THE INTERNET IN HUNGARIAN PRIMARY AND SECONDARY EDUCATION

László Gulyás, Péter Szlávi and László Zsakó
Department of Informatics Methodology, Eötvös Loránd University, Budapest

About the authors

All the three authors lecture at Eötvös Loránd University, Budapest (Mr. Gulyás, Mr. Szlávi assistant professors, Mr. Zsakó associate professor). They have long been working in the field of teacher training. They are registered at John von Neumann Computer Society (NJSzT), which is scientific society of teachers, researchers involved in informatics and at the Hungarian Association of Informatics Teachers (ISzE), which is a professional organization as well as a union for the representation of interests of informatics teachers. Mr Zsakó is a member of the board of NJSzT and ISzE (the two above mentioned organizations).

Abstract

In our lecture we are drafting the present-day situation of teaching informatics in Hungary. We are going to organize our lecture along two governmental projects, which are aimed at propagating and popularizing informatics in our country. After a brief review of the history of informatics, we are analysing the topic from some points of view, which we consider to be important, touching upon the objectives and tasks defined in the two projects; then going on to sketch the situation so far developed during the realization of the projects and the situation expected to evolve in the near future. Our points of view are as follows: Using informatic tools in primary and secondary education, Computers in primary and secondary education, Course books and software, Informatics as a school subject, Teachers of informatics, The future of informatics teacher-training and refresher courses, Teaching computer skills to teachers not specialized in informatics.

0. Introduction

In Hungary the history of teaching informatics goes back to over 25 years. These are the 25 years, during which the Ministry of Culture and Education in power has been taking steps to introduce and spread informatics in education then later to rise its level of teaching. Let us sum up this history briefly.

The “Antiquity” of informatics teaching, where written documents prove the government's realizing the decisive role of informatics, started in around 1972. It was the year when (after a few years of preparatory work) the training of informatics experts was launched at Hungary's most dignified universities. Being regarded as an off-shoot of Mathematics, these subjects were characterized by the dominance of Mathematics. Meanwhile some secondary schools, which were interested and active in informatics, were equipped with a PDP 8 compatible Hungarian-made minicomputer. That was the end of the central initiative for about 10 years.

The new era starts in around 1981. Let us call it the “Middle Ages” of Hungarian informatics teaching opened by purchasing ABC80 personal computers (a joint development of a Hungarian telecommunication company, BRG and a Swedish firm, Luxor) for Eötvös Loránd University, Budapest and some secondary schools. It meant that learning computer skills became accessible at our university; every student studying for a teacher's degree spent 2-4 semesters learning the usage and programming of computers.

At the beginning of the 80s this process speeded up a bit; event comes after an event. We can see the realization of the importance of informatics in the fact that on the initiative of the Local Education Authorities there were organized informatics courses for teachers in several county-towns. In 1983, which the cultural government considers to be an important year, the so called “School-computer Project” was launched. Owing to this project each secondary school was provided with one computer and, of course, the universities playing an important role in teacher-training also received 6-7 PCs, which were the Hungarian-made version of the popular TRS80. Besides providing the hardware, the Ministry of Education financed an educational software project. In the same year there was a brainstorming national competition called “informatics is Everyone's, informatics for Everyone”, where 15-18-year old students were able to test their skills. In 1984 several universities made it possible for their students to specialize in informatics as a third speciality. 1985 is the second date as far as informatics competitions are concerned: since that year there has existed the National Competition in informatics, which rouses bigger and bigger masses of secondary school students (and 10 years later that of primary school pupils too) year after year. This, definitely, was a milestone in introducing informatics as a school subject.

The second half of the 80s is characterized by bustling work. Let us note – and forgive us for our prepossession/partiality – one event worth mentioning: at our university, which is the oldest university in Hungary, the first computer the by then out-of-date HT1080Z (a TRS80-clone) was substituted by Commodore 64 computers.

