondary school teachers from nearly 400 towns or villages. The breakdown by sex reflects the usual disproportion: 71% of the interviewees are female, 29% are male. They characteristically (79.8 %) live in unbroken families, but 7.7% are divorced, 10.3% are single, and 2.2% are widows or widowers. Over four fifths of the interviewees have at least one child. The most frequent family model is two children, but we found families with seven or eight children. The average age of the interviewees is 44.8 years, the youngest being 23 and the oldest 67. (Six people did not tell us their age.) On the basis of age, we delegated them to three groups of nearly identical sizes: for easier identification, we termed the first group, those between 23-40, as "younger age group"; the second, between 41-49 years, "middle aged"; and the third, between 50-67, as "third age." The majority of our interviewees, 653 people (57 %), work in primary schools, the rest teach in some secondary education institution (395 persons) or mixed-type institutions (95 persons). (Three people did not offer the type of their workplace.) They are highly qualified, as generally possessing over two (2.16) university or college degrees, but there were teachers with six, and even eight degrees. (In spite of this, however – as we will show – college or university education played a role in acquiring their IT knowledge in the case of only 41% of them.) Apart from the number of degrees, we asked them about the field of the first and last qualifications. 151 people acquired first degrees that may be delegated to the circle of IT qualification, while 240 had last degrees in the field. Among the latter, 50 persons majored in such a field after secondary school, meaning that they increased the level of their degrees with their newer qualification. As we did not ask about the majors of all degrees, on account of the existing data we can only state for certain that out of the interviewees at least 341 have a degree in informatics (as well). We have to add that persons with mixed-type qualifications (two or more majors in different disciplines) did not indicate in the questionnaire to have informatics qualifications as well, thus we studied the subjects taught by our interviewees. Most people, 303 persons indicated informatics. From the discrepancy in numbers it is clear that several people do not teach this subject although they have such qualifications. On the other hand, by collating the subject taught with the data on qualification available to us, we found that 502 pedagogues were qualified to teach informatics (too), on the basis of their degrees or their current teaching practice.⁴ Note, however, that during our survey we found several surprising connections between qualifications and teaching informatics. By analyzing the replies it was found that at least 24 people teach informatics who, according to their statements, have no such teacher's degrees!⁵ For instance, there were people teaching the subject with a degree in arts, and other persons with degrees in agricultural studies or another different degree in natural sciences, but we also found examples of people teaching IT with qualifications for teaching technical or competence-based subjects. In the light of all that, the question which asks our interviewees about the circumstances in which they acquired IT knowledge becomes even more intriguing. We indicated six areas as sources of IT knowledge, and the teachers were allowed tick more than one.

⁴ The difference is owing to the majors of the third and fourth, etc. degrees, as well as to the mixed-type qualifications (for instance, English-Informatics).

⁵ The term "at least" is used here as – assuming professional qualification – teacher's degrees were accounted for together with specialization in IT, while in the case of mixed-type qualifications we assumed one of the majors to be informatics. If these assumptions should not be realized, the number is of course higher than 24.

Table 1: *Sources of IT knowledge*

Source of IT knowledge	Number of references	Number of interviewees for whom only this single factor was significant
self-education	786	140
college/university	467	111
further education for teachers	418	45
family members, acquaintances	316	31
ECDL course	273	62
secondary school	125	4

393 people relied on only one source of information, including 4 that state to have only learnt such knowledge in secondary school (further, those are all women between 25-26). The other pole is inhabited by two persons, in whose case all six factors played a role in gaining knowledge. The decisive role of self-education in acquiring IT knowledge is owing to the lack of such education received at secondary school and, to a greater extent, in higher education programs, as the lack must be made up for. The prominence of self-education, however, is probably primarily due to the fact that the possibilities provided by new hardware and software generations could not be learnt, let alone utilized, in any other way. The figure on higher-education training knowledge provided more intriguing findings. As it was previously seen, only 502 were found among the interviewees that teach or could teach the subject, but out of the total sample, only 467 learnt IT in higher education. The deviation between the two figures already asserts a sort of anomaly, but the picture offered by the replies is simultaneously more and less favorable, as out of the 341 pedagogues surely having informatics degrees only 215 confessed not having learned IT knowledge at college or university! The data are shocking, on the one hand, as they yield a rather negative view of the quality and useful content of the trainings; on the other hand, we may assert that a significant number of non-IT majors received such trainings in a higher education institution.

