OECD/CERI ICT PROGRAMME

Hungarian case study No. 4

A Case Study of ICT and School Improvement at the

PRIMARY SCHOOL AT ALMÁSI STREET, MAKÓ, HUNGARY

June 2001, Budapest

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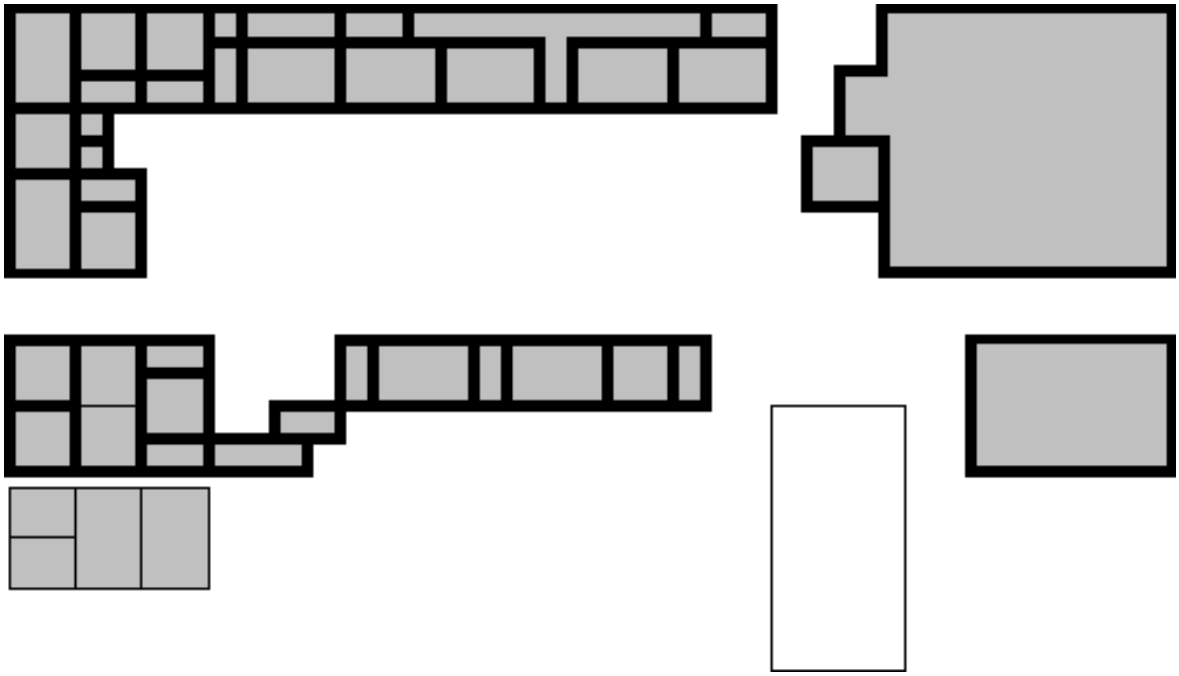
1. Overview of the present

"*Makó - the South-eastern gate of the European Union*!" - this proud slogan is printed on the cover of the information bulletin of a small town in the South of Hungary. "*Hungary- bridge from west to East*!" sounds another line in eye-catching bold type. These two statements gain a special meaning if we realise that in 1998, Makó was the first town in our country to create a large local Intranet enabling more than 150 public institutions to connect with each other and access the Internet and thus deserve the title "digital settlement". The school we introduce in this paper is instrumental in introducing Makó to the Knowledge Society.

Picture 1: The school building shows phases of extension

Picture 2: Floor plan of the Primary School at Almási Street, Makó



1.1 ***What has been accomplished?***

The Primary School at Almási Street (abridged name in this paper: Almási) is considered the flagship primary school for ICT in education for the whole county of Csongrád - one of the richest, most developed areas in Hungary. This is probably the only school in Hungary where the position of the System manager is proudly fulfilled - without pay - by Pál Almási, ICT teacher, the Principal. (Almási, the school is not his, nor has the street been named after him -his family has no connections with the noble family the street his school was named after. There is a more important family link, though: his mother, Mrs. Almási was his predecessor in the seat of the Principal of the school.) Mr. Almási has been instrumental in setting up 60 multimedia PCs - a record number for a Hungarian primary school - and convincing most of his staff to use it regularly.

We have visited the frontrunners of Hungarian educational computing culture and met enthusiastic students and staff. But here at Makó we found the only school in our survey where most of the students selected Information Technology as their favourite subject. They mentioned, as their only improvement wish, to have much more of it as a compulsory component of studies. In fact, they have already much more ICT lessons as the Hungarian average:

Primary school grades	**Compulsory** number of ICT lessons per week in the **National Curriculum**	Number of **compulsory** classes at **Almási**	Number of **optional** classes at **Almási**
1-4	None	None	1.5, taught in small groups of 10-12
5	None	1	2, small groups
6	None	1	2, small groups
7	1	1.5	1.5, small groups
8	1	1.5	1.5, small groups

Compulsory ICT studies are almost double in lesson hours and teaching content than the Hungarian average. Junior grades learn basic ICT skills through playing educational games and processing simple texts. Senior grades get acquainted with word processing, the Logo programme language, database design, the MS Office software package, simple graphic applications and Internet search. 7. and 8. Graders learn a range of subjects through ICT applications. The essence of innovation is that ICT content taught in senior grades of primary school and in secondary school can be acquired during the 8 grades of primary education. Moreover, ICT-enriched teaching methods increase the motivation level of students and make the learning experience richer and more authentic. On primary level, Almási is one of the most important sites of innovation in the development of ICT skills.

