Conference on
„Remote Education and Informatics"

TELE TEACHING '86

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1.
Remote education
General

INFORMATION TECHNOLOGY IN HUNGARIAN EDUCATION

György PÁRIS*

THE PRESENT SITUATION

The rapid development of science and technology, the appearance of micro electronics, and the penetration of computer technology into various fields of the social division of labour have all called attention to the importance of teaching computer technology. It has become clear that the tasks facing society can be solved with the necessary efficiency required in our age only with the help of computers and information technology.

Acknowledging the given structure and nature of Hungarian schools and education - when determining the tasks of education - the first thing to consider is that it takes at least 5-8 years to put a decision into practice. This means that when setting the tasks of education, one has to think 10-15 years ahead.

Accordingly, the teaching of computer technology in Hungarian higher education started in 1969. In the first period this was limited to the training of experts, then from 1975 on it began to include training in the application of computer technology. At technical universities and universities of the natural sciences the training of future teachers started. In 1980 a decision was brought to teach information technology in the whole of the education system.

THE SCHOOL-COMPUTER PROGRAM IN OUR EDUCATION SYSTEM

The 1980 educational program made the following requirements:

- to make the advantages of computer technology and its efficient use widely known. In the following 10-15 years the teaching of computer technology has to be organized throughout public education, and in higher education it has to be developed further. Adult education has to be organized for those who need information technology, and in evening schools and correspondence courses - in connection with this structural change - a retraining of teachers may be necessary;

- to provide for the training of teachers and staff who are not familiar with the field;

- the same applies to teachers in higher education;

- in public as well as higher education, teaching materials, collections of problems and exercises, and experiments have to be revised or rewritten;

- software in the necessary amounts and qualities should be prepared, made available and spread;

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- it is imperative that in the whole of the educational system, from elementary school to postgraduate level there should be a sufficient number of hardware - from pocket calculators and programmable small computers to professional PCs, and in higher education also small, medium and large computers.

This means that the program bore a relation to public and higher education and had cultural aspects as well.

ELEMENTARY SCHOOL EDUCATION

In the 1985/86 school year according to the school computer program, in about one tenth of the 3700 elementary schools experimental computer courses started with several computers, partly in optional classes or in the form of extra-curricular courses. The optional classes had started already in the 1984/85 school year following a decree of the Ministry of Education. At the beginning of the 1986/87 school year, about one third of the elementary schools, about 1000 schools, had one or more computers.

The number of educational programs as a result of a secondary school program writing competition is growing, and there is a choice of programs now to meet the requirements of elementary education.

SECONDARY SCHOOL EDUCATION

In secondary technical schools the teaching of information technology started with the training computer technicians, programmers and process organizers and with information processing and the application of computers, and in secondary grammar schools with operator training and the optional computer classes. This was followed by the wide-spread introduction of the basics of information technology in extra-curricular courses as part of the school-computer program in all secondary schools except adult, evening and correspondence courses and health and typists' schools.

The first Hungarian PC' model manufactured in relatively large series was ordered for the program and the PCs reached the schools in March 1983.

Following the guidelines of the Ministry of Education, extra-curricular courses started in all types of secondary schools (Grammar, comprehensive, vocational). In the 1983/84 school year, 1537 beginner's and 318 advanced courses were run. The experiences of these courses prove the hypothesis that with the development of micro electronics and information. tech. teachers and students alike take part in the development of teaching materials. The so far more or less passive participants of education have become active participants in the educational process.

To help the introduction of computer technology in education the Institute for Science Management and Informatics conducted a secondary school educational program competition.By June 30th 1986, 20.000 programs were distributed in the schools.

By the end of the 1985/86 school year secondary schools got as many as 1930 computers as part of the program and had altogether 2765 PCs. So by the end of the 1985/86 school year in 56 % of the schools there were 2 PCs, in 34 % of them 3-5, and in the remaining 10 % 6-22 PCs. At the end of the 1985/86 school year a computer served an average of 130 students.

The distribution of computers went parallel with the basic training of about 1000 teachers.

The National Pedagogical Institute deals with the pedagogical and methodological aspects of the widespread introduction of computer technology, prepares for it and for its application in other subjects. They have examined the necessary changes required by appearance of computers in pedagogy, the management of public education their application in various fields. These changes affect the relationship between school and its social environment.

Since, as a result of the rapid introduction of this technology, the search for new methods takes place at the same time as practical work, there was and has been a need for an exchange of experiences, to organize exhibitions and conferences. Several exhibitions were organized in the counties and in Budapest where schools could present the results they achieved. Secondary school computer technology competitions have been organized annually since 1983. 3200 students from 340 schools entered the 1985/86 competition though a year before only 500 did so.

In the summer holidays, camps were organized by various institutions and social organizations with excellent possibilities to learn computer technology.

TEACHER TRAINING

At the natural sciences faculties of universities students can become familiar with the possibilities of bigger computers, with the use of various programs for their application, and how to make use of their bigger capacities. Programs made to solve scientific, statistical and techno-scientific problems and calculations are also widespread.

At the arts and humanities faculties of universities, and at art schools the spreading of computer technology has fallen behind, and the lag here is the greatest. At present there is only one university where computer technology is taught to future teachers (of the humanities) with two subjects: the basics of computer technology, and computer methodology.

For teacher training at universities and colleges, the computers required by the school computer program are available. At present in all institutions with teacher training a school-computer cabinet operates. We should mention here the subject "technical knowledge" which is a very computer oriented supplementary course.

In spite of all the efforts so far, the goal, that every student should be near an accessible computer to a sufficient degree has not been reached yet.

ADULT EDUCATION

Some estimate 100.000 as the number of personal computers owned by the population. Most of them are believed to be used for games. Therefore there is still a lot to be done to extend the use of PCs by programs designed for educational, cultural and household purposes.

The general training of the public is to be undertaken by public education. Courses on computer technology have been launched by a great number of community centres and cultural institutions. An outstanding part is being taken in the dissemination of knowledge on computer technology by TIT (Society for the Dissemination of Scientific Knowledge) and NJSZT (János Neumann Computer Science Society). The latter has started a micro-club movement on its way for acquiring practice in computer technology, which serves as a framework to mobilize the available computer capacity of institutes, factories and private enterprises.

The efficient cooperation with Hungarian Television was further strengthened by negotiations between the Ministry of Education and the Chairman of Hungarian Television in 1983, which helped to launch programmes for computer technology training on School Television.

The press also has a significant role in supporting computer technology training, therefore we contributed to the establishment of a computer column in the weekly magazine "ÖTLET" (IDEA) and a new monthly "MIKROMAGAZIN".

In cooperation with a film-making company we prepared a training package of 16 units (including film, video, slides and a book), which introduces its user into the rudimentaries of computer technology.

DEVELOPMENT PROGRAMME FOR THE COMING FIVE YEARS

This programme should embrace various areas of training and education extensively, in accordance with the long-term development programme and developments already realized, so that it can live up to demands expected to be posed by the whole of society. The training of information technology therefore should not fail to be extended to the whole of education in order that

- the whole society should get acquainted with the rudimentaries of information technology;
- those who actively use it should be prepared for the employment of information-electronics;
- experts should be trained in the field of information technology and electronics.

THE SCOPE OF THE PROGRAMME

In the elementary schools, the principal aim is to have the rudimentaries of electronics and information technology acquired along with cultural elements of information technology involved, and to extend this knowledge to the whole of society thereby ensuring that at further stages practical knowledge and expert training can be put into practice. During the period 1986 to

1990, the conditions for achieving these aims should be established in elementary education. It follows then that in the period mentioned above:

- in all elementary schools the necessary materials in methodology, reference books, thesauruses, software-products for training and other aids should be available;

- there should be at least 2 teachers per school who are well versed in electronics and information technology, and annually about 1400 teachers should be trained at courses on the subject;

- annually, cca 700 schools should be given computers;

- 3-10 school computers should be available per school;

- up-to-date interfaces and peripheries should be available for use to the school computers.

In secondary education the aim is to acquire the rudimentaries and user's knowledge as well as to train experts in the field of electronics and information technology. In the secondary schools all pupils should participate in information-electronics training. A great emphasis should be laid on expert training as well. During the coming five-year period the basic knowledge of electronics and information technology should be acquired by all taking part in the system of secondary education.

In order to reach the aims of the development programme is secondary education the following principles should be fulfilled:

- all the necessary methodological materials, thesauruses, teaching aid softwares, films, books, video-tapes etc. should be available in the required quantity and to adequate standards;

- there should be at least 4 teachers on the average per school who are trained properly to teach information-electronics;

- an average of 18 computers should be available per school giving priority to technician training schools and to those which have achieved results above the average;

- the computers should be equipped with up-to-date interfaces and accessories for use;

- in accordance with special training purposes, word processing, simplified automatized planning systems and equipment for mechatronic and other purposes should be bought.

In higher education, a high level practical knowledge of information-electronics should be acquired and experts, instructors and teachers should be trained.

In order to attain the afore-mentioned aims, the teaching of the knowledge of use should be made general at the technical colleges and universities, the science faculties as well as the schools of economics and colleges. The teaching of practical knowledge should be more extensive at agricultural colleges and the faculties of humanities and teacher training colleges. This discipline should be introduced into law faculties, medical colleges and art academies.

Some principal ideas to be considered as to aims related teacher training:

- the modernization of information-electronics teaching materia should be sped up, with a stronger emphasis on system aspects;

- along with modernization of teaching materials improved a updated materials, books and softwares should be worked out;

- the improvement of methods and syllabuses designed for i -service training of teachers and instructors should developed;

- the major organizational units of universities and colleg should be given personal computers;

- all higher educational institutions should be give professional personal computers with interfaces and oth accessories based in modern laboratories.

An overall modernization of teaching information-electronics courses is necessary for those participating in re-training a in-service training programs.

Special efforts should be made to put into practice the progr aiming at the training of the general public, which is bei carried out by various social organizations headed by NJSZT. T ultimate objective is to create a training programme which wi make it possible for everyone in the long run to learn t rudimentaries of this new discipline.

The realization of this programme requires a lot of input behalf of both the whole society and those involved in t programme. The impression gained so far encourages us to tru that the programme will end on a winning note.

TELETEACHING AS THE MOST IMPORTANT MEANS OF THE INFORMATIZATION OF THE SOCIETY

Győző KOVÁCS*

BASE-SITUATION

The eighties are regarded - especially in popular scientific writings - as the epoch leading to the age of informatics.

It would be an interesting investigation work to examine and define the characteristics of the age of informatics. I don't even try to do it in the frame of this short writing, but try to define the features of the transitional period instead, and by taking them all into account I'll try to summarize the conclusions concerning the training of informatics.

HARDWARE

- Cheap computers of relatively great performance appeared in an ever growing number not only at work-places but also in schools and households.

- Data-networks over the whole world were established not only for serving business affairs but also to cope with the requirements of the private spheres (p.e. Videotex).

- More and more products have been made - from the telephone sets and cameras to the motorcars - which function by means of connecting them to computers, even may these products be built together with simple or complicated intelligent electronic constructions. Thus, willingly or unwillingly, nearly all members of the society will gradually get in touch with informatics.

SOFTWARE

- The conditions of software development changed as the equipments were getting cheaper and cheaper, thus, they might be accessible to anyone. Amateurism grew stronger and the experts of software development were hereby constrained to enter into competition.

- At the same time, the demand for ready software products was steadily increasing. In order to meet the requirements, the software industry established itself, and, to assure the conditions of quality, the software technology was brought about. The process was similar to, but essentially faster than the development that lead from craftmanship to the establishment of modern great industry. The latter lasted for nearly two centuries (18th and 19th cent.), whereas producing the software industry, the mass production and technology took only three decades (circa 1950-1980).

- The software products appeared and consequently the a market

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for them was called into existence. The mass-production started keeping up the possibility of producing tailo software, too. This dualism has also been reflected in software prices. While the mass-products can be bought at a pr of a few ten dollars, the price of the tailored software is m tenthousand dollars.

SOCIETY

- Writings about the social effect of informatics appeared in ever growing number in the course of the late years. Nowada not only the experts of informatics but those of education naturally also the experts of social sciences are m intensively dealing with this subject.

For a long time, computers could be bought only by economically prosperous great enterprises, national instituti and concerns; therefore, the effect of these systems could o be noticed within institutions mentioned above. That time, could not practically speak of the social effect, or in cert regards only. Only the experts trained in informatics could in direct touch with these enterprise-systems. The user gave o the basic data, resp. received the results of calculations f the computer center.

Having put into operation the systems of many terminals in late sixties, and early seventies, the social effect could first noticed. Terminals connected with great mainframes co also be used by people untrained in informatics in the fields input, controlling partial results, resp. printing them o Thus, the person-machine contact was established in a very sim form which was, however, very important as regards the ensu development.

The first cheap equipments of informatics (personal compute appeared on the market in the late seventies. Nearly all spheres of economy were conquered by them in the course of a years. Their cheap prices and the low running costs resulted ever growing use of the personal computers by instituti (belonging p.e. to public health, education, etc.) that - ap from some preferable ones - couldn't even think earlier of general use of the information processing. One of the m important consequences - producing a lot of problems - was t more and more people were getting in direct touch with systems of informatics and the possible work by means computers hardened hereby to an obligatory one.

In several countries, among them also in ours, it was education that first came to the right conclusion to announce schools-informatics-program. In Hungary p.e. all the second schools got computers in the course of a few years, and supply primary schools with computers has been started, too. The soc effect of this rule, which is of great importance as regards development of the future generation, has surprised even experts, and in my opinion, it is promoting the success of society-informatization-program. The wide spread of compute hasn't had only positive effects, it causes often soc problems, even it becomes sometimes the source of generat problems.

- The school-informatics-program has caused problems in the family, most earnest ones than for instance the teaching of mathematics based on new theories has caused. A great number of parents simply refuse the getting acquainted with computers and the learning of informatical methods with the remark: I am to old to do it.

- There is often discrepancy between the young people knowing informatics and the senior experts. Having finished the university studies or the secondary school training, the youngs meet the seniors who, having gained experience during their working, of more decades, can't learn the new technology or don't want to do it.

- Perhaps the greatest conflict came about between the youth receptive to informatics and teachers not willing to apply informatics. This conflict has often caused the decrease of the teachers' respect or led to grave educational troubles.

EDUCATION

The social conflicts of the age of informatics can only be solved by a society-wide education program.

There is a Hungarian proverb. Take a hair of the dog that bites you. Informatics, being the cause of conflicts, also offers the tools and methods to the social-wide training of informatics through which all these problems can be solved.

The key-person of the traditional training is the teacher, because
- he is compiling and elaborating the matter of instruction,

- he is the interpreter while explaining and teaching,

- and finally it is he again who examines the level of the acquired knowledge in the course of questioning the students.

A the teacher has the most important role in all phases of the course of training, therefore, he can also be the weakest point in traditional education. The efficiency of teaching can mostly be spoilt by a bad pedagogue. The authorities responsible for education can only intervene efficiently at one point in the course of teaching and that is by providing the school with an instruction material compiled and controlled many times by the center of education. Teacher and controlled many times by the center of education. Teacher and his questioning the students can only be controlled from time to time, as it is not possible to appoint an inspector to every teacher, and it would be in vain, as all bad teachers couldn't be replaced by good ones.

The other problem of the traditional training is that it is very difficult to change the instruction matter elaborated by the educational center. New school-books, new tools for testing should be given to all schools. In the GFR.p.e. publishing the new subject matter of informatics takes at least five years which is a very long period in case of the informatics knowledge. Brenel B: Die vielgeforderte "Qualifizierungsoffensive" darf sich nicht nur auf die Arbeitslosen beschranken. Handelsblatt 18.02.1986. Experience proves that the knowledge matter necessary in

informatics must - due to the fast development - be renewed i
- 4 years.

TELETEACHING - MASSEDUCATION

According to the information coming from the GFR, the 70 % of workers must dispose of the knowledge of informatics in ab five years.

It means that up to 1990, altogether about 20-25 millions people must be educated in informatics, i.e. 3-5 million work per year. In case of accepting the "knowledge refreshing" to obligatory in every third year, the above figures will redoub As this estimation refers only to the retraining of the ad working people, therefore, the number of the students of pub education and universities must still be added.

I think, it isn't necessary to continue reasoning in order convince all competent people that this demand for informati reeducation can't be met by means of the traditional educat system neither in the GFR nor elsewhere.

The only solution is teleteaching, or, in other terms, education aided by machines (not only by computers).

I couldn't find a precise definition for teleteaching, theref I should like to characterize it shortly as foll Teleteaching, or remote teaching, is the form of teaching which it is the teacher's task to elaborate the subject mat satisfying all special demands, and to organize the systems teaching and examinations. The subject matter (coursewa reaches the student by means of technical tools. During course of training, teacher and student, in general, do not m each other directly.

In traditional teaching, the teacher has the only role, notwithstanding he is charged in teleteaching, too, with stressed task of elaborating the training system, but courseware, the computer as intermediator and the medium port the information are also very important elements of the rem teaching.

- The ancient, classical teleteaching mediums are writ matters, books, notes and letters. In point of fact, they ans all necessary training demands, they are cheap and easy handle, the subject matter can be repeated as many times students want to do it. The book is a passive teaching sys element, as one can learn by means of it, but it is not able examine the acquired knowledge.

- The educational film was perhaps the first teleteaching med operating by means of pictures. Videos and records belong to t category, too. As a matter of fact, each of them is a pass teaching-system-element; too, the pupil has to look at or lis to them until he doesn't know the matter. The system does examine the knowledge.

- Also radios and televisions belong to this category. It evident that the teleteaching system organized to be transmit by means of them is the cheapest, but it is efficient only case it is combined with the use of videos, records or even of programmed text-books, as the training matter can't otherwise be repeated.

Up to the present, the computer is the only active teaching instrument. It stores the matter of training in form of texts, images, and graphics (magnetic band, magnetic disc, recently also optical disc, etc.), and is teaching the students in accordance with the stored subject matter repeating it as many times as it is needed, even poses questions to the students, and where it finds a lack of knowledge, it is doing the repetition again. Thus, the computer is apt to do the examination, too.

- Collective systems of computer teaching: the star network for teaching a smaller learning group, locale networks within one school, or connecting more schools, national teaching network (p.e. videotex), computer- and terminal networks of educational aims linked to the international datanetworks.

Highly developed countries, developing countries and teleteaching.

It is generally believed and told very often that teleteaching was found out in the industrially developed countries (U.K., France, GFR, Austria, USA, Japan etc.) and is chiefly employed in these countries. Because of the relatively high prices of the necessary computers, there is no perspective in the less developed countries and in the developing ones for applying this teaching form.

It was mentioned, too, that the courseware elaborated in countries disposing of developed teaching traditions could hardly be used in the developed teaching traditions could hardly be used in the developing countries even in case of an existing teleteaching system, because the matter of courses couldn't be understood by the pupils.

I think that after a bit more meditating upon this subject, I could mention at least ten new counter-arguments in connection with teleteaching, but each of them would be a weaker argument than that one which says that there is no development without teaching informatics at the level of the whole society; and in the lack of it, the economic, scientific and cultural distances between the developed and developing countries will continue to increase.

The country that neglects the effort of making acquainted the tools and methods of informatics to every active member of the working staff that makes impossible

- its joining to the worldsize information change,

- its getting in touch with developed countries in the fields of equal rank science and commerce, and

- it cannot produce competitive goods without the possibilities granted by informatics,

- it cannot organize the optimal production in lack of informatics, therefore,

- the production costs are more and more increasing, i.e. t production is getting more and more expensive, thus,

- the realization of the products doesnt't assure any profit,

- the country becomes defenceless, because without the knowled of informatics it has to charge foreign experts, who a qualified but often very expensive, with the care of i connections, etc.

The list of the arguments and counterarguments could be a ve long one, but the final result couldn't be changed by it. T great and important step leading the whole society to informati must be done by all nations.

The informatizated society can only be established by qualifie educated people, and this task can only be solved - within acceptable period - by an efficient educational system, i.e. by T E L E T E A C H I N G. There is no alternative.

THE EDUCATION INDUSTRY

Neil Spoonley

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1. INTRODUCTION

This paper presents a picture of the education industry where the educational activities are the customers for technological products. This has been the case in the past for books and many other items, but the level of expenditure is now substantially higher. Computer companies are deliberately targetting their activities towards the education market in search of profits. This paper considers the issues in a broad context, looking for aspects which will improve the overall usefulness of investing in technology.

2. THE EDUCATIONAL OBJECTIVE

It should be without question that the purpose of spending money on a computer (or indeed, any other purchase), which is to be installed in the school, should only be done on the basis of improving the educational process. For small purchases this question rarely arises, but when computers are bought it is only reasonable to ask if their use will improve the quality of education in some relevant way. But, how many of the educational institutions can give a clear description of their objectives and precisely where the computer fits in ? As we shall see, not all the elements of the educational industry have the same objective and it is worthwhile for the customers to appreciate this.

3. THE INDUSTRY

Later in this paper there is more detailed consideration of each of the elements below, but firstly let us consider the functions of the industry with particular reference to the use of technology.

The "customers" of technology for serving education are within the educational system itself. They may be in the schools, or the parents, or perhaps in the Education Authority which manages them. They, above all, should be looking at the reasons for purchase and for ensuring that they only buy products which enhance the process.

Although the schools have been considered in this context as the customers, it is also true that they are, of course, the principal producers of the industry. They create a product, namely, a better educated individual and they consume other products and services in so doing.

Like all production systems, the quality of the raw materials and additives is vital for the quality of the end product. Thus, it is essential that we know what the computers are for and how they should be used to achieve their purpose.

The principal "suppliers" to the industry are the hardware manufacturers and the software creators. Their objective is to make profit from sales of their products.

Some software producers only sell to the hardware manufacturers and their software becomes part of a package available from the latter.

In between are the various means of publishing and distributing both hardware and software. For the former, there are generally well proven ways of arranging licences or agencies. However, for software, it seems to be a different picture.

Finally, there are all those organizations that influence the level of activity. It is often through these that specific governmental actions are channelled. It is possible that there is a greater range of ways to do this than may be realised.

Thus, we have the elements of the industry. To a large extent, the success of each element in achieving their objectives lies with the others. Money flows out of one pocket into another and the level of investment in any area needs to take the success of the other areas into account.

4. THE EDUCATION SYSTEM AS "CUSTOMERS"

As suggested above, the education system should be clear as to why it is buying computers. They are not, in general, experts in computing and there is no reason why most people who touch one should ever be so. However, they can be expected to be expert in the process of education and therefore, their objectives for using a computer ought to be expressed in such terms.

A recent study in the U.K. (1) showed very clearly that not only was there no clear understanding of the uses of computers but, there was no collective approach, as to how to express the usage. The need for such information may not be fully apparent to a teacher but, they must recognize that the suppliers of such computers need market studies, intelligence, etc., on which they base their plans. The absence of such information deprives them of a basic tool for product design and leaves them only considering the commercial market potential for their design criteria.

The following types of usage are therefore proposed as a check for ascertaining current usage and as a way of ensuring that in planning for the use of computers, that it is clear as to why they are being bought.

A. Teacher / School / Administration Efficiency

The computer is used to help in all conceivable ways to aid the efficient operation of the staff and other resources. It includes timetabling, record keeping, management tasks, examinations, etc. Different members of staff may see the computer in different ways; some may use it for drill and practice for the student, whilst others will see it as a file for notes.

B. Teaching Enhancement

The computer is used to teach a topic. Generally, the use would be independent of a teacher but under their control. They may adjust the parameters of lessons to make them more complex or limit their use. In a sense, the teacher is using the computer to extend their own range of capabilities.

C. Information Resource and Management

To a large extent, this particularly applies to the use by a student. In some subjects, the computer will be used like a calculator or a typewriter. But, as database, spreadsheets and graphics become more available, so will the use multiply.

D. Teaching of Computing or Information Science

Here computers are needed for the topic itself, to teach programming, design and other aspects which require an intimate knowledge of the device.

Each of these categories of use has value for the suppliers, particularly of software, and it is vital that they understand, not only the existing pattern of use, but that which can be forecasted or is intended.

In the U.K., there appears to be a general consensus from the recent study that:

1. There is a definitive move in the secondary sector to Category C. usage.

2. Over the next few years Category D. will decline in importance.

3. Category B. will not play a major role for many years to come.

4. Category A. use will increase with the need to meet the multigrading and assessment criteria of the new examinations (GCSE), from 1988 onwards.

These feelings are made in a context where there is no specific change in the syllabus of any topic to accomodate the new opportunities that computer availability offers. For example, it does not include the use of databases for history teaching, the use of simulations, the use of spreadsheets for "what if" explorations etc. Should a country take specific action to bring these possibilities into the syllabus and the examination system, then new patterns of use may occur.

It is an interesting point to consider as to where in an educational system there is the trigger that sets a new initiative in motion. In the U.K., it seems that the examination system governs the intentions of most teaching. The syllabus is, however, agreed on a regional basis, mainly by subject committees of teachers. There is thus an in-built conservative approach which will generally consider any change with regard to the use of computers as some "trendy thing". Of course, there are exceptions where there are quite exciting developments, but they tend to be alongside the examination system, rather that within it. Thus, we have the local school enthusiast and the computer clubs which make the news about the use of computers.

An influential aspect of the education system is the support structure that may have been created to assist in development of the use of computers. Some authorities in the U.K. have created effective support units to advise on purchase and, even, to develop software. Others have set standards or trained teachers.

5. THE SUPPLIERS

Most personal computers and many of the lower end of the business computer range can be found in schools across the world. Few of these computers can be said to have been specifically designed for the education sector. In the U.K., we have had the RML and Acorn/BBC computers which have been primarily targetted toward this sector, but both would agree that it does not offer a large enough market to create the investment to design machines just to meet educational needs.

There seems to be no escape from the fact that the education sector is not a major influence on the development of hardware and, in the manufacturing world, they see little evidence that it will ever be so. It is interesting to speculate on the pattern of purchase in the U.K. of 8-bit versus 16-bit machines in the future. There are many in the schools and local authorities who would wish to continue to increase their investment in computers by buying more of the same, ie 8-bit machines. But, for the suppliers, this is the opposite of what they wish. The business community do not wish to buy them and it is now cheaper to make the 16-bit machines. Thus, it is in their interest to encourage the 16-bit machines to be bought, even the extent of increasing the price of the 8-bit to well above the going price for the newer computers.