The fact that only 125 teachers (11%) gained their knowledge in the course of their secondary education may be regarded as a criticism of IT education in secondary schools. As for the older generation, it is understandable, as when they were secondary school students such courses were not available. However, 19% of the interviewees are under 35 years of age and 30% of them under 40; they were surely taught some basic IT knowledge. We examined whether this difference is detectable.

Table 2: *The percentage of different factors that participate in the obtaining of IT knowledge in a breakdown by age groups*

Source of IT knowledge	younger generation (358 persons)	middle-aged (378 persons)	third age (404 persons)
college/university	59.2	35.2	29.2
ECDL course	17.6	27.5	25.5
family members, acquaintances	34.1	24.1	25.2
further education for teachers	19.8	41.0	47.3
secondary school	31.0	2.6	1.0
self-education	67.9	69.6	68.1

Analyzing the factors in a breakdown by age groups, self-education played a prominent role in all three age groups. There is a marked difference, however, with respect to the other factors. The significance of secondary school and higher education is still dependent upon age nowadays, and the discrepancy is logically related to the change in the role of further education. As the ECDL program also supplements the deficiencies of a formal training, it is understandably more important to the older age group. The age of the interviewee is related to the ages of relatives and acquaintances, and as a consequence the impact of these people also presents a generational difference: whereas young people already include digital natives, older people are all digital immigrants.

Attitudes

At the beginning of this study, we found it important to learn the way pedagogues answering the questionnaire relate to technological and methodological progress, what they assess their own and their colleagues' knowledge to be. To learn the attitudes related to the educational use of the computer and individual as well as staff attitudes, we used different statements. We asked teachers to evaluate the statements on a four-grade Likert-scale (grade one signified full disagreement, while grade four reflected maximum concord). We received the following result:

Table 3: *Teachers' attitudes to the use of computers*

Statements	average
I like teaching	3.77
I am interested in new developments in technology	3.40
I continually update my teaching methods and equipment	3.35
I can operate a computer efficiently	3.29
I feel I am well-prepared to use a computer for educational purposes	3.14
My school is well-equipped with respect to ICT devices	2.87
School consumes all of my free time	2.84
Along with teaching I have time left for self-education	2.72
My fellow teachers use a computer in their daily practice efficiently	2.38
I am interested in the educational use of IT devices but have no appropriate knowledge of them	2.35
Few people in my school are interested in the use of computers in education	2.10
The staff meeting never involves the problem of using computers in class	2.04
I believe in the traditional "board & chalk" method	1.91

On top of the rank lies the love for the profession, although nine interviewees fully reject the statement. (Six of these teach natural sciences and some of them are even school principals!) The interviewees judge their own preparedness and interest as being more positive than their fellow-teachers': for instance, only 58 people were fully content with the efficient computer use of their colleagues. 88 interviewees are convinced that their schools have few people interested in the educational use of computers and 163 people declared that not one word of this subject is raised in staff meetings. We naturally do not wish to imply that in these schools the teaching staff does not use ICT devices at all as we have no information to that effect! Nonetheless, it gives food for thought that one sixth of the interviewees work in institutions where the school management does not regard the in-class use of computers a problem worthy of discussion or debate. Last in rank comes the statement on the privilege of the board & chalk method. 362 interviewees categorically reject the statement; only 32 people signaled their full disagreement (7 out of the 32 are, surprisingly, teachers of informatics).

Studying the problem in a breakdown by sexes, with the help of T-test, we may observe several differences.