In the late 80s and early 90s lies the boundary of yet another new era. The first event in the modern age of informatics education is the introduction of informatics as a major i.e. it ranks among other subjects like Physics or Mathematics. At about this time there comes another change in the machine stock: Commodore 64s are replaced by IBM PCs in higher education. Since the state's financial means were becoming more and more restricted we had to find other sources of funds. We just might hope that the unsettled financial situation was not the only factor that brought about a controversy between the government and the teachers over the reform of the content of informatics as a school subject (as well as over the reform of the whole education). This war of words has been going on up to the present day. Meanwhile far from the frontiers, at the schools conditions – as far as computers are concerned – have improved. Now in every secondary school there is a laboratory with (mainly) IBM compatible computers and in primary schools there are some computers as well.

And now we are entering the new age, the demands of which (multimedia, the Internet) we must meet in education too. How we would like to do so and where we are now will be the topic of the following chapters. there are two governmental projects: one of them is the so called National Informatic Strategy (NIS), the other one is the so called Internet Project aimed at realizing the previous one.

1. Using informatic tools in primary and secondary education

Objective

The application of informatic tools must be built in a wide range of school subjects. In class they should be used for demonstration, for experiments or as a mean of individual, independent study.

Tasks to do

In each special classroom there should be placed for demonstration purposes. These computers are supposed to give access to the server of the school via a local computer network. A closed-circuit TV-video connection is also needed.

A certain percentage of classes (other than Computer Science) should be held in computer laboratories so that they can perform the simulation experiments of the given subject.

Schools should provide their students with access to the computers rooms or computers (under the supervision and with the help of the teacher) in the afternoon (or during the day), which may turn out to be the main field of individual learning at school.

Students must be given the opportunity to do their projects and other kind of homework with a computer so that they will use the computer according to their interest. It is especially important for the students who commute to school or during the week stay at students' residences. In their interest students' residences will have to be equipped with computers so that the students will be able to use them late in the evening or early morning.

Application of informatics need not be restricted to classroom activities. There should be worked out some informatics projects which can be solved by co-operation of the students and teachers, respectively. Such a big project could be the computerization of libraries, which is a must anyway, as well as setting up educational databases.

On the way to realization

The Ministry of Culture and Education has announced a competition for multimedia educational software supporting individual learning within the framework of its Internet Project. The topics of the competition are as follows:

- The sound
- The light
- Colours
- Motion
- The sun
- Water
- The man
- The woman
- The human body
- The blood
- The skin
- Nutrition
- Dreams/Sleep
- Memory - Remembrance
- Death
- Love
- Mother
- Family
- Inventions
- Laws
- The greatest rulers in the world
- War
- Signs
- Cities/Towns
- Money
- The national anthem
- Rhythm
- Peaks
- Mirror

It might be worth having a look at the planned contents of one or two of the topics.

THE LIGHT:

- luminous phenomena, physical properties of light
- sight – in various animals and in the man –, the structure of the eye
- demonstrating perspective in painting with the help of light – e.g. Rembrandt
- film art – with a special regard for black-and-white films
- the Enlightenment as a philosophical and literary trend
- photography

MOTION:

- visual display movements defined in physics
- physical education and biology – the structure and functioning of the muscles via the demonstration of physical exercises
- the history of moving picture
- standstill motion in sculpture

- the motion of animals broken into phases then merged just like in a film
- the motion of planets

SIGNS:

- as means of communication (speech, writing)
- history of writing
- How do animals speak?
- How do plants communicate?
- symbols
- mathematical signs

2. Computers in primary and secondary education

Objective

Schools must be supplied with up-to-date informatic equipment and professional operators and provide continual operation.

Tasks to do

All this requires the renewal of the school-computer project started in 1983. On one hand it means the provision of schools with up-to-date computers, PCs (see fig. 1; rounded figures taken from the Ministry of Education's statistics), which must be able to run multimedia application, be connected in networks and give access to national/international networks.

Equipment/school	Primary schools	Secondary schools	Altogether
The number of schools	4,000	1,000	5,000
PC: 40/80	160,000	80,000	240,000
Network server: 1/2	4,000	2,000	6,000
CD-ROM:2/4	8,000	4,000	12,000
Scanner:1/2	4,000	2,000	6,000
Laser printer:1/2	4,000	2,000	6,000

Fig. 1

When computers are obtained centrally, we should exercise stricter control over the quality of hardware and software, shipping deadlines and servicing as compared to the previous years. Schools must obtain the new, up-to-date hardware and software via tenders with the guarantee of the necessary personal and material conditions together with their introduction in the actual teaching process, which later will have to be controlled regularly.