This will generate more resentment in the schools, particularly for those people who have written useful packages that only work on the old machines. It will also accentuate the pressure to use the software in Category C. usage, ie spreadsheet, databases, etc.

What must be accepted by the schools is that, there is going to be a range of hardware as time passes and each school must develop its strategy for making most use of all of it, whether it is old or new. Computers do not wear out that easily now and most of them can be useful for up to 10 years.

The problem is now being recognized and we are seeing the networks where many varying computers can be linked to a common source of programmes, databases, etc. The first thought is to insist on upward compatibility so that all the machines can run all the work that can be done on the lowest machine. The suppliers will not be hamstrung by this and it will not happen. Thus, again the schools will find that they will have to define the limits of use of each range of machines and fit them within their overall objectives.

In the U.K., there is an annual spend by the schools on hardware that is over 10M pounds. By contrast, the spend on software is about 1.5M pounds.

The software suppliers have different problems. Those who create commercial software, which is delivered to a user via the hardware suppliers, are isolated from the educational world. These suppliers, providing the tools like Visicalc, Dbase II, GEM, Wordstar, etc. design their products for the commercial world and then let the hardware suppliers package them and bundle them in the hardware product. It seems to the school as though they are getting it all for free. It is highly unlikely that this trend will change, particularly as many educational and commercial customers buy in bulk and are only too happy to have an easy way of accepting an imposed "standard". However, it can be said that, in the educational context, so many of the packages are so sufficiently similar that it really does not matter which they use.

But there are also the software developers for educational software itself, especially developed for the schools. There are three categories of developer.

1. Commercial Developers

   They develop the software with the intention of making a profit out of its sale.

2. Subsidised Development

   This is often done by units which exist in the schools system, perhaps associated with a local authority. They develop the software and then, either give it away, or charge some notional sum for it in their local area with a scale of cost recovery charges for elsewhere.

3. The Shadow Developers

   Most of this is done by enthusiastic teachers or others and it is passed on by hand, or word of mouth. Generally, it is of poor quality (but there are exceptions), poorly documented and rarely achieves little purpose.

Predominantly, the second category undermines the hope for a live industry of creative software developers. The subsidies have allowed t schools to undervalue the good software and to have a price expectati that is totally unrealistic for profit earning. Thus, not only is i impossible for companies to make a profit, it is equally unlikely that investment organization will finance such activity.

The consequence is that there is little development of good education material and little sign that the situation will change. The free mark approach demands that the buyer appreciates the value in meeting the objectives and is prepared to pay appropriately. At present, it wou seem that not only do few people appreciate the benefit of the use computers but, even if they did, they would not have the money to spend.

However, in one area things are clear and that is in Category D. usa where computing is the subject being taught. There are definitive nee like languages that have to be served but, even here, there is still mu confusion as to whether we are teaching computing as a subject or maki people aware of the role of the computers which is something complete different. For the latter, there have been some large sales of softwa but that period, in the U.K., seems to be over.

6. DISTRIBUTION AND PUBLISHING

Generally, the educational software developers have scorned th publishers as a means of taking their wares to the buyers. It seems tha there is considerable ignorance of each other's intentions. The softwa people have seen the publishers as just an another intermediary that the have no need for, and they do not appear to understand software Meanwhile, the publishers have dabbled a little and some have lost thei investment.

Let us consider the assets of a publisher:

- The know where to find subject matter experts (authors) and the know how to motivate them to produce with royalties, up-front money etc.

- They know how to take a prototype (script) and productise it for th market, sub-contracting most of the activity.

- They know where the markets are, have channels to them and can se them in motion.

- They know how to establish licences, publishing rights, and set u relationships with foreign companies.

- They do not have large investment capability and have few tangibl assets to borrow against.

The above is generally true of the book or magazine publishers but it is the function itself that seems to be missing in the educational computing industry. For, publishers do several most important things:

- They discriminate and remove from the market the poorest material.
- They set standards by ensuring that their products meet some common quality.
- They invest in marketing their products, helping the buyer to see the benefits.

The above has been done for many years by the educational book publishers and now they face the opportunity of adding a new dimension to their business as long as they can accept the new parameters of this new business. For them, to be seriously involved and to work for profit, they must recognize that software publishing

- demands capital at a level which is substantially above the book business;
- requires negotiation with a development team and not single authors;
- produces an item which is not in itself attractive and is far less tangible but can rapidly be reproduced to meet demand;
- creates a balance sheet that is markedly different from their traditional form.

Despite all the above issues, there is one over-riding problem and that is the price that the schools are prepared to pay for the software products. It has been pointed out that the schools have been able to obtain heavily subsidised software. That has lead them to see the typical price in the same range as that for computer games. However, the markets are very different with game sales being in the 100,000 and the education software in numbers well below 10,000. The latter is often achieved over years and the former over several months.

There is a need to increase the revenue earned for the effort put into creating good software, by perhaps 10-fold, before we can expect to see a flourishing business of serving education with an ever widening range of excellent material.

7. STRATEGIES

It is worthwhile repeating that the sole purpose in installing computers in schools is to meet some pre-declared educational objective. It is not to support a local industry, or promote employment or exports. If these latter intentions predominate, it is highly unlikely that the education system will benefit and ultimately the demand will cease and destroy the suppliers who had become dependent on it.

For any country now coming to terms with the possible uses of technology it is vital that they have the correct priorities within their strategy. A most important aspect is to ensure that the appropriate motivation is provided in each part of the industry. The educational needs are paramount and then, the category of application or use is vital in being able to specify clearly the intended purpose. Without this understanding it is impossible to train the teaching staff to use the machines effectively. We have seen so far, too little education of the teachers into an understanding of how to apply the computers to meeting educational objectives and given the material to work with.

The examination or certification system must be a part of the planning process. Without their involvement, there is really little incentive for the teaching staff to take on the additional load of understanding about the benefits of using computers. For the present, there is no simple way to introduce the benefits without the investment of time on the part of the teaching staff.

We must recognize that there are some things that you can do with one computer per class as, perhaps, in a primary school; but as the number rises to scheduled occasions where we have one computer per student there are totally different capabilities in the syllabus.

We must recognize the existence of hierarchy of capabilities in the equipment. As years go by, it is essential that we do not discard the continuing capabilities of the earlier machines.

All this demands an overall strategic approach which ensures that all the actions are compatible and consistent with a declared aim. The experiences gained in countries like the U.K. can be invaluable particularly in assisting countries in looking at all the issues. We were in the field at the beginning and have learnt some hard lessons. There have been many different approaches taken by the various local educational authorities and these can be considered in the light of other local objectives. It seems that the various elements of the industry have surprisingly limited vision over the whole range of inter-relationships and the suppliers, in particular, cannot offer much strategic help. In the engineering profession, we saw the development of the role of the "consulting engineer". They worked across the world assisting many countries to develop new industries, build bridges, etc. We need the same for our education industry where such organizations can assist in setting the use of computers in education on to a solid foundation across the world.

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Remote Education

with

Online Communication and Laboratories

A new approach to bridge the gap between remote students and their university

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ABSTRACT

The "Fernuniversität Hagen" is the only university in Germany which offers Remote Education for several subjects, e.g. computer sciences.

Our students may enrol for a full diploma degree in computer sciences, for a certificate covering a specific area of computer sciences, or even for individual courses. They may either study full-time or part-time; most of them are fully employed otherwise.

Our students mainly are living remote from the university and, at the time being, are chiefly taught via written course material, written exercises, etc.They usually

communicate with their supervisors via mail or phone, only for rather compact seminars and computer laboratories, they have to be present at Hagen.

Though many of our students either have their own computer at home, or have access to terminals or computers, e.g. at their employers, there is not yet any overall concept to use these computers for learning, training and experimenting, and communicating in the course of distant education.

In contrast to 'normal' universities, due to their remoteness our students are faced with several specific problems:

* The communication and co-operation among students and between students and their supervisors is rather limited.

* Only for a few weeks a year, most of the students can use sophisticated computers and their high level course related software.

* As during the past years the number of students in computer sciences at Hagen increased in an unforseeable rate, a poor ratio of the number of students and the size of the teaching staff additionally makes individual tutoring almost impossible.

To overcome these problems, the Department of Mathematics and Informatics is being starting a project, how to use electronic media for distant teaching and remote learning. This project is partly supported by the German Government.

Its main goals are

* Integrate each student into a sophisticated online communication system, allowing for fast and comprehensive communication among students and between students and their supervisors.

* In addition to full textbooks available for each course, for selected courses provide the student at his computer with electronic course material, which makes use of graphic presentation and animation. Thus 'learning by reading'

can be complemented by 'learning by intuition and example', and the main drawbacks of isolated and remote learning may be compensated for.

Like electronic laboratories, electronic course material is kept and maintained in Hagen, and, on the student's request, dynamically loaded into the student's computer via the communication network.

* Provide 'laboratories' for individual courses, allowing the student to continuously work and experiment with course related tools at his own computer. If possible, the tools actually needed, are dynamically loaded into the student's local computer via the communication network. Large-scale tools, running at the central computers only, can remotely be used by the student via the same communication network.

* Develop tutor systems which integrate the laboratories into the electronic courses, and guide the student through electronic courses and laboratories as well as through exercises.

* Develop a new sophisticated author system, or extend an existing one, which assists in designing and implementing individual electronic courses, laboratories, and their integrating tutor systems in an efficient and safe way.

* In order to facilitate switching between different laboratories, design a unified user interface for different tools and their supporting operating systems.

Although the final design and implementation of the system will be independent of any specific communication network, as a first approach the German videotex network BTX will be used for the following reasons:

* The access to and use of BTX is cheap compared with other public communication networks.

* BTX can be accessed by non intelligent decoders as well as by intelligent ones (computers).

* BTX allows access to external computers.

* BTX provides high-level communication services facilitating th implementation of the project's communication system.

While non intelligent BTX terminals can only be used for basic BT communication services, an intelligent terminal can be used to hide th shortcomings of the BTX interface from its user.

The paper

* gives a rough overview over the present course system of the University of Hagen,
* outlines some basic ideas and design decisions for the project,
* discusses briefly the integration of electronic courses and laboratories int the existing course system.

2.

Educational Strategies

KNOWLEDGE-BASED SYSTEMS IN TELETEACHING

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In this article, after presentation of present-day teaching problems at all levels, the use of a combination of communication networks and Knowledge-Based Systems is proposed as a solution, with a possible structure for same.

1. PRESENT-DAY PROBLEMS: DIAGNOSIS

If there is something in this world on which there exists complete agreement among all human beings, without regard to race, sex, age, religious beliefs or political ideas, it is the lack of quality in present-day instruction at all levels.

The reasons for having reached the present situation would seem to be multiple and various, in accordance with different countries and historic cultural circumstances. However, there seem to be three which stand out as most visible and important. The first is the reluctance of teachers and politico-administrative persons responsible for instruction to apply the new technological advances to education. In effect, if an analysis is made of an operating-theatre of 100 years ago and a present-day one, it will be observed that any resemblance between the two is mere coincidence. The technological resources presently used in operating theatres are of such calibre, both in quality and quantity, that without their aid it would be well-nigh impossible for the operations carried out there to be successful. However if a look is taken at a classroom of 200 or 300 years ago and a present-day one, it will be observed that their differences are minimal. In spite of everything, as we shall demostrate below, the possibility of using new technology in teaching is more than a possibility, and should become a necessity.

The second is determined by the massification of instruction, at least in the developed countries, and the lack of resources, fundamentally human ones, who can adequately transmit their knowledge to these pupils.

In all the advanced countries, schooling is obligatory up to 14 or 16 years; in these conditions it is impossible to have a sufficient number of competent teachers available to teach all these pupils within an adequate pupil/teacher relationship, with the aggravation that it is precisely in the first years of schooling where pupils are most numerous and, on the contrary, where pedagogical and formation requirements for teachers in this educational period are fewer. In spite of everything, world-over there exists a sufficient number of teachers so that, if adequate advantage was taken of their pedagogical capabilities and their knowledge, the previous problem, in the worst case,would be alleviated.

Finally, the third reason giving rise to the problem is the speed with which discoveries are produced and the vertiginous increase in knowledge. A new teaching method is necessary, ba on fewer subjects, better selected and less descriptive.Otherw it will be impossible for students to be capable, not only of applying, but of understanding the new know-how. And with the aggravation that the new formative knowledge acquired in the initial phases of education, quickly becomes obsolete, due to rapid evolution of knowledge itself. In fact, the majority ar being forced to learn, badly, many things they will use only a little. This is a waste of time, energy and money that, apart uselessly tiring the pupil, lessens the time and desire to car out a more productive and gratifying work. The words of Einst in this respect are very clarifying: "as a consequence of a br period during which I had to remain at school preparing a degr exam, I felt incapable of carrying out any creative work at al for several years."

Said in other words, on the one hand, it is necessary to reduc to the maximum the memorization aspect presented by teaching nowadays and, on the other, achieve an adequate reduction of t transmission function of know-how, for the sake of a better le ing organization by the pupil, that is of self-learning and permanent formation.

Faced with this accumulation of difficulties one could, as Goe said, lose everything but hope. If, during good times, certain licences can be permitted, when difficult moments arise the on advisable thing is to do things well. Nowadays, doing things well consists in using in a rational and efficient way the pedagogical facilities offered by the new technologies and, in particular, communications and expert systems.

2. THERAPY

Once the diagnosis of the present state of education has been established it is possible to prescribe a therapy which, at le may alleviate the permicious effects that the bad health of present-day education might produce.

In the first place, since there are few conveniently trained teachers, use them as efficiently as possible. One way of achieving this would be to transmit their classes live, using present means of communication (satellites, laser, optical fib etc.). On a second plane, there is no sense in not using computers joined to projectors as new "blackboards". The flexibility and versatility that this proportions makes the us of conventional means seem inadequate and antidiluvian. Furth more, on permitting the pupils reception of the contents of th lecture through a magnetic or conventional support means that they do not have to be copying what the lecturer is explaining both in writing and aloud, which allows them to give full attention to the lecturer's explanations.

Finally, present reality permits the affirmation that computer facilitate memorization, and the handling of information. Thi implies a new concept of learning. Facilities for the memoriz re-structure and reinterpretation of data and information, and we are in the course of doing the same with knowledge, have multiplied in such a way that human memoristic capacities for reaching learning are reduced. In consequence the necessity arises for other different skills in order to make knowledge available. An "ideographic" knowledge, as description of individual events occurring in the past, is no longer convenient, if ever it was, but a "nomothetic" knowledge is so; that is, a formulator of laws or relationships within a concept structure of a theory.

This necessity of new skills, in order to make knowledge available, is beginning to be satisfied through the application of Knowledge-Based Systems, obtained by means of advances carried out in the area of Artificial Intelligence, the use of which, as we shall see, not only favours self-learning and permanent formation, but is also an extraordinary help in achieving individualized instruction. These systems, which are authentic knowledge distributors, allow the solution of, or themselves solve, cognitive problems, as well as helping to understand, point out, clarify, save time, generate, maintain, and increase the attention, increase the motivation and give life to facts in such a way that information becomes formation and so knowledge.

What is intended by the use of this technology is that the pupil should acquire methodology, developing a spirit of criticism and initiative, forming his capacity for synthesis and analysis, obtaining a decisive and imaginative character and reaching a capacity for group communication and work. The difficllty of reaching these objectives is no secret, but without them there is no direction, and to navigate without it across a stormy ocean of knowledge, daily more numerous, profound and varied, is to go adrift.

Our opinion is that the joint use of communication networks, and knowledge-Based Systems will contribute to alleviate the problems set forth above.

3. KNOWLEDGE-BASED SYSTEMS

The generic name of "Knowledge-Based Systems" designates a set of programs, constructed through the use of principles, methods and tools of artificial intelligence, whose contributions depend more on the explicit presence of an ample body of knowledge, than on the possession of ingenious and/or potent computational methods. In other terms, it is the step from the power pattern to the knowledge pattern. In effect, for a long time, AI (Artificial Intelligence) centred its attention almost exclusively in the development of methods of "intelligent" inference; which was known as the power pattern. But the power of expert systems is knowledge, which is what is known as the knowledge pattern.

Knowledge-Based Systems, as shown in Figure 1, have two essential parts: the knowledge base, broken down in turn into fact and/or data base, and rules base; and the deductive machine or inferences motor, which permits making inferences and reaching conclusions by logically analyzing combinations of rules. By taking advantage of this architectural principle, which is shared by knowledge-Based Systems, the following step was to separate these two functions.

The fact that in order to construct these systems it is neces to design and construct separately the knowledge base of the inferences motor, holds a strategic implication of the highest order that is, frequently, passed over. In effect in a certai sense, the bases of knowledge are something like a form of sto of human knowledge in an active way, that is not only accesibl for the machine, but that, and this is important, can be under by the machine.

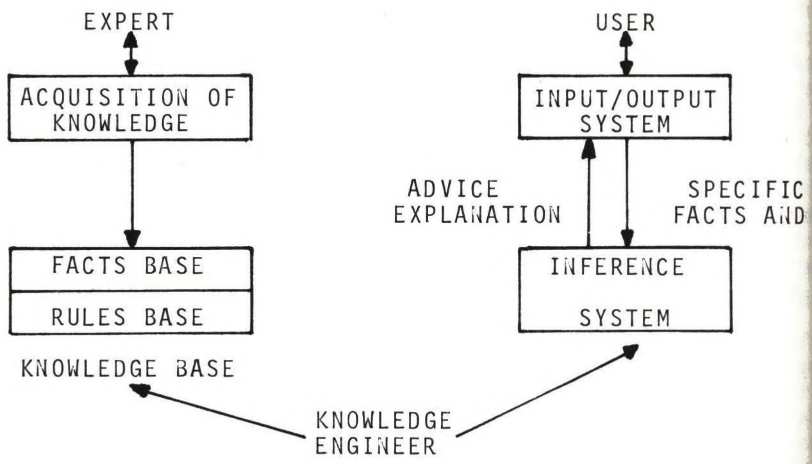

Figure 1

This is particularly profound and transcendental if one thinks that this gives rise, neither more nor less, to building a kno ledge industry in which the modules of knowledge and experienc are created and sold, perhaps even under patented names. It is difficult to imagine the impact that such an industry would ha on society, given the enormous influence that passive informat has had. The capacity of passing on knowledge from one genera to the next one will be without a doubt a similar achievement but greater than, the appearance of the first graphics in the of the Sumerians or the invention of the printing press.

But we should not deceive ourselves, knowledge and experience continue to be scarce and precious resources, from which their intrinsic value, whose refinement and reproduction create rich This justifies delicate and, at the present time expensive "mining" operations to extract them from humans and place them a computable form. Said operations require efficient and effe instruments and technologies in order to convert them into an industrial and commercial product, making reality of the dream their synthetic reproduction. In such a way that, by wider and better use of the knowledge that is patrimony of entire mankin the degree of happiness and wellbeing of the individual increas and as a result, of all peoples.

At the present time a Knowledge-Based type of system is being to achieve tele-teaching that eliminates the deficiencies of conventional computer-assisted instruction methods, among whic the following are to be found: impossibility, on the student' part, of raising questions, incapacity for adequately treating unforeseen replies, lack of any kind of knowledge on a concrete subject, and lack of friendly communication in a natural language with the students. These systems present the following as main components:

1. Resolver Expert Problems which have as tasks:
   a) To generate problems.
   b) To evaluate the correction of the proposed solutions.
   c) To represent knowledge, which goes beyond storing information in order to obtain some way of joining the stored facts of interrelated knowledge. This can be done as:
      - Semantic Networks.
      - Production Networks.
      - Procedural.

The expert component of a teleteaching system is called "transparent" or "articulate" if it can explain each decision in the solution of a problem in terms that correspond, to some abstract level, to those of a human resolvent. Teleteaching systems separate teaching strategies from the subject to be taught; they are conceptually very similar to representing the matter itself or the language used in discussing it.

The introduction of a new knowledge or of a fresh theme is organized by using trees or reticles showing the interaction of the pre-requisites.

2. Student model. That is, some method of identifying what things a student is capable of understanding and what mistaken conceptions or errors are to be found in the student's thinking or in his strategies to resolve problems. The computer needs to follow the track of what the student knows and what he needs to know. By posing him questions, the computer can imagine what the student does not know and supply him with this knowledge. It is an advantage for the system to be capable of recognizing alternative ways of resolving problems, including the incorrect methods the student may use as a result of his wrong systematic conceptions on the problem or of the use of inefficient strategies.

In this way, the use of AI techniques to model the student's knowledge includes:

a) Recognition of Forms applied to the history of the student's answers.
b) Signals in the semantic network or in the rule base, representing the areas dominated by the student.

The student model is formed by comparing the behaviour of the student with that of the "expert", based on the computer, in the same circumstances. The modelling component marks each piece of knowledge according to whether the evidence indicates that the student knows or not the material.

Other information that can be accumulated in the student model includes: the means preferred by the student to interract with the program, a "gross" characterization of his capacity level, a consideration of what he appears to forget as time goes by, and an indication of what his goals are and plans for learning the subject matter.

The main sources of evidence for maintaining the student mode can be classified as:

a) Implicit, of the student's behaviour in resolving prob
b) Explicit, from the questions posed directly by the stu
c) Historic, from the suppositions based on the student's experience.
d) Structural, from suppositions based on some measure of difficulty of the theme.

3. Tutorial Module. It must integrate knowledge about dialogu in natural language, teaching methods and the subject matter. is the module that communicates with the student, selects pro for him, watches over and criticises his contributions, gives help on request and selects revision material.

Teaching methods explored are based on the "diagnostic model" in which the program filters the student's understanding by s him tasks and evaluating his replies. From the program feedb it is hoped that the student will learn what knowledge he is incorrectly, what he is not using but ought to use in order t improve, etc. At the present time, work is being carried out the possibility of telling the student correctly exactly what he should do in such a way that he perceives his own errors a turns to a better method.

Another focus is to provide a circumstance that encourages th student to think in terms of filtering his own knowledge. Th possibility is suggested of fomenting the capacity of constru hypothesis and verifying them by establishing problems in whi the student first makes a probably incorrect guess, and in th way centres his attention on how to detect what is wrong and to revise it.

Another very successful teaching strategy is that called "preceptor". In this case, no attempt is made to cover a determined plan of lessons within a fixed time. Rather its g is to encourage the acquisition of general abilities and capa for resolving problems by tying the student to some activity which could be a computer game. The tutorship arises when th computer, observing the game being carried out by the student interrupts him and offers him new information or suggests fre strategies.

4. THE PROPOSED SYSTEM

The system proposed is the following:

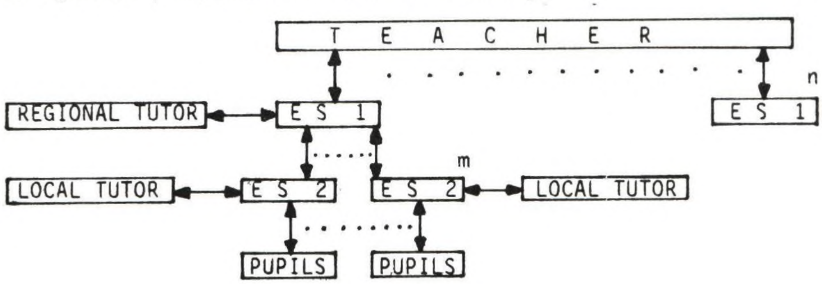

Figure 2

In this the following levels for each communication node can be distinguished:

Level 1. This is where the TEACHER is found, so naming the person who has shown him/herself to be not only an expert, in the determined area explained, but also the person having a high pedagogical level to put over its instructions.

This TEACHER is inter-related with Level 2. by means of an expert system.

Level 2. Expert System (ES) 1. and the Regional Tutor are found on this level. ES 1. receives the lessons from the TEACHER, passing them on to the other members of the network; this ES is modified and brought up-to-date not only with the knowledge from the TEACHER but also with that from the Regional Tutor; this Tutor will try to resolve the problems brought up by the different lower levels, passing the question on to the TEACHER if it cannot resolve same.

The Regional Tutor, together with the ES 1, will control a geographical zone, more or less extensive according to the interests and needs, and conveniently this region should have the same spoken language.

Level 3. The ES 2, local Tutors and Pupils are to be found on this level. The ES 2, receives the TEACHER's lessons from the ES 1, passing them on to the Local Tutors and Pupils, and receiving consultations from both which, where required, will have access to the ES 1, Regional Tutor and, finally, the TEACHER if necessary.

The compass of these ES 2, Local Tutors and Pupils, will, if possible, be that of a country unless its area, number of consultations or other causes advise otherwise.

5. CONCLUSIONS

The architectural separation of Knowledge-Based Systems between on the one hand, knowledge base (that is, assertive or declarative facts, or knowledge and operative rules or knowledge) and on the other hand, the inferences motor, together with its modular flexibility which makes them easy to modify, favouring both supervised learning (that is, with a monitor) and non-supervised learning and its transparency or, what is the same, its explanatory capacity, makes the focus of Artificial Intelligence, applied to remote instruction, differ substantially from other conventional focuses.

It is quite true that even with this process, the problems of "distance" existing in education are not resolved, the excessive nearness between teacher and pupil (habitual instruction) provokes a defensive attitude on the pupil's part, and the distance (remote education) provokes a desire for help and warmth.

In any case, Artificial Intelligence is and will continue to be the most promising field of investigation and development in remote education. For this reason, educators should be wary of indiscriminately accepting and using all Artificial Intelligence realizations, since the interests of one and the other are distinct and the methods, languages and applications frequently even appear incompatible. The proposal here made is that educators should understand the possibilities of what Artificial Intelligence is and make an effective use of same.

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CONDITIONS GOVERNING THE PRODUCTION AND RECEPTION OF KNOWLEDGE

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1. PRELIMINARY REMARKS

Conceptual and cognitive problems play an equally important role in specialist and in everyday knowledge. For the production of specialist information and the transmission of specialist knowledge, clarifying concepts of subjects and processes is thus not only particularly important, but absolutely essential.

