ICT AND THE QUALITY OF TEACHING - SOME HUNGARIAN RESULTS OF THE OECD ICT PROJECT

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INTRODUCTION

Information and communication technologies-related educational investments are among the highest of all European countries. In the first phase of investments, between 1996-98, in Hungary as everywhere else in Europe, most government funds were allocated to *hardware* and *Internet connectivity.* Schools were supplied with tens of thousands of computers all around the world and Internet connections were provided before substantial research on their functions and use had been conducted. The second phase, therefore, focused on *content*: *development* of educational software, quality assurance and promotion / evaluation of public-private partnership. (Schooling for Tomorrow, 2001) The educational research institute of OECD, CERI commissioned an extensive study to investigate if and how ICT resulted in changes in the quality of learning. The research project entitled "*ICT and the Quality of Learning*" involving 23 member and allied countries. The three sub-themes of the project were "*Software Quality Issues*", a series of national surveys that provided information on educational software development, quality assurance and monitoring of school use. Topic 2, "*Public-Private Partnership",* yielded an international collection of case studies of co-operation between industry and education discussing and documenting a variety of internationally relevant, good models of encouraging, developing and maintaining such partnerships. Topic 3, *"Experimental studies",* the Hungarian results of which will be discussed in detail in this paper, investigated two main areas. National research teams made ethnographic surveys on the functioning of schools that incorporated ICT in education, internal and external communication and management. The other area was the study of *ICT competencies* in the framework of a "quasi-experimental study" to test the development of computer skills, learning to learn skills and ICT-related attitudes of 17-

year-old students who were taught with the help of new technology within the school year of 2000-2001. (Venezky and Davis, 2001)

As part of Experimental Studies, *school based case studies* that evaluated the functioning of schools incorporating ICT in their education, internal and external communication and management. Altogether 91 cases were documented in 23 countries to verify five *pairs of hypotheses* verified through 3-6 school studies per country The anthropological / qualitative approach included structured interviews, observation of teaching and extracurricular activities, analysis of students' ICT-related work. Schools revisited after 6, 12 and 18 months to see how educational change due to the introduction of ICT culture prevailed. The primary goal of research reported here was to understand *how ICT can relate to educational innovation*. When making huge investments in computers and educational software, Hungarian educational policy makers were convinced, just like almost every other participant in the OECD study, that reforms will naturally follow. After the first phase of the computerisation campaign, 1990-98, statements about the effects of ICT became more modest, emphasising the importance of *good practice* and the leading role of about 15 % of secondary and 3-4 % of primary schools that excelled in ICT policy and practice. As the OECD research project focused on cutting-edge institutions, we hoped to obtain results to be used in the second, more difficult phase of ICT-related reforms.

Data collection was carried out employing both qualitative and quantitative methods: Interviews with teachers, administrators, students, parents, and technology specialists, on site observations of school life – production of video films and photographs on spaces equipped with computers and related activities, analysis of digital products of students and teachers, survey of teacher ICT practices in class and in back office hours, analysis of public e-mail logs and interviews with knowledgeable people outside of the school: inspectors, principals of feeder and feed-to schools, business partners, community members, individual sponsors e.t.c.

The Hungarian sample of ICT pioneers included two primary and four secondary schools – selected on the basis of successful involvement in at least two major national educational computing project and providing evidence of regular ICT use in teaching and learning as well as communication and management. School 1 was an alternative secondary school of economics in Budapest – the first private secondary educational institution established after the II. World War in the country, in 1988. As a flexible and innovation-oriented institution, it readily embraced the educational potential of the computer and tailored its functions and software options to the needs of a business-oriented institution cherishing humanistic values. With individual study programmes for every student, mixed age student groups and a publishing house for textbooks written by the staff, this school was a paradigm example of ongoing reform. As a

contrast, School 2, another educational frontrunner: the first bilingual (English and Hungarian language) secondary grammar school in Budapest, safeguarded traditional values and study forms. A large and well-funded institution housed in a prize-winning, modern school building, it showed how tradition and innovation can be harmonised through ICT. School 3 was totally different from both: a modestly equipped primary school about 30 kilometres north of Budapest, in a village of small landowners that excelled in one respect "only": highly trained staff, totally devoted to ICT. This school acted as a catalyst for computer culture in the whole settlement where parents could learn about ICT from their children only. School 4, another primary school from a well-to-do town in southern Hungary, boasted on a relatively good infrastructure and constant parental support in computer matters. School 5, a secondary vocational and grammar school in a middle-sized, unemployment-stricken town an hour's drive from the capitol, was selected because of its excellent work in establishing a knowledge centre in its library and offering training in the most up-to-date ICT-related vocations. School 6, another secondary vocational school was situated in one of the most affluent county seats and enjoyed the support of an interested and knowledgeable local government and parent community. Cutting-edge technology, a wide range of foreign connections and good management all contributed to making this school an ideal candidate for the study of best practice.