Staff involvement is much higher than the Hungarian average where there are 2-4 ICT specialists and 5-10 course certificate holders in a 50-member learning staff. (Survey done in 1999 and 2000 by Éva Tót, National Institute for Educational research.) At Almási, about 50 % of staff members (that is, 15 out of 51 teachers) have completed an ICT course. 85 % of teachers were interviewed and all of them declared themselves ready for more ICT immersion. (Level and type of use will be specified later in Point 3 of this study.) The most important feature of the second phase of ICT diffusion is that the majority of teachers is not reluctant to do simple programming tasks in order to customise a software or install a new application.

Moreover, the top 30% of them are eager to try their hands in *designing and programming simple educational applications*. (Similar attitudes were revealed by Daniel Vígh who questioned 800 Hungarian non-specialist teachers about their computer-related knowledge, usage habits, training needs and plans for future use and found secondary grammar school teachers of science disciplines most prepared, active and ambitious.) In Hungary, ICT was first and foremost introduced on secondary level, thus the eagerness of non-specialist secondary school teachers, holders of MA degrees from universities is understandable. It is, however, remarkable that college-trained primary level teachers at Almási share the same views and perspectives than their more profoundly trained colleagues. It is perhaps the most important achievement of this school *that teachers act as innovators, not merely adopters of ICT culture.*

1.2 Who profits from the introduction of ICT?

The most important group that profits is *high poverty students*. Socio-economic status of parents is mostly low income, agrarian (small landowner, farmer) families. ((Indicators used: type of education, present profession, percentage of students requiring financial support for school book purchase and subsidised meals, declared income level, number of supported lunches and amount of regular learning aid received by parents from the local educational authority). Most parents finished compulsory primary school only (8 grades, ages 6-14), some finished secondary school (4 grades, ages 14-18) but often without taking the final examination (baccalaureate). Very few parents hold higher education degrees. According to the ICT teachers, an astonishing 35 % of students have a computer at home (other estimates given by classroom teachers and Parent-Teacher Association members are even higher, 40 %). Still, the majority of students count on the school facilities to improve their ICT skills and get immersed in a culture so important for their peers and the adult world as well.

Generous amount of free training in ICT and computer-mediated, rich and personal learning content provided by the school helps a lot in preparing high poverty students for further studies in good grammar schools and consequently grants them a chance for higher education. Social mobility in Hungary, still experiencing the rude and anti-social first phase of capitalism, is very low. Thus, *the ICT-enriched environment of Almási can be considered a model for closing the social gap*.

1.3 How do the staff, students, and parents view these accomplishments?

The principal of the school, Pál Almási described the following objectives for the diffusion of ICT culture in education as especially important:

1. Preparing students for vocational studies and providing a basic skill necessary for a range of future jobs. Makó is rapidly developing into a high tech industrial area. Most students will have basic computer skills as an employment criterion.

2. Intranet services are invaluable for building a common knowledge base accessible for staff and students. Their use also trains for making use of information resources of the Learning Society.

3. The Internet provides a rich resource for authentic presentation of scientific and social phenomena and processes.

Picture 3: The staff of the school - the man in dark grey sweater in the centre is Pál Almási, Principal and Systems Operator of the school

Almost half of *staff members*, as emphasised before, are competent private users and more and more experienced in-class users of computer technology. They have experienced the first two phases of reform - utter joys followed by deep disappointment - and now *have a sophisticated set of views and beliefs* about this culture. Teachers of the junior grades (1-4, ages 6-10) believe that students can profit a lot from ICT-based practice as it gives an immediate, personalised feedback - and this is exactly what youngsters need to go on doing the monotonous exercises of basic numeracy and literacy. Teachers of senior grades, however, warn that ready-made solutions to chose from hinder the development of higher order thinking skills. Spelling check is good for making mistakes noticed but also bad as it can be used automatically, without comparing the mistake made with the good ones proposed. Most students quickly choose the replace function and the first option given without even reading the alternatives. Moreover, word processing makes writing by hand seemingly superfluous - an odd skill to master. As a consequence, fine motor skills often remain underdeveloped due to the lack of handwriting practice.

Students are unanimously enthusiastic about ICT culture. Many of them are well aware of the innovative projects carried out at this school. Some even expressed their envy for the lucky peers who "are allowed" to learn maths, physics and foreign languages through the use of computers. Mathematics is generally considered a difficult and not too popular subject among young teenagers but here, where computer applications are a standard feature, many students told us about "getting to like it more and more" because of the new methods of teaching. "If we had more ICT devices, we would not need any traditional lessons any more." - told one of our 12-year-old, female respondents whose words were received with much criticism even among her peers. The statement, however, was not meant to be against teachers whom our respondent seemed to like. It only shows how popular these devices are among youngsters.

Parents like this school and are pleased that their children will have skills they themselves cannot have, only admire. Some of them, however, expressed sceptical views about the spread of ICT-based methods: "They will never replace traditional ones that are so much cheaper. It is easier to open a book that to learn from a CD." - Others express fears about the "*overcomputerisation*" of education. "Children will forget how to add up two figures. They are lazy to make an effort, just take their calculators without even trying to do a task in the head." - "Children will forget logical thinking if they do nothing but follow the steps prescribed by the software." These views show how important it is to explain the benefits of ICT use for parents who are mostly non-users themselves. Unfortunately, *the Hungarian popular press is mostly negative about the use of computers and Internet access in schools*. Stories about kids who spend hours chatting, get fat and make immense phone bills, find marihuana growing instructions on the Web, receive e-mails from malevolent adults get large coverage whereas "normal functioning" does not. Parents are happy about important skills being taught but a it worried because of the media rumours that overshadow impressive achievements in this area.