The following thoughts concern specialist and everyday knowledge, their definition and their relation to specialist information. Such important matters as specialist and everyday language will be treated only indirectly.

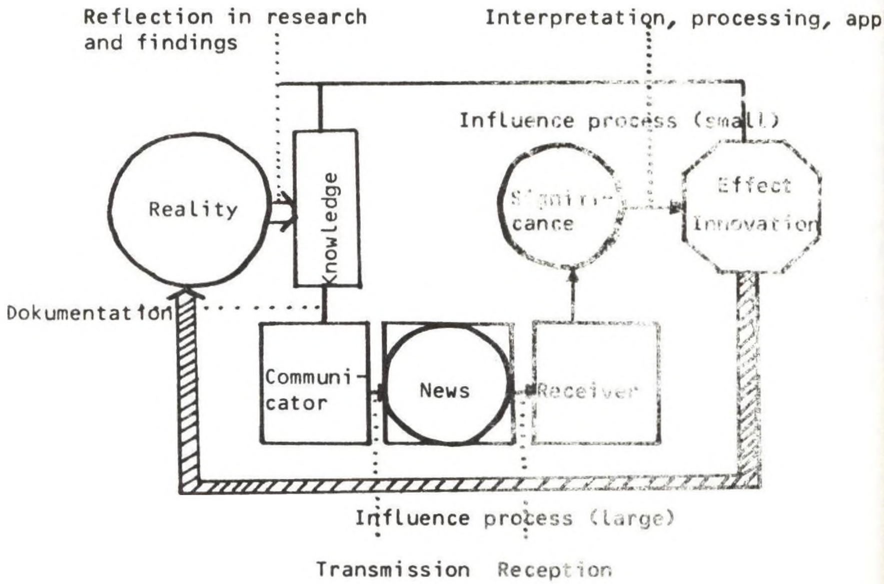
Differing concepts of specialist knowledge and specialist information are under discussion. For instance, the problem of transfering specialist knowledge to everyday knowledge has been raised because it is supposedly just as much intended for the mastery of everyday problems as for the further development of specialist knowledge itself (1). This involves two procedural steps: the reduction of complexity for analysis and the reconstitution of complexity through communication processes. Hitherto existing ideas of specialist information have declared all institutionalised specialist knowledge to be the subject of specialist information (2). Specialist knowledge has also been interpreted as necessarily constituting "qualified knowledge" (3) and, consequently, "qualified information".

2. REALITY AND KNOWLEDGE

Diagram 1 shows the interaction of reality and knowledge, though it is nai concerning reality s "reflection" in research and cognitive processes (4).

Diagram 1

THE INTERACTION OF REALITY AND KNOWLEDGE THROUGH INFORMATION



The problem of according significance to knowledge as the representation of tions of reality is particularly acute, depending on individual and social tors, even when it is specialist knowledge (5,6). All knowledge represents segmented and selective choice of elements of reality, depicted and transm by language (both in the narrow sense and in that of non-linguistic symboli (7). The rules and methods followed by both specialist and everyday knowle when reducing the complexity of reality to knowledge vary as regards verifi lity.

The academic industry has developed a series of methodological steps inten to guarantee optimal verifiability.

Only the empirical methods are interesting in our context, and even they de out of generalisations of previous knowledge, leading to the formation of theses, the formulation of paradigms and, possibly, theories, which in turn be verified or falsified empirically.

In everyday knowledge empirical verification is usually received via direct transmitted experience and is only to a limited extent traced back to spec findings. The needs marked and selected by notions of value combine with ge cal norms to form directives for action in everyday life. Thus, the object educational reforms and the prolongation of education to a life-long proce always to incorporate specialist knowledge in everyday knowledge, as a subs tute for unverifiable experience.

Under the axpect of anthropogenesis through communication the transmission processes themselves, and not just the content of the information transmitted, acquire a special, almost constitutive role (8).

3. PRODUCTION AND TRANSFER PROCESSES

Diagrams 2 and 3 depict schematically different levels of relationship structures which may be used by analogy for production and transfer processes (9,10).

Diagram 2

DIFFERENT LEVELS OF COMMUNICATION RELATIONSHIPS (AFTER THAYER)

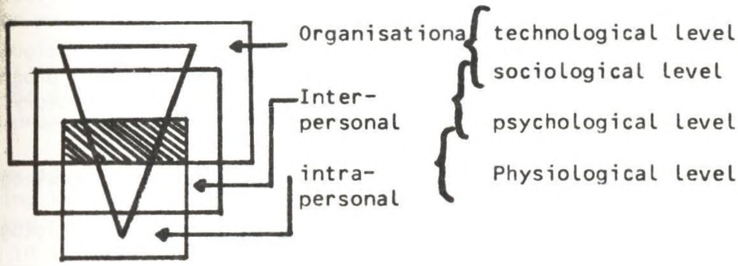
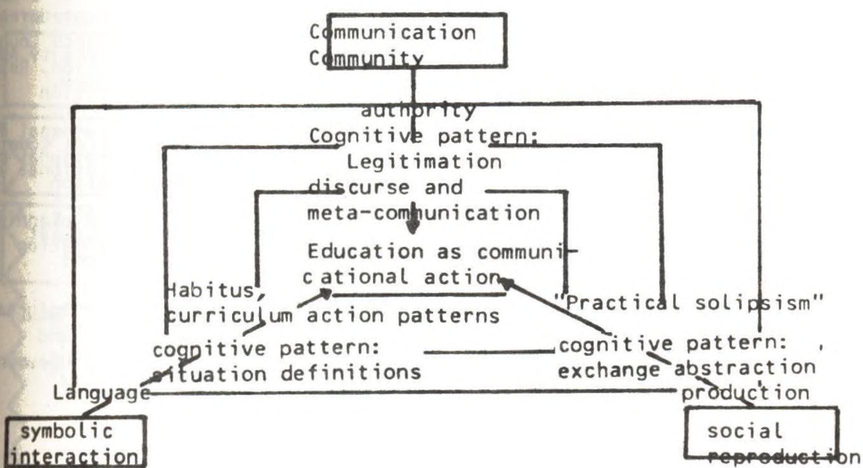


Diagram 3

THE INTER-RELATIONSHIP OF INFORMATION STRUCTURES (AFTER MOLLENHAUER)



Various descriptions of processes and various patterns of interpretation exi
for the production, construction, acquisition, transfer and further developm
of knowledge as a more or less structured network of information (11).

The following descriptions of processes and patterns of interpretation are t
be understood as more or less interdependent and thus represent an attempted
sketch of "interpretation typology".

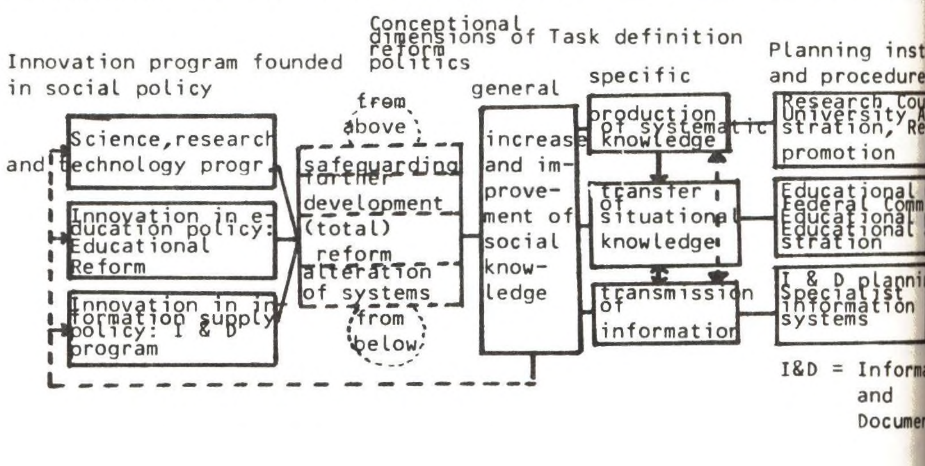
3.1 For the process of constructing reality I refer to:
- the neuro-physiological analyses of Foerster (12) and others;
- a semiotically orientated approach which has acquired importance in soci zation theory, i.e. symbolic interaction (13,14).

3.2 For the process of linguistic and communicational acquisition and transf of knowledge following should be mentioned:
- the socio-linguistic paradigms of Chomsky (15) and others;
- the recently developed neuro-linguistic programmes, which include proces of hypnotic and de-hypnotic transfer (16). Neuro-linguistic programming gins with the various systems of reality (visual, aural, sensory, motori etc.).

3.3 For the process of social production and reproduction of knowledge follo should be mentioned:
- the approach of Weingart and others (17,18) based on the sociology of kn ledge;
- the political approach; more precisely, socialisation and education poli information and media policy (see diagram 4).

Diagram 4

POLITICAL CONDITIONS FOR KNOWLEDGE PRODUCTION, LEARNING AND INFORMATION TRA



3.4 For the process of knowledge transfer following should be mentioned:
- the construction of paradigms in the field of the origination of everyday knowledge and its definition as against specialist knowledge (19);
- the relationship between the production and transfer of knowledge and research, information and education systems (20,21).

The problem of distinguishing material and social realities is of great significance for the various kinds of knowledge (22,23).

3.5 For the process of reception attention should be drawn to the historically determined conditions and course of reception which include not only individual and social components, but also the concrete environmental conditions reflecting individual and social ones (24).

3.6 The process of reconstructing reality by reorganising individual and social knowledge must als be mentioned in this context (25).

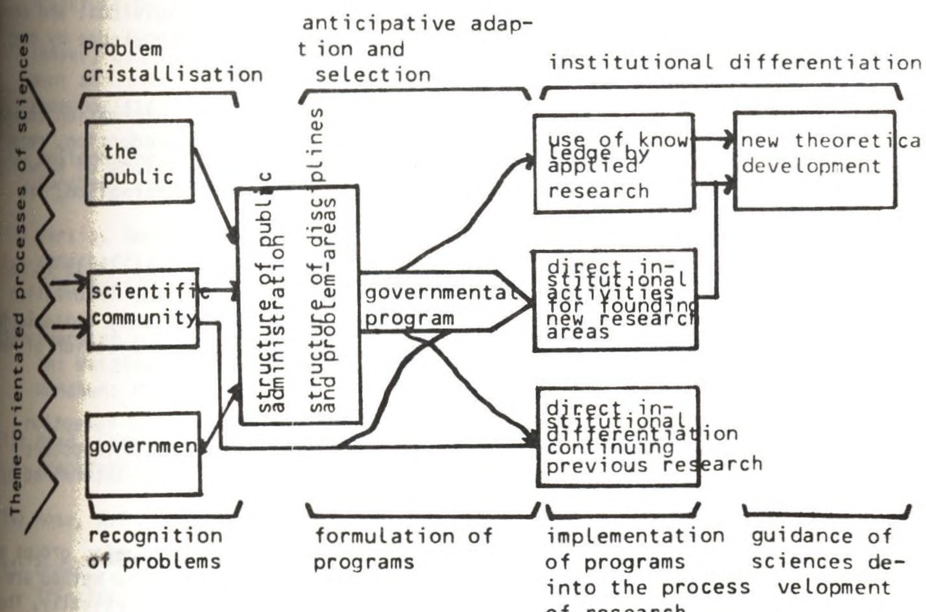
3.7 The relationship of knowledge transmission to situations and problems is the subject of diagram 4 (26). The course and the results of knowledge transmission processes are determined by the different dimensions of a "situation".

3.8 Processes of cancelling information, of distortion and recreation acquire increasing importance, processes that may be determined by:
- social and personal alteration and cancellation mechanisms such as age, changes in systems of values and norms, etc., as well as by
- storage and transmission media, which influence both the content itself and the form and content of receiver conditions.

4. INSTITUTIONALISED TRANSFER OF KNOWLEDGE

The reader is again referred to diagram 4 and also to diagram 5, which represents the phases of research relating to politics (27).

Diagram 5
PHASES IN RESEARCH RELATING TO POLITICS (AFTER WEINGART)



The same applies by analogy to knowledge transfer as to the conditions for ledge production. In specialist knowledge both processes are often combined stitutionally - not only in academic institutions, which also pursue inform and documentation, but also in the field of pure information systems, where creation of new conditions for the processing and dissemination of informat feeds production results back into the process as a whole. Much the same is of the educational field which, in a particular way and with certain genera cial aims, makes cultural techniques and specialist contents a subject of e quiry. Here, equally important roles are played by steps close to research relating to information and educational systems: the results of research ar described and enter a research report, which is furnished with directions f evaluation and then passed on to information and information transmission s (documentation, press media, education) where, again, different processing struments, faculties and procedures intervene.

In transfer processes both the production and reproduction of knowledge pla corresponding part. Furthermore, by combining old and new knowledge institu transfering information also produce new knowledge, partly intentionally (s mary knowledge), partly unintentionally in the course of transfer processes

5. THESES AND CONCLUDING REMARKS

In conclusion I present for discussion some theses on the problems describe above.

5.1 Reality may be registered as objects, actions and words and through the

5.2 Knowledge registers sections of reality by reducing complexity through guistic (verbal and non-verbal) statement.

5.3 Information consists of linguistic (in the sense of symbolic) statement that are produced, preserved and transferred. Knowledge is thus passed by the transfer of information, then reconstructed synthetically, under or misunderstood and finally, possibly, evaluated for action.

5.4 Social knowledge is realized in processes determined by individual and cial cognitive conditions, i.e. the individual activates knowledge by c bining or distinguishing old and new information.

5.5 The information circuit causes a continual alteration of information co on its path through the different instances of knowledge production, re tion and reproduction. It thereby alters the initial conditions of know The mode of knowledge transfer influences the "fate" of information, it structure, authenticity, capability of reception, etc.

5.6 Especially on the basis of findings in communication research it is to assumed that the changed conditions produced by new media and informati technologies - particularly by their combination - are not only suitabl the transmitted representation of reality, but also for the creation of government conditions.

The historical conditioning of knowledge production, transfer and reception leads to the different communication patterns we call cultures. This occurs through institutionalised models of knowledge transfer which are determined evaluation requirements.

In every historical situation the conditions of life for individuals, group society as a whole are again at stake. Form and content, style and method a inextricably bound in reality and can only be differentiated analytically. reintegration and synthesis determine our social and individual existence.

that reason, and in spite of new technical and organisational possibilities in information transfer, we continue to be responsible for the creation of conditions for integrating knowledge in individual and social life.

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ANIMATION INFORMATIQUE AUPRES DE GROUPES DE JEUNES

1 - Le Centre X 2000 d'Amiens

Le Centre X 2000 d'Amiens (Picardie, au nord de Paris) se met en place depuis un an seulement, mais, conformément à l'esprit de la Fondation, il regroupe un certain nombre de partenaires qui menaient déjà des activités informatiques lui permettant ainsi de bénéficier d'une expérience antérieure.

Ces partenaires sont aussi bien des Associations d'Education Populaire, que l'Université de Picardie, d'autres structures de l'Education Nationale ou des entreprises : 40 organismes sont ainsi adhérents, de toutes tailles (petites associations locales ou structures régionales) et de plusieurs secteurs d'activités (entreprises, associations, collectivités locales, Université).

La coordination du Centre est assurée par une équipe légère constituée de 2 animateurs informatique et d'un temps partiel de direction. Ce dernier poste repose sur une personne déjà responsable de l'une des structures à l'origine du Centre X 2000.

Les principaux axes d'activités sont les suivants :

- accueil du public sur un nombre d'heures ouvrables important chaque semaine dans un site actuellement provisoire ce qui en limite les possibilités

- sessions de formation grand public (le Centre X 2000 n'assure pas de formations spécialisées pour des emplois d'informaticiens par exemple) dont font partie les actions informatiques dans les stages d'insertion sociale dont nous reparlerons plus loin

- soutien à l'initiative d'Ateliers informatique dispersés dans le département (opération "Informatique Pour Tous", maison de jeunes, foyers ruraux ...), ce soutien se traduisant par :
  - . la formation de formateurs d'ateliers
  - . l'acquisition de matériel d'animation en vue de prêts
  - . l'aide aux actions spécifiques des sites I.P.T.

- mise en place de services auprès d'associations (comptabilité, mailing, traitement de texte)

- télématique (messagerie inter-associative en projet).

.../

Les activités peuvent être :

- réalisées en propre par l'équipe permanente X 2000 da secteurs non assurés par les partenaires du réseau

- coproduites avec un membre du Centre X 2000 (exposit sessions de formation...)

- d'assistance à un projet totalement conduit par un partena

L'avantage du Centre X 2000 est de pouvoir s'ad par sa grande souplesse, aux situations les plus diverses, des partenaires qui n'ont pas l'habitude de travailler ens (exemple d'une entreprise privée avec une Association). L'inconvénient en corollaire est de sembler "toucher à tou qui serait dès lors se condamner à une action superficielle. se faire connaitre le Centre doit mener un proj développement dynamique, mais il doit aussi savoir atten demande.

Mais nous n'allons pas ici développer ces questi concernent la place d'X 2000 dans le dispositif Inform Grand Public en France, ce serait un autre débat. Nous seulement voulu situer le contexte pratique dans lequel action s'insére.

2 - Présentation des expériences pédagogiques

Nous pouvons en venir maintenant à la présentat deux expériences qui entrent directement dans le cadre colloque.

Les deux expériences retenues correspondent bie spécificité des Centres X 2000 puisqu'elles concernent actions qui au plan pédagogique sont moins formalisées peuvent l'être soit la formation dans le cadre scolaire, soi formations assurées dans des sessions d'initiation perfectionnemnt qui s'apparentent à la Formation permanente.

L'une de ces expériences se situe au sein d'un de loisirs, lieu privilégié pour une découverte multip usages des ordinateurs.

L'autre se situe au sein d'un stage d'inserti les jeunes de 16 à 18 ans et s'adresse à des jeu l'agglomération d'Amiens (140 000 habitants).

La France, touchée par la crise économique, épro grandes difficultés pour l'insertion des jeunes, surtout le démunis qui, arrivés à 16 ans :

- quittent l'école sans réelle qualification
- ne disposent même pas de connaissances suffisant français et mathématiques.

.../

On parle alors de jeunes en situation "d'illétrisme", au sens ou ayant appris à lire et à écrire nous ne sommes pas devant un groupe "analphabète", mais un groupe ayant "oublié" l'écriture et qui doit déchiffrer la lecture. Ces jeunes sont ainsi incapables souvent de remplir des formulaires administratifs.

Pour répondre à ces besoins multiformes (tous les jeunes n'en sont pas à ce point) il a été mis en place en 1982 un dispositif de stages dits d'insertion et de qualification, faisant appel à un large réseau d'intervenants : Education Nationale, Associations, Organismes professionnels ont alors été invités à mettre sur pied l'encadrement de stages d'un an au démarrage de l'opération, 6 mois aujourd'hui (pouvant être renouvelés), stages constituant une sorte de pré-qualification afin de faciliter l'insertion de l'individu dans la société.

Ces stages permettent :

- une remise à niveau dans les matières de base
- la présentation des réseaux professionnels, sociaux, économiques
- des sessions de découverte en entreprise.

Ils débouchent sur des emplois ou des stages de qualification, dans les cas les meilleurs (car le stage ne peut assurer l'emploi, qui dépend de la reprise économique).

Ces stages sont l'occasion d'expérimenter de nouvelles pédagogies, de développer l'autoformation, afin de répondre aux attentes de jeunes qui doivent dépasser le handicap d'une période vécue comme échec (de la scolarisation, de l'emploi...).

C'est dans l'un de ces stages, qui regroupe 12 jeunes, que nous intervenons pour la partie informatique.

- Première expérience : compte rendu d'animation au centre aéré de Proyart

) Le Centre d'Actions Sociales EDF/GDF de Proyart

La Caisse d'Actions Sociales d'Amiens a acquis une propriété dans le village de Proyart afin d'y développer des activités de loisirs pour le personnel actif et retraité EDF/GDF, ainsi que leur famille. Actuellement le Centre est équipé d'une salle de restauration et de divers ateliers d'activités (poterie, photos, menuiserie, salle informatique, studio audio-visuel, plateau de sport). C'est donc dans ce cadre que se tient le centre aéré qui accueille les enfants des employés ainsi que ceux des habitants du village.

.../

Dans l'atelier informatique se trouvent micro-ordinateurs professionnels (6 Apple IIe, 2 Goupil 3), imprimantes et logiciels (traitement de texte, dessin, ainsi qu'une tablette graphique.

b) Présentation du projet pédagogique

Au cours d'une réunion préparatoire l'éq d'animation et les responsables de la C.A.S. définissent ense le fonctionnement du Centre aéré pour l'année 1985 / 1986.

Les enfants sont répartis par groupes d'age :
- petits : 5 - 7 ans
- moyens : 8 - 12 ans
- grands : 13 - 14 ans.

Chaque enfant du groupe des moyens et des gra s'inscrit dans deux activités (l'une le matin et l'a l'après-midi) pour une durée de 6 semaines. C'est ainsi que séances d'informatique se déroulent avec les "moyens" le mati les "grands" l'après-midi.

Cette activité, démarrée l'année précédente (19 1985), a un passif particulier : les séances étaient devenues consommation effrénée de jeux vidéo et aucun suivi ne possible d'autant plus que le concept même d'apprentissage l'ordinateur n'était pas défini (pourquoi et comment util cette machine dans le cadre de loisirs ? Taper sur un clav est-il un but en soit ?).

Pour cette raison il était donc demandé d'apprendre enfants à programmer et à utiliser l'ordinateur.

Cependant, une telle demande ne peut avoir des chan d'être satisfaite, que si l'outil informatique est intégré d un projet général : aussi la question posée à toute l'équipe de voir comment l'activité informatique, plutot que d'être affaire de spécialiste, peut avoir sa place dans un ensemble.

Nous nous sommes fixés deux objectifs parallèles :
- le suivi avec les enfants
- aborder une réflexion avec les animateurs.

Le premier objectif était d'amener les enfants d état de consommation de jeux (la plupart était déjà prés l'année précédente) à une étape de réflexion, d'action qu'ils s'orientent vers la construction de projets personnels collectifs à long terme.

.../

La réticence des participants (refus de faire autre chose que du jeu) n'a pu être vaincue qu'au bout du premier cycle de six semaines. Les séances étaient découpées par moitié : "travail" et "jeux" et nous nous sommes tenus à imposer cette règle jusqu'à ce que des perspectives émergent et fassent basculer l'équilibre de départ au détriment du "flipper" et autres programmes ludiques.

C'est ainsi qu'à mesure de l'avancée des séances, des projets se sont réalisés et les murs de la salle se sont remplis pour devenir, de ce fait, une vitrine des applications de l'ordinateur et ont permis un travail de réflexion avec les animateurs, qui trouvaient là matière à réutiliser dans leur propre atelier. Des propositions nouvelles ont vu le jour et offrent des perspectives sérieuses pour le prochain centre aéré.

- Expérience stage d'insertion

Les stagiaires ont été répartis en deux groupes, afin de pouvoir travailler avec un effectif réduit (7 par groupe) ; ainsi lorsqu'un groupe se trouve en entreprise, l'autre est en journée de formation. La période de rotation est de trois semaines. Les séances informatique (d'une durée de trois heures par semaine) se tiennent sur le lieu de stage et le matériel est amené sur place à chaque fois, entraînant de ce fait les stagiaires à installer les ordinateurs et leurs périphériques.

Tout au long de ce stage, l'atelier informatique est l'endroit où se développent trois objectifs principaux :

- acquisition et maintien de connaissances individualisées
- approche d'un langage (Logo)
- réflexion sur l'outil informatique et sa place dans le quotidien.

Après un premier temps de mise en route, au bout duquel la plupart des participants se trouvait en confiance devant l'ordinateur (ils étaient capables de monter, démonter, mettre en route, charger un logiciel), le véritable travail a démarré.

Cette relative autonomie a permis d'établir des modules d'Enseignement Assisté par Ordinateur individualisés, chaque personne pouvant aller à son propre rythme. Nous nous sommes efforcés dans cette partie d'amener le stagiaire à définir ses propres besoins, de lui faire prendre conscience de ses lacunes pour qu'il puisse aller vers le logiciel le plus adapté à sa demande.

.../

Notre role est alors de suivre l'évolution du stagi dans son parcours du logiciel, de relancer son intérêt, bre nouer une relation privilégiée avec le jeune. Ce temps de tra individuel ne dure jamais plus d'une demi heure, car en paral est menée une approche à un langage de programmation (Logo), langage outre qu'il permet de confronter les stagiaires à problèmes de latéralisation, de rigueur d'écriture des ord fournit le moyen de mettre en place des projets à long t (création d'une boite à outil géométrique, simulation d montre à aiguille ...).

La pratique de logiciels professionnels a été abo de façon plus diffuse mais en rapport avec la vie du stage. de nos préoccupations principales est de ne pas couper l'acti informatique du reste des travaux et faire ainsi appréhe l'ordinateur comme un outil parmi d'autres. Ainsi :

- à la suite de visites d'entreprises, les stagia doivent par petits groupes faire le compte rendu d'une visit la présenter aux autres. La mise en page est alors assurée pa traitement de texte et un logiciel de dessin

- une autre fois il s'agit de rechercher informations par réseaux télématiques,

- puis on constitue un fichier d'entreprises etc...

5 - Conclusion

Tout au long de ces 2 projets, bien que les object soient différents (dans le premier nous sommes en situatio loisirs, dans le deuxième de formation), il apparait une démar commune.

Après une première phase de mise en autonomie, au co de laquelle chacun est capable de brancher, alllumer, manipu les disquettes, charger un programme (il s'agit en fait de pas un "permis de conduire"), nous nous sommes efforcés de fa naitre des projets et de les mener à terme. Tout au long de l conception une réflexion sur l'outil informatique est mené (dois faire telle ou telle chose, l'ordinateur peut-il m'appor un plus ou non ?).

Ainsi nous passons progressivement d'un état fascination (aspect magique de l'ordinateur) à une banalisati à l'enrichissement et à une maitrise d'un environne technologique dans lequel chacun peut ainsi évoluer de mani plus souple.