The placement of the machines listed in Fig. 1:

- in computer laboratories: 1-4 classrooms per school
- in special classrooms (those of Physics, Chemistry etc.) for demonstration purposes: 4-10 computers
- computers for the teaching staff: 6-10 computers in the latest configuration

The lattest group may help teachers in their preparation for their classes. For the sake of the continuos improvement of their own professional skills, informatics teachers need to have a computer of their own at home as well. They should be allowed to write it off their taxable income (or some other kind of financial aid should be awarded to them).

In order to operate the machine stock efficiently, a part-time or full-time professional operator need to be employed depending on the size of the given machine stock.

Purchasing the computers is not enough for the regular use of informatic tools; one should take into consideration overhead (paper, floppy disks, toner etc.) and maintenance costs.

On the way to realization

	Independent computers	Computers in network	Computers with access to the Internet
Presently	7472	13916	1801
After the realization of the project	7472	13916	approx. 6300

Fig. 2

The chart above shows that after the first stage of the project has been completed, approx. 50% of secondary schools and approx. 10% of primary schools (especially the schools of smaller settlements) will be connected to the Internet through a computer laboratory. Within the framework of the project schools will receive a powerful server, 3-10 workstations depending on the number of students, a network operating system, a basic software package (Windows 95, Office, HTML-editor, Lotus 1-2-3) and free (full-range and unlimited) access to the Internet. the most important features of the workstations: a Pentium 166 MHz MMX processor, 16 Mbyte RAM, a 2.5 Gbyte hard drive, 16X CD-ROM, sound card with speakers.

In the second stage every Hungarian school will be connected to the Internet (to be more precise, in 1998 every secondary school and in 2002 every primary school).

3. Course books and software

Objective

In order to develop computer literacy, schools must be provided with curricula, course books and up-to-date, legal basic and application software.

Tasks to do

Informatics course books are of a special kind for public education. They contain long lasting information as well as material which become out of date within 2 or 3 years due to the fast development in the world of informatics. Owing to the wide range of informatic applications, teachers should be given a free hand in drawing up the syllabus. It requires forming a set of course books consisting of modules, which lets the teacher choose 3-6 modules for one academic year. Parts of the syllabus are supposed to be published via informatic tools.

Scientific books are a must for informatics teachers, they are essential for them to keep pace with the fast development of this discipline. Therefore informatics teachers should be given the chance to get reimbursement, up to a certain limit, for the course books they have bought at their own expense through some kind of tax allowance.

Professional circles of informatics teachers should be entrusted with the assessment of course books and curricula. Local Education Authorities (LEA) are supposed to set up databases of course books and curricula, which will give schools the chance for the “real” free choice of books.

Schools should be entitled to the unlimited and free use of the 10-15 basic programs necessary for the acquisition of modern basic computer skills. Therefore, the Ministry of Education or the leading software houses are expected to ensure a countrywide licence for these products.

At educational centres, which – for practical purposes – are supposed to be the Local Education Authorities, there should be demonstrated as well as given access to the full range of software used in education.

Before this happening, educational software will go through strict professional assessment, which will be performed by professional circles of informatics teachers and other computer experts.

On the way to realization

Every LEAs will be given a laboratory of 15-25 workstations. There will be copied or installed new educational materials, software, curricula, and course book reviews, which will be accessible via a network, could be used freely or loaded down. The long-lasting, valuable ones will be put into a central archive after a while.

4. Informatics as a school subject

Objective

Developing computer literacy requires the introduction of informatics as a school subject. Meanwhile we should encourage the teaching of computer skills.

Present day situation

After several years of struggle informatics teachers have reached great success: in every document of public education informatics is regarded as an independent discipline i.e. an independent school subject. The National Curriculum sets the requirements for 6-10th years while it is the school's job to decide on the number of classes per week. Schools have to agree on the extension of teaching to other age groups as well.