Picture 4: The coat of arms of the school was designed by a parent and amateur heraldic expert

2. Overview of the past

2.1 What led to these accomplishments?

The Makó sub-region is in fact *a bridge between East and West*. The E68 Trans-European Road transgresses the region and provides a major channel of traffic and trade. (As part of the IV. Helsinki Corridor this road is the link to Turkey and the Southern part of the CIS via Romania, to the Balkan Peninsula via Yugoslavia and to Western Europe, via Hungary.) The county seat, Szeged, is only 28 kilometres away. It is a very important national cultural centre, home to the second largest university of the country and numerous research institutions is often called the Hungarian Cambridge. Teachers and students alike profit from this vicinity and enjoy the bustling intellectual life - without the problems of life in a big city. With its 27.000 inhabitants, Makó is a quiet country town in the valley of the Maros river - but also a municipal centre that organises the economic, commercial, educational and cultural life of the neighbouring 17 settlements. With their population, people living in the Makó region add up to 54.000. Famous Hungarians born in Makó include Joseph Pulitzer - founder of the famous literary prize - and Joseph Galamb who designed the T-Model for Ford. Its special flora and fauna are protected in the surrounding Körös-Maros National Park that boasts with the largest number of sunny hours in Hungary. The most famous local vegetable is the onion, mentioned in numerous folk tales and songs and sold world-wide. Local industry builds upon the research and development potential of the neighbouring big city, Szeged - bio-technology, for example.

The municipal council is a very ambitious promoter of industrial development - ICT culture included. There are 230 enterprises in the area, 30 of which are big, and the majority is small and medium size company. Their work has been based on Ict culture right from the start and many of them are already getting prepared for or have already joined *e-commerce*, a new feature in Hungarian commercial life. Measures like tax preferences for cutting edge industry, creation of an Industrial Park for high level food processing (22 hectares in the North-eastern part of the town, close to the industrial area) with up-to-date infrastructure has won the region the Enterprise Zone title.

As a follow-up, substantial central development funds started to flow in. One of the largest grants was spent in

1997 on setting up *a town-wide Intranet* connecting, as mentioned above, more than 150 institutions through 350 computers with each-other and the Internet. Among them, there were the 10 primary and secondary schools of the town. The Principal of Almási, Pál Almási was instrumental in developing this network. A nationally acclaimed specialist in ICT in education, he was part of the design and implementation team of the network.

2.2 Who initiated the ideas, who shepherded them to completion?

As it was the case in most other Hungarian schools in the pioneering group of ICT users, it was the Principal of Almási who initiated the ideas. As a start, he and likely minded other principals in the town joined forces with local educational administrators and organised training courses for the teachers of Makó to make full use of the newly implemented infrastructure. In his own school, he encouraged his staff members to participate in the training courses and national ICT in education conferences and made major computer purchases when his staff was ready to use them.

He has been active as a Systems Operator right from the start, designing, implementing, upgrading and maintaining the PC network of his school. In 1999, when the "ICT in Education" Subcommittee of the Committee of Education at the National Academy of Science in Hungary was founded, he was invited to become a founding member. As one of the five "ordinary teachers" to assist the body of top-level researchers in their consultative role to the government ICT policy. A very outspoken representative of school-oriented reforms and opponent to improvised measures in the field, he used his membership also to broaden his professional network and involve his school in a number of national projects. These projects mean permanent consultation with experts, access to new information and software, context for permanent improvement and a chance to profit from the experiences of others. Thus, Almási - a very ordinary small town school with average facilities and mostly lower middle class students - became a hothouse for primary level ICT education and a national model school for computer use.

2.3 What barriers were overcome in doing this?

There were no major barriers. Reluctant staff members and lack of appropriate maintenance funds are standard obstacles of any reform in any country. Here, the local educational authority as well as the whole Town Council was very supportive at start but later failed to provide adequate funding for maintenance. Permanent grant writing (and frequent winning) is a regular activity here as in any other cutting edge, innovative school in the country.

Negative feelings about ICT still characterise a small percentage of staff members. (We estimate the percentage of anti-ICT teachers between 5-8 %). Their views are often shared with the promoters of this culture, but they see these deficiencies as challenges for further developments. Most frequently heard negative comments were:

Ø *Ideas are way ahead of technical possibilities*. Several features of CD-ROMs are bad because the realisation of a good teaching idea is impossible with the technical limitations given.

Ø *Intranet is slow and insecure*. As all PCs are connected to it. Downloading a single picture file may take minutes and a teacher of humanities may need several for one single lesson. "You cannot use Internet during classes unless you know exactly what to make students find in a search. But then, it is not the real thing."(Male teacher aged 35)

Ø *You can become a PC junkie*. This is a general belief among parents and many teachers see it as a real threat. In reality, students loose temper with slow PCs just as easily as their teachers and do not get "lost" in cyberspace. In a school where sports options are abundant, fear from an unhealthy, motionless existence for kids also seems unjustified.

Ø *You must print what you have found to make it usable.* Reading habits do not change overtime - an e-book software may be a solution.

Ø *English is the language of the Internet* - Hungarian materials are there but meant mostly for secondary

level or adult use. *Educational portals for primary school students (and their teachers)* should be more numerous.

Ø *Materials on the Internet and on CD-ROMs* are not in line with the compulsory national Curriculum. You have to work hard to complete, adapt or even restructure materials published to make them suitable for classroom use. *Teachers should be much more involved in the planning, design and testing of ICT-based teaching aids*.

Ø *Electronic government* is still in the initial phase. When all data will have to be submitted to and received from the educational authorities, regular use of ICT will be much more encouraged.