.../

Nous pouvons illustrer ce propos à travers deux types de perspectives.

Pour le prochain centre aéré, après le travail mené cette année, nous souhaiterions mener à bien pour l'année prochaine, la réalisation d'une ville imaginaire : les moyens mis à disposition seraient liés aux différents ateliers proposés (terre, bois, informatique). Les enfants intéressés par le sujet, se déplaceraient d'un atelier à un autre à mesure des besoins qu'ils pourraient définir.

Dans cette optique l'atelier informatique serait le lieu où s'élaborerait la recherche des formes et des volumes, permettant la modélisation à l'écran des idées. La multiplicité des propositions ainsi faites, autorise un travail critique en vue du choix unique par un groupe.

En ce qui concerne la mise en place d'un module informatique dans un stage 16-18 ans, le projet s'oriente vers la mise en situation dans une entreprise fictive. Il faudrait alors simuler différents postes de travail pendant une semaine. Cette intervention aurait lieu aux deux tiers du stage pour pouvoir ainsi réutiliser tout ce qui aura été appris et vécu, lors des stages pratiques en entreprise, tout autant qu'à l'occasion de l'apprentissage de l'ordinateur etc...) par les stagiaires.

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Amiens - Juillet 1986

MODELLING IN EDUCATION

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In the paper one of our models which aims at assisting the introduction of exact methods into the region of university management is described. All of the models were constructed using the system dynamics method.

1. INTRODUCTION

Education has a great influence on the activity of the whole national economy. The education a worker has acquired is utilized for tens of years, so that unsuitable decisions concerning education can have a negative effect on national economy for a long time. Nowadays, with growing scientific and technical progress, it is even more so. In order to assist improvement in school management, we have begun censtructing a system of models for the information system of education. These models are formed by the system dynamics method /see e.g. [1], [2], [3], [4]/.

While constructing a system of models, we began with a model for the acquisition and utilization of professional skills. Teaching students is certainly the most important activity of a university while a sufficient number of well trained workers with university degrees in all regions of our economy is a necessary condition, though not a sufficient one, for introducing the most progressive results of science successfully into practice.

In the first stage a basic model illustrating, in an aggregated form, the processes of acquiring professional skills and thier utilization in the national economy was formed /see [5], [6]/. We have also formed a few other models which all have their origin in this fundamental model. One of them is described in this paper.

2. A MODEL FOR THE UTILIZATION OF GRADUATE SKILLS FOR MEN AND WOMEN

While constructing the model we proceeded from an aggregated model of acquiring and utilization of graduate skills. Our sole attention was payed to the region of utilizing university-level qualification, which we deaggregated. We divided UG /short for university graduates/ into two groups: men and women. We assumed the men would have 1 year of army training immediately after graduating from University. For women the model contained maternity leave.

The aim of the model was to test whether this deaggregation would enable describing the region of graduate skill utilization better than our original model of acquisition and utilization of graduate skills used to. The model describes the utilization of graduate skills in the Czech republic and is not deaggregated accordin specializations or according to the regions of our national e nomy. In the model we assume we have only left out unimportan flow and information links. During the simulation we used a y as the length of a period in the model.

The graphic model is illustrated in Figure 1.

2.1. Denotation of model quantities and reservoirs

We divide model quantities into variables and parameters. The value of a variable in a certain year is its value on 31^{st} Dec ber or the sum of values for the year concerned respectively.

Exogenous variables of the model:

ADM number of men graduating from university day study in th given year
ADZ number of women graduating from university day study in given year
AZM number of men graduating from extra-mural university stu in the given year
AZZ number of women graduating from extra-mural university s in the given year
M number of planned positions requiring university-level qualification

Endogenous variables of the model:

ZVS number of university graduate men taking military traini
ANM number of men university graduates /UG/ working at posit not requiring university-level education /ULE for short/
ANZ number of women UG working at positions not requiring UL
AVM number of men UG working at positions requiring ULE
AVZ number of women UG working at positions requiring ULE
MDN number of women graduates taking maternity leave who use work at positions not requiring ULE
MDV number of women graduates on maternity leave who worked positions requiring ULE before they left
SPM number of men high school graduates /HSG/ working at pos tions requiring ULE
SPZ number of women HSG working at positions requiring ULE
MDS number of women HSG on maternity leave, who went on leav from a post requiring ULE
DMDN increase in number of women UG going on maternity leave the given year from a position not requiring ULE
DMDV increase in number of women UG going on maternity leave the given year from a position requiring ULE
DMDS increase in number of women HSG going on maternity leave the given year from positions requiring ULE
If any of the last three variables are negative, they denote decrease.

The variables M1,..., M8; S1,..., S4; Z1,..., Z7 represent fl inside the system. Their meaning is evident in Figure 1.

DM increase in number of planned positions requiring ULE in given year
DV increase in number of women UG working at positions requ ing ULE in the given year
DN increase in number of women UG working at positions not quiring ULE in the given year

DS increase in number of women HSG working at positions requiring ULE

UM number of positions requiring ULE, which it is necessary to occupy in the given year /i.e. positions from which specialists have departed or new positions/

VHU number of UG not working at positions requiring ULE who are keen on obtaining such a position

PUV proportion of number of UG not working at positions requiring ULE who are interested in such a position and obtain it in the given year in number of all UG not working at positions requiring ULE who are keen on obtaining them

VMS number of free positions requiring ULE obtained in the given year by HSG

Parameters of the model:

MDVS proportion of number of women UG on maternity leave in number of all working women UG

MDSS proportion of the number of women HSG on maternity leave who used to occupy positions requiring ULE in number of all women HSG working at positions requiring ULE

PPSZ proportion of the number of women HSG who obtained positions requiring ULE during the given year in the number of all HSG who obtained positions requiring ULE during the given year

PPV proportion of the number of positions requiring ULE vacated in the given year, in which UG without positions requiring ULE are interested in the number of all vacant positions requiring ULE in the given year

ANOP proportion of number of UG leaving positions not requiring ULE in number of all UG working in positions not requiring ULE

AVOP proportion of the number of UG who are leaving positions requiring ULE in the given year in the number of all UG working in positions requiring ULE /including men on basic military service/

SPOP proportion of number of HSG leaving positions requiring ULE in the given year in the number of all HSG working at positions requiring ULE

AVAN proportion of number of UG working at positions requiring ULE who left in the given year for positions not requiring ULE in the number of all UG working at positions requiring ULE

AAN proportion of number of UG working at positions not requiring ULE who are interested in changing to a position requiring ULE in the number of all UG working at positions not requiring ULE.

Interface reservoirs:

R1 men university day students

R2 women university day students

R3 men high school graduates working at positions requiring ULE

R4 women high school graduates working at positions requiring ULE

R5 men university graduates who have left work

R6 women university graduates who have left work

2.2. Description of the mathematical model

We shall now gradually present the equqtions of our model with comments. Each endogenous variable in the model has a single equation determining the value of this variable. The equations are listed in a sequence suitable for calculation /they cannot be

in random order because some equations use values of the vari
bles that are calculated in the preceding equations/.

The form of the equations for calculating flow and informati
variables follows:

- from the meaning of the variables used in calculating them /which variables will be used for determining the value of given flow and information variables is illustrated in the graphic model using information links/,
- from the meaning of the parameters used /we assume no signi cant error will appear if we regard the value of each para as constant during the whole phase of simulation/;
- from the assumptions concerning individual equations.

We assume that all extra-mural university graduates work at p tions requiring ULE, so that

$$M1_{t+1} = AZM_{t+1}$$

$$Z3_{t+1} = AZZ_{t+1}.$$

Equations describing the continuous departure of university high school graduates from work have a simple form:

$$M7_{t+1} = ANM_t . ANOP$$
$$M8_{t+1} = (AVM_t + ZVS_t) . AVOP$$
$$Z6_{t+1} = (ANZ_t + MDN_t) . ANOP$$
$$Z7_{t+1} = (ANZ_t + MDV_t) . AVOP$$
$$S3_{t+1} = SPM_t . SPOP$$
$$S4_{t+1} = (SPZ_t + MDS_t) . SPOP,$$

just as the equations describing UG leaving positions requiri ULE for positions not requiring ULE:

$$M6_{t+1} = AVM_t . AVAN$$

$$Z5_{t+1} = (AVZ_t + MDV_t) . AVAN.$$

We presume that all men UG from day studies leave for their military service in the year in which they graduate, so

$$M2_{t+1} = ADM_{t+1}.$$

We shall now derive the form of the equation determining the iables $DMDN_{t+1}$, $DMDV_{t+1}$ and $DMDS_{t+1}$. The number of women UG w in the year t, work at positions not requiring ULE /including those on maternity leave/ is $(ANZ_t + MDN_t)$. The increase in number of these women during the year t was DN_t. Then the est of the number of women UG working at positions not requiring /including those on maternity leave/ in the year t+1 is equal $(ANZ_t + MDN_t + DN_t)$. So the value of the variable MDN_{t+1} is e to $(ANZ_t + MDN_t + DN_t)$. MDVS and therefore the value $DMDN_{t+1}$ which is equal to the increase of MDN from the year t to the year t+1 is equal to:

$$DMDN_{t+1} = (ANZ_t + MDN_t + DN_t) . MDVS - MDN_t.$$

The forms of the equations for the variables $DMDV_{t+1}$ and $DMDS_{t+1}$ are derived analogously:

$$DMDV_{t+1} = (AVZ_t + MDV_t + DV_t).MDVS - MDV_t$$

$$DMDS_{t+1} = (SPZ_t + MDS_t + DS_t).MDSS - MDS_t.$$

The increase in the number of planned positions requiring ULE in the national economy in the year t is

$$DM_{t+1} = M_{t+1} - M_t.$$

The number of positions requiring ULE which should be newly occupied in the year t+1 is equal to the sum of DM_{t+1} and the number of formerly existing positions, which have become vacant in the year t+1, i.e.

$$UM_{t+1} = DM_{t+1} + DMDV_{t+1} + DMDS_{t+1} + S4_{t+1} + S3_{t+1} + $$
$$+ Z7_{t+1} + Z5_{t+1} + M6_{t+1} + M8_{t+1}.$$

We assume that all UG who begin working for the first time are keen on obtaining a position requiring ULE. Of those who are already working at positions not requiring ULE only a part, determined by the parameter AAN, is interested in positions requiring ULE. The number of UG who are not working at positions requiring ULE and would like to work at one is equal to

$$VHU_{t+1} = ZVS_t + ADZ_{t+1} + (ANZ_t + MDN_t + ANM_t).AAN.$$

There exist some positions in which no UG are interested even if they could not obtain another position requiring ULE so that the proportion of workers determined by the value of the variable VHU_{t+1} who shall actually be accepted for such a position can be estimated as:

$$PUV_{t+1} = \min\left(\frac{PPV + UM_{t+1}}{VHU_{t+1}}, 1\right).$$

/the proportion must not be larger than 1/.

The equations decribing how new or vacated positions requiring ULE and posititions not requiring ULE are being occupied by UG then have the form:

$$M4_{t+1} = ZVS_{t+1}.\ PUV_{t+1}$$

$$M3_{t+1} = ZVS_{t+1} - M4_{t+1}$$

$$M5_{t+1} = AAN.ANM_t.PUV_{t+1}$$

$$Z2_{t+1} = ADZ_{t+1}.\ PUV_{t+1}$$

$$Z1_{t+1} = ADZ_{t+1} - Z2_{t+1}$$

$$Z4_{t+1} = AAN.(ANZ_t + MDN_t).\ PUV_{t+1}.$$

We assume that no position requiring ULE stays vacant, so that the number of positions requiring ULE which will be occupied by NSG is equal to the number of new and vacated positions left i.e.

$$VMS_{t+1} = UM_{t+1} - M4_{t+1} - M5_{t+1} - Z2_{t+1} - Z4_{t+1}.$$

Of these women will occupy

$$S2_{t+1} = VMS_{t+1} \cdot PPSZ$$

and men

$$S1_{t+1} = VMS_{t+1} - S2_{t+1}.$$

Now it is necessary to determine the stock equations of the
Their form can be derived directly from the graphic model /

$$ZVS_{t+1} = M2_{t+1}$$

$$ANM_{t+1} = ANM_t + M3_{t+1} + M6_{t+1} - M5_{t+1} - M7_{t+1}$$

$$AVM_{t+1} = AVM_t + M4_{t+1} + M5_{t+1} - M8_{t+1} + M1_{t+1} - M6_{t}$$

$$ANZ_{t+1} = ANZ_t + Z1_{t+1} + Z5_{t+1} - Z4_{t+1} - Z6_{t+1} - DMD$$

$$AVZ_{t+1} = AVZ_t + Z3_{t+1} + Z2_{t+1} + Z4_{t+1} - Z5_{t+1} - Z7_{t}$$
$$- DMDV_{t+1}$$

$$MDN_{t+1} = MDN_t + DMDN_{t+1}$$

$$MDV_{t+1} = MDV_t + DMDV_{t+1}$$

$$SPM_{t+1} = SPM_t + S1_{t+1} - M1_{t+1} - S3_{t+1}$$

$$SPZ_{t+1} = SPZ_t + S2_{t+1} - Z3_{t+1} - S4_{t+1} - DMDS_{t+1}$$

$$MDS_{t+1} = MDS_t + DMDS_{t+1}.$$

Then it is necessary to update the increase in the number of
en i.e. the variables DV, DN and DS:

$$DV_{t+1} = AVZ_{t+1} + MDV_{t+1} - AVZ_t - MDV_t$$

$$DN_{t+1} = ANZ_{t+1} + MDN_{t+1} - ANZ_t - MDN_t$$

$$DS_{t+1} = SPZ_{t+1} + MDS_{t+1} - SPZ_t - MDS_t.$$

Estimating the parameters of the model then still remains.
estimations of the parameters were obtained from statistical
vestigation:

$$MDVS = 0{,}110, \quad MDSS = 0{,}122, \quad PPSZ = 0{,}246.$$

We have tried to estimate all the other parameters to achie
values of the variables obtained from the model being as nea
possible to the actual values of the variables.

As a criterion of the consistancy of the model with reality
chose the arithmetic mean of Theil's inequality coefficients
[7]/ in the years 1971-80 for the variables AVC and ANC, i.e.
only two variables for which we knew the actual values /at l
approximately/.

AVC number of UG working at a position requiring ULE /includ
men in basic military service and women on maternity lea
ANC number of UG working at positions not requiring ULE.

So

$$AVC = AVM + AVZ + ZVS + MDV + MDN$$
$$ANC = ANZ + ANM$$ holds.

The obtained estimates are:

AVOP = ANOP = 0,015, SPOP = 0,164, AVAN = 0,061,
AAN = 0,464, PPV = 0,481.

With the parameters of the model thus estimated the square root of the arithmetic mean of Theil's inequality coefficients of the variables AVC and ANC for 1971-80 turned out to be 0,054.

3. CONCLUSION

The research task in which this model and others not mentioned here were introduced was ordered by the Ministry of Education. The models should help to introduce exact methods into the region of university management. The University long term planning department of the Ministry of Education is the chief user of the models. It uses them for forming long term prognoses which in turn enable a better quality of management. The Ministry of Work and Social affairs, department of staff qualification is also interested in utilizing the models. The models are computed in the Institute of educational information of the Czech Ministry of Education.

The greatest problem that a designer enconuters is obtaining the necessary data for model construction and simulation. Data are obtained from statistical research, some data are a qualified estimate made by specialists.

At the Computer Certre of Charles University we have been working at this task for 5 years. Students of the higher grades participate in some parts of the task. A seminar is held on its theoretic questions.

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SIGN-MANIPULATION RESULTING FROM NEW ECOLOGICAL CONDITIONS PRODUCED BY THE MEDIA

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0 INTRODUCTION

Sign-manipulation or manipulation by signs? Questions like this are surely tautological, for, in the face of manipulative employment of information, the signs themselves remain neutral units used by the media for transmission. It all depends on the theory, then. This allows one to ask if we are not, in fact, concerned with manipulation by means of the theory of signs itself. That would constitute a meta-level for the question of manipulation through, and by means of, signs.

Let us assume that the basic suppositions of semiotic theory are formal. In our (pragmatic) context the structure of the theoretical statement is this: the pragmatic is one among many aspects of signs and, according to the questions asked, is either a point of departure or a subsequent point of view. This has to be determined in each individual case (Klaus, Morris, Eco).

Neuro-psychological research (Guttmann), new psychotherapies (Watzlawick, Bandler, etc.) and applied constructivism (von Foerster, etc.) have shown that the lasting effectiveness of signs - measured by behavioural disposition and memory ability - depends more on the form and structure of signs and their combinations than on the content and statements they transmit. What does that mean? Perhaps that in the beginning was the form, to which content adapts itself - realising the form, as it were. In linguistic terms this would mean syntax taking precedence as a statement over semantic explanation and decoding.

I leave these questions open. Semiotics should be on the lookout for new models explaining the exchange of signs between communication partners.

1 LEARNING TO INTERPRET SIGNS

Symbolic Interactionism (Mead, Rose, Brumlik) provides a socio-psychological behaviorist model for explaining the socialization process. With the help of symbols - which with Mead and his followers are almost invariably synonymous with signs - human beings learn in their earliest childhood the meaning of things and events as well as their value evaluation. As a rule, evaluation is derived from the context. The context be conditioned by function (water is necessary for a bath, warm water is pl sant, water that is too hot or too cold is not pleasant) or, where function evidence is lacking, may be complemented by data from other levels of exper (fighting is naughty, not because one finds out by trial and error that it but because God in Heaven, daddy or Santa Claus and the Christ child have f bidden it).

We are right in the middle of our subject. I advance the following theory. meanings and values which do not appear plausible or self-evident from the functional or experiential context are introduced into the pragmatic relati ship between sign-user and sign (in plural and in a sytactical context as when, therefore, unverifiable values which affect meanings (i.e. sanction stigmatize them) are introduced into the processes of symbolic interaction take place with the help of signs), then we have a case of manipulation, p ly even of the need for manipulation.

2 THE NEW MEDIA

I use this term in the double sense of

- the media which have been developed from the old communication media with help of micro-electronics and cable improvements and which operate for t most part with the audio-visual medium of the screen, and
- the new forms of communication made possible by communications technology which, increasing in quality and quantity, operate with communication su other than human beings, face-to-screen instead of face-to-face. The auth

of the screen as a, so to speak, infallible communication partner is enter more and more into competition with the fallible one. And the face-carriers losing the race for their attractiveness hands down (Mc Luhan).

Signs and their combinations are manufactured in the media, and produced a disseminated on a massive scale. They are also stored - one asks another s at the "man-machine intersecting point" (as the computer people call it) a one uses an "interface" to a large computer store, a giant technical brain.

The increased presence of these media in the form of appliances is altering structure of the environment at home, at work and in leisure-time. The "in world" (in the neuro-psychocological/physiological sense) adapts itself in to cope with this changed (media) environment. This has produced occasional triumphs for achievement psychology: sudden increases of IQ, training with micro-computers in schools, etc.

Manipulation by accomodation? To simulate, and also partially to bring abo common community of signs among the individuals working on and with these c munication techniques general messages are increasing at the expense of co information. And that means that the communication partner at the screen i ing increasingly hypnotized. The communication partner is faceless and no l tangible, is represented by the screen (Bandler).

3 THE MEDIA SYSTEM AND STOCKS OF SIGNS

The human beings at the "intersecting points" are connected - at least in t so-called active communications media - with one another via a network syst (e.g. video-phone). However, they are generally played on by central instit tions, i.e. they are provided with sign parcels which have been manufactur form and content. In the terminology of Symbolic Interactionism this is ca starting learing processes which repeat continually the same signs and sig combinations to improve understanding semantically and syntactically and w transmit decoding patterns and strategies via these sign combinations. This process entails the simultaneous learning of values and evaluations in order to understand meanings and thus be "in". Such processes of communication and understanding are then extended in face-to-face contact, according to how communication takes place in the "presentation of reality by the media". The media give rise to over half the topics of conversation in West-Germany families (Bonfadelli, Mayer).

The authority of the stocks of signs of the so-called new media, as network appliances and as qualitatively altered transmission intersecting-points (face-to-screen), is continually on the increase just because their growing quantity sets off generalising processes which, threatening with the sanction of exclusion from the communication cummunity, constitute this very community. This is achieved by transmitting sign parcels and by reference to, and consideration of, the parcels contents in groups.

Our "symbol environment" (Gerbner - here, too, synonymous with sign environment) is thus designed in the central offices of media organisations and "realised" by communication partners (receivers). The attraction of these "second realities" is sometimes so great that they no longer allow the awakening of interest in discovering primary (i.e. direct) reality and occasionally replace it voluntarily. In simplified, neuro-psychological terms this means that the brain makes no distinction between primary and secondary reality unless expressly told to do so by a, so to speak, meta-coding. But that is just what those people do not want who wish to take "as it were" for "it is" (Guttmann, Bergler).

4 COMMUNICATING AND ACTING

It is characteristic of media communication that the medium's communication partner (receiver) is not under direct social compulsion to act. The question of identification, with others and with onesself, nonetheless gains in importance in the sense of an alteration to the receiver's role: he is a part of media events as long as he does not interpose the above-mentioned meta-coding between them and himself. This integration of the communication partner in media events is termed "para-social interaction" (Horton). Symbolic Interactionism's concept of role is thus applied to the role of the media consumer. In the final analysis it therefore depends on how the receiver adopts the roles he has perceived - imaginatively or actively (Teichert).

The model of the "active viewer", as a person who can control intensity of reception, is caught up in the net of a paradox: "understanding" the media s message presupposes identification with the structure of the media's "world of symbols", yet independence from the products of manufactured reality requires distancing from identification. This explains why integrated receivers are unable to find a level on which to communicate with those who distance themselves analytically: the decoding keys used for evaluation are fundamentally different.

The paradox just described has given rise to a compromise which several authors - especially those involved in media education - have come out in favour of (Teichert). It allows the receiver (in consciousness of para-social interaction) to choose from, and interpret, the realities offered by the media.

It must be objected that this compromise implicitly, or unconsciously, assumes that the receiver has so much experience of the real world that he is able "to choose from the realities on offer". If this were always the case, the media would play the part of stimulatiing agencies for symbolic interaction, i.e. they would stimulate new combinations of symbols (= signs) and thereby give rise to new processes of understanding reality (the world). In comparison, media reality is "the other way round". One becomes acquainted with "symbol environments" in childhood and the experience thus acquired is projected onto the real world. What can the real world hope to offer when judged according to reduced likenesses produced by signs?

5 CONCLUSION

The present thoughts have been guided by the assumption that, in the real world of existence, the media are increasing in quantity and quality and gaining in significance. This is occuring situationally and ecologically at home, at work and in leisure-time, but, in a broader sense, is also affecting the life-histories of each individual member of the "information and communication community". That which is called "media behaviour" and which to a considerable degree reveals the preferences prevailing with regard to face-to-face of face-to-screen communication makes it easy to see this media behaviour as a key behavioural factor, one practiced in childhood and later used as a basis for behavioural dispositions in front of screens in various life-situations (Prokop).

Behaviour is learnt through socialization, including those ecological contexts in which media are present. Today, stocks of signs and their syntactic models as well as coding and decoding strategies are by and large no longer generated by social interaction but by "para-social interaction", i.e. by media consumption. Even if the sign material were to remain identical, then at least the evaluations constituted by various levels of reality would differ. On the other hand, we know that the mixing of various levels and the inability to differentiate between levels themselves create new meanings and, in particular, new evaluations.

If manipulation is everything which leads away from a primal understanding of the self, then conventional socialization already constitutes manipulation. Yet there is a qualitative difference between face-to-face or face-to-screen communication and manipulation: the medium does not permit the control and reversibility possible in an interpersonal context. Seen thus, sign-manipulation by the media is in itself final at every stage in the process.

I assume that we are concerned here solely with diagnosing and interpreting. The question as to what consequences for socialization and media policies should be drawn from the present considerations and insights must therefore remain unanswered.

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3.

Remote education of Informatics

COSTOC - COMPUTER SUPPORTED TEACHING OF COMPUTER SCIENCE

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ABSTRACT

A strong need for quality education in computer science can be noted world-wide. This is mainly due to three reasons: (i) the growth of computer-usage in a multitude of areas affecting most parts of life has not abated; (ii) despite continuing growth of computer-science, and similar university programs not enough quality graduates remain in a teaching environment, (iii) the "half-decay-rate" of knowledge in computer science has now dropped to about six years (i.e. half of some knowledge obtained is outdated within six years unless refreshed).

Altogether it seems clear that this kind of "education crisis" can only be mastered by using the very devices that have caused the crisis: computers. Indeed, computer aided instruction (CAI) - after almost three decades of unfullfilled promises - is starting to turn into a realistic hope for supporting computer science education.

In this paper we describe a major project in this direction, COSTOC. The aim of COSTOC is to produce over 2000 lessons (corresponding to about 2000 contact-hours or 50 computer-science monographs) of high quality "presentation type" CAI material to support the teaching of computer science within universities and in connection with teleteaching institutions.

For the COSTOC project "presentation type" CAI, but assuming high-quality animatable colour graphics, has been chosen for reasons which are explained in detail in the body of the paper but can briefly be summarized as follows:

(a) Presentation type CAI courses are comparatively easy to create and to maintain

(b) Presentation type CAI courses can be distributed over fairly simple networks

(c) Presentation type CAI courses can be executed on a wide variety of inexpensive home- and personal-computers

(d) Presentation-type CAI courses are a pragmatic compromise: by not going to the limits of technology affardable tools are obtained which nevertheless provide a significant improvement in many cases (and should only be used in such) over education via books or mass-lectures.

The present paper describes in detail the rational behind choosing "presentation type" CAI, how such courses are created and used, and some first experiences with the lesson-material developed.

CLEAR - COMPUTER LEARNING RESSOURCE CENTERS

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ABSTRACT

Most universities have been relying for their main business, i.e. education, on traditional teaching methods and the use of standard computing services. However, standard computing services are not specifically designed to improve the quality and efficiency of university teaching. Other methods should also be actively pursued, such as the use of TV, video, electronic information and computer aided instruction (CAI). This is particularly evident in computer-related fields where an abundance of university computing services is available but does not overcome the rising needs for high-quality education for students, local industry, re-entering professionals and faculty.