Table 4: *Attitudes of teachers related to the use of computers by sex*

Statements	men	women
I like teaching	3.69 *	3.81 *
I am interested in new developments in technology	3.60 *	3.32 *
I continually update my teaching methods and equipment	3.26 **	3.38 **
I can operate a computer efficiently	3.47 *	3.21 *
I feel I am well-prepared to use a computer for educational purposes	3.40 *	3.03 *
My school is well-equipped with respect to ICT devices	2.95 **	2.84 **
School consumes all of my free time	2.76 **	2.87 **
Along with teaching I have time left for self-education	2.73	2.72
My fellow teachers use a computer in their daily practice efficiently	2.37	2.38
I am interested in the educational use of IT devices but have no appropriate knowledge of them	2.05 *	2.47 *
Few people in my school are interested in the use of computers in education	2.13	2.09
The staff meeting never involves the problem of using computers in class	1.98	2.06
I believe in the traditional "board & chalk" method	1.93	1.89

* p<0.001 ** p<0.05

From the data it is evident that women prefer teaching and methodological renewal is also more characteristic of them than of men⁶. Nonetheless, the replies also show that renewal is less related to the use of ICT devices in teaching; men think of themselves to be more capable in this field. A direct consequence of this is that men think they use the computer more efficiently, although they do not spend time with self-education despite the fact that members of this sex have more free time than the opposite sex. We also examined the impact that age has on attitudes. Variance analysis showed significant differences in several statements. With the advancement of age, interest in technological novelties and the computer decreases, which substantially influences the preparation for their use. Older people feel they cannot really operate the computer, and use these devices in teaching less than their younger fellow-teachers. The older they are, the more unsatisfied they are with their own informatics competencies but more satisfied with such knowledge and interest of their colleagues. Most people think that the more aged and experienced a teacher is the less time they need to expend on tasks related to the school. Our interviewees denied this assumption as they feel that, conversely, school takes up more and more of their free time. The answer may partly derive from the fact that old people spend more time with self-education than younger persons; in spite of this – as seen previously – their informatics knowledge could be developed.

⁶ We have no information on the content and magnitude of this.

Use of Devices

In pedagogy, the dichotomy of theory and practice is quite common, and unfortunately it is not exceptional that there is a significant discrepancy between the two areas. That is why, we examined the frequency of the use of classroom equipment and came up with two ranks. In the first rank all replies were taken into account, while in the case of the second and third ranks, we disregarded those interviewees that do not use the given equipment at all. In the latter case the calculated values naturally increased, the distance between most often and least often used equipment decreased, and several elements of the rank were significantly modified.

Table 5: *Frequency of using school equipment in the classroom*

equipment	frequency of use	number of non-users	corrected frequency of use
course book	3.98	54	4.13 (1)
board & chalk	3.91	65	4.09 (2)
computer	3.22	172	3.62 (3)
reference books	3.01	119	3.25 (7)
projector	2.84	295	3.48 (4)
the Internet	2.79	268	3.35 (5)
CD-player	2.51	406	3.35 (6)
DVD-player	2.45	299	2.97 (10)
professional journal	2.37	266	2.79 (14)
literature	2.23	404	2.91 (11)
video player	2.18	382	2.78 (15)
tape recorder	2.04	604	3.22 (9)
OHP	2.01	503	2.82 (12)
art album	1.97	484	2.69 (16)
interactive board	1.76	745	3.24 (8)
slide projector	1.45	773	2.42 (17)
classroom response system	1.37	886	2.81 (13)

5: in almost every lesson; 4: several times a week; 3: every week; 2: rarely; 1: never

Rankings are not different in the respect that, despite the majority of interviewees do not regard themselves adherents to the traditional board & chalk educational method, they use this equipment most frequently apart from course books. That is, practice does not follow theory in this case either, which may be so for several reasons. The most obvious reason for this may be the deficient supply of technological equipment in schools. This could be an explanation, but, on the basis of the responses, it cannot be an appropriate one, as teachers tend to hold the technological equipment of their schools sufficient and 281 are fully content with the devices available to them. According to this, the reason for the prominent use of books, boards, and chalk lies in the problem of educational methods. (A separate study would be needed, however, for examining this problem in detail.) Apart from this, the availability of devices naturally also play an important role, which is traceable in the use of two of the most cutting-edge school ICT devices, interactive boards and response systems. Both are at the end of the rank with regard to frequency, but looking at an adjusted rank compiled

by disregarding negative responses we may establish a significant shift towards the center of the list. Out of different types of technological equipment, interviewees most frequently turn to computers and projectors, but CD-players and DVD-players are also made use of in classes. The latter is rather popular, but it follows from the adjusted frequency ranking that application is not too intense.