3. The present

Picture 4: The coat of arms of the school was designed by a parent and amateur heraldic expert

3.1 ***Characteristics of the school***

The *administrative structure* resembles that of other Hungarian primary schools. There is a Principal or Headmaster, 2 Deputy Headmasters for educational and management affairs and subject specialists:

Mathematics: 4 teachers

Hungarian Language: 4

Sciences: 9

Humanities: 6

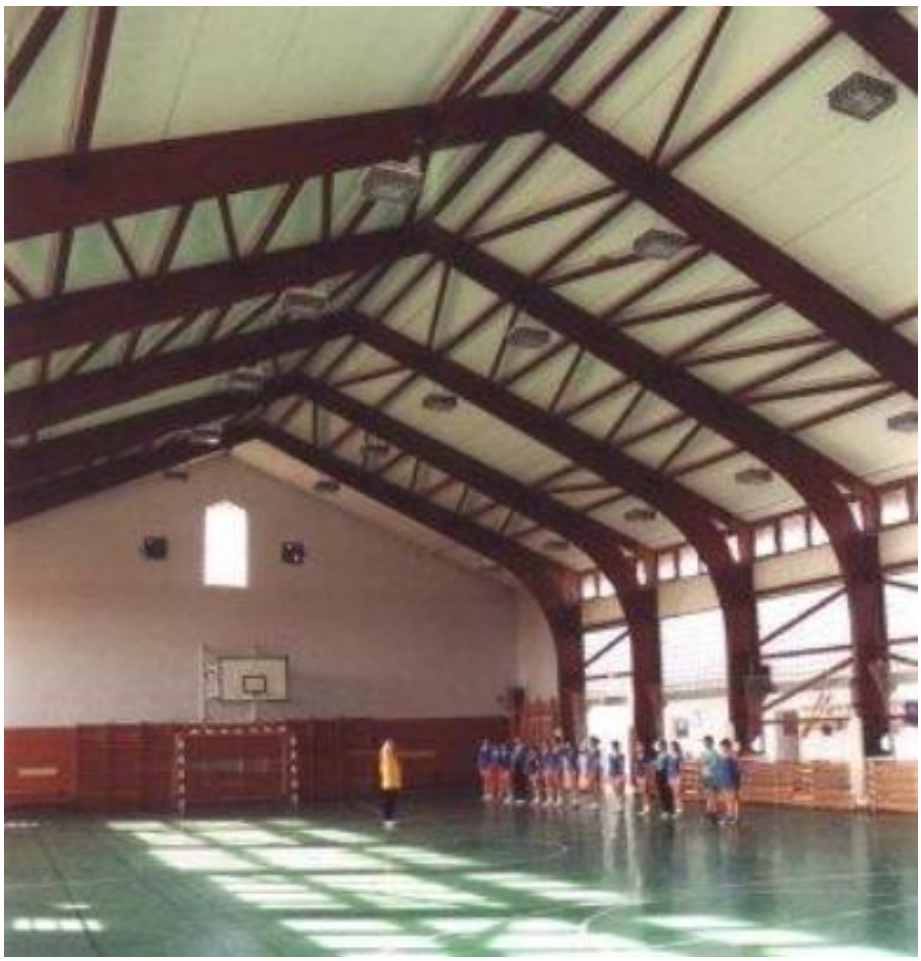
After school day care centre teachers: 7

Junior level staff (Grades 1-4, ages 6-10): 11

School psychologist employed part-time: 1

Picture 5: Typical classroom environment

Picture 6: The gym hall, completed in 2000, has a beautiful wooden structure characteristic for the Hungarian architectural style called "organic" for its roots in folk architecture



Total number of staff is 31, total number of students is 344, there are 195 boys and 149 girls. The curriculum does not have a special education component. The *two major features are ICT and Physical Education.* The former will be described in detail later - the latter is worth a few words here. The fitness level of Hungarian schoolchildren is far below the level described as desirable by the European Union. We have a compulsory military service of 12 months at age 18 and yearly about 25 % of a cohort is generally found unfit for this training. The number of compulsory PE classes is high enough, 3 for primary grades, but most schools do not have adequate facilities for teaching the varied and balanced National PE Curriculum. Here at Almási the

management and staff finds it very important to train students for a healthy and active life and provide a high amount of exercise as a compulsory component of studies. For frequent computer users - and 60 % of students declare themselves "enthusiasts", 10 % out of them even game freaks or programming fanatics - doing regular exercise is an important part of training.

The *educational level* of the school is good. Proof of it are results from a recent survey done by the Institute of Education and Psychology at the Szeged University of Sciences. In Maths, the school participated in the 2000 Spring County Survey for Csongrád county - one of the most prosperous and educationally successful areas in Hungary: Grades tested were 4-8 (ages 11-14), results reported were good - above average in all areas tested. In Hungarian Language the 2000 Spring County Survey revealed similar results. Grades tested were 4-8 (ages 11-14), results reported were good (above average in most areas tested).

The school has an *ICT infrastructure much above the Hungarian average.* There are 60 multimedia computers mainly housed in two labs: the ICT Laboratory and the Multimedia Laboratory. (The latter was created to house non-specialist classes that make use of computers to teach a range of subjects from History through Art.) All computers in the school are connected to the Internet. Staff members have five PCs at their disposal in a cosy little area adjacent to the main *Staff Room*. Here, music is constantly played by the CD player of one of the PCs. Teachers e-mail, browse or exchange ICT-related tips - providing what they call the most enjoyable and profitable in-service course many have ever frequented. The *type of Internet connection* is the usual for Hungary ISDN connection (64kBit/sec, to be doubled by January 2002) provided by the Hungarian SchoolNet free of charge, 24 hours a day.

Picture 7: The computer laboratory where ICT classes are held

The *library* is small and cannot house more than one computer - but its search services are accessible from all the other machines of the school. Ten more PCs are situated in the offices of administrators and in *discipline cabinets* (storage and study rooms for teachers of a school discipline.). Teachers are satisfied with computer access - students of course would like to have more, although the average number of students per computer is 5:1 - incomparably higher than the Hungarian primary school average, 19:1.