Studies of the computer science education situation at colleges and universities show that there is a tremendous need for material to support the teaching of computer science courses due to the shortage of qualified teachers.

One major component of such teaching aids can be CAI. The major stumbling block for the success of CAI in the past has been its poor price/performance ratio. However, with the arrival of inexpensive personal computers allowing an excellent level of presentation and of software packages for easy lesson creation, the quality of CAI systems is not the main problem anymore. The main problem is, rather, the quality of material, how it is presented and how it can be controlled and applied to computer science education.

In this paper, we outline ways which integrate CAI into the teaching role of universities and expand the university's appeal to the community and industry. In particular, we:

(1) Propose the establishment of Computer LEArning Resource Centers (abbreviated CLEAR) within universities which are (a) modular systems of fairly low cost and are easy to set up, (b) provide easy maintainance and distribution of courseware, and (c) lend themselves to inside and outside university use;

(2) Report on one approach towards the establishment of such centers within university environments and provide design strategies and concrete recommendation of how to go about it;

(3) Analyze the forms in which such electronic learning centers are particularly useful to a computer science department, especially in view of the multiplicity of roles computer science is required to play within a university;

(4) Discuss the important role of CAI within CLEAR Centers as an effective teaching aid for a variety of fields including computer science and computer engineering;

(5) Outline uses of CLEAR centers for the vital university-industry educational interaction, for university's role in continuing education and for supporting general university-teaching to improve computer science education.

DISTANCE EDUCATION THROUGH MULTI-MEDIA

By Professor Dr.Wichit Srisa-an*

1. INTRODUCTION

A common educational problem of developing countries is the inequality of educational opportunity. This means that only a minority have the chance to study above the legally-required minimum level. The higher up the educational ladder one goes, the fewer the opportunities for further study. While the educational needs of the people grow increasingly greater, the capability of developing countries to meet these needs for higher education remains limited. This is because resources are limited, and these limited resources must be poured into other areas of the country's development. This causes the quantitative and qualitative development of the people in general to be out of harmony with the country's overall development even though, in fact, the quality of human resources is the most important factor in a country's development.

In developing countries, human resource development is of crucial importance. Such development not only increases the quantity of trained manpower in response to national needs, but it also improves the quality of life and work for people generally. As human resources are developed, rising expectations are engendered in the people for further education. But opportunities for education at the highest level are limited because resources are limited. Under these conditions of scarcity, inequality of educational opportunities naturally arises. Such inequality can be erased only by efforts to democratize education. Thus various models and methods must be explored to make higher education truly education for the masses. But it is essential that these approaches be economical and efficient so as not to exceed limited resources.

In the past decade many countries in Asia have extended the range of educational opportunities by adopting the open education system and setting up, for this purpose, higher educational institutions of distance teaching and learning. Pakistan's Allama lqbal Open University, Sri Lanka's Open University, China's Central Broadcasting and TV University, Australia's Deakin University, Japan's University of the Air, Korea's Correspondence University, Indonesia's Terbuka Open University, India's Indira Gandhi National Open University, and Thailand's Sukhothai Thammathirat Open University - all these institutions of distance teaching, despite their individual characteristics, do indeed have one aim in common: to serve the needs of adults seeking to upgrade professional qualifications and/or to acquire a real understanding of the subjects chosen. At present, a large number of countries in the developing world, especially those in Asia, have expressed a great interest in providing higher education through distance teaching systems. It is to be expected that other distance teaching institutions will be established in many countries in the near future.

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In the past, whenever there were extensive educational reforms, the caus ally cited were social changes, academic and technological advances, or e political influences. It is true that the aforementioned items might we been the stimulus or impetus for the educational changes. However, if a profound analysis is made, it will be found that the factor having the gr influence on the changes and serving as an important basis for the use of methods in the field of education has been "the conceptual factor" which istrators and educational personnel have adopted as their guiding princi

One of the concepts which has most influenced the provision of educatio present age is the concept of *lifelong education*, and education is, of co an important factor throughout one's life. It is a process and an activi which concerns people from birth to death. Education according to this must meet the needs of society and of individuals of all ages and catego There must be models and methods of providing education which foster lea for both young people and adults - both formal and non-formal. The conce lifelong education in the past decade has become a firm belief which has fluenced education in various countries throughout the world.

If the concept of *lifelong education* is considered in its social aspect, generally accepted that today's society is a learning society. By this that for a person to adjust successfully and contentedly to a rapidly ch society such as today's, he must ensure that his learning is constantly date. Continuous learning thus facilitates the leading of a successful and a member of society who wants to get ahead must make use of various of education. Modern technology has become an important vehicle in provi lifelong educational activities. In the modern age there is thus a mergi coming together of the learning society and the technological society. social institutions, apart from educational institutions that impart kno to school-age children, have an important role to play in providing vari types of education for young people and adults. The home, church, and types of public and private agencies - including mass media institutions been stimulated to play an ever-increasing role in improving the quality of the people.

Adopting the concept of lifelong education as a principle in providing has resulted not only in the expansion of the scope and manner of such p but also in the development of many new educational methods. Of particu portance has been the establishment of open education using the distance and learning system, which has been expanding rapidly in various countri throughout the world.

In general, the educational systems with which we are familiar usually characterized as "closed education," closed in three senses, namely:

1. Limited student enrolment - that is, the number of students admitted mited to those who can be accommodated in terms of the number of desks, buildings, and supplies. This is because the students must come to stud specifically designated place. Since there is a need to limit the numbe students, this type of educational institution ordinarily looks for a se process which will ensure the number of quality students that it can acc This in turn leads to the condition of limited opportunity, and perhaps effect on the equality of educational opportunities if the selection pro not correct and appropriate.

2. Structural limitations - that is, the process and structure of this educational system is ordinarily fixed fairly rigidly. It is difficult vide learning activities which will satisfy individual needs and allow f vidual expression, and there is very little flexibility and facility in tire educational process.

3. Limitations concerning the learning environment - that is, teaching and learning are ordinarily limited to the classroom or lecture hall. Thus the learning environment is usually limited to the confines of the educational establishment itself, with the relationship between the teacher and students in the classroom being the most important consideration.

Open education featuring a distance teaching and learning system, on the other hand, could be considered "expanded education," in that it seeks to expand educational opportunities fairly and to the greatest extent possible. This alleviates the problem of limitations regarding the process, structure, and learning environment. Instead of using a conventional classroom with a teacher as the center of teaching and learning, open education emphasizes various types of educational media, which result from the application of advanced knowledge or technology to education. The intention is to have the students study to the fullest extent of their own without having to enter a conventional classroom. An important factor in open education at whatever level is *instructional media*, which is one component of educational technology.

In the past, there have been different experimental approaches to open education featuring various types of instructional media - both single media and mixed media. The first well-known approach was correspondence education, in which te teaching materials were sent by mail directly to the student's home. It was believed that printed materials were the most efficient instructional medium. If the materials were well written and organized and appropriate techniques were employed, the student could study by himself with very little or indeed no direct assistance from the teacher. Correspondence education has thus been an important medium for expanding educational circles, extending learning opportunities, and destroying barriers to learning, thereby making open education available to ever greater numbers of students.

With the advent of radio broadcasts, another medium was applied to the field of education. Radio broadcasts were used not only to supplement conventional classroom instruction, but also as a medium in open education as well. Schools or educational institutions of the air were established which broadcast radio lessons directly to the home. In some instances radio broadcasts were used in conjunction with correspondence education; in other cases the broadcasts were used as a single medium of instruction. An important development in the field of instructional media occurred when television was applied to education. Telecasts can be considered a highly effective instructional medium, for there are pictures as well as sound. The subsequent introduction of color TV has further enhanced the effectiveness of this medium in many countries.

Research conducted both within and outside Thailand concerning the effectiveness of different types of media has indicated that each particular medium has its strong and weak points. The exclusive use of one medium is not likely to be completely effective. The use of the traditional classroom with regular interaction between the teacher and students is highly effective but can be used to only a limited degree, and it may not be appropriate for certain age groups. Printed materials, while obviously nothing new, can still be an effective core medium for those who can read and write. Radio and television can effectively spark student interest, but the student must pay very close attention to the programs and tune in on time or the lesson will simply pass him by. Of course, the programs can always be taped for subsequent review at the learning speed of the particular individual, but this can be fairly expensive. Open education at present has thus turned to the use of *mixed* or *multi-media*, instead of the exclusive use of one single medium. That is, printed materials, electronic media such as cassette tapes and video-tapes, and radio and television broadcasts have been combined in a mixed media system, with one medium serving as the core medium and the other media serving as supplementary media. This is done in order to make teaching and learning more effective and interesting. Thus we might say that the use of "multi-media" has been "multi-beneficial" in terms of increasing the prospects and the effectiveness of distance education.

2. DISTANCE TEACHING SYSTEM

Distance teaching means quite simply that the students and teacher are at a distance from one another, with little opportunity for face-to-face contact. They are, however, able to have joint educational activities through the various instructional media geared to facilitate learning on the part of the students. The bulk of this learning arises from self-study, at times and convenient to the students. Distance teaching thus involves the communication of knowledge, attitudes, and skills to learners in such ways as to enable to acquire and extend them into the conduct of their everyday lives. Since communicating the above-mentioned items is the prime objective, this communication must be as efficient and effective as possible within the constraints of resources. In general, the criteria for determining the efficiency and effectiveness of distance teaching involves analyzing the extent to which learners have achieved the learning objectives set by the curriculum or by themselves. Ideally, an effective distance teaching system should ensure that the students find the learning experiences stimulating, interesting, enjoyable, and relevant to their aspirations and lifestyles. Thus the effectiveness of distance education depends to a large extent on the quality of the instructional media and delivery systems.

The selection and development of instructional media appropriate to the conditions of individual societies is thus an important problem. Factors to be considered in media selection include the following:[1]

2.1 Availability

It is essential that the chosen instructional media and delivery systems be technologically practicable; that is, the technology to be used in the individual societies must have been adequately developed, and there must be sufficient manpower to make continued use of the technology.

2.2 Accessibility

The instructional media and the delivery systems to be used must be accessible to both the distance teaching institution and the learners. For example, if television is chosen as an instructional medium, not only must there be appropriate and adequate air time; but also the students must have TV sets capable of picking up the programs.

2.3 Acceptability

The instructional media must be accepted both by the teachers and the students. This concerns the aptitudes and attitudes of both groups with respect to certain types of media. If the teachers or students are not skilled in the use of a particular medium, it is not likely to be very effective.

2.4 Validity

The instructional media must be appropriate for achieving the objectives of learning materials. Care must be taken to choose media which are suitable for the content or subject matter one wishes to convey.

2.5 Economics

The instructional media must not be overly expensive. This will involve considerations of economies of scale and cost effectiveness.

Once development of distance teaching systems is undertaken in various countries based on the criteria just mentioned, there are two major approaches which can be followed, namely:

1. *The Uni-Medium or Single Medium System* - This is the distance teaching system which has long been used in correspondence education. Printed materials will generally be used as the core medium, but this approach can involve the exclusive use of any single medium, such as radio or television broadcasts. The extramural studies programs of various universities in Australia which use printed materials exclusively are a good example of the Single Medium System.

2. *The Multi-Media or Mixed Media System* - This is the distance teaching system developed later, most particularly in the period when electronic media came to be used more widely in the field of education. The multi-media system ordinarily employs one medium as the main or core medium with other media playing a supplementary role in order to bring about a more interactive format. Printed materials or print media are generally used as the core medium, with electronic media such as radio, TV, audiocassettes, videotapes, etc., serving as supplementary media. Most open universities employ the multi-media system and feature printed materials as the core medium. This is true of the Open University in the U.K. and Sukhothai Thammathirat Open University in Thailand.

In fact, the development of instructional media for self-study in the form of mixing printed materials with other media actually accurred on a widespread scale even before the advent of the open universities. One well-known example of the mixed media approach is Linguaphone which developed language lessons combining printed materials with records and, subsequently, tapes to teach language skills. Mixing of just these two media improved the effectiveness of language teaching and enabled students to study on their own. With advances in electronic technology, many different media could be mixed together and used in the transfer of knowledge. This led to an even more effective use of instructional media.

Regarding the media used for distance teaching and learning, a survey conducted by the International Centre for Distance Learning of the United Nations University[2] found that many institutions used several different methods - correspondence, telephone, radio, TV, audio, video, study center, and so on. As correspondence is by far the cheapest method of communicating at a distance, only 27 out of 468 programs do not use correspondence as one of the methods. Of all the distance-learning institutions, 29 percent use only correspondence, particularly in Western Europe and North America.

The results show quite remarkable differences between regions. The telephone is used as a teaching method by more than a quarter of the programs in North America, Western Europe, and Australasia, but is hardly used in Africa, Asia, or South and Central America. Radio and television show a similar picture. Both are used worldwide to roughly the same extent, but whereas the use of radio greatly exceeds that of television in the developing world, television is much more popular than radio in North America. This almost certainly is due to the penetration of the media.

The cost of audio cassettes has fallen dramatically, and they now offer a real alternative to the printed word. Australasia has been quick to recognize this and to use it: no fewer than 70 percent of their programs use audio cassettes. Australasia is also leading the way in the use of video cassettes.

Another striking fact is the very low use made of any technique other than correspondence in Western Europe. This is probably because much of the distance-learning activity is done by conventional institutions which use only the cheapest methods. Thus radio and audio cassettes are the only other methods used widely.

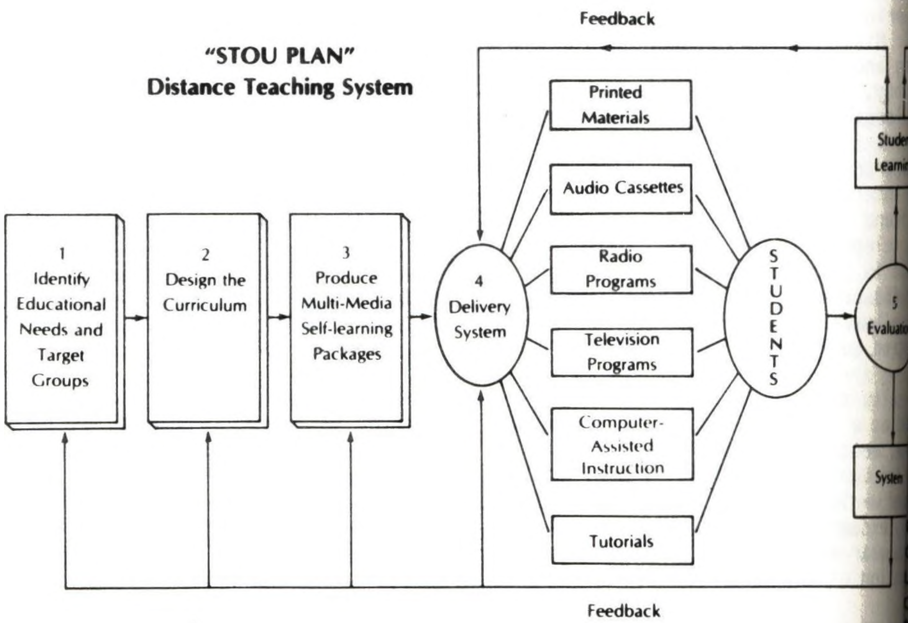
Electronic media today have an increasingly important role in distance te
learning systems, especially those media which permit the development of i
active potentiality and allow students convenient control over their use.

The media which have attracted special attention in this respect are compu
and, in particular, their application in Computer-Assisted Instruction (CA

In distance teaching/learning systems employing a multi-media approach, CA
therefore, one important medium that can contribute significantly to enhan
the effectiveness of distance education.

Since I myself have direct experience with the development of a distance t
system which uses the mixed media approach and features printed materials
core medium, I will emphasize this approach in my paper. It could be vie
one model of the use of printed materials in distance education.

The distance teaching system which I will present as a case study is the
developed at Sukhothai Thammathirat Open University in Thailand. It is a
of the development of a distance teaching system employing a mixed-media
suitable for the conditions of a developing country. The "STOU PLAN"[3] for
tance Teaching System, which is composed of 5 stages, can be concisely il
trated in the following chart.



The first stage in the development of the distance teaching system invol
tifying the educational needs of the target groups through perliminary s
and research. This enables us to know the needs of the general public a
as various individual groups. This information can then be used as a bas
the development of the following stage.

The second stage is curriculum development, and the structure of the curriculum must be set up in such a way that it facilitates the use of distance teaching techniques. The academic structure in the "STOU PLAN" is based on the principle of course integration. That is, an attempt is made to integrate different academic areas into specific groupings or categories which will facilitate the student's ability to synthesize and apply the knowledge acquired and which will be easy to study on one's own. Course integration is thus primarily of an interdisciplinary nature. The establishment of the different schools has been carried out along the lines of career and professional development rather than being discipline-oriented in order to conform to the principle of course integration just mentioned. The curriculum is thus divided into "course blocks," each of which carries 6 semester credits. Four-year bachelor's degree programs are composed of 22-24 course blocks or 132 to 144 semester credits. The reason that the "STOU PLAN" has set up the 6-credit course block exclusively rather than subdivide into smaller courses is based on two major principles, namely:

1. *Academic principle* - Setting up the course blocks in the manner just described facilitates course integration; that is, it makes it easier to integrate course content in an interdisciplinary fashion more completely than would be the case if smaller, less-encompassing courses were used. In terms of learning, this approach is appropriate for the distance education system since it enables the students to concentrate rather than diffuse their study efforts; for in any one semester, they will not have to study more than three blocks. The use of the course blocks allows us to oversee the standards and quality of the teaching/learning process to a fairly high degree. This is because the production and development of the course blocks is done by a course-production team. Academic standards are thus the responsibility of a group of academics rather than of individual instructors. Aside from this, the use of course blocks also facilitates the establishment of such supplementary media as radio, television, and special tutorial sessions. Particulary when there is a limited amount of time, it is easier to produce interesting programs related to the course blocks than would be the case if numerous smaller courses were used. When the curriculum structure featuring this block system is considered solely from the academic viewpoint, four positive aspects can be identified, namely:

1) It facilitates academic integration;
2) It facilitates self-study;
3) It improves the oversight of academic quality and standards; and
4) It facilitates the use of supplementary media in systems based primarily on printed materials.

2. *Administrative principle* - The use of the course-block system reduces the complexity of administration, making it more economical and efficient. Students are able easily to control their own study load, and the system is convenient with respect to registration, testing, and teaching. Students are able to register by mail, and examinations can be given in every province in the country in a single weekend. In addition, the course-block system helps avoid "academic monopoly" in which a single instructor is the sole authority on a particular subject. This is due to the fact that the course block has far more content and activities than could be produced by a single instructor on his own with a substantial teaching load. The course-block system also helps bring about an integrated approach to work, for the system demands that work be carried out as a team in the form of a course-production group. Each team has content specialists, an educational technologist, and an evaluation specialist who are jointly responsible for all phases of course production. This naturally results in integrated instructional materials and ensures that the educational system will be fully open, for it provides the opportunity for numerous specialists from outside institutions to participate in the development of the materials. The excellence which exists in society is thereby utilized to the fullest extent. An additional benefit is that this working together as an academic team helps bring about a spirit of teamwork in administrative work as well, a great advantage for the

overall administration of the University.

The third stage involves selecting and producing the teaching media packages The "STOU PLAN" was chosen to make use of a mixed-media approach based on th five following criteria: availability, accessibility, acceptability, validit and economics. Printed materials are the main or core medium, and tapes, ra and television programs, and special tutorial sessions are the supplementary media. For each course block, the student is expected to spend approximatel 180 hours per semester studying the printed materials. (This amounts to rou 12 hours per week for 15 weeks). He also listens to at least one 60-minute (For some course blocks, such as the English courses, the student will liste as many as 15 tapes.), listens to fifteen 20-minute radio programs, and view five 30-minute television programs. He also has the opportunity to attend 1 hours of special tutorials held in local study centers located in each provi In producing teaching media packages according to the "STOU PLAN," the first is the production of the printed texts and workbooks. Then selected portion the text are used as the basis for tapes, radio and TV shows, and tutorial-s sion work workbooks. These latter media are considered as supplements to th printed materials - the core medium. The completed teaching package is thus the form of a multi-media self-learning package.

The fourth stage involves establishing delivery systems in order to communic knowledge to the students. The printed materials and accompanying tapes are sent by mail to the student's home, and radio and TV shows are aired at the time throughout the country. The tutorial sessions are held on weekends in study centers located in each province. CAI programs are provided at select study centers and function as "electronic tutors" for such courses as scienc mathematics, and statistics. The distance education system established acco to the "STOU PLAN" is thus in the nature of home-based education.

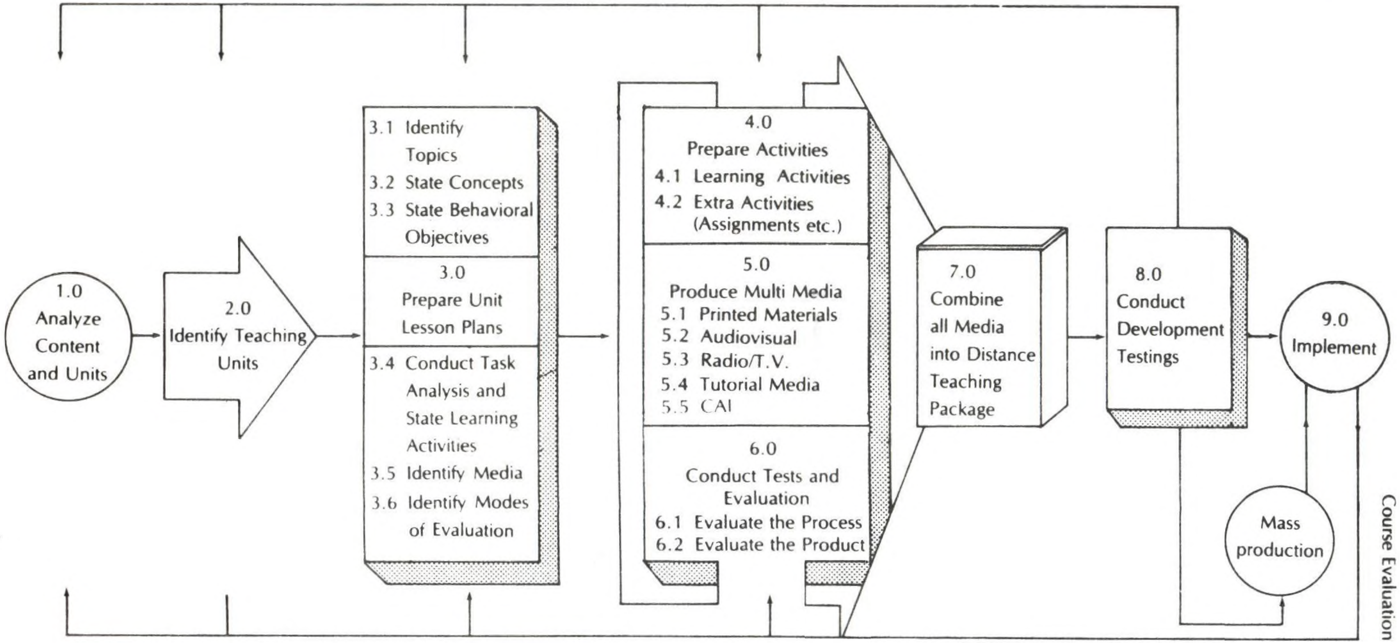
The fifth stage is composed of evaluation and follow-up, which is of two typ The first is evaluation of student learning by final examinations held each mester in the local study centers. A student must sit for the exam in the s center to which he has been assigned, and the exams are held at the same tim throughout the country, ordinarily on weekends. The second type of evaluati is system evaluation, which is conducted in order to obtain feedback that ca used to improve the effectiveness of the curriculum and the teaching/learnin process.

3. THE PRODUCTION AND USE OF PRINTED MATERIALS

In distance teaching systems using mixed media with printed materials as the medium such as in the "STOU PLAN," the production of these materials is an im portant process and activity of the Distance Media Production System. This s tem can be graphically illustrated in the chart on page 20.

The production of printed materials for use in distance teaching can be carri out in various ways; for example, these materials might be in the form of con ventional textbooks or lecture notes. The effectiveness of the printed mater in terms of helping the student to study on his own depends largely on the fo and the way in which the content is presented. Special efforts were thus ma to develop a format suitable for printed materials which were to be used spe fically in distance teaching. One format in widespread use in distance edu- cation is the programed textbook, which is adapted from programed instructio The production of this type of printed material aims at making the student a active learner. Thus materials of an interactive nature must be produced, an these include both a programed text as well as an accompanying workbook. St dents who use this type of printed material will master the content in small crements, in accord with their study time. They must complete various acti ities or exercises as part of learning the content of each unit, and they wi

DISTANCE MEDIA PRODUCTION SYSTEM



receive periodic feedback to indicate the extent of the progress in their dies. Thus they experience a series of successes in their self-study, and encourages them to progress further in their quest for knowledge.

In the block system of the "STOU PLAN" every block carries 6 semester credi Each of these blocks has a programed text and a workbook which are divided 15 units, each of which requires approximately 12 hours of study time per Each unit begins with a unit lesson plan which spells out clearly the topic concepts, objectives, activities, and evaluation methods for the unit. The follows the presentation of the actual content, which is broken down into tions. In each section there are activities which the student must do in workbook, and in each unit there is a pre-test and a post-test complete wi answer keys in order to give the student feedback.

From STOU's experience in developing these programes texts for use in the versity's distance teaching system, it appears that they have been quite ful and have accomplished their purpose. The methods of writing these tex obviously more complex than that used for writing ordinary texts. However course writers are adequately trained before they commence their work, the academics from various fields can accomplish their task without undue diff

4. CONCLUSION

In the development of distance teaching/learning systems employing a multi approach, the most important consideration concerns the blending or harmon of such media to permit distance education to become even more effective.