The infrequent application of OHP may surprise many. Indeed, some time ago this device was widely used (Halász & Lannert, 2006) and for a lot of teachers it was equivalent to the first-rate technology. Reduction, however, is evident, given that it has been replaced by more efficient technology in exemplification, such as computers and projectors.

We also analyzed the use of school equipment by factor analysis performed by the SPSS program. This method depicts the hidden system of relations among the variables, and new, artificial variables (factors) come into existence, which display the examined phenomenon in a simpler way than the original variables.

Table 6: *Factors of using equipment in the classroom*

Equipment		Factors				
		1	2	3	4	5
computer		.862	-.165	.041	.033	-.194
the Internet		.847	-.085	.051	.058	-.114
projector		.838	-.191	.079	-.011	-.169
interactive board		.673	.003	-.125	-.003	-.076
oral examination		.253	.252	-.188	.227	.065
CD-player		-.048	.810	.204	-.049	-.015
tape recorder		-.140	.773	.135	-.023	.049
literature		-.186	.692	.100	.266	.135
art album		-.123	.635	.170	.391	.060
video player		.091	.382	.703	.025	-.040
slide projector		-.066	.111	.667	.189	.099
DVD-player		.316	.403	.632	-.019	-.125
OHP		-.168	-.026	.619	.285	.163
professional journal		.074	.075	.210	.838	-.075
reference books		.033	.121	.148	.818	.041
course books		-.138	.141	.089	.074	.856
board & chalk		-.289	-.007	.031	-.077	.799
Rotation Sums of Squared Loadings	Total	3.001	2.631	1.958	1.782	1.546
	% of Variance	17.651	15.477	11.520	10.484	9.097

KMO=0.774; Sig. of Bartlett's Test=0.000

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

From the table we may see that the factor analysis method put the previous variables into five, well-distinguishable factors. The first factor holds the ICT equipment usage data, that is, one part of the teachers mostly uses these devices. The interactive board significantly influences their work along with the computer, the Internet, and the projector. Also, the testing system appears here, though its role is insignificant. The second factor implies an ambition for providing taste and supplying emotional warm-up, which are partly realized through using audio materials, but visual stimuli play an important role, as well. The third factor stresses visuality to a great extent, and for this traditional equipment, the video, the DVD-player, the slide projector, and the OHP is applied; these elements are positively closely connected to visuality. The characteristic of the fourth factor is the use of printed materials, primarily traditional school equipment, such as reference books and professional journals. The fifth factor represents conservative teachers, whose equipment system is made up of the classic course book/board/chalk trio. Their attitude is even more highlighted by the fact that the other appliances influence their work to a very insignificant degree, and in the case of ICT equipment, even this inconsiderable relation is negative.

By examining the use of devices in the lesson in a breakdown by different groups, we may find significant differences only by sexes. In this case, however, a substantial difference is detected in 12 out of the 17 devices, discrepancy which is parallel to the findings of the attitude survey. Computers, projectors, interactive boards, and the Internet are more frequently used by men, the rest – including printed tools and ICT devices not connected to the computer – by women.

Applicability

The application of modern school devices requires not only technological background, but also user's knowledge and an appropriate area of application. We have previously disclosed the sources of computer knowledge; in this case, we will analyze the areas of school activities where our interviewees regard computers as the most useful. The questionnaire studying this area was adopted from the 2006 National Survey on Informatics in Public Education, supervised by Márta Hunya (Hunya, 2006)⁷. The questions were directed at the problem of to what extent may computers assist school work in the areas listed, according to the interviewees. The replies were placed in a five-grade Likert-scale, where grade one signified "not applicable" and grade five meant "highly applicable."