From the five investigated in the research project, (discussed in detail in Venezky and Kárpáti, to appear) the following two problems will be summarised in the paper, based on Hungarian data: the *diffusion process* of ICT culture, and the *role of school leadership* in using ICT for more effective teaching, learning and communication. Both are related to the role of the teacher in the successful integration of ICT technologies. In a country with modest resources and traditionally good mathematicians and computer scientists, the human capital is the most important asset any reform can rely on. Our results show that Hungarian teachers are in fact the key players in the ICT in education game.

DIFFUSION PROCESS OF ICT IN EDUCATION

About 2.1 million Hungarians - 25 % of the adult population - possesses a computer. The number of Internet subscribers quadrupled within the two last years. In a country of about 10 million inhabitants, this is still not satisfactory but represents a 40 % increase as of 2001. 85 % of Hungarian Internet-users has access at school or work. The largest age group (an estimated 50 % of all) among regular computer users, as in other countries, is the young: students and professionals between 18-29 years of age. *The digital divide in Hungary is age-related*, similarly to the gap separating the yuppie generation from their parents. Only 6 % of those above 60 years of age volunteer to test and employ computer technology. (Considering the

percentage of teachers employed near and above pension age – 62 years for women and 65 years for men – about 30% of teachers belong to this "ICT – no, thanks" subculture.) Another divide is of geographical nature: a little less than 50 % of Internet surfers live in the capitol, Budapest and a further 30 % are the inhabitants of a county seat or big country town. These data place Hungary in the middle of European computer user rates.

In Hungarian public education, Information Technology as a discipline dates back to the 1970s. from the 1980s, a shift is observable from a technology-centred towards a teaching – learning centred approach. (Kárpáti, to appear, Turcsányi-Szabó and Ambruszter, to appear). Today, it is a *compulsory discipline* for grades 6-8 (student ages 12-14) in the primary and 6-grade secondary school and grade 9 (age 15) in the 4-grade secondary school. The content of ICT studies shifted from subject-specific studies towards a *cross-curricular approach* – teachers of all disciplines are trained and encouraged to teach ICT skills related to their area of studies. At present, *training of intelligent users* seems to be at the focus of curricula. (Körösné Mikis Ed., 2002)

When we examined diffusion patterns of ICT culture in the OECD study, we wanted to find out if the diffusion pattern by Rogers (1995) was applicable in countries with a wide variety of cultures and financial means. The starting point for Rogers is to view schools as social systems composed of individuals with varying degrees of openness to technological innovations. He divides potential adopters into five categories, based upon socio-economic status, communication behaviours, and personality values. This diffusion pattern includes a small group of Innovators (the first 2.5% to adopt), a larger group of Early Adopters (the next 13.5% to adopt), an even larger group of Early Majority (the next 34%), with the rest distributed among the remainder groups of Late Adopters and laggards. In the OECD study, national researcher teams did not provide such quantitative definitions, only general trends described in the model were verified. Traditional diffusion pattern held in almost every school in the OECD sample – Hungary included.

In School 1, the early adopters included junior staff members who came fresh from college with a reasonably up-to-date ICT skills. As *transparency of operations and democratic communication forms* between leader and staff, teachers and students were facilitated by computer culture, its importance for flexible learning management in this school with individual study paths was soon declared as a necessity. Late adopters were few: mostly teachers of arts who feared their discipline would suffer if the "human touch" was even partially replaced by touching buttons. In School 2, bilingual educators soon realised Internet was an invaluable asset for authentic language learning. Here, Early Adopters included English teachers quickly followed by science and the fine arts educators. The latter, an elderly lady who learnt computer-assisted design at the age of 65,

became a national role model for media oriented art teachers. However, most older teachers decided to wait. Laggards were those who thought pension age was too close to bother about learning new, seemingly complicated skills.

Schools 3 and 4, the two primary institutions showed that the ideal age for successful teaching in a computer-supported environment was between 35 and 45. Contrary to our expectations, *best educational users* – those who were most competent in the use of ICT for teaching and self-guided studies – turned out to be middle-aged professional who were experienced in the practice of teaching and knew how to harmonise new methods with traditional ones. Young teachers were often afraid of entering "the road less travelled" and are too preoccupied with the chores of teaching and the intricate process of fitting into a school staff. (Cf. Fehér, 2000) Similar findings were reported in another European study on school culture that monitored average institutions. (For Hungarian results, see Kárpáti, 2001)
In Schools 3 and 5, the head teacher dictated the pace of changes – more about this in the following part on the role of leadership. The staff followed the lead more or less enthusiastically because the mission statement of both schools – and all financial and other management decisions that followed – clearly indicated that you either adopt ICT in your teaching practice or leave. There was an immense pressure from parents who demanded education in marketable jobs for their children that made Schools 5 and 6 adapt ICT-supported vocational training programmes among the first in the country.