The school is steadily improving its infrastructure. New features include the laboratories for Chemistry and Physics (in Hungary, there is no integrative discipline called Science) and the new dining hall and kitchen complex to be finished by August 2001. These large investments show that the school is able to attract local school improvement funds not just national ones. Although the management and staff are not completely satisfied with the financing scheme of their school (no money for ICT-related expenses) but the external observer find many signs of high esteem from local authorities. To be appreciated locally is an important component of success not granted for many ICT frontrunner schools. (Cf. Case Study 3 in this survey.)

3.2 Use of ICT by specialist teachers

There are 3 ICT specialists at this school who realise the national curriculum. The most important local component is the production of the school newsletter (entitled *SuliMédia* in Hungarian, that is SchoolMedia in English) appears both in printed and HTML version and is written, designed and distributed through ICT. One of the much-quoted articles in it was written by the Principal and bore the following title: "What kind of computer to purchase? Hints and tips for You t make Your parents angry!" Students whose parents are ready and able to purchase the newest computer games write the most popular column of the newsletter entitled "Introduction to New Games ". The newsletter has a dictionary of most frequent Internet phrases and gives an account of the upcoming computer shows and other, ICT-related events.

Picture 8: ICT lesson in progress

The *Multimedia Circle* run by the ICT teachers is a very popular free time activity where students acquire basic multimedia development skills.

All of them are very active professionally. The Principal, who proudly declares himself as the main Systems Manager of the school, is a leading figure in professional debates, be it at national conferences or on e-mail discussion lists. All ICT specialists at Almási are eager readers of professional publications and are instrumental in establishing international exchange projects. The most interesting of them couples the school with the United States, where a small city in North-West Ohio called Toledo has entered into partnership with Almási and two other schools in Makó. (In fact, Lucas, the county where this city is located, has already been liased with Csongrád County, home to Makó.) The authorities of the town were approached first and they selected two primary schools and a secondary grammar school for inclusion in the project. Makó was responsive because the town already has an American sister city: Maumes, also from the State of Ohio

Picture 9: The new media lab where computer-assisted classes of all disciplines may be held

Staff and students of Almási entered the project in 2000 and have been engaging in English language correspondence ever since. They also have visited international youth camps to meet their America and Ukrainian partners. Both venues were selected by the American organisers of the exchange project, *The Great Lakes Consortium* - a charity organisation distributing funds in underdeveloped areas - to give American teenagers a chance to experience different lifestyles. (At the international camp in Ukraine last summer, many Hungarian students actually had their first experiences of high poverty and immense efforts by the state to provide ICT facilities for remote village schools.) ICT teachers help students and staff to send images, text and sound through e-mail, build web pages and engage in projects about issues of common interest.

Co-operation with another sister school, the Endre Ady Primary School at Csíkszereda, Transsylvania (the Hungarian-populated region of Romania) has been completely done by e-mail as postal services between Romania and Hungary still leave much to be desired. ICT teachers are key agents in this exchange programme as well.

3.3 Use of ICT by non-specialist teachers

Non-specialist teachers are encouraged to participate in experiments, innovation projects and in-service training courses to increase their competence. Six of them have an European Computer Driving Licence (ECDL) and many prepare for an examination. The school has two expensive PC projectors (equipment absolutely necessary for presentations and not present at all in 85 % of Hungarian primary schools). Teachers can also use scanners, a digital cameras and good quality printers to produce tests or other learning materials. (In a high poverty area, the more teachers can give as a handout the less parents have to purchase.)

Picture 10: Chemistry class in the newly furnished chemistry classroom

Teachers appreciate the *multi-sensory* effects of ICT materials. Text, image and sound seem to be reinforcing each-other if the learning sequence is well planned. Especially teachers of science subjects find visualising tools and simulated experiments and virtual laboratories very useful for enriching verbal information with kinetic, vocal and pictorial cues.

Preparing tests and task sheets are very popular with teachers who are also interested in the possibilities of online examination. Many teachers prepare tests that students have to download from the home page of the teacher and then work on it and resubmit. Thus, ICT skills are developed along with problem solving skills in Maths or History.

We have seen 12 lessons with the use of ICT and witnessed the following *educational applications of computer technology:*

Ø *Mathematics 1*: a DOS-based programme for the creation and measurement of different types of triangles. The programme also assesses student work. The teacher gives out differentiated tasks for homework according to results.

Ø *Mathematics 2*: an interactive CD-ROM is used to practice calculus. Students are fascinated by the cartoon figures who cal, them by the name and give their results in percentages. They enjoy the beautiful images of the software that apparently does not seem to detract their attention from the tasks.

Ø *Chemistry*: student presents self-made Power Point presentation on the ozone layer. Others reflect on the issues raised but also evaluate the presentation as a way of expressing ideas in a more effective way. Possible uses of Power Point applications related to the topic are being discussed and demonstrated.

Ø *English*: a language teaching CD-ROM is being used for grammar exercises and spelling check. Students enjoy working in their own pace and being individually corrected by the software. Questions not explained by the CD and raised by one of the students are being discussed frontally by the teacher. She makes notes of problems with the use of the software and gives an assessment for fellow English teachers at the "ICT in Teaching Foreign Languages" project meeting.

Ø *English2*: an Internet-based testing database is being used to test the grammar skills of students. The connection is slow and overcrowded in the morning hours when more than 4000 schools use the School Net network. The database itself is a Hungarian site, (http://www.angolsuli.com/), easy to use and if the tests had been downloaded before, the lesson would have been smooth and more effective.

Ø *Physics*: the teacher intends to use a CD for presentation but it fails to start. The teacher and class discuss possible problems and decide what to do in the break to ensure proper functioning. A drawing is produced on the blackboard in replacement but he promises to give the CD another try as it offers interesting animations of phenomena the blackboard drawing and illustrations in the textbook of the students could not

visualise properly.

Ø *History Circle:* optional activity for students specially interested in History. The teacher shows search methods and explains how authentic information can be identified. The Circle lasts 90 minutes (twice the time of a normal lesson hour) so students have an ample amount of time to search and download text and images using the rather slow School Net network.