Our interviewees deem computers to be useful for various administrative tasks; 93% marked the two highest response values. Apart from this, however, the views on computer-supported student, teacher, and in-class activities are highly heterogeneous. People thought that computers are more applicable to the preparation of teachers than of students, but the device may better assist the individual researches of students, let alone students' in-class presentations. (The frequency of these activities, of course, is doubtful.) The most diverse replies were received as to the communication of various different groups. While, according to 83% of the interviewees, computers are applicable or highly applicable for student to student communication, the proportion is only 76.4% in teacher to teacher relationships, 52.4% in teacher to student communication, and only 39.4% in teacher to parent relationships. This is exactly the area that has undergone the greatest changes since the 2006 survey. While this is probably also due to the widespread use of the Internet and electronic mail, the major impetus in the progress was provided by the dynamic development of various networking and community pages. Today, the

⁷ In 2006, as requested by the Ministry of Education, all of the Hungarian public educational institutions were asked to participate. In this study, however, the management of the given school was allowed to choose the teachers being interviewed. According to the study owners, the picture received during the analysis of the replies of the 3718 interviewees was better than the Hungarian average, but the data showed that the difference should not be too great.

Table 7: *Applicability of computers in different areas of school work*

Activity	2009	2006*	difference
Reports, making statistics	4.85	4.68 (1)	0.17
Keeping records of the students	4.78	4.63 (2)	0.15
Keeping records of the results and analyzing them	4.63	4.39 (3)	0.24
Students maintaining relations with one another	4.35	3.63 (13)	0.72
Students' individual research	4.32	4.26 (4)	0.06
Students presentations	4.26	4.10 (5)	0.16
Teachers' preparation	4.17	4.07 (6)	0.1
Helps in teachers' explanation	4.16	3.90 (9)	0.26
Teachers' professional development	4.16	4.05 (7)	0.11
Teachers' maintaining professional relations with other teachers	4.13	3.78 (11)	0.35
Completing project assignments	4.05	3.63 (14)	0.42
Students' individual practice	3.96	3.83 (10)	0.13
Examining, testing	3.81	4.01 (8)	-0.2
Co-operative work	3.69	3.50 (15)	0.19
Students' preparation	3.66	3.71 (12)	-0.05
Organizing students' work with PC	3.56	3.29 (16)	0.27
Teachers maintaining relations with students outside the classroom	3.48	2.76 (18)	0.72
Giving out and collecting assignments	3.30	3.08 (17)	0.22
Maintaining relations with the parents	3.12	2.48 (19)	0.64

* calculated from the figures of the National Survey on Informatics in Public Education

1 = no help at all, 2 = almost no help, 3 = a little help, 4 = beneficial assistance, 5 = highly suitable

majority of secondary and also primary school classes are represented on *iwiw.hu* ("international who is who"), and it is not a rare case that students convince their parents and teachers to join the network. The other substantial difference between the frequency rankings of the 2006 and 2009 surveys is related to ideas on computer-supported testing. In 2006, due to differing requirements and various conceptions, interviewees deemed this potential area of utilization more important than in 2009. The discrepancy in numbers is not substantial, but as in 2009 people regarded computers more applicable for other activities than they had done 3 years earlier, the difference is remarkable between the two rankings.

Threats

The ideas on the applicability of computers for various activities, in addition to knowledge and experience, also depend on the real or imagined threats associated with these devices. Therefore, we also examined to what extent do negative concepts related to students' computer and Internet use appear in the thinking of our interviewees. For the sake of comparativeness, this area was also examined with a questionnaire adopted from the National Public Education IT Survey. Replies in this case were also placed in a five-grade scale, grade one being total rejection of the given item, and grade five signifying highly severe threats.

Table 8: *Threats of students' use of computers and the Internet*

Threats	Average
Uncontrolled information is used	4.21
The role of oral communication diminishes	3.95
Students' linguistic command deteriorates	3.85
They "acquire" finished materials instead of working and studying	3.78
They do not learn how to write in nice hand	3.77
They are exposed to malevolent strangers	3.67
They live in a virtual world instead of reality	3.65
They establish fewer social relations	3.33
They are alienated from one another	2.93
Computers narrow their scope of interest	2.77

1 =not at all characteristic, 2 = small threat, 3 = rather frequent, 4 = severe threat, 5 = very true

According to pedagogues, the most significant hazard is the use of uncontrolled information, but they also regard the impact on communication remarkably negative. They fear primarily the deterioration of oral communication and of the means of linguistic expression, but the latter has a natural impact on the declining neatness of writing. Teachers deem negative socializing effects less severe and are least afraid of the contracting of students' scope of interest.