Interestingly, *gender was not an issue*. As the majority of primary and more than half of secondary school teachers are women, ICT pioneers had an equal number of male and female teachers in the Early Majority category – although among early Adapters, the number of male teachers is higher. Being an ICT teacher is also a suitable and likeable for women profession – perhaps because male ICT specialists will rarely choose the teaching profession as they have other, more lucrative job offers that major family providers (in Hungary, these are the men) cannot refuse. In Schools 3, 4, 5 and 6, we met competent female systems operators who most often served as ICT teachers as well who could in turn serve as role models for girls and have in fact made them interested in computer culture.

Incentives for adoption included free courses in educational computing – to learn a fashionable skill turned out to be very motivating. "*Computers for teachers*" campaigns by the educational government offered cheap PCs for home use for those who demonstrated ICT skills in teaching. The most important facilitators of change were *systems operators* – in fact, their role turned out to be crucial. Three of our schools – 1, 2, and 6 – employed a full-time support person, the others managed to have only part time help but intended to change this arrangement for at least one full time position.

In the late seventies, teacher training programmes and in-service training courses were introduced in big numbers to satisfy the accelerating need for ICT educators. Already at this phase, an important objective was formulated but, unfortunately, not realised until about two decades later: to train teachers of different disciplines in basic programming and / or educational software use to enable them to use computers in their preparation and daily teaching practice. Thus, teachers of disciplines other than ICT had to rely on their own initiative at start – a fact that made diffusion slower than expected. Today, a wide range of in-service training programmes facilitates computer-supported learning and, as a result, the spread of new tools and methods has accelerated. In all of our selected, frontrunner schools, at least 60% of staff has a certificate in educational computing. In School 3, the smallest and poorest of all, 100% of staff has obtained a diploma in ICT education and thus managed to overcome deficiencies of infrastructure and become one of the best performers among primary schools in this area. Diffusion, we found, is more closely related to *teacher training and motivation* than to available material resources and equipment – a result that gives hope to less affluent countries showing the predominant role of human potential in ICT-related educational reforms..

The *location of schools* turned out to be another important factor influencing use patterns and teacher roles in educational computing. Most primary teachers living in villages expressed their discontent with ICT training, tools and infrastructure - they seem to be more critical than their counterparts in towns and cities with similar equipment. Apparently, the *Internet as a source of information and communication has a geographical value* in education. It means entirely different things for a teacher living in close proximity to libraries, museums, universities and community centres than for those who have to make up for the lack of all these through skilfully using the Net. Access to traditional teaching resources and in-service training is also difficult for this group of educators so they are ready to use ICT to make their own up-to-date teaching aids using scanner, desktop publisher to construct learning materials from the text and image databanks on the web.

However its diffusion pattern is similar to those of previous educational innovations, (overhead projector, educational television, pen and pencil tests, project-based teaching, portfolio assessment), computer technology still functions differently as *it is extremely flexible and thus targets all areas of teaching and learning*, management and assessment.

ROLE OF LEADERSHIP

The most intensive phase of hardware development in Hungary occurred between 1995 and 1997, when the World Bank and PHARE launched their big ICT projects in the country. (Cf. Turcsányi Szabó and Ambruszter, to

appear) Between 1997-1999, however, the Ministry of Education initiated a massive computerisation movement. 3 billion HUF (cca 500.000 USD) was allocated, to connect all secondary schools, (about 700 in number), 30 % of primary schools (400 in all) and one educational institute per county (22 in all) to the Internet. By the end of 1999, the ambitious plan was accomplished. The role of school leadership in applying for grants and facilitating the work of ICT-oriented teachers has been crucial from the start. As most resources were and still are allocated on an application basis, head teachers are key elements of innovation.

At present, Hungarian schools are moderately equipped – and, as our results show, dedication of management and level of infrastructure are closely related. A good example for this is School 2, that had been in the front line of all innovation and research efforts related to ICT and made an optimal use of computer culture in all areas of school life. It had an entrance registration system with chip cards, Intranet was the basic source of communication for the large staff, Internet was regularly used for teaching – also through high quality teacher pages and even alumni kept coming back to design and running the student pages and news network.