From the author's experience, the harmonizing of the print medium and the tronic media is of primary importance. The results of experiments conduct Sukhothai Thammathirat Open University to date serve to confirm that the b of printed materials and computer-aided instruction is a most interesting lopment, which promises to bring real benefits; and, if this process were extended and practised more widely, it would enhance considerably the effe ness of distance education. Ultimately, on the basis of such information, conceivable that distance teaching will, more and more, come to rely on co as the main instructional medium in the emerging Computer-Based Education

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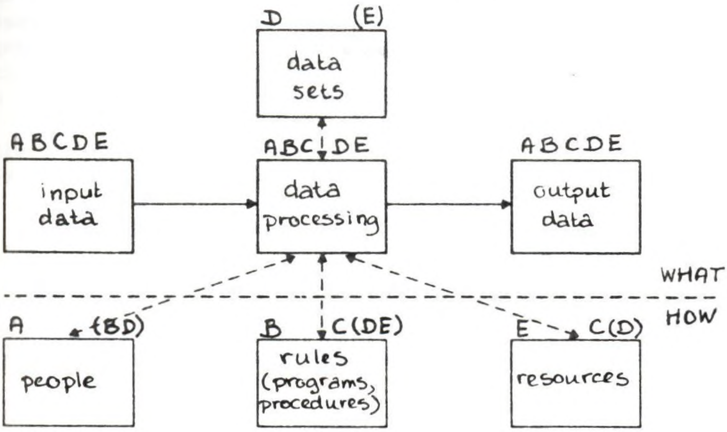
A university level introductory tele-course on informatics

(Fred Mulder, Open University, Heerlen, The Netherlands)

At the Dutch Open University different fields of study are offered to students through courses or packages of courses. One of those fields is informatics, which not only is important in its own right but also for studies in other subjects such as engineering , natural sciences, economics or business administration as well as in social sciences, law or arts.
Because of this broad base of importance, a course has been developed which gives a broad introduction into informatics for students with quite different backgrounds and interests.

'Introduction to Informatics' is a 'tele-course', a course which can be studied at a distance from the central university institute. The course requires approximately 200 hours of study and consists of extensive printed self-study material (± 1200 pages), three video productions (in total ± 2 hours) and four computer practicals (in total ± 25 hours).

The separate components which can be distinguished in informatics are linked in the course and elaborated coherently in five different blocks (A-E); see the figure below.



The starter is the A-block which, on the basis of rather simple cases, deals with the general concepts of data processing and information systems (with some attention to design aspects). Another important subject in this block is the role of information technology in society.
The B-block offers an elementary but fundamental approach to algorithm design as a first step towards program construction. Program Structure or Nassi-Shneiderman (NS)-Diagrams (using a simple pseudocode) serve as an important visualization tool in the process of learning the basics of structured programming.

The so important role for data types in the design of algorithms, which NS-diagrams completely ignore, is covered by adding data type tables to these diagrams. By filling out what we call state tables, students can systematically trace algorithms, thereby learning to appreciate why algorithms do or don't work the way you want them to.
After completing this (theoretical) block and having received a specific problem the student can implement the algorithm to be designed for the problem as a Pascal program on a computer, according to a simple set of transformation rules. This is done in the C-block in three computer practicals which can be done in the regional study centers on IBM-PC's. In a short practical the student can get acquainted, in part through Computer Assisted Learning (CAL), with the IBM-PC and its operating system (PC-DOS). A second short practical is concerned with the Pascal compiler (Turbo). In by far the longest practical, the student finally codes, tests and executes his or her own Pascal program.
In the D-block the structuring of large sets of data is the key issue. In a step-by-step picture-oriented approach the student discovers normalization as a powerful and elegant procedure for structuring data at the conceptual (or logical) level. Relations between objects (entities) are visualized by Data Structure Diagrams. The basic operations for manipulating data are introduced and exercised, first at the conceptual level and, derived from this, in a practical session with an IBM-PC. In this (fourth) computer practical each student performs predefined queries on a rather simple set of files using the query language of dBASE. This is preceded by a theoretical treatment of the database concept and a short explanation of the relational data model.
The last block, the E-block, is a technical one, dealing with distinguishable levels in computer architecture, software versus hardware, operating systems, data transmission and data communication networks. In this block the history of the technical development of computers is also handled.

The video productions are well-suited for such an introductory course and are aimed at helping the student to appreciate such abstract concepts as algorithms and data structures or models in a compact but adequate way.
Throughout the course a considerable number of activity oriented questions and self tests with comprehensive feedback help the student to actively study the material and continually assess his or her achievements.

The course is a tele-course which however does not imply that (in its present state) students can completely confine themselves to working at home. The computer practicals and video productions must be done in nearby study centers. Students can also make use of personal tutoring in a study center in the case of specific questions or problems. This is primarily the case in the C-block where each student has to design his or her own algorithm and implement the corresponding Pascal program.

Furthermore quite often group meetings are organized for examination training, while the final examination itself to date takes place three times a year in the study center places. Of all these activities it is clearly the computer practicals which are candidate for home-work as well. Actually an increasing number of students is already doing the practicals on their own homecomputers.

In a research project called 'Tele-education' the Open University is investigating the possibilities of a more extensive use of homecomputers (not only for computer practicals!) along with network facilities (see the congress paper by Boon/De Wolf). This may have far-reaching consequences, not only for the organization of the learning process (computer based tutoring, computer based self-assessments, computer based examinations, and so on), but also for the choice of the didactic concept for the course. For example, it is then possible to give serious consideration to an integration of theory and practice of programming (the B- and C-blocks of the course) instead of the rather strict separation of the two which has been explicitly chosen for in the present course.
Time will tell........

I. BASES AND CONTENTS

I.1 FUNDAMENTAL VERIFIED IDEAS

The X 2000 Foundation has the responsibility of running and managing the network of X 2000 Resource Centres.

Today, X 2000 counts 140 Centres spread nationwide, thus forming a unique network for training in computers and experimentation in their latest applications.

The underlying thinking behind X 2000 has thus been proved valid: favouring local initiatives and bringing together multiple partners to create Resource Centres in micro-computing and telematics, linked into a single network, thanks to the structuring effect of a "Foundation".

The X 2000 Resource Centres today fulfill a role in the computer field that in certain ways has been compared to that played by municipal conservatories in the area of music: acquisition of a cultural experience, initiation into applications, training in a technique.

The X 2000 Centres however are very distinct from purely municipal services, in that they are based on the central notion of multi-partnership, upon the blending of various yet converging desires of key figures in local development. Furthermore, the X 2000 Centres are dedicated to auto-financing and are thus securely anchored in the reality of economic life.

We could sum up the nature of the X 2000 Centres by listing the following specific strengths:

- <u>The creation of major Resource Centres</u> with autonomous means (in terms of staff, equipment, premises) thus making them different from the structure of "micro-clubs" and allowing for trai and experimentation in computer use.

- <u>Multipartnership</u>, not simply to gather together these means, but rather as a philosophy vital to life of these newly created Centres (rooted in an participating in their local development) that ca only spring from local initiative.

- <u>The liaison between these Resource Centres</u> that i the task of the X 2000 Foundation, so as to build a <u>true network</u> and full sharing of experience, know-how and knowledge.

- The objective of <u>promoting and broadening compute culture to a wide range of consumers</u> (well beyond that of computer fan clubs): an unusual objective which stands out both from that of professional training bodies and from that of various socio-cultural animation institutions: an objecti which however presupposes a seeking out of synerg with these organisations and institutions.

- <u>An action programme</u> of the X 2000 Centres keyed t two basic poles:

  . training in computer use
  . experimentation in the new <u>applications</u> of computers.

Over the last few months, the spread, the strong basis and t involvement in local development of the X 2000 project has gone from strength to strength. The Regional Councils of si French regions have entered into agreements for the opening of Centres. Three of these regional agreements were signed end 1985: Provence-Alpes-Côte d'Azur, Picardie and Franche Comté. Three further agreements were signed in 1986 with

Languedoc-Roussillon, Aquitaine and the Hérault department; several further agreements are currently under negotiation with other local collectivities. These agreements provide that such collectivities give significant support to the endeavours of the X 2000 Foundation to provide the Centres with appropriate equipment and to aid the creation of new Resource Centres.

I.2 THE CONTENT OF THE X2000 CENTERS

It is clear to any outside observer that one of the key characteristics of the X 2000 project is the promotion of computer knowledge and practice. Being neither training centres, nor "Maisons des Jeunes et de la Culture" (Youth Cultural Centres), the X 2000 Centres can proclaim even more their ultimate aim. Then, if this aim were based above all on the cultural appropriation of computer science, what is to be understood, what content is to be given to the objective?

The answer to this question seems to be moulded around the concept of innovation. For the X 2000 Centres, the diffusion of computer knowledge could be above all:

- an initiation into new products and applications using computers (social or technological innovations);

- research and use for this initiation of innovative educational methods (self-teaching, C.A.L.);

- experimentation and when required production and promotion of software and teaching software that innovate or meet specific local needs.

Today, the services of X 2000 Centres are called upon both by

- company workers' committees which wish to go beyond the simple framework of socio-cultural animation and to offer their members proper training for half professional/half personal ends;

- by companies themselves who feel the need to train all their staff in computer knowledge and no longer just train the "accounts department" in "accountancy applications" or the "personnel department" in "pay-personnel management applications", etc.).

It is well worth pointing out this convergence of requirements not only because it is unusual (in France, perhaps it has never existed) but because it bears evidence to the usefulness and targeting of the X 2000 Centres. Today, they are virtually alone in providing the twin desire expressed. The ability to satisfy a need is vital to the current development of the X 2000 Centres.

The convergence of requests sent to the X 2000 Centres can be explained by the vast range of areas covered. The X 2000 Centres make their services available to everyone - but with order and method.

Their area covers four key points:

- initiation, training,
- awareness, animation
- experimentation, creation, research
- advice and service.

Initiation - training

As we have seen, the founding of X 2000 Centres is based on training and initiation. The range covered by these activities is in itself vast - going from the most basic initiation to advanced, lengthy training leading to qualification. The main axis is generally semi-personal/semi professional. However, there seems to be an increasing trend towards more professional training. This is why it is best to keep up frequent contacts with the various training/teaching institutions (engineers, architects, farmers, municipal employees, trainers).

Awareness - animation

Awareness and animation often break into a training proposal by themselves. This can mean multiple training and demonstration meetings, animations during school hours or after school, operations in the most varied of contexts, all with the aim of making computers more understandable and conveying their magic. It means participating in numerous colloquiums, day sessions, week sessions, salons, shows, or even the organisation of "summer universities". It means cultural exchanges with certain foreign countries. It also means activities largely drawn from those of the end-users clubs.

Experimentation - creation

In the area of experimentations and creations, the main axis of the X 2000 Centre's activity is also keyed to the educational field: production of educational products, C.A.L. software, teaching programmes, etc. However, research and production of management programmes are present in certain X 2000 Centres, along with the creation of software programmes and system maquettes run by computer.

Advice and service

Advice and service are still unequally spread among the X 2000 Centres. Yet this promising function takes many shapes:

- advice in the choice of programmes, programme adaptation and test programmes
- telematics services
- light maintenance of hardware.

As in this area we are as yet unable to give a fully accurate count, it is worth noting the creation of data-banks by numerous X 2000 Centres:

- banks
- software libraries, teaching libraries
- building up of product assets (rental of teaching software and educational material: robots, automat
- building up of image banks.

II. DEVELOPMENTS

II.1 TOWARDS A REFOCUSSING OF ACTION:

The rang of activity covered by the X2000 centers many seem from what you will have read so far to be vast.

Yet in most of the X2000 centers, there is a clear recentering of their activity.

Two major axes emerge:
- training in well tried uses of the computer,
- Experiments of new applications of computer technology.

This brief résumé may of course seem over simplified. It's underlying plassification in currently being discussed within the X2000 network. Therefore it is well worthwhile explaining in the clearest of terms what is meant by training and experimenting for computer users.

The X 2000 Centres' experimentations have been widely published. They are technological (educational robotics, memory card, graphic and musical creation, etc.), social (applications for the handicapped, the illiterate, jobs for the young, reintegration of ex-prisoners, etc.), cultural (often linked to animation activities) or local (use of telematics micros, creation of programmes for farmers, shopkeepers, craftsmen, etc.).

The training proposal of the X 2000 Network was also recently featured by "Centre Inffo" the french official organism for information about training. The X 2000 Centres' aim is to reach every kind of target group. Some will be playing a significant role in jobs for the young, in particular regarding qualification for the 16-25 year olds. Keenly attentive to the requirements of their environment, the X 2000 Centres frequently give their favourable reply to requests for specific or "à la carte" training requests. The training programme proposed thus ranges from introduction and general initiation to lengthy "qualifying" professional training, corresponding to the needs of specific professions or businesses. It includes an overall initiation to computers (basic notions, languages, systems, programming) and training in office automation (word processing, tabling, file control) and integrated software programmes (Framework, Open Access, Excel, etc.). This training offer is also increasingly geared towards computer applications by sector (accounting, craftsmanship, agriculture) but also towards electronics and maintenance, educational robotics, computer assisted learning (C.A.L.) telematics, etc.

When X 2000 was created, the main concern was to broadcast widely as possible basic information about computers. The tactic adopted was that of short sessions, proposals of ho of initiation based on general notions of programming, algorithmics, language (BASIC).

Consumer demand seemed substantial: the general public cro round the doors of the Centres then open, drawn by true curiosity, sometimes tinged with uneasiness.

The X 2000 Centres programmed their activities to meet th demand, organising initiation into computers as a leisure activity, drawing on the experience of socio-cultural animation.

The partners active in the creation of the X 2000 Centres, convinced of its social and cultural appeal, agreed to fi a large part of the activities.

Today, demand has changed. There are no longer queues at doors of the X 2000 Centres for initiation: it would seem the media, computer equipment in schools, computerisation offices, along with the Resource Centres, workshops and cl have played a vital role in this initiation.

The X 2000 Centres have reacted: they operate far less in initiation, but rather downstream from the workshops and which continue to fulfill this need.

Prime social demand has moved towards a need for training, following the acceleration of computerisation in places of work.

In particular, a large majority of X 2000 Centres organise training sessions aimed at helping the young to ease into new social and professional context of inevitable technolo development.

To adapt oneself better to the evolution of demand naturally calls for a new organisation, a broadening of abilities, a project that asserts fuller professionalism.

The X 2000 Centres are thus faced with the necessary professionalisation of their approach.

The initiation sessions gradually phase out in favour of true training sessions organised as such, sold as such to individuals (at their expense or out of the 1% company training tax) or to any other interested organisation or company.
The X 2000 Foundation seeks to conclude outline agreements with national institutions faced with initiation and training needs for professions or specific economic agents.

The significant example of the X 2000 Foundation's approach is given by the agreement signed on December 4, 1985 with the Architecture Department of the french Ministry in charge of Town Planning. This ministerial department is confronted with the inevitable evolution of the architect's profession which has to absorb major technological advances, such as in particular computer-aided conception (CAC) and computer-aided design (CAD). The Architecture Department has judged that the X 2000 network could be a precious aid for initiation into these new applications, based on the equipment owned by the Centres, their abilities and (not the least important factor) the possibilities of self-training they can offer, allowing the continuation and extension of training sessions by trainees using the computer equipment themselves. The X 2000 Centres furthermore mean such training can lead to "experimentation" so that former trainees, following on from their training, move towards the creation and production of experimental applications.

While the X 2000 Foundation thus intends to favour training for professional purposes, it does not neglect training for cultural and social purposes. In January 1986, it signed an agreement with the Delegation for Professional Training to set up a training scheme of computer animations. This agreement stipulated that the X 2000 Foundation confer the overseeing of this long training session to the IFACE (Institut de Formation de la Chambre de Commerce et d'Industrie de Paris) in collaboration with three X 2000 Centres.

The initial session has been running since April to terminat in October 1986. The X 2000 Foundation offered to these apprentice computer animators, during the summer of 1986, a practical training session in various municipal services in the Paris area.

In this way, the X 2000 network meets a major need, expresse in particular by numerous municipalities - that of specialisation of agents in computer animation.

In this context of municipal needs, it should be noted that the X 2000 network, in conjunction with the Centres for Municipal Staff Training (CMST) has initiated several hundre of civil servants into computer use and office automation (a one example the X 2000 Centre in Aix-en-Provence alone has trained, to date, over 300 municipal employees).

II.3 TOWARDS A NEW INSTITUTIONAL POSITIONING

There has been a clear evolution in the positioning of the X 2000 Centres.

The X 2000 Centres were initially created as centres of animation of computer skills. Hence the highly socio-cultu orientation and priority given to animation in certain Cent today. Yet it must be noted that this orientation is not t of the majority of X 2000 Centres. The X 2000 Foundation itself is seeking to reinforce the professional and economi vocation of its Centres rather than encouraging them to position themselves in competition with the municipal socio-cultural services. The reasons for this orientation have nothing to do with ideology. After all, certain X 200 Centres could pride themselves on having been named "comput culture centres" by their institutional environment. Before coming across the X 2000 idea, we ourselves, some years ago had wished to propose the term "municipal computer conserva to denote the para-municipal bodies which, like the music o ballet conservatories, offered the cultural practice that cannot be drawn directly from the theoretical teaching affo by the State.

wever the X 2000 project goes beyond a purely municipal
vision as numerous proponents or opponents of local
stitutions have well understood. X 2000 is based on the
ntral notion of multi-partnerships, on the meeting of wills,
rious yet convergent, of the key actors in local
velopment. X 2000 makes it possible to have the local
cision makers in the centre of a group. X 2000 projects
uld hardly be conceivable without the active participation
f local collectivities. They could not be the fruit of just
e cultural, educational, association, municipal, trade
ionist or consular partner. Thanks to the blend of all
ese various partners, many of the X 2000 Centres today are
ll entrenched in the economy. The majority today are
sentially Centres for training and experimentation into the
st recent computer applications.

4.

Courseware

TELESOFTWARE - THE SIMPLE WAY

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. INTRODUCTION

lesoftware is a method of forwarding computer programs or data home computer owners via the broadcast television channels, thout affecting in any way either the tv programs or the tele-xt service. Originally the vertical blanking interval was used r data signal transmission and to get access to these data, the levision receiver must have a dedicated interface unit through ich it is possible to download the programs or data to the at-ched home computers. Somewhat less elegant, but much cheaper thod has been developed and tested at the Budapest Technical iversity. In this new procedure the sound channel of the tv twork is used to transmit the audio-band data signals, while the sion channel and the teletext service is uneffected. This method telesoftwaring does not need any kind of special equipment and uld be used in tv programs directed for computer fans or hobby-ts, for whom a temporary fall-out of the sound channel makes no oblem at all.

TELESOFTWARE THROUGH THE TELETEXT CHANNEL

e rocketspeed growth of the home computer market is putting a ld-wide demand on software houses for all kind of computer grams. The ususal way of distributing software is by means magnetic tapes (cassettes) and floppy discs sold by retailers.

ere are quite a lot of mainly educational, tutorial programs, wever, which are published in the literature practically free charge. To make use of such information the computer fan must -in the data byte-by-byte, which procedure can be very tiring also time consuming. To help this situation a new service, lled telesoftware was introduced in certain countries in Europe, ere an advanced teletext service has already been established. ing the same techniques as the teletext data transmission, the puter data are broadcast by the tv transmitters for those re-vers, which are equiped with dedicated hardware to extract the ta from the television signal. This extracted data thus becomes ilable for the home computer enthusiast in such a way, that ither the tv porgrams, nor the teletext service is disturbed. fact, since a complete computer program can thus be downloaded thin minutes, the procedure can be cyclicly repeated over and r again, providing a long time-slot (e.g. a whole afternoon evening) for anybody to join in and pick up the broadcast gram at any desired time. To establish such a telesoftware vice involves sophisticated electronics at the transmitting and - as mentioned already - a specially designed interface in the tv receivers, something similar to a teletext decoder.

3. TELESOFTWARE THROUGH THE SOUND CHANNEL

By sacrificing the television sound channel - only for the peri of the downloading of a computer program - it is possible to a-chieve telesoftware without additional hardware in the receiver. Of course the fall-out of the sound channel rules out the possi bility to transmit data at any time: this can be done exclusivl during such tv programs as school-television or tv-teaching of computer programing, where the viewers will no doubt tolerate t non-standard use of the sound channel. It should be noted, howe that a similar method on a radio-sound-transmitter would not be feasible, because the average radio listener must never be dis-turbed by the irritating sound of the data signal. With televisi on the other hand it is possible to give a warning on the scree for viewers, and explain in writing the reason for the unusual sounds coming from the loudspeaker. Furthermore, the visual dis-play can obviously be used for detailed information of what is be done by the computer owners, what is the title of the softwa just being transmitted, etc.

To carry out a complete computer program downloading the follow steps should be taken:

a/ At the transmitting end - preferably in the tv studio - the previously selected home computer should be loaded with the program (or data) to be broadcast.

b/ The audio output of the computer, which normally is connected to the recording input of a tape recorder, is to be connected through an appropriate voltage devider to the audio modulatio input of the television transmitters. The voltage devider is chosen such, that the data signal drives the sound transmitte with appr. 50% average modulation level (25 kHz peak frequen deviation)

c/ The viewers should be advised to connect their taperecorders t the audio output socket of their television receiver, and pre pare for a program recording.

d/ An announcement is now to be made for the viewers asking the to mute their tv receivers, preferably the same text simmul-taneously being sent on the vision channel to be displayed on the tv screens.

e/ The viewers, who would like to take over the software should now be prompted visually to start their tape recorders for a complete recording.

f/ When the downloading of the software is finished, this should be indicated visually on the tv screens, promting the viewers to stop their taperecorders.

g/ inally a visual indication should be given to the viewers ad-vising them to disable the muting of the sound channels by setting the volume control back to normal.

PRACTICAL CONSIDERATIONS

By following each step as outlined above at the end there will be a tape with the software recorded on it exactly the same way, as if it had been saved conventionally form a computer. The recording is ready for use, it can be loaded into the computer, may be edited, saved again, etc.

A few explenatory remarks seem to be appropiate at this point. First it may be questioned why a tape-recording was made instead of the direct loading of the home computers with the telesoftware? The reason is very simple: most home (hobby) computers need a relativly high signal level (appr. 1 ~ 3 V) for loading, which is not readily available at the audio output socket of the tv receiver. To avoid the use of an amplifier it is best to use the low signal level for tape-recording, not speaking of the inherent advantage of having the possibility of repetitions in case of subsequent "tape loading errors".

An other problem might be the non-standard type of tape-recorders used with some computers (e.g. Commodore 64, ABC-80). Obviously if a specific software is downloaded, then it must be destined for a certain type of computer, different computers are usually not compatible at this level even if they are (more or less) software-compatible with each other. So if a specific type of computer uses a special type of tape recorder, then naturally this should be used for making the recording, as well as for the playback.

Finally an advice for those hobbyists, who prefer to file and archive their computer programs. The software arriving through the sound channel is more or less distorted, and it may be desirable to refresh this recording. This can be done easily by loading and then re-saving the program using the conventional computer routines.

CONLUSIONS

Several experiments have been carried out at the Budapest Technical University to test the feasability of such a telesoftware method, which uses the sound channel of the television network for data transmission. Different home computers were tested and life-like situations were created and simulated. The results have shown that the temporary loss of the sound channel was not disturbing for the viewers taking part in the tests, and the sound channel proved to be quite adequate for data transmission. The resulting error-rate turned out to be negligably low, and even non-skilled persons could follow the steps to get new programs for their computers. All these advanteges fully compensate for the temporary loss of the sound channel and the low cost of the realization makes the method very attractive.

AUTOOL - AN AUTHORING SYSTEM FOR VIDEOTEX

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1. INTRODUCTION

Among the many applications which are available for Personal Computers are systems for the creation of software for learning purposes, so-called authoring systems. The increasing capabilities of PC's such as high resolution color graphics and fast processors available at a moderate price make these applications feasible. We describe AUTOOL, an authoring system which has been developed for MUPID, the Austrian Videotex Decoder. MUPID can also be used as a home computer and hence can execute programs which are distributed via Videotex (Telesoftware). AUTOOL enables a teacher to write lessons on any topic without any programming knowledge, using text, color graphics and animation as well as questions to test the student's understanding of the material. For special purposes it is also possible to incorporate video and Basic programs. AUTOOL is based on the famous PLATO system of Control Data and uses a menu-driven editor for the writing and editing of lessons. Lessons created in this way can be distributed either via discettes, Videotex, or local networks such as CONNEX [3]. Not only does this way of distribution offer cheap education to a large audience, but it also guarantees an up-to-date standard of the lessons. Chapter 2 describes the development of AUTOOL and chapter 3 how lessons are edited using AUTOOL. The student's view of a lesson is presented in chapter 4. The following chapter deals with the Videotex aspects of the authoring system. In chapter 6 some conclusions are drawn and improvements that will be made are summarized.

2. COMPUTER AIDED INSTRUCTION

The age of computer aided instruction (CAI) started with Skinner's work on "The Science of Learning and the Art of Teaching" [12]. There was one main reason for introducing computers into the field of education: making education cheaper. Previously, there had been several applications of computers where they had proved successful in reducing costs. In the early sixties, various different projects were started. Some of the projects only intended to create courses on various topics such as physics, mathematics or foreign languages. Other projects like TICCIT tried to investigate whether it is possible to split teaching strategies and lesson content. One of the biggest projects - PLATO - , which started at the University of Urbana, Illinois, developed different models for different purposes such as drill & practice or simulation including graphics. Numerous other projects were started, some of which survived, while others failed. A description of the major projects and the different ways of using computers for teaching is given in [6].

All in all we can conclude that most of the expectations could not be fulfilled for simple reasons. One of them were the high hardware costs. The PLATO system e.g. was running on a mainframe servicing several hundreds of terminals, and only big compani the army could afford to buy such a system. And even if the ware was only rented, a student contact hour cost about 13 do [11]. Another reason was the limited abilities of the termi Only a very few terminals could display graphics in va colours. Consequently, it was necessary to look for other niques to facilitate the use of graphics. One of the succe approaches was an experiment using a flat plasma displa guaranteed a flicker free high resolution image and was abl superimpose slides and computer generated output [1].