We get a more graded picture when conflating the three topmost hazards, by signifying more severe dangers and grading them along the lines of three possible replies – "may occur rather frequently," "severe threat," and "very true." We ranked the answers according to this adjustment.

Table 9: *Threats of students' use of computers and the Internet in % (threats regarded as most frequent)*

Threats	2009	2006	difference
Uncontrolled information is used	95.7	87.9 (1)	7.8
They "acquire" finished materials instead of working and studying	90.7	84.6 (3)	6.1
Students' linguistic command deteriorates	88.3	81.4 (4)	6.9
The role of oral communication diminishes	87.4	86.3 (2)	1.1
They live in a virtual world instead of reality	87.0	73.5 (5)	13.5
They are exposed to malevolent strangers	85.6	65.7 (9)	19.9
They do not learn how to write in nice hand	82.2	73.3 (6)	8.9
They establish fewer social relations	74.7	69.7 (7)	5.0
They are alienated from one another	64.0	66.2 (8)	-2.2
Computers narrow their scope of interest	58.6	59.8 (10)	-1.2

* National Survey on Informatics in Public Education

1 =not at all characteristic, 2 = small threat, 3 = rather frequent, 4 = severe threat, 5 = very true

The use of uncontrolled information still comes first on the list, not in the least due to the fact that only six people think that the use of computers involves no such threats. This first rank is also corroborated by second-ranking replies to the question on the application of preliminary prepared materials, which, compared to the rank based on averages, traded places with the statement predicting the reduction of the role of oral communication. It is interesting to observe that the statement connected to the other, written, form of communication, also moved down the rank. It requires further study to see whether this is only a judgement of the statement or it implicates the devaluation of neatness of handwriting or even of handwriting itself.

As compared with the 2006 data, the most remarkable change is that in 2009 almost all potential threats were deemed more significant by our interviewees. Only two factors, "alienation" and the "contracting" scope of interest, received a more positive evaluation, but this change is rather meager. In contrast to this, responses reflect that the threat of students living in a virtual world where they are exposed to strangers has increased. The real danger has probably not increased to such a degree, but replies are influenced by experience (e.g. spam) and news supplied by mass media. More and more news pieces are related to Internet-based frauds, harassment, and sexual influencing. It is chiefly young people that are exposed to this, as their being inexperienced is usually coupled with a naiveté that is easy to exploit through the lack of control and with the help of anonymity.

The Conditions of Change

“Hardware”

Above we have examined the attitudes pedagogues have to the application of ICT devices in class, including, most specifically, computers and interactive boards. It was found that the principles adhered to by the interviewees and their daily practice differ. Data referring to this were supplemented by the responses given to the advantages and drawbacks of the application of computers, thus acquiring a more precise view of the factors leading to the difference between theory and practice. We may, however, focus the picture even more by learning what teachers replied to the following question: “What would you need in order to use informatics devices in class (more frequently)?” 887 persons have answered the question, including 628 – that is, over two thirds – who regard the improvement of conditions necessary. The most basic condition is to have more and more up-to-date devices. Depending, nonetheless, on the state of equippedness of the institutions and their experience, the interviewees have differing views on what improvement of the equipment means. Those much disadvantaged in this area would be satisfied with only little: “. . . *we do not have interactive boards or computers at all in our classrooms (except in the IT room). We have a single laptop and projector which we carry to class on our shoulders and in our hands, on the basis of a schedule created together with our colleagues. We can only carry out developments from tender funds (the municipal body maintaining the school is poor): we were happy with being able to acquire a photocopier, some computers, a laptop computer, and a projector in this way*” (age 52, female, primary school). Furthermore, there are also those that do not even think about the development of devices and would like to use those that are available: “*we should first be able to get into the IT room or be granted some classes in the interactive board room*” (age 39, female, vocational secondary school). Others are more straightforward than this and would like to realize the full-scale supply of devices: “*IT devices installed and operable in all rooms*” (age 51, female, grammar school), but “*not in place of repairing collapsing walls and leaking roofs!!!*” adds another fellow pedagogue. What several interviewees find to want is financial support for the purchases, but there are also those who think that devices “*should not be purchased by the schools but that the schools should be entitled to it along with the school building, similarly to heating, lighting, water, etc*” (age 61, male, mixed-type institution). Even where the supply of devices is of a high level there is much to improve, indicated by the demand for the availability of cutting-edge technology or the demand that not only the teachers but also students have their own computers in the classroom. Several teachers find necessary IT assistance for the safe and proper operation of devices, the degree of which is also pending – similarly to equipment purchases – the state of equippedness of the given institution. Technical assistance would be used in more poorly equipped schools to ensure that it is “*not the teachers that spend their breaks with collecting, setting up, then carrying back the devices at the end of the class*” (age 55, female, primary school). That is, it would be the technician that would carry “. . . *the laptop and projector from room to room like an armor bearer . . . until we are fully digitalized*” (age 45, female, primary school). Those that see wanting an auxiliary staff indeed wish to have an IT administrator: they would like to have a person that maintains the programs executed on the computers and makes possible the necessary auxiliary programs and settings. Some people, on the other hand, wish to see such assistance as would “rummage for materials” on their behalf, that is, properly compile and prepare different presentations and animations on the basis of predetermined scripts.