Tasks to do

Informatics as a school subject should be introduce at least in the 6-8th years of primary schools and 1st-2nd years of secondary schools. The number of classes per week required is 2.

Presently about 10% of primary schools start teaching informatics in the 5-6th years, the main objective of which is giving a wide informatic basis.

A lot of schools teach a trade or allow their students to specialize in a certain subject (which give them a better chance to find a job after leaving grammar school). Grammar schools should be encouraged to teach computer skills, which will provide students who do not want to continue their studies with skills that will facilitate their employment. Let us list just a few of them: secretary with computer skills, editor, tour operator, education technologist-information technologist.

An important area is the expansion of the informatic application profile of special secondary schools, which could be realized in the following groups:

- secondary schools specialized in technological sciences
- secondary schools specialized in economy and finance
- secondary schools specialized in agriculture and food industry
- secondary schools specialized in health care
- secondary schools specialized in commerce and catering

Special attention must be paid to the education of gifted students within the framework of competitions, camps or after school study groups.

Informatics as a school subject has two main purposes: on one hand, like mathematics, it helps to develop students' thinking through algorithmization and data modelling; while, on the other hand, it forms application skills through using ready-made systems.

The main purposes of teaching this subject could be demonstrated with the following:

- forming modern application skills (teaching students to be able to make use of computers and the possibilities of informatic culture)
- developing algorithmic thinking (a role similar to that of mathematics, which helps to developing thinking, essential at school as well as in everyday life)

- developing the ability of working on their own (Computers, which react immediately to the students' actions, gives them the chance to learn at their own pace; meanwhile they allow the teacher to pay special attention to the gifted students.)
- developing the ability of co-operation (complicated computing tasks require teamwork, sharing the job, and keeping in touch with the others)
- educating on high-level creative work (when you write a program, a document or a database, the outcome of your work will be a product with all of its characteristic features)
- the realization of the interaction between informatics and society (the rapid development of informatics will basically change the whole society and you will not feel at home in this ever-changing world unless you understand the changes and the forces behind them)
- students will be expected to produce computer materials (programs, projects, lectures, demonstrations etc.) in a topic connected to some academic subject

On the way to realization

Since the beginning of the 1997/98 academic year a new education system has come into being, which besides the academic subjects contains informatics as well. It states that each Hungarian school must provide teaching in informatics for the 13-16-year old. A basic criterion of introducing this subject is equipping schools with a suitable computer and connecting them to the Internet.

5. Teachers of informatics

Objective

In order to perform the tasks listed above, schools will 2-3 informatics teachers i.e. 10,000-15,000 teachers altogether.

Present day situation

At the moment there are approx. 2,800-2,900 teachers graduated/graduating in informatics from universities or colleges.

Fig. 3 shows the distribution in time of graduates from Eötvös Loránd University, Budapest and Kossuth Lajos University, Debrecen. So far 1,710 people have graduated and there are approx. 800 undergraduates.

It was 2 years ago that the students of the first evening and correspondence courses graduated at the universities in Szeged and Veszprém. They were small in number and even today they have 15-30 students in a year.

Year	Regular/full-time students	Part-time students (i.e. evening and correspondence courses)	Year	Regular/full-time students	Part-time students (i.e. evening and correspondence courses)
1986	40	119	1991	67	55
1987	35	98	1992	63	113
1988	26	169	1993	53	98
1989	49	129	1994	66	164
1990	50	164	1995	51	141

Fig. 3

Tasks to do

Schools can provide satisfactory teaching in informatics if we train approx. 1000 informatics teachers a year during the next 10 years (at the moment there are approx. 4-500); not counting the ones who leave the teaching profession or retire.

There is something else that we would like to note here: the first informatics teachers graduated about 10 years ago; since then 3 generations of computers (HT1080Z, Commodore, IBM PC) have followed one another at schools, not to mention software, where the pace of development has been even faster. Consequently, teachers should be offered refresher courses to be organized by the universities.

Software houses are expected to give more professional support (as compared to the present day) to methodological journals and teachers' conferences since they are the forums for teachers' self-organization, which facilitate the fast exchange of information and ideas.

It is essential to promote to set up and maintain a professional-pedagogical information system.; a national informatic network of public education should be founded.