Ø *History class:* students search for information on the European Union on the Internet. The teacher explains the functions of the institutions the home pages of which they locate and thus givers an authentic and amusing overview of how an international organisation functions. Students discuss the chances of Hungary entering the EU as the first Eastern European country while looking at the Hungarian pages supporting our cause.

Ø *Physics:* a computer-based Amper measurement device is being used for measuring the electric current. The software is difficult, students need a lot of explanations but apparently enjoy using a digital device that acts like a "real thing".

Ø *Grammar:* students practice the use of word processor and test the "skills" of a Hungarian spell check software. They are amused to find out that it does not recognise all mistakes and sometimes fails to come up with a good solution. Apparently, our language is so difficult that learning grammar rules properly cannot be "replaced" by the use of a software.

Picture 11: Mathematics class in progress - one of the disciplines taught with the help of ICT

The most important educational experience we had during classes was that *teachers always teach their own subject and ICT at the same time* - a task envisaged by our educational policy makers but often found impossible to fulfil by the teaching community. Half of the teachers at Almási have been trained to use computers in teaching and the more advanced colleagues constantly coach others in the use of applications they found most appropriate for a given age group or topic. Students discuss problems of software and Internet use with their teachers while reflecting on the material presented by the ICT device. Thus, they receive *an authentic presentation of the uses and limitations of computer technology.*

Picture 12: Mothertongue class in progress

We have interviewed 85 % of teacher about their computer use habits through questionnaires followed by verbal discussion of some issues. The following results were obtained:

Ø 52 % of teachers use ICT for education more than once a week, 35 % more than once a month

Ø Educational software, however, is used only by 17 % more than once a week and by 48 % never. Teachers are very critical about the quality of available software and plan to learn how to develop their own applications.

Ø Internet is used by 23 % more than once a week, 23 % more than once a month and 49 % never use it. Reason: too slow or too little useful stuff in Hungarian for lower primary grades.

Ø Web page design is not taught and very rarely practised by teachers themselves.

Ø 22 % of non-ICT teachers takes into consideration the level of computer use when giving marks for performance - an indicator of frequent use and the identification of relevant for the discipline ICT skills.

Ø Internet search by students during classes is limited to predetermined sites by 18 % of the teachers only. 35 % restrict the time spent on searching and 47 % gives no limitations at all, trying to keep the task as authentic as possible *- even it requires a big amount of precious lesson time.

*3.4 **Use of ICT for internal communication***

The school is small, communication is mainly done verbally. Some e-mails are sent by teachers to students to test their e-mailing skills or just to make a nice surprise and students sometimes turn to teachers with questions, mostly with ICT-related tasks.

Picture 13: Chatting in the break in the spacious courtyard of the school

Students co-operate through e-mailing only if they prepare for a competition and have to do tasks together. Normally they meet and talk in the courtyard. Family atmosphere - often mentioned by our interviewees as something they appreciate a lot - is manifest in many extracurricular activities and outdoor festivals or games where students and teachers can meet informally. Thus, electronic correspondence with peers is restricted to work and e-mails of communicative character are mostly sent to those living far away, in another town or country.

The *school home page* is meant for parents and other interested outsiders, it is not really used for internal communication. The school newsletter is produced and distributed electronically - this is the main use of ICT for internal communication.

Home pages of teachers are sometimes used for communication: students find learning materials or tasks sheets here to download and resubmit.

3.5 ***Incentives used for spreading ICT culture***

Teachers who have completed an ECDL course or any other ICT training, receive a salary supplement given by the Ministry of Education to promote the use of ICT in education. No other special incentives are being used. Grants are distributed according to work needs.

3.6 ***Level of computer use by students***

The school has not participated in any surveys related to this topic. Percentages of competent performers of different activities are given in Appendix B. Teachers believe that basic word processing and Internet skills are acquired by all students, but sophisticated tasks like home page design are done by only the most interested few who visit the Multimedia Circle.

Students themselves find *word processing skills a creative activity and one that facilitates memorisation of the learning material*. Many of them told us that they regularly "type out" their homework from the textbook in order to produce their own version that they find easier to learn. They feel that their spelling becomes better and page design skills are also enhanced.

We asked about the *use of pair and group work in ICT-based classes* as opposed to the traditional frontal and individual working arrangement. Teachers reported that pair and group work is rare, most tasks are performed individually. Computer-supported presentations are given to the class as a whole - a more enjoyable way of frontal lecturing - and project tasks are rare. The school participates in several ICT-oriented competitions and some of them require group work. Naturally, in these cases student groups work together and use e-mail to exchange documents and ideas.

3.7 Computer use by students and their parents at home

35 %-40 % of the students have a computer at home. According to classroom teachers, students have to be taught the use of computers for anything else than playing games. Low achievers only do this and do not learn from the CD-ROMs their parents provide. High achievers, on the other hand, often practice skills learnt at school and become more confident in ICT use.