But what if the *head teacher prefers other areas of innovation*? In School 5, one of the flagships of computerisation at the time of our survey, there was a change in leadership that resulted in the preference of other educational areas. The school still enjoys a relatively up-to-date infrastructure but staff dedication and innovative projects are on the decrease. From cutting edge to average in ICT – it took only two years for this school to completely change orientation. Decrease of performance was even quicker in School 3. After our survey, the local educational government decided not to prolong the contract of the head teacher who turned out to be instrumental in ICT-supported reforms. The school excelled in practically every learning criterion and attracted groups of visitors interested in village ICT culture from all over the country. Thus, the forced change in leadership could not indicate discontent with results but a wish of local authorities to change directions of development. The head teacher left together with about 15 loyal staff members (70 %) and today the school has practically abandoned all features that qualified them as outstanding in ICT. As a consequence, village children have lost a chance to obtain free training in key labour market skills.

When leadership does not prefer ICT, interested teachers must turn to *peer support*. (Leask and Younie, 1999) The Hungarian Schoolnet was established in 1998 to provide educational and technical help for connected schools. Members of our Schoolnet receive free, 24-hour Internet connection (mostly ISDN), a computer laboratory with up to 20 PCs and a server, a software and printed manual package called Internet Starter's Kit. The Schoolnet Office employs a large group of subject specialist part-time who create a weekly updated, authentic content-rich and therefore

increasingly popular web site: http://www.sulinet.hu. It is a problem that the Hungarian Schoolnet is mainly for secondary schools, so most of their materials are not directly useful for primary school teachers. In Schools 3 and 4, therefore, teachers must engage in adaptation or even in of software – a time-consuming innovation that would have been impossible without firm leadership support. (Halász ed., 1998, 1999)

School leadership in Hungary is at present not in the position to totally disregard ICT-related innovation. *Obligatory data provision* is Internet-based and so are information resources vital for the day-to-day functioning of educational institutions. Through central measures, the Hungarian government managed to make the use of ICT practically compulsory for all schools in the country – at least for management purposes. The Central Educational Information Database (KIFIR) supplies information on educational institutions in the country and is an inevitable resource for teachers who are obliged to offer study and career counselling to students and parents. The KIRSTAT system is our Central Educational Statistics Database that requires the submission of digital data regularly from all schools. Head teachers in our survey first found these requirements difficult to meet but soon reported that computerised data processing made their work a lot easier. Similar findings were disclosed from other national studies. (E. g. Csákó, 1989, 1999, OEAS-Europe Survey, 2000)

The role of leadership in ICT-related innovations was generally considered highly important in the OECD survey. The integration of ICT into instruction and learning was found to depend mostly upon staff competence with head teachers playing an instrumental role. As they decide over the allocation of finances and co-ordinate most grant applications, providing means for ICT-generated reform is clearly in their hands. Teachers are trained to choose and use ICT applications suitable for their discipline in every country and thus may facilitate and, through their demands for new tools and teaching aids, encourage the work of leadership. We found that *the best and most innovative teachers are likely to be good ICT users as well*. Influential figures in their schools, they often act as a body of consultants for their head teacher and thus support the innovation process that naturally follows the introduction of ICT. Similar relationships were also reported in other international studies. (Passey and Samways, ed., 1997)

Both leadership and good teachers, however, have to be convinced that expensive infrastructure that requires constant maintenance would actually result in better teaching and more effective learning. In-service training courses conducted at well-equipped college campuses or laboratories of training firms were found less effective as teachers returning to their schools and being faced with problems of a different, inferior infrastructure could not employ freshly gained knowledge. Therefore, the Hungarian research team invited participating schools to join on-site, school-bsed

training courses and teaching experiments during OECD ICT project: *Learning communities for teachers and university staff members* proved to be highly effective in facilitating improvement and gained positive recognition from school leadership. Teaching experiments for six disciplines, that lasted for two years were expanded to involve 90 schools. A series of manuals, videotapes, demo CD-s, test software as well as pre- and in-service training modules for teacher training programmes was elaborated that are now being used as propaganda materials for convincing hesitant head teachers about the benefits of ICT for education.

In Hungary. the OECD/CERI research project, entitled "ICT and the Quality of Learning" has been slightly altered in direction to emphasise the *importance of dissemination of good practice in computer-generated reforms*. The title of this paper indicate this endeavour and formulates our most important result: though ICT can be used for traditional, frontal delivery of knowledge, it opens new perspectives for modern educational paradigms and has an inherent motivating capacity for teachers and students alike. In this paper, the pattern of diffusion and the role of leadership in the diffusion process was outlined – in papers that follow, the importance of technology, teacher education and student competence will be evaluated and contrasting view about the effects of ICT-related reforms discussed. (Venezky and Kárpáti, to appear)

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