At teacher-training and kindergarten-teacher-training colleges students should be offered the possibility to choose informatics as an optional course. Experiments of teaching informatics to the age group under 10 should also be encouraged.

6. Teaching computer skills to teachers not specialized in informatics

Objective

There are a large number of teachers not specialized in informatics who are supposed to use computer in class. They should be trained for basic computer skills as well as for using educational software related to their own subjects.

Tasks to do

Full-time students trained to be teachers will have to be taught basic computer skills as a compulsory course (like courses psychology or pedagogy). They will also have to become familiar with applications related to their subjects.

At schools informatics teachers should be invited to train their fellow-teachers for basic computer skills, which is the most efficient and cost-effective solution.

In order to familiarize them with educational applications related to their subjects we could organize regional courses, practically LEAs (responsible for a county) in a school that has the best computer stock in the county. LEAs will have to be provided with the latest hardware and software for demonstration purposes.

The topics of these courses will be decided on by experts of the circles of teachers affected as well as by professors of universities and colleges.

On the way to realization

The Ministry of Culture and Education can allocate 3.4 billion HUF (approx. 17 million USD) from its budget for the year 1997, approx. 1 billion (5 million USD) of which will be spent on a retraining scheme for teachers not specialized in informatics, which will take place in 4 levels:

1. training basic computer skills, basic use of the Internet for teachers not specialized in informatics
2. training computer-literate teachers of subjects other than informatics
3. training informatics teachers to be system administrators at school
4. informatics teacher-training for teachers not specialized in informatics

7. The future of informatics teacher-training and refresher courses

Objective

We must put an end to the current shortage of informatics teachers since it is them we can rely on when computerizing other subjects in public education.

Tasks to do

On one hand, we must raise the number of full-time students of informatics at a faster rate than that of other subjects at universities and colleges that provide high-level education at present.

On the other hand, since the problem cannot be solved fast by full-time courses, more attention and resources should be allocated for retraining schemes. Like at present, universities and colleges should be invited to do these schemes and we had better refrain from commercializing it because – despite their goodwill – computer experts inexperienced in teacher-training might do more harm than use.

The retraining scheme should include teachers of mathematics, physics, technology i.e. teachers whose subjects are close to informatics as well as computer experts who are interested in taking part in public education. In the latter case the curriculum of the scheme will be completely different.

In order to perform the above listed tasks the number of teaching staff at the universities must be raised by 50-100% and computer laboratories as well as software packages are required.

Furthermore we must take into consideration that the topics of informatics as a school subjects are constantly changing owing to the rapid development of informatics tools and methods. Therefore it is essential to organize regular refresher courses for informatics teachers. (The first students learnt the basics of computer science on HT1080Z and Commodore 64.) Therefore we suggest that every informatics teacher should take part in a general refresher course every 5-8th year.

It also means that the investment we are making now to make up for the shortage of teachers will not get lost in the future hence the regular refresher courses will be organized on this basis (of equipment and experts).

As far as special topics such as software tools, new methods in methodology etc. we suggest organizing regional courses in a county co-ordinated by LEAs and arranged by schools that have the best computer stock and the best-educated teachers in the county.

Informatics teachers of secondary schools specialized in computer science will have special needs as far as refresher courses concerned but, owing to the little number of participants to be expected, it is not cost-effective to organize them independently. Therefore there further training should be done within the training of computer experts.

On the way to realization

The sum allocated for the refresher courses can be used for informatics teacher-training as well as for refresher courses. Teachers will be given this some and they will decide on which course offered by the ministry they will attend. There are about 4,600 courses on the list, which contains topics that prove to be useful not only for informatics teachers (e.g. topics such as “Folk Dances” for teachers of physical education, “The Latest Results in Biotechnology” for biology teachers, “The Physical Bases of the Symptoms of Life” for physics teachers etc.)

Conclusion

Within the framework of the Internet project we are taking the first steps to propagate and popularize informatics in public education. We can notice some disproportion in the development: we might be content with setting up the infrastructure and the general use of the Internet while the competency of the teachers is far from being perfect and the content of informatics education has not been adjusted to the opportunities either.