Another important aspect of CAI is the way in which lessons created. There are two quite different approaches: one is t programming languages that may be dedicated to authoring purp the other is to use authoring systems [8]. Both have their a tages and disadvantages, but for most purposes programming systems seem to be better suited. First of all, the author lesson does not have to learn a programming language which i most cases rather hard, but just how to work with an editor this way, a programmer becomes superfluous, and the person knows all about the content of the lesson as well as the teaching strategy can create the lesson. Secondly, the autho immediately see what he has created, without any transla since all editing takes place onscreen and with easily manipu objects. Furthermore, already existing lessons can be e modified by others, not just by the author of the lesson, wh changing a lesson written by means of a programming language be a rather complicated process. Of course there will be situations, where a programming free authoring system essential capabilities (e.g. in simulations), but a good auth systems should allow the incorporation of programms.

Almost all of the drawbacks that prevented a wide acceptance CAI in its early days have been overcome today. Hardware have been dramatically reduced, whereas the performance eve small systems has increased. There are high resolution colour plays available at a moderate price. Even personal computers some hundreds kBytes of memory, which is enough for stori whole lesson. In conclusion, we believe that there is nothi prevent an extensive use of computers for teaching purposes a are together with others convinced that the computer will b an important delivery system for education within a few years

In 1983 a project was started at the Institutes for Inform Processing at the Technical University of Graz. Its aim wa adapt existing TLM lessons for the Austrian Videotex System. is the Tutorial Lesson Model, one of several models of the system of Control Data. TLM is a frame-based lesson model uses text and graphics with few colours, question/answer dial and learner controlled branches to present tutorial knowledge any topic. The institutes developed a software package executing TLM lessons on MUPID, which is the Austrian Vid decoder, built to the specifications of the CEPT standard wit ability of displaying text and graphics. With its 64K of user and a discette station it also can be used as a personal com [5].

Because the original hardware for TLM lessons had fewer capa ities than MUPID, soon the idea was born to write an editor generating lessons on MUPID. The first improvements that achieved with AUTOOL, as the editor was named, was the avail ity of more colours and graphic objects than before. Further the answer analysis was improved, and it was made possibl incorporate Videotex pages into lessons and to call Basic gramms. The structure of answers has been enriched, and there pound graphic objects available. The key ideas of the TLM itor have been kept: it is a programming free system based on a -driven editor which is easy both to learn and use [4].

EDITING A LESSON

. Frames

OOL is a frame-oriented authoring system. There are several fferent types of frames. The standard frame is called "normal me". Its purpose is to show tutorial facts using text and phics. There are 24 lines of text and 40 columns for text and a arate line which is used by the system for displaying messages the student. The resolution of graphics is 320x240 pixels in 16 ours. Each normal frame has branches to two other frames, a decessor and a successor. These branches are set by the author the frame is edited. During execution of a lesson the learner choose which of these frames he wants to see next by pressing ey.

frame containing at least one question is called a "question me". As soon as the author defines a question within a frame, editor automatically changes the type of the frame to a ques- frame. A question frame has one predecessor, which the rner can reach if he wishes, and two successors (which may cide). The successors correspond to the correct and incorrect ering of the last question in the frame, respectively. A ques- is either of type fill-in-the-blank or multiple choice and is ribed in more detail later in this section.

branching within a lesson there is an "index frame" available. index frame has one predecessor and up to nine successors, h are reached during execution by typing a number between "1" "9". As with question frames, the type of an index frame is matically determined by defining an index object. Indexes and tions in one frame are mutually exclusive.

so-called "help frame" acts like a subroutine. It can be hed from different frames, and after it has been displayed, learner is led back to the frame from which he had called it. pt for its linkage, the help frame is built up like a normal e, i.e. without questions and branches.

he author wishes to display a constant part of text or graphic ore than one frame, he can use a "graphic frame". This frame displayed prior to the frame that calls it and the contents of call-frame are superimposed on the graphic frame. The graphic e has neither a predecessor nor a successor.

least one frame within a lesson has to be a summary frame. The ary frame serves as the end of a lesson and hence has no suc- sor. Since there are no special objects within a summary frame, as a question or index object, the author has to change the explicitly.

. Objects

frame is built up of objects. They are defined by typing a le character which is either mnemonic (O for circle, / for , u for circular arc) or an abbrevation (r for rectangle, a answers). During definition there is an "Undo" function avail- , which aborts the current definition.

most common object is text. It can be displayed in 16 colours, four different sizes, seven blinking modes and a couple of attributes. There are different character sets available, cluding one that can be defined by the author.

A great part of the objects are graphic objects. All objects the C2-level are available (marker, line, arc, spline, cir sector, segment, polygon, rectangle) including a special ob (vector). Graphic objects can be drawn in 16 different colo various linestyles and fillstyles. The thickness of lines ca chosen arbitrarily between 1 and 255 pixels. All graphic obj are drawn onscreen and can easily be manipulated (transfor reshaped, modification of attributes). The author can gr different graphic objects and store them on a discette with specific name for later use. In this way he can build up his graphic library containing the objects he needs most, reducing the amount of work considerably.

Answers can be defined in two ways: either as a multiple cho answer or as fill-in-the-blank. It is assumed that the quest has already been defined as text. Regardless of the type, learner has an author-definable number of tries to enter correct answer. If all tries are incorrect, and if the answer the last within the question frame, a branch is made accordin the specifications of the author. A multiple choice quest consists of up to 16 choices. The author can define whether choice is correct or incorrect as well as the feedback message each choice. During learning this message is displayed as soon the learner types the corresponding key. In case of a fill-in-t blank answer the author can define three feedback messages: first is displayed if the student's answer is correct, the ot if it is incorrect. The author can force the student to repeat wrong answers.

In case of a text answer the author also has to define a m answer with which the student's answer is compared in order to termine whether it is correct. Using special symbols the au can easily specify different model answers. He can for exa define synonyms or a list of words which can appear in any or within the answer. If not stated otherwise by the author, student is allowed to enter "sloppy" answers, since typing spelling errors do not necessarily lead to an incorrect answer case of a slight error the student is shown the correct word defined by the author and requested to repeat the answer. We lieve that this is a better solution than using exact matching just comparing part of each word with the model answer.

Text and graphics - including combined graphic objects - can animated, i.e. moved across the screen. The author has to de the path, which is either a straight line divided into eq parts, a series of points, or a circular arc. The animated ob is drawn at each point of the path, erased and drawn at the n point. The author can specify that no erasing should take pla leaving copies of the object along the path. Furthermore it possible to change the size or orientation of the object du animation. Animation has shown to be very useful for explanation of dynamic processes or concepts like exchanging values of two variables.

For simulation or demonstration purposes it is possible to inc porate Basic programms into a lesson. Programms enable the au to do things that are not possible with a programming-free edi such as detailed interaction with the learner, or showing a spe fic sorting algorithm with numbers entered by the learner. programm itself can include graphics, so that the author can figures calculated from the student's input.

1. Editing Commands

ter the author has created a frame he may wish to modify some jects. There are two ways of doing this: he can redraw the me, stepping from one object to another or he can pick objects ring frame creation. In the stepping mode the screen is erased d built up again in the same sequence in which the author has fined the objects. After each object the author may interrupt e display process and modify the object. Depending on the type the object, the author is shown menus describing valid modifi- tions. He can e.g. change the position of objects on the screen, reshape graphic objects or edit text. He can also insert new jects or delete old ones. The pick operation is used for anging only a few objects: a picked object is highlighted and e author can again apply all modification operations to it.

4. Preparing a lesson for distribution

ter the lesson has been stored on a discette and tested, the thor can make it available for distribution via Videotex. Using special programm the lesson is optimized so that as few Videotex ges as possible are necessary for storing the lesson. The final ges also contain all programms and user defined character sets at are refered to in the lesson. To keep line costs low during rning, lessons have to require less than 32K of memory, which equivalent to about one hour of student contact time. If a sson is smaller than 32K then the telephone connection can be errupted after loading the whole lesson, and the lesson can be ked through offline. Otherwise the connection has to be kept. ther result of the compression is that the student can start king through the lesson as soon as the first frames have been ded; the rest of the lesson is loaded whenever the system waits user input, reducing the time from selection of a lesson to start.

EXECUTING A LESSON

re are several ways of executing a lesson: one is to use a cette station, the other is via Videotex or a local network and eserver such as CONNEX [3]. After conversion lessons can also worked through on an IBM PC with enhanced graphics adapter. ept for loading times there is no difference between them, and what follows we describe how a lesson is executed via Videotex.

e editor generates a description of all objects in a lesson. se data is interpreted, i.e. displayed by a special program, led executor. The executor is also responsible for interaction h the learner in the case of answer and index objects. After student has chosen one of the 50 currently available lessons, check is made whether the executor has already been loaded into memory. If necessary, the executor is loaded first, and starts n to load the description of the lesson. In this way loading e for multiple access to lessons is reduced. After few frames e been loaded, the student may start looking at the lesson, le the rest of the lesson is loaded from Videotex whenever re is time for it, e.g. during waiting for learner input. After whole lesson including programs and user defined character s has been loaded, the telephone connection is automatically connected to keep line costs low.

student is guided through a lesson by means of messages in the last line of the screen. If the author has defined user contro pauses within a lesson, then the learner is requested to press key to continue, and at the end of a frame he can decide w frame to see next. The messages in the last line are generate the executor. In case of answers author defined feedback mess are merged with messages of the executor. If an index object encountered, the learner is asked to enter a number that cor sponds to the defined branch. Any invalid input is ignored so the possibility of input mistakes is eliminated.

The student's activities are not monitored for two reasons: f we do not think that it is necessary after the lesson has tested and secondly it simply would not be possible with the line strategy of Videotex. In the Austrian Videotex system yo not have to identify yourself as long as you just retrieve pages. All AUTOOL lessons are free of charge so that lesson exe tion is fully anonymous. However, since it might be of use to author to know which questions are too hard to answer or wh frames are hard to understand (this can be measured by the t required to go through the frames), there is a special versio the executor available, which monitors the student's activit and stores the answers and other data into CMOS RAM. Because t executor is only available when the lessons are executed loc with a discette station, abuse of the traced data is avoided.

Additionally a whole lesson can be copied from Videotex ont discette, which is mainly interesting for schools and other in tutions.

5. WHY VIDEOTEX ?

There are some reasons why we think that Videotex is better su as a distribution medium than any other media:

* All Videotex users have direct access to all lessons which not only advantageous to them but also to those who of lessons.
  As soon as a lesson is offered, it is available to all Vide users without any delivery delay.
* No one is excluded from access to lessons at any time.
  A learner is not tied to any scheduling as with other media TV, and he is free to learn whenever it is most convenient him. This is an especially user-friendly aspect of Videotex.
* All lessons are continuously up-to-date.
  Using electronic delivery it is much easier to keep all less in an up-to-date standard than when e.g. discettes are maile the students. If an error is reported to the author of a less the changed version can be made available immediately to users. Using the communication facilities of Videotex, lear can make their suggestions in an easy and fast way.
* Videotex is cheaper than other media.
  The storage of a whole lesson costs about US $20 per month smaller lessons it is even less). To distribute the same le in a typed version, much larger costs would have to be cal lated, not considering all the other advantages of the media.

6. SUMMARY

We have explained AUTOOL, the Austrian Videotex authoring sys which is as far as we know unique in its way. We believe t using electronic media could be a solution to the problem of f and cheap distribution of high-quality teachware.

Nevertheless AUTOOL will undergo two major revisions to make lesson creation even more comfortable: first we want to use rubberbanding for the definition of graphic objects and secondly, the graphic input device will not be the keyboard but a mouse, which is easy to handle and cheaper than other comparable input devices.

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5.

Technology

THE WIDEOTEX TERMINAL,AS AN AUDIO-VISUAL TEACHING AID

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INTRODUCTION

ideotex (viewdata) terminals originally provide means of commu- ications with databases, using the conventional telephone lines the transmitting media. The data flow to and from the terminals thus confined to the voice frequency band. The terminals trans- rm the received data into a visible image by displaying the des on a television screen.

exploiting this feature of the videotex terminals it is possi- e to make an audio-visual setup together with a conventional ereo taperecorder.On one of the sound tracks of the compact stereo ssette a data signal is recorded, which is similar to the one mally coming from a database. The other track carries the re- rding of the accompanying sound (voice and/or music), which thereby inherently in synchronism with the data signal produc- g the visual display. Although the performance of a video ssette recorder (VCR) is obviously much higher, than the display- g capability of a videotex terminal, yet the significant ad- ntage of this audio-visual system lies without doubt in the ormous price difference between a VCR and an audio (stereo) ssette taprecorder.

PREPARATION OF THE MASTER-TAPE

prepare an audio cassette ready for direct use or for mass production, first a suitable subject should be chosen. Typical amples are: language lessons, music teaching, mathematics, ometry, spelling exercises, etc. Next comes the task of out- ning the basic content of the chosen lesson so, that the lesson, lessons would each fit in into an approx. time-duration of -30 minutes. Next comes the task of writing the script book for e whole program, including all the conversations , talks, music serts, etc., which should be audible during the replay. Paral- l with the text the script writer also has to plan carefully e visual displays, which in turn may consist of written material ing the ASCII characters, and there is also the possibility of serting simple mosaic graphics illustrations convetionally ed in Prestel type teledata systems.

ving compiled the audio-visual script book, paying special tention to the required synchronism between the audio and the sual materials, the next phase of preparing the master tape is design and create all the necessary frames to be displayed on suitable teledata editing terminal. If the frames are designed be still pictures, then these should be recorded on floppy disc, using the conventional teledata code-protocol. On the other hand, if some of the frames are planned to show a certain amount of animation, then this should be taken into consideration, there-fore the floppy-disc prerecordings are made. Of course to generate dynamic teledata pictures one must use such an editinig terminal, which is capable of producing such frames.

At this point all the preliminary work is done, so that the stereo cassette taperecorder can be connected for the maser recording to be made. If the left channel is chosen for the sound track recording, then a good quality microphone should be attached to the left input of the taperecorder. The right channel input then must have an input signal exactly equivalent to the (Prestel) teledata protocol: 1200 Baud data rate, the signalling frequencies being 1300 Hz and 2100 Hz respectively. This signal is provided by an interface unit connecting the taperecorder with the teledata editing terminal. This interface is essentially comprised by half of a modem used to connect a database to the telephone lines. In this case obviously the high data rate (1200 Baud) channel will be used only, since the return channel (75 Baud) is of no use during datasignal recording.

It is essential, that during the whole recording procedure there should be no breaks in the data-channel signal, since they would lead to an automatic disconnection of the teledata display terminal. In other words at any time between data-packet transmissions the standby frequency of 1300 Hz (=logic high) must be held constant at the right channel input terminal. The interface automatically provides this signal, if its data input receives no coded data to be forwarded to the teledata display terminal.

Having started the taperecorder in the recording mode the speaker should begin reading the text from the script book, while the technician is operating the editing terminal in such a way, that the prerecorded frames - still, or moving - would arrive through the interface at the data channel input at the desired time. If musical inserts come up in the script book, then these should suitably be mixed into the audio channel at the proper time.

3. REPLAYING THE MASTER TAPE

In contrast to the relative complexity of the recording procedure, playing back the master tape is quite simple and needs no skilled operator. Only two things are needed besides the master tape: a teledata terminal and a stereo cassette tape recorder. One simple connection should be made from the right audio channel output of the recorder to the (telephone) line input of the terminal. Before starting the tape, the stereo balance setting should be offset completly to the left so that only the left channel would be audible in the loudspeakers. On certain taperecorders it might be necessary to disconnect the right side loudspeakers e.g. by inserting a dummy plug into the right external loudspeaker socket.

In order to enable the teledata terminal to receive and display the data signal, the normal remote control should be used and those keys sh ould be pressed, which are used to initiate a data-base call. Having done this everything is set to start the program flow. When the tape starts, the data channel immediately begins to transmit the standby frequency of 1300 Hz, which in

informs the teledata terminal, that a "database" is answer-
the call on the telephone line. So the connection is built up
the normal way and as soon as the tape reaches a point, where
data signal is recorded, the terminal will react to these as
they were coming from a true data base. The result is a display,
series of displays, still, or moving and they automatically
mpany the spoken words coming from the audio channel in
fect time synchronism.

is possible to start the program from any intermediate point
to break the replay at any time, since the data and the audio
als are recorded on the same tape.

ULTIPLICATION OF THE MASTER TAPE

e a master tape has been finalized, it can be multiplicated
ng the usual procedures for normal audio tape reproduction.
should be noted, however, that second, or higher generation
ies of a master tape might develop display errors, due to the
ruption of the data signal waveform on higher generation copies.
o it should be pointed out, that out-of-tolerance tape recorder
ed differences may result in erroneous picture/text repro-
tion.

CONCLUSIONS

has been shown that a commercial stereo cassette taperecorder,
ether with a teledata terminal can be used to produce an audio-
al program, which otherwise would require a much higher priced
eo tape recorder and significantly more expensive video
settes. Compact audio cassettes can be made and mass-reproduced
n teaching programs covering all kinds of different subjects.
prove the feasibility of the outlined system, several demon-
ation cassettes have been produced at the Institute of Tele-
munications Electronics, Budapest Technical University.

TELECOMMUNICATIONS AS AN ASSET IN EDUCATION

Sylvia Charp, U.S.A.

h the increased emphasis on life-long learning and the greater demand for cation by those individuals who cannot avail themselves of the traditional cation provided at a specific educational institution, members of the edution community are examining a variety of educational systems in order to iver education outside the regular school or college environment. Growing s of computers and communication devices have occurred on campus, off-campus in the home and we are providing opportunities for learning not previously ilable. Many individuals require and desire educational opportunities, not y those students who can attend regular school hours and can come to a resitial campus. Provision must be made for those students who are handicapped, e family responsibilities or who have any reason which prohibits the utilition of the normal or usual educational established patterns.

lt learners are the most rapidly growing segment in education, especially in rican education. Demographers state that young people under the age of 25 l decrease by four million and those over the age of 25 will increase by 22 lion. The increase in adult learners can be attributed to:

- need for new knowledge and skills as a result of automation
- new job opportunities available to women and minorities
- movement away from centers of learning and opening of job opportunities in remote places
- greater emphasis being placed on the value of access to information in order to function in a technological society.

f-paced study has been in existence for many years. One estimate states t over 3 million people in the U.S. study by correspondence each year. rning at a distance, through independent study, is provided to many indivils. Work is, therefore, done at the time and rate of speed most convenient the individual. However, certain disadvantages have been noticed. Partiants readily lose interest and feel a sense of isolation from other students the institution providing the instruction.

transition into the information age demands the development of innovative ational delivery systems and the examination of technology as to its role roviding the motivational and intellectual support lacking in traditional respondence courses.

tance learning" has become an integral part of at least two institutions in U.S. New York Institute of Technology, Westbury, NY, combines independent y with on live communications. A student can obtain a bacealaureate degree a distance learning mode using the computer as a communications device ween the instructors and the student. The courses are still dependent on ted material but students join classmates in conferences based on specific ses, i.e. World History, Philosophy or any of the undergraduate courses red by the New York Institute of Technology distance learning program. nication technology permits interaction to occur between the instructor student and between students taking the same courses. The student engages the following learning activities:

- submitting homework assignments
- raising questions

. debating issues
. exchanging information

A specific course conference is organized by an instructor or mentor who the student in various learning activities. Conference members receive, and send messages to the course conference center which, in turn, can be and reviewed by all participants. As members of the "electronic classroom students submit essay assignments and ask questions, or debate issues in collaborative network of shared information. These activities are just possible in a one student - one instructor correspondence or electronic environment.

Messages are transmitted instantaneously and at any time of the day or All communications are numbered, stored and are immediately accessible required. The conferencing software maintains an on-going permanent record all messages so that a particular topic can be read or reviewed at any

In the preparation of homework assignments, students exchange ideas and forward to group-oriented communications and interactivity. Discussions usually organized around a specific topic. Users send private messages individuals participating in the discussion or communicate privately with instructor. Special student conferences permit interaction with one another to discuss special issues or share a solution to particular topics. To be a member of New York Institute of Technology's distance learning "electronic classroom", a student needs the following equipment:

. a personal computer
. a telephone and modem for sending digital information by tele lines
. a communication software package at the user end
. access to a data communication network

The computer conferencing software is a VAX 11/785 located on campus. The software is designed to organize the text based communication as it accepts stores and organizes messages and to provide users with access to these messages.

The on-going ability to communicate with the instructor seems to be the favorably received aspect of the program. However, since the instructor such an important role, proper training is essential. Willingness to parti pate must be established at the outset. Use of the computer conferencing tem is quite simple and students are able to learn the fundamentals within first two weeks of the course. They spend, on the average 1 - 1½ hours per week, on the system. Access to library data bases and other sources of information is enhancing the learner's ability to manipulate and share ideas.

It is important for students to verbalize about their activities and learn accomplishments and to have the opportunity to interact directly with their teachers and fellow students about material being studied. Computers effectively aid a student's communication process as well as to individualize instruction for that particular student. Students do learn from each other's strategies, can work cooperatively to solve a common problem and do exchange questions and comments electronically.

The University of Delaware, Newark, Delaware has been using terminals off- since 1982 to provide lessons in mathematics, English and science to students 12-18 years of age who have been found to be deficient in those areas.

Plato terminals, which are networked to the central computers on the campus are placed in a residential facility for handicapped students. The project accomplishing the following objectives:

- Computer-based instruction is made available to the physically handicapped student
- Information is brought to students who have great difficulty in traveling to any school
- The skill level of the students involved is increased
- Cultural isolation of the students is diminished and learning of computing skills is made possible.

The Plato mainframe to which the terminals are networked has two processors, two million words of extended memory and the capacity to serve 275 simultaneous users. At present, 336 terminal ports are connected to the system. The Delaware University Plato System is linked to a Plato network that permits authors to exchange material and ideas with other Plato users in the U.S.

Many educational users of the computer exist and many institutions have implemented computer-based learning, computer assisted instruction, computer simulations and a number of other ways of integrating the course material into the curriculum. The convergence of computing and communication can satisfy the growing dependence on information and the need for its accessibility. Educators can provide remote education and on-line communication for non-traditional learners.

1. Fundamental telecommunications concepts are not generally understood.

2. More needs to be known on the structure of conferencing systems, user behavior during remote sessions, technical aspects, accessability to data bases and educational resources and societal effects of remote education.

3. Educators have had little contact with the transmission of voice and data and an aura of mystery prevails.

However, regardless of the numerous barriers that seem to surface, we must continue to investigate the role of telecommunications as an asset in the learning process and how to most effectively provide remote education to those who can benefit from this type of educational environment.

TEACHING THE BLIND WITH THE HELP OF A TACTILE COMPUTER PERIPHERIAL /TCP/

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last decade has provided us with the appropriate technology to equalise ability-disparities of the handicapped. Robots, sors, audio-visual-, and tactile devices are designed and built accommodate a wide range of human disabilites. /1/

such trend lays high emphasis on Tactile Computer Peripherials P/ to aid visually disabled and blind people./2/ Information red in computers, in magnetic discs and tapes, as well as tele-tdata provided by television companies can be made accessible s way to the blind people. It is generally agreed that the ellectual capability of the blind, very often coupled with an onishingly good memory, is a human resource that is worthy of estment. In other words not only humanitarian needs but also gterm resources development policy calls for more research in s area.

pite of such promising perspective thus far only a few Braille put devices appeared on the market - most of them from the ted States /5/ and from the Federal Republic of Germany /6-9/. se devices offering though good technical solutions are simply hly priced for the less developed world. Even in countries with anced technologies most users have access to these devices via governmental support program.

aim is to develop and offer a lower priced Tactile Computer ipherial /TCP/ such that is capable to represent Braille-, dot/ and extended /8-dot/ Braille coded information coming from omputer, or teletext device.

current prototype development is equipped with Centronix erface, hence it can be plugged into most presently used compu-s /e.g. PC families/. RS 232 interface can also be made ilable upon request.

racter-to-Braille conversion is made by software means, hence the need arises, alternative national converions can easily be lemented. A line is represented by 40 characters, whereas each racter is represented by 8 movable pins for tactile detection. character is of the size of 6mm x 11 mm, corresponding to ndard Braille typewriter character size. Pins can be addressed. ins are arranged in a row, 2 rows make on Braille character.

Tactile Computer Peripherial /TCP/ is suitable for teaching puter programming to blind students, as well as, for lecture iewing - from electronically stored material -, and also for eractive programming.

It is extremely helpful in on-line communication between blin persons and the seeing world. A number of unusual circumstance can easily be dealt with such as blind teachers teaching seei people, blind people reviewing file data, or a mixed classroo communication of blind and seeing students. An unusual applica is teaching Braille code to those blind, who do not yet know i

Further developments are inherently linked to electronic and mechatronic possibilities. With unlimited funds, and very high prices only the sky is the limit. There are at least 5 differe mechatronical solutions to the problem of tactile relief-like representation. In the gruesome reality of economics with very limited funds and aiming a modest price the only present alternative we have is to increase the number of characters, and charcterdelivery speed, while increasing weight, energy consumption and price.

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UPGRADING HOME COMPUTERS INTO AUDIOVISUAL TEACHING MACHINES

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INTRODUCTION

e significant spread of home computers has underlined their ssible usage as audiovisual teaching aids. In certain cases .g. language teaching) the quality of the voice synthetizers ilt into home computers is far from being satisfactory. This oblem can be solved by using a conventional stereo taperecorder combination with the computer and a colour display equipment. e of the sound tracks can carry the synchronising signals to ntrol the computer, while the other track provides the audio ogram in good listening quality meant to accompany the displayed sual information. This letter one is produced by the computer self having been loaded with the properly written software. fferent kinds of tutorial materials can be made and multiplicat- on prerecorded compact cassettes.