4. Projection to the future

4.1 How likely is it that these accomplishments will remain?

The guarantee for any reform to survive is the *level of satisfaction* of those who participate in it. The town of Makó has completed a Satisfaction Level Survey in which Almási has also participated. Here are some of the results:

Issue in question	**Teachers' Views**
Change of quality of education	Very satisfied - ICT has contributed to improvement
Devotedness to reforms and quality maintenance	Management and majority of staff very devoted, local authorities could do more, parents mostly passive
Satisfaction with functioning	Staff is most satisfied with the tone of management, the human approach to problems, the high level of organisation of the school. Discipline of students has received a low satisfaction score.
Differentiated education	ICT seems to be a very appropriate vehicle for coping with teaching problems created by different achievers
Innovation process	Very good for preparing students for further studies or work. Excellent for developing task orientedness and communication skills. Less efficient for building discipline and formation of character.
Co-operation of staff	Highly satisfactory. For many respondents, friendly atmosphere is the most important feature of the school.
Competency of fellow staff members	Very good in school matters but most teachers do not care for students' out of school life..
Working load for pupils	Time spent on the individual student is less than satisfactory. Working load seems to be bearable, output requirements should be more specific.
Time spent on doing homework	Students should spend much more time for preparation
Student satisfaction with their school	High - most students are proud of belonging to this school.
Strengths of the school	Major strengths: familiar atmosphere, child-centeredness, many extracurricular activities, good relations with parents
To be improved	Discipline, infrastructure (constant upgrade needed), better programmes for low achievers and for the gifted and talented

Apparently, teachers are satisfied with their school but see several issues that need improvement. Some of them - differentiated education for underachievers and gifted children - can be improved by the increased use of ICT-supported teaching and learning methodology. Others need resources that may or may not be readily available. But most problematic issues are within the scope of competence of the staff that views present accomplishments with pride and intend to carry on with the innovative process in the future.

Picture 14: The newest extension: the school dining hall

4.2 How easily could they be extended to other schools?

Increasing the number of ICT lessons and enriching the study of other disciplines with ICT-supported resources requires the following input:

Ø *Getting to know the model* is a basic requirement. The management and staff of Almási make numerous presentations, are affiliated with Eötvös University, Budapest and Szeged University as a site for pre-service teacher training and educational research. They also publish a lot in electronic and traditional fora. Thus, experiences are quite well-known among those most likely to adapt them: interested primary schools from smaller towns and villages.

Ø *At least 3 ICT specialists* for a medium sized school of 400-50 students to cover the increased number of classes. In most towns, those who graduate with a degree in ICT, be it a teacher's degree "only", will find several many betters paid occupations.

Ø *Training for staff* in the use of ICT in education. Given the motivation, this requirement is relatively easy to fulfil. There are many training sites all over the country and there are also centrally allocated in-service training funds that help school cover the expenses of courses, travel and substitute. Moreover, every single teacher in Hungary is required to sit for a re-training course once every seven years.

Ø *Computer labs or in-class equipment* for hands on classes and presentations. Although primary schools are not so well equipped with computers as secondary schools, but large government funds are being made available for new labs, Internet connections, even beamers (LCD projectors). Thousands of machines will be distributed on an application basis and a good teaching programme is needed to apply. Thus, the programmes developed in Makó should be made available for those who intend to apply and improve their teaching through ICT.

Ø *Competent management.* Mentioned last, but of utmost importance: dedicated to the diffusion of ICT culture management is a must. In order to facilitate the acquaintance of managers with recent development in ICT technology and pedagogy, a set of training course was developed and are now being taught at all the major In-Service Training Centres for Educational Leaders. A charismatic leader is born and cannot be trained, but ICT competency helps a lot in making financial and management decisions.

In sum, most requirements for spreading the Almási model seem to be granted. Adaptation will not be easy but it will not be impossible either.

4.3 What resources are required for maintenance?

Funds for upgrading and maintenance should not be dependent on grants. The basic problem for all Hungarian schools is that ICT is a very expensive resource - and one that has not yet been included in the school budgets at the majority of school owners: local educational authorities, churches and other organisations.

Picture 15: Daycare is provided for all pupils from age 6 till age 12. ICT use is possible for all in the afternoon hours under teacher supervision in the computer and media labs.

5. Main hypotheses

1. Technology is a strong catalyst for educational innovation and improvement, especially when the World Wide Web is involved. The rival hypothesis is that where true school-wide improvement is found, technology served only as an additional resource and not as a catalyst, that the forces that drove the improvements also drove the application of technology to specific educational problems.

At Almási, the first hypothesis holds. This small suburban school had been one of the average educational institutions in the town before the present Principal realised the importance of computers in education. Starting the innovation process with a school-based in-service training was a very good idea. As shown in Case Study 3, (Neumann) as well, such an approach leads to instant involvement and enables teachers to adapt and even develop teaching aids suitable for their own style of instruction. Experimentation with the computer ran parallel with the invention of new teaching methods. Major investment in equipment followed the first training wave, thus computers and accessories as well as Internet connection was much better utilised by a trained staff.

2. The diffusion of the innovation/improvement (and therefore of ICT) followed the traditional diffusion pattern for innovations, as outlined by Rogers (1995). The rival hypothesis is that technology functions differently from traditional innovations and that therefore different diffusion patterns occur.

As stated in all other Hungarian case studies, the diffusion of ICT culture in schools follows a unique pattern that does not resemble other innovation processes. At Almási, it was basically needs driven. A large group of teachers trained in the use of computers started looking for possibilities to use their newly gained knowledge. They found different ways, became involved just as much as they presumed their subject they taught required it and convinced, through their example, reluctant colleagues to follow their lead and be inventive themselves. Nobody could offer ready-made solutions - a method well suited to Mother Tongue was completely useless for Maths or even Foreign Languages. Constant encouragement from the Principal and the eagerness of students - a special form of double motivation coming from "above" and "below" - as well as continuous technological development secures the expansion of this never-ending process of innovation.

3. Successful implementation of ICT depends mostly upon staff competence in the integration of ICT into instruction and learning. This hypothesis assumes that teachers mediate ICT applications when they are successful, and that ICT's academic value relates positively to teacher competence. The rival hypothesis is

that the school technological infrastructure and student ICT competence rather than staff competence determine ICT implementation outcomes.