“Software”

Naturally, it is not enough to have the technology available for the efficient use of ICT devices in the classroom, there is also a need for proper content and methodological preparedness. Several people miss digital material to present, data banks available, but there are also others that would like to have thousands of freely available materials for the interactive board. They communicate

their wishes, too: “. . . auxiliary materials that are not preordered but are module-based and can be reordered along other lines of thought (on the basis of the material and adjusted to the individual classes), and which are also based on some methodological view supporting skills development and cooperative work” (age 42, male, grammar school). Such individual concepts and wishes frequently remain unsatisfied, and duly some people are highly critical of educational material: “. . . what the school bought at a high cost from the publishers is from a professional perspective weak and many times useless” (age 38, female, primary school). “There are doubtless many useful things on SDT,⁸ but a lot of it is useless. The pages download at a terrifyingly slow pace, are not available, or freeze the computer (not a fault of our system!); the educational material (e.g. documentaries) cannot be downloaded, and thus it can only be used in classrooms where there is Internet access, and we only have 1 or 2 such rooms. Thus, even if the material was useful, we could not use it!!!” (age 38, male, vocational secondary school). Some people urge content development for “personal” reasons, “. . . as I have no time and energy to create ‘everything’ myself” (age 35, female, vocational secondary school). Further, we found examples for the misplaced investment of energies, too: “. . . for the time being, I can only use what I created. I also experience that programs developed by me for the request of different institutions (NFI, SZP) are not distributed” (age 62, male, grammar school).

Irrespective of external conditions, the effective application of ICT devices also requires the preparedness and appropriate attitude of teachers. Out of the 1146 interviewees, 96 (8.4%) were satisfied with their use of the devices. “In my opinion, I use it as frequently as necessary” (age 56, female, grammar school); “I cannot use it any more frequently than this, and we have nearly everything from the subsidies for developments” (age 38, female, vocational secondary school). This, however, does not always mean that ICT devices are used in every class! “I use informatics devices in the majority of my classes (approx. 70%), and would not like to apply them any more than that” (age 45, female, mixed-type institution). Three interviewees gave reasons for not wanting to use the equipment more, and their self-restraint derives from the same sources in all three cases: “I think I use the possibilities of IT devices to the maximum in my classes. This is enough, as it would take away part of the significance of personal contact, which I deem an important principle of education” (age 54, female, primary school).

At the same time, in addition to the satisfaction regarding the use of devices, several responses reflect the problems that have been identified during the discourse on different conditions. Accordingly, the lack of devices appears here, as well: “In my opinion, I use computers for appropriate periods of time. The problem is not this but that my colleagues are also catching up, and thus I will have fewer possibilities to use the equipment, as there is only one portable computer and projector in our institution” (age 48, male, primary school). The reliability of devices is another restrictive factor, “When it works, I always use it” (age 37, female, mixed-type institution), similarly to the lack of usable digital contents, “I use it in every class, but if the digitalized versions of pictures and images in the course book would come with the books on CD or DVD, that would really assist the teacher’s work!” (age 47, male, primary school). There are some who are even more ahead and are thinking of how to assist students missing classes with the help of ICT devices, in order to ensure faster catching up, or how to make available for the parents any complex assignments made on the computer.