One of the biggest myths in school ICT culture is "*students know best*". Youngsters can naturally access computers much more often. (They have incomparably more free time to do so than the average Hungarian teacher: a middle-aged woman with two teenage kids, a husband and a household to take care of on top of a minimum of 20 lessons weekly to teach and prepare for.) Students are more fluent in the acquisition of ICT technology, more inventive in problem solving (mostly through time-consuming experimentation) and are highly motivated to acquire skills that make them part of the highly esteemed by the press, their peers, parents and teachers Net Generation. On the other hand, *teachers are and will be the ones in charge of education.* All fears (and hopes) of the teacher-less, fully mechanic, self-supportive teaching package as described in mastery learning theory, programmed education and distance learning theories have been unjustified so far.

The teacher assumes new names implying new roles: mentor, leader, filter of information, guide, and counsellor but he or she is still the one directing the learning process. The very best information found on a web page will not be embedded in a solid knowledge structure unless the teacher catalyses the information retrieval and utilisation process. There is a *minimum level of infrastructure* below which no ICT-supported education can take place. (PCs and accessories needed seem to depend mainly on culture, age group and discipline taught.) Above this minimum infrastructure level, we have found no connection between the quality and effectiveness of ICT methods used and the sophistication of equipment available. There is good hope for this culture in less advantaged school (and countries): *training and motivating teachers is most likely the key to success and not huge funds spent on gadgets.*

4. Gaps in academic performance between high and low poverty students will not increase when all students have equal access to ICT. The rival hypothesis is that equal access to ICT will lead to more advantaged students increasing the performance gap with disadvantaged (high poverty) students.

At Almási, 60 multimedia computers are available for students in the afternoon hours to make up for not having one at home. As the total number of students is 344 and presumably a minimum of 30 % has a computer at home, there is one computer for five pupils for free use every afternoon. Thus, staff and parents agree that everyone who needs extra time for learning ICT skills or just browsing around for interesting information may do so at school. Most households in this region are lower middle class and high poverty children constitute a minimum of 20 % of student population. For them it is important that ICT circles are free of charge and there is teacher support available even for those who only "hang around" in the computer lab in the afternoon. The knowledge gap will certainly not increase - although it may not decrease, either.

Interestingly, students find ICT an important vehicle for the improvement of their skills. They like the orderliness of word processing, find it helpful to make notes on the computer. Many senior students and prepare presentations for memorising and fully understanding the material. Let us not forget that it is a primary school, these "seniors" are 12-14 years old - what we are witnessing is the *spread of learning methods characteristic for higher education down to primary level.* Both low and high poverty students use ICT for learning, but better students are using it more, unrelated to their financial status. Poor achievers mostly play games, while high achievers have realised the teaching potential of this new culture. Thus, ICT is capable to become the vehicle that helps high poverty highe achievers to overcome social obstacles.

5. Successful implementation of ICT will lead to the same or higher academic standards in spite of the low quality of many ICT materials. Academic standards are a function of teacher and school expectations and not of the standards of textbooks, ICT materials, and the like. The alternative hypothesis is that ICT use will lead to a lowering of academic standards as students spend more time on marginally beneficial searches and in browsing poor quality Web and courseware content.

The widening of the gap in academic performance between low and high poverty students has not been observed, but no increase in performance has been noted either by the majority of teachers. They are aware of the motivational power of computers and witness how students diligently practice drill tasks if the PC calls them by the name and monitors their results. Increased practice time may lead to better performance - but only

in selected areas and disciplines, teachers at Almási believe. Generally, ICT does not directly impact the level of performance but it increases the quality of teaching a great deal.

The quality of digital teaching aids has been much criticised by the staff of Almási. Teachers exchange reliable CD-ROM titles and URL-s and feel the need for educational portals as safe havens from the overload of stupidity spreading through the Internet. The quality of teaching of competent and experienced teachers will not be affected by poor quality aids as they do not rely on them as their major resource. But *for novices and less capable / diligent ones, bad CD-s* just as well as old fashioned textbooks, dull illustration materials and outdated videos - *can do a lot of harm*. It is very tempting to substitute thorough preparation with the use of a 45-minute video or lesson on a CD-ROM.

The staff at Almási intends to continue training and be involved in innovation projects in order to become independent of commercial teaching aids and develop their own. The newest government initiative - the *E-Learning Project for Public Education* - serves exactly this purpose. It intends to train the best teachers in the country to be part of ICT based teaching aid development teams - or even develop their own products. Through this initiative, to be launched in September 2001, Hungary hopes to create a wide variety of reliable teaching aids in a language not spoken by anyone else apart from the 10 million inhabitants of our country.

Appendix A : Methodology; description of the amounts and types of data collected

Size and composition of the research team: as the school is involved in the experimental curriculum project, "ICT-supported Mathematics, Physics and Foreign Language Education", it is regularly visited by three subject specialists. In addition, an expert in teaching aids and an educational researcher was employed to carry out interviews and classroom observations. The principal of another, "rival" primary school in Makó acted as an external expert as he has been closely observing the innovation process in the school in the last 20 years.

Amount of time spent at the school: 5 days.

Amounts and types of data collected:

- *Interviews* with teachers and school administration (15 interviews executed)
- *Interviews* with parents and students (20 interviews executed)
- *On-site observations* of classes (12 lessons observed)
- *Observation of written and visual communication* of the school (school home page, issues of the school's electronic newspaper, home pages of teachers related to special disciplines), school magazine,
- *Analysis of digital teaching aids developed by staff and students* (PowerPoint presentations of students and teachers)
- *Questionnaires of ICT use* given to all staff members, 95 % replied
- *Critical reading of project applications and reports by staff members* for grants donated by the school and by foundations.
- *Observation of student work* done with the help of computers (papers, presentations, tests, creative work, computer programmes etc.)

Appendix B: Use of computers by teachers and students-based on the Teacher ICT Use Questionnaires

Activity	Teachers who do it (%)	Students who do it (%)
Teaching	87	0

Word processing	90	40
Correspondence	40	40
Chatting	0	10
Downloading files	55	20
Browsing	55	50
Playing games	5	40
Programming	10	30
Administration	25	5