Among the reasons for the more frequent application of ICT devices in class, a relatively low number of teachers, 61 (5.3%), included factors that related exclusively to themselves. These few pedagogues indicated their own hesitation, the lack of will or proper mood (!) as hindering factors, and only one interviewee wrote about a need for external appreciation as motivation. Time is prominent among the factors mentioned by the interviewees; nearly two thirds of the 61 persons would like to have more time for preparation. It is not known whether they deem their IT knowledge as appropriate or include learning, too, in the time allotted for preparation, but out

⁸ Sulinet Digitális Tudásbázis (Sulinet Digital Knowledge Base)

⁹ NFI – Nemzeti Felnőttképzési Intézet; SZI – Szakképzési Intézet (NFI - National Institute for Lifelong Learning; SZI - Vocational Education Institute)

of the teachers several indicated separately their inadequate knowledge: *“I need to develop my IT knowledge – and develop it a lot”* (age 46, female, grammar school). There are also large differences in the amount of knowledge to gain. Some people would only like to learn how to install the equipment or use the devices, while others intend to use more spectacular presentations and wish to learn, e.g. the creation of Flash animation. Others still wish to improve their methodological preparedness: *“To know how to apply these things during teaching and learning”* (age 45, female, primary school). Several people feel that their lack of professionalism is a problem, and they would need much more practice to be more certain; the use of these devices would be only then integrated organically in their pedagogical practice. As we have previously seen, the necessary amount, profoundness, and content of practice vary, primarily on the basis of personal commitment. A perfect example is the subject of PE. Among our interviewees, five people stated that they would only be able to use ICT equipment in class if they did not teach PE. In contrast, out of those satisfied with their daily practice, two teachers indicated that they use such technology with pleasure in all of their classes, including PE: *“I exploit my possibilities to the maximum. I even use IT for PE. For instance, I show the animation of physical phenomena and other things”* (age 52, male, primary school). It is also important to note that in contrast to the 61 replies denoting some lack or deficiency, only 28 people indicated that, according to them, the more intense application of IT devices in class would be enhanced through trainings: *“to me it is trainings, free of charge, as only teachers are expected to finance their own obligatory further education from their meager salary”* (age 49, female, primary school).

Although our question, “What would you need in order to use informatics devices in class (more frequently)?” referred expressly to the interviewees’ personal needs, 16 people still found the key to change not in the external system of conditions, not in their own knowledge or training, but in other persons. According to five people, it is students that need to change. They are expected to be more attentive and to have more reliable, higher-level IT knowledge. 11 interviewees, on the contrary, criticized the preparedness and attitudes of their colleagues, thinking that they would need higher-level further education in order to be able to use IT devices more freely, to learn the rules of application, and, last but not least, *“. . . the majority of teachers would need to substantially change their views”* (age 60, male, vocational secondary school).

Summary

On the basis of the data presented above, the majority of the pedagogues interviewed acquired their IT knowledge primarily in the course of self-education, and also extended such knowledge in the same way. Therefore, higher education should devote more attention to this field, moreover, the number of further education programs of this type should be increased, as – despite the fact that in the last few years the range of supply has widened and a strong support was present in the supply of further education courses centered on ICT – Hungarian teachers are still voicing a marked demand for further education programs providing IT knowledge required for teaching (cf. Hunya, 2006).

Yet, the interest in new technologies and the related methods, as well as the rather positive attitude, manifest themselves in a small degree in everyday practice. The role of the classic book-board-chalk asset system remains to prevail, while interactive boards, for instance, are used by few. Moreover, digital boards are very often made use of for activities which could be realized without this asset, that is, they in fact do not exploit the possibilities available. This problem also signifies that there are still gaps in the preparedness of pedagogues, but it is positive that the competent parties are also aware of this, and many make an attempt to change their or their colleagues’ attitudes. According to the large majority of our interviewees, however, to achieve quality improvement, the system of conditions must first be developed. This does not only mean the increase in the number

and quality of devices available, but also relates to the development of available content. Therefore, in order to enhance progress, these fields must be first successfully developed.

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