THE OUTLINE OF THE SYSTEM

e computerised audiovisual teaching set up designed and de- loped at the Budapest Technical University consists of a home obby) computer, a colour tv receiver and a stereo taperecorder. e demonstration programs produced were made for the ZX-Spectrum d the Commodore 64 hobby computers, other types of computers y obviously be used too, provided they have facility to be nnected to taperecorders. Having been loaded with the proper ogram the computer displays all the texts, figures comprising e visual part of the teaching material. These displayed figures d texts are synchronised firmly with the sound coming from the udspeaker of the taperecorder, since the data track, controling e computer triggers the program flow with short-duration sine- ve bursts. These bursts must suitably be recorded together th the audio-material, on separate tracks each, so that even if r some reason the tape is halted - for instance to provide me for additional explanations - this will not upset the nchronism between picture and sound.

USING THE AUDIOVISUAL SYSTEM

ving assembled and interconnected the equipment, they should be itched on. Next the computer must be loaded with the teaching ogram, this can preferably be made by using the same tape- corder and cassette which can easily carry not only the combined dio program and the date bursts, but also the complete software. e computer is then prompted every time a sinewave burst comes up on the data track. It is advisable to make experiments to find the optimum settings of the tone, volume and balance controls the taperecorder. In case of correct settings the triggering of the computer will be faultless, while the synchronising sine-bu will practically be inaudible.

4. MAKING AUDIOVISUAL PROGRAMS

Besides the equipment mentioned so far the only extra things needed for making a cassette recording are an audio frequency generator and a microphone. First the computer program should be written together with carefully located breaks in it, these serving to stop the running of the program, and waiting for a key to be pressed. The script-book of the complete audiovisual program should then be compiled, including the aural speaches, music, etc. The microphone is connected to one of the stereo in channels, while the other input should receive the suitable ga or keyed AF generator signal. The AF generator output level is be adjusted to drive the recorder to appr. 0 dB recording level, the frequency to be used is e.g. 200 Hz. Starting both the recorder and the computer program, the speaker should read the te from the script-book into the microphone. Every time it contains a break (for a visual display to be changed), the AF generator should be keyed in for appr. 3 records, and also a computer ke should be pressed. This latter one will let the program to conti in the computer, while the AF generator signal marks the point on the tape, where a change in the display is expected.

After the whole script-book has been recorded on tape, the computer program should be reedited so, that the breakpoints, which so far waited for a key to be pressed, should now be changed for a properly designed waiting routine. This letter one will wait for the sound-bursts to come in, which in turn will let the program to continue. With this procedure the audiovisual program is ready for use, or for mass-reproduction.

5. CONCLUSIONS

The research team at the Budapest Technical University has made several demonstration cassettes to prove the feasibility of the above outlined new audiovisual system. The home computers involved were the ZX Spectrum and the Commodore 64. The demonstrations showed that a commercial stereo taperecorder can significantly boost the computers' ability to serve as very attractive audiovisual teaching machines.

CD-ROM/Video Disc

CD-ROM AS STORAGE MEDIUM FOR COMPUTER AIDED INSTRUCTION

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INTRODUCTION

lthough until recently the extent of usage of computer aided truction (CAI) had failed to match past predictions, CAI [2], , [7] has nevertheless been firmly established in some areas of plication [9]. Numerous experiments and projects at elementary, condary and university levels as well as those in industrial aining programs have shown that the importance of CAI is eadily growing. Until now, courseware has been distributed tly via local area networks of large computer systems or disks , as in some cases, via videotex systems [1], [3], [5], [6],], [10]. However, because of the rapidly growing amount of urseware and the amount of data involved it has become creasingly necessary to look out for other suitable storage dia.

this connection, optical storage media immediately suggest mselves because of their high capacity as well as their speed data transfer. With its enormously large storage capacity (up about 300,000 printed pages can be stored on one disk), a CD- M (Compact Disk Read Only Memory) opens up completely new ways creating instructional material.

our research we have looked into the possibilities of applying -ROM to increase the use of computer graphics and audio- pported lessons. For example, digitized pictures as well as gitized language have until now hardly been used because of eir large storage requirements. Also, with a more systematized plication of CAI courseware the need for an extensive and easily cessible documentation arises. A CD-ROM makes it thus possible store not only the entire educational software consisting of xt, graphics, pictures and audio information, but also a mplete lesson documentation which can naturally also be printed.

rthermore, the use of optical disks also guarantees a certain gree of copy protection. The simple way of distribution, the problematic handling and the durability of the disks are ditional reasons which speak in favour of an application of CD- OMs.

llowing the introduction, the second section provides some basic formation about the storage medium CD-ROM. In the third section discuss some of the different possibilities CD-ROM offers for e use of graphics. The fourth section deals with the ploitation of CD-ROM's storage capacity for the integration of dio sequences into CAI. In the fifth section we look into some pects of cost and copy protection. Finally, the sixth part ntains a few concluding remarks about CD-ROM.

2. CD-ROM, A NEW MEDIUM

CD-ROM is a new and versatile medium for the distribution information. For educational purposes, its unique ability integrating text, complex graphics, voice and images at relative low costs turns CD-ROM into a flexible, future-oriented medium.

Although the idea of using CD-ROM as a storage medium relatively new, the development of CD-ROM has nevertheless b based on internationally recognized standards. Originally set Compact Audio Discs, these standards are today likewise applied data processing.

Clearly, one of the most impressive aspects about CD-ROM is relation between capacity and cost. Using an optical la technique, a single-sided 120mm diameter disc can be used to st about 600 MBytes of data. Additionally, the inexpensi replication technique further reduces the cost/byte ra considerably. As an illustration, a single Compact Disc c contain what corresponds to 300,000 pages of written text, seve thousand optical images or hours of audio material - this in chosen combination.

Because data stored on a Compact Disk is sealed under a protecti coating and is read by means of a contact-free laser-optic syst the probability of data damage or simple wear is drastical reduced - an important aspect easily appreciated in sch environment where educational software is often exposed to rou treatment.

A CD-ROM disk is built up in the following way: the spiral tr is divided into sectors, each containing 2 Kbytes. Since the d is written with a constant linear density, each sector addressable with an absolute sequence number from the start of track. In connection with CD-ROM, absolute time is used to ens compatibility with CD digital audio format. Consequently, sect addresses consist of number of minutes (0-60), number of secon (0-60), and 75ths of a second (0-74). Using a time/positi algorithm, fast access under microprocessor control is achieved.

The transfer of data from the CD-ROM drive is conducted via a bi serial interface. The transmission rate for data is 1. Mbits/sec. [11].

The field of application of CD-ROMs is manifold. With its enorm storage capacity and fast access time, CD-ROMs can be used in a area where immediate access to a vast amount of structur information is required, as for example in business, publ administration, legal and medical professions, science a engineering. However, because of its singular ability to combi text, graphics, pictures and voice, CD-ROM stands out as a natur and highly effective medium especially suited for education purposes. For this reason, we have made the education application of CD-ROM the object of our study.

3. GRAPHICS AND CD-ROM

Normally, computer graphics (e.g. vector graphics) is stored coded form and must consequently first be decoded after it h been read into the computer from an external medium. The reason for this are among others a demand for limited memory requirement and short transfer times. The importance of this demand is easil recognized when we consider the relatively small storage capaci of the floppy disks and the slow transmission rate of data vi telephone (as is the case with for example videotex or other narrow-band communication lines). On the other hand, this method implies that we must accept a relatively slow re-draw rate (because of the necessary decoding). Despite this fact this method is due to the slow transfer speed still faster than using digitized pictures.

By employing CD-ROMs, an optimal application of graphics stored on pixel basis is made possible. If we calculate a storage requirement amounting to 40KBytes for one pixel-wise stored picture (sufficient for a resolution of 320 x 240 pixels if 16 colours are used), then it is still possible to store 15,000 pictures on one disk side. Since the data can be read directly into the graphics memory of the computer from the CD-ROM (no decoding is required) it is possible to build up complicated graphics in a split second.

Graphics of this kind could be drawn with a paint editor which enables direct painting on the screen. However, pictures stored on pixel-basis could also first be drawn by means of a draw-editor. This has the advantage that pictures or parts thereof can be easily manipulated (change of colour, reduction of size, rotation etc.). Not until the graphics has been finished is the screen memory read out by means of an auxiliary function of the editor and the information required for the pixel-wise storage is filed on an external storage medium. In order to achieve a large variety of creation possibilities, it seems in this connection that a combination of draw and paint editor systems is the best solution.

Also the use of digitized pictures could be greatly intensified when used in connection with CD-ROMs. A video-picture recorded by a camera, or a section of a picture can be coded via an analog/digital converter in digitized form. After digitalization, a graphic modification such as e.g. point correction or line correction is possible.

If the picture is stored pixel-wise, the storage requirements are admittedly large, but we have the advantage when the graphics are re-displayed of being able to read the data directly into the graphics memory which significantly reduces the time needed to re-draw the picture. Consequently, because of their large storage capacity and high rate of transmission, CD-ROMs make an uncomplicated integration of digitized photographs into CAI lessons possible.

Also, as far as animated graphics are concerned, additional interesting aspects present themselves compared to the present possibilities such as for example the use of sprites in a program. In the following considerations we assume a suitable organization of the data stored on the CD-ROM in order to keep the access time optimally short.

If a number of pixel-wise stored pictures is shown immediately succeeding each other a simulation of a film projected in slow-motion (a few pictures per second) is achieved. If we do not require the whole screen for the animated graphics, we can limit the pictures to a smaller rectangular section where the film simulation can be run with correspondingly shorter time between picture sequences.

In order to create animated graphics it is not always necessary to re-draw screen-size pictures anew. Sometimes we can reduce the sections where the animation takes place to rectangles which can vary in numbers, position and size. Since the changes do not take place all the time it can be advantageous to store the time interval until the next picture, and for each of the rectangles the co-ordinates of the starting point, their length and height and only then the graphics data on a pixel basis. Using suitable software and the high speed of transfer of the CD-ROMs we can thus achieve animation on background graphics which can cover the whole screen.

The application of CD-ROMs as storage medium for CAI lessons offers the author of courseware not only entirely new approaches to the creation of graphics, but it also opens up new ways of integrating audio into CAI lessons.

4. AUDIO-SUPPORTED LESSONS AND CD-ROM

In our opinion, the possibility of incorporating audio sequences into CAI courseware is of high importance for the future success of CAI. Especially the teaching of languages could be in many ways facilitated so that for example in volcabulary lessons the words would not only be displayed on screen, but also spoken at the same time. Another obvious possibility is the use of audio information in music courses (e.g. a guitar course). An equally important aspect is the integration of audio sequences into lessons which aim at the teaching of the handicapped.

A further advantage of audio-supported lessons is the fact that the amount of text displayed on screen can be reduced at the same time as exhaustive information can be transmitted acoustically. The visual display of the instructional material can thus be fully concentrated on graphics (animated or static) supported by the most important key words.

However, it is necessary to take the large requirements for the digital storage of music into account. A compact disc can contain only slightly more than one hour of stereo music.

It is thus advisable to provide for a possibility of using an audio-supported lesson without the accompanying sound. This means on the other hand that it were necessary to produce two versions of each course, namely one with audio-support and another which had been extended by corresponding information which would then be displayed on the screen (see above).

At first sight it seems as if the use of tapes as storage medium for the pure acoustic information is simpler, since the production of such tapes is relatively easy. Especially demonstration and test lessons could be quickly produced. The sound could then be reproduced via a cassette recorder which had been integrated into the CAI system. Unfortunately, such devices normally allow only a "start/stop" control which means, of course, that a systematic search of specific tape positions is not possible, and would require a fairly long time, anyway. This has the disadvantage of forcing authors to structure their lessons sequentially hereby highly limiting the desired degree of student inter-action.

CD-ROMs make it possible to create high-quality audio-supported lessons where the users can define their own paths through the material and where the audio lessons can be adapted to the individual skills and needs of the users.

If we can do without hifi stereo sound which requires extremely large storage capacity (1.41 Mbits for one second), other kinds of acoustic additions to CAI lessons become available, which are well worth looking into.

One variant is a simple digitization of speech. Using this method, only the zero crossings of the frequency spectrum are analyzed and digitally stored. Hence the storage requirement for a sampling rate of 8,000 Hertz is less than 1 KByte per second of commentary, respectively about 3 MByte per hour. Because of its large storage capacity, a CD-ROM can thus contain data for about 200 hours of speech.

The playback of commentary which has been stored in this way can be carried out by means of an add-on device which consists in essence of a D/A converter and a loudspeaker on the monitor. As far as the acoustic quality is concerned, digitized speech can be placed between a tape and a speech synthesizer, i.e. is easily suited for mere lecture-style lessons.

A further variant is synthetically produced speech. A speech synthesizer (hardware and software) which is connected to a microcomputer produces sound by means of a phoneme generator which converts written texts into artificial speech. Since the input data required for speech synthesis consists of the usual characters, we can calculate the storage requirements as one byte per character. If we calculate 2 minutes to read the contents of a standard A4 page (with about 2 KBytes), we arrive at only 60 KBytes memory requirement for one hour of synthetized speech.

To be sure, the quality of speech synthesizers leaves some improvements to be desired and necessitates in the presently available form a certain degree of tolerance.

5. COSTS AND COPY PROTECTION

If we now consider the costs of the storage of courseware, CD-ROMs immediately suggest themselves because of their phenomenal cost/byte ratio.

It is recommendable to produce CD-ROMs in large numbers (several hundred discs), since mass production drastically reduces the cost of production (down to about 10 US$ per CD-ROM).

In a sense, optical storage discs guarantee in themselves a certain form of copy protection. Since it is only possible to write data on a CD-ROM when it is produced, pirat copies cannot be made. Also, fabrication of CD-ROMs is in itself a rather complicated and costly affair which further contributes to indirect copy protection. A possible transmission of data to another storage medium can be easily prevented by the software producers if they fully exploit the specific features of CD-ROMs and CD-ROM drives. It would for example be impossible to use floppy discs as storage medium if a lesson contained digitized pictures, audio sequences or complicated animation requiring large storage capacity and high rate of transfer.

6. SUMMARY

With a reasonable relation between graphics, animated graphics, digitized pictures, simulation programs, audio sequences and documentation, an optical storage disc offers sufficient storage space for the entire software of a generously created lesson. Short access times, protection against damage and wear, high degree of reliability, easy and convenient handling and finally also the low costs of this new medium make CD-ROMs an ideal and obvious storage medium for the distribution of CAI lessons.

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ideo disc as a teaching aid

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DIA is a subsidiary of Bertelsmann AG, Europe`s largest media
ation. TELEMEDIA and their sister company Sonopress operate worlds`s
t factory for production of sound-, vision- and data-carriers, amongst
laser video discs. Besides this TELEMEDIA is active in development of
ated systems for use of optical discs like TELESELECT 1000 and 2000.

ed for teaching is rising

lem increasingly encountered in personnel recruitment is the lack of
iy qualified staff. And even for the most highly qualified employee,
difficult nowadays to keep his level of information up to date with
orter product life cycles.

e need for training is constantly increasing.

r, since the costs of instructors and lost manhour on attendance at
s are permanently rising too, the result is a conflict between the
for more training and an inability to bear the costs of conventional
ing methods.

Demands made of a high quality training medium

Positive changes in training methods can involve either the training con[...] or the training media employed. High quality training media must be suffi-ciently flexible to adapt to different training contents or different trai-ning routines. In this respect, the laser video disc has the following features:

1. It is easy to use
2. The disc will not wear; it is robust and reliable
3. Each item of information is clearly identified via frame and section numbers
4. It can be cross-referenced to written material via unambiguous addresses
5. Each item of information can be accessed directly
6. Search times are extremely short
7. It allows high speed perusal ("scanning")
8. Frames can be frozen at any time and for any length of time ("scene freezing")
9. Reproduction is extremely flexible
10. It allows mass storage of individual frames/mixtures with films
11. Moving sequences can be presented in compressed form by series of frames
12. It has two separate sound channels
13. It can be linked to external computers (e.g. via VTX)
14. It can be used interactively as an instructor's aid, or for self-teaching workstations.

The typical applications that follow reveal just how important these features are for individual training applications.

disc applications in education and in-service training

vantages of the video disc as a teaching medium become evident from plications that follow, and from comparison with the other "visual" - slides, films, video-cassettes and computer graphics.

se of video disc in schools

Verlag have put five programs onto video disc to tie in with the dary grade I biology curriculum. Section and frame number details on ideo disc sleeve assist the teacher to access the individual parts of rogram. In some cases, accompanying written material is provided.

Klett's programs have been put to the test in 30 schools in North-Westphalia, in trials organized jointly by Klett, Philips and the ".

provisional report on the trials by the "FEoLL" (see Dr. Hertkorn, RAFIE, volume 2/83), I quote:

.. over 90% agreed:
advantage of the video disc is that I can interrupt a sentation at any time to add my own explanations.
ly 7 teachers out of 100 answered 'No' to this question).

statement with the second highest proportion of agreement was:
video disc is the sensible, logical progression from existing aching media.
s: 89, No: 10)."

"The teaching version of the video disc, the most user-friendly teaching and learning medium to date for educational media use, represents a qualitative leap, an extension of the possibilities offered by films, videos, slides and transparencies alone.

With this medium, one no longer needs to concern oneself with technical and organizational details, but can concentrate exclusively on the content and on getting it over in the best way for the students."

Given its frame-freezing capability and high memory capacity (with 54,000 individual frames per side), the laser video disc can easily replace the slides archive still common in schools organizations. Hence the cost of handling and transporting FWU slides via local picture libraries could be greatly reduced, since all 40,000 or so FWU slides fit on a single video disc.

The use of video discs for in-house training

The Bundesinstitut für Berufsbildung (BIBB) (the Federal Institute of Professional Training), a central media institution under the Federal Ministry of Education, on the basis of its trials considers the laser video disc to be the most suitable AV medium for educational and training purposes. It brings the years of eneavours to make use in education of quality still and motion pictures, combined at will, to fulfilment. Every section of film and every individual frame, irrespective of whether it is an individual frame of a film or a slide, can be accurately pinpointed and projected for whatever length of time is required. Given the possibility of repeating, stopping and slow motion, over and above the earlier "play back", this AV medium can thus be fully integrated in education and/or training. Teachers and students gain a universally usable tool with which they themselves can define their own tuition.

IBB" has already produced a series of its training films on video and is intending to continuously expand its range.

follows a number of applications for the video disc in occupational ing and in-service training, arranged by sector:

motor trade

the USA the major motor manufacturers use video disc players M: 10,200 units; Ford: 5,000 units) for training dealers and mechanics d for sales promotion purposes. Sales staff training and customer formation are cleverly linked on one and the same disc, simply modified different computer programs.

efore Ford decided to use the video disc, the company had a video-assette system that proved unusable due to the impossibility of locating dividual parts of films, excessive access times and the high level of aterial wear.

iat in Germany has intoduced video disc systems for just under 900 ealers; once again they are also being used both for training sales taff and mechanics, and for customer information. These systems have een extremely well received, and the network ist therefore continually eing expanded.

edicine

n addition to Essen University's video disc on medicine, pharmaceuticals ompanies Pfizer and Boehringer of Mannheim - like Miles, Pfizer, Merck nd others in the U.S.A. - are using (still the conventional method of in-service training for doctors in many places). There are also major handling advantages to a video disc system when compared with 16 mm equipment.

The military

The US Army, in trials carried out among American soldiers, found that interactive video disc systems maintain in a high level of concentration for 54 minutes, as compared with just under 20 minutes with other learning methods. On the strength of its findings, it has now gone out to tender for 40,000 video disc players for use in soldier training, particularly in the operation of technical equipment. The introduction of video discs into NATO is already being discussed.

Computer manufacturers

Major computer manufacturers such as IBM, DEC, CDC, NCR, Wang and Apple, most of whom a few years ago were maintaining that all teaching problems could be solved by the us of VTX or computer graphics, have since introduced video disc systems both for training their own staff and for external computer users.

VTX and computer graphics are not real alternative for training purposes. They cannot transmit sound or photographs, let alone films. And text alone is unable to provide sufficient motivation for learning or to explain complicated visually recorded facts.

So, in America IBM has set up "Guided Learning Centers" in 142 towns and cities, in each of which a series of self-tuition workstations has been installed, with an integrated video disc player/PC configuration. Based on their initial experience, IBM have calculated a saving of 30% on training costs in comparison with previous expenditure.

In England, too, 27 IBM Guided Learning Centers have already been set up, and a similar project is scheduled for the near future in Germany.

IBM are also seeking to train their PC customers by video disc units installed with dealers, and in Europe alone 1,500 players have already been ordered for this purpose.

Another highly interesting application is the training of technicians responsible for maintenance at nuclear power stations or teller training for staff in big banks like Lloyds Bank in England with about 1,500 systems.

The advantages of video disc self-tuition systems

When using a video disc self-tuition system, the student himself becomes active. Her determines his own learning path and learning rate, and receives continuous feedback on his progress.

The only method surpassing in the use of interactive video disc tuition in terms of effectiveness is one-to-one personal tuition, although here the cost would be prohibitive.

The advantages of the **video disc self tuition** system are, specifically:

- elimination of travelling and accommodation costs
- limited loss of time/use of free time
- learning is unobserved, hence no embarrassment
- the rate of learning is individually set
- the learning program is individual
- learning success is constantly monitored.

The interactive video disc self tuition unit consequently provides **optimum training quality** for a **maximum number of students**, at minimum cost.

Possible configurations:

An number of alternative hardware configurations are available for video disc training units, specifically designed to suit different applications.

Even the standard video disc player designed for the general consumer will offer the first of the video disc self tuition system advantages mentioned. Although operation via normal remote control is non user-friendly and cumbersome for professional use.

In view of these operating difficults, the TELESELECT 1000 video disc information system ha been developed, easily operated by anyone, even without being accustomed to the system. To work in interactive mode with the video disc player, the user needs only to enter a figure taken from a screen menu, via a ten-key keyboard. Apart from an "index" key which returns him to the main menu, there are noch other operating keys. The TELESELECT 1000 system is, for example, being used with great success by Pfizer in the in-service training of doctors mentioned earlier or by Lufthansa and in public information centers.

Non computer-linked video disc systems already have a high interaction capability naturally offering substantial cost and reliability advantages, but if, in addition to this, individual learning success monitoring and automatic teaching program adaptation in line with the user's progress are required, a computer has to be incorporated in the video disc system.

One way in which this can be achieved is by combining the player and the computer within a single housing. As a rule, the computer program is then loaded either by the video disc as computer dump, or via a plug-in EPROM. The advantage of an extremely compact system has to be weighed against the disadvantage of limited application flexibility: the permanently installed computer is, for example, difficult to use for other AV functions.

The second possible configuration involves linking a standard personal computer, possibly with an integrated VTX decoder, with a video disc player controlled via a standardized computer interface. This configuration offers maximum applications flexibility and the maximum number of design variants in didactical/method terms.

It is available, for example, in the TELESELECT 2000 system, which in addition to the system's full computer back-up, offers:

- maximum ease of handling (as with the TELESELECT 1000),
- VTX page overlay with video information from the video disc and
- (if the system is used in a network of several self-tuition work stations) country-wide program updating from a central computer, with no additional handling of hardware or data media at the place of use

As with all other training systems, however, the most important design paramenter in video disc self-tuition systems is not the hardware, but the didactic/method conceptual design. However, the new hardware recently introduced - and in particular TELESELECT 2000 - opens up some new and extremely interesting possibilities in the field.

ational Case Studies

THE NETWORK X 2000, A CENTRAL SUPPORT OF THE POLICY OF COMPUTERIZATION OF FRENCH SOCIETY

"REMOTE EDUCATION AND INFORMATICS" Congress
BUDAPEST 20th to 25th OCTOBER 1986.

Jean A.vergnes, Docteur Es-Science, Professeur à l'Université d'AIX-MARSEILLE III, Directeur du Centre d'Informatique Sociale de SALON de PROVENCE.

until the beginning of the 1980's, the progressive roduction of computers has enabled the optimization of the ctionning of the Civil Services, the improvement of the agement of companies, the controlling of industrial processes, acceleration of development in all the fields of scientific technical research.

se thousands of electronic machines destined to the processing information, this raw material which our civilization greatly s, have been introduced **with a great number of the working ulation not really fully aware of their number, the importance the depth of the transformation of our civilization which ld or are going to be the outcome, their vital economic role agine for a moment the social economic effects resulting from assive break-down of all the computers in the world due to a antic and terrible electromagnetic atmospheric disturbance !!).**

eed, the opinion polls, the interviews, the surveys show that important percentage of the working population are still not e of the unavoidable process of mutation of our society, that important number of the executives and managers still avoid realistic and objective reflection on the inherent problems the introduction of the technologies (*) of data processing in fessional daily life.

ay, few people suspect that the next twenty years are going to characterized by an acceleration of the transformations of our iety, this due to the performances of new electronic ponents and the developments in the applications of artificial elligence.

reasons for this ignorance, this denial are multiple : torical, psychological, conjonctural,.......

The adjective "NEW" has not been used : It has a short lived relative meaning. What is new for some is not necessarily so others.

Historical ? For example :

-To have historically in France defined "l' Informatique" as Computer Science, favouring the confusion between "informatics" and "electronics".

-To have harboured for data processing this connotation of "scientific", maintaining the confusion between "informatics" and "mathematics".

Psychological ? For example :

-The impression of an alienation of power resulting from the mastering of information (or a partition of information) by the manager on behalf of other people.

Conjunctural ?

The "informatic's crisis of 1986" is due to :

-The publicity concerning the failures of the computerization of companies.

-The absence of a coherent policy for computerization, taking into account in particular the rapid evolution of the technologies of the processing of information.

-At the same time, the even more rapid evolution of costs, of reliability and of power.

-The absence of normalisation.

-Information which is insufficient, sometimes obsolete, and other times too idyllic.

-The inadequacies in the syllabuses of training programmes.

This reveals a fundamental need of objective and realistic information, but also of awareness, of initiation and obviously training programmes for adults.
Information, awareness, initiation and training of which the contents must be continually kept up to date.
Information, awareness, initiation and training which must be accessible to everybody.

This enhances a policy of the computerization of society concerning the scholastic population and above all, the people involved in working life.

Re' 3B/Large

are essentially interested in the problems connected with the uterization of the business world.

training programme syllabuses must be proposed in 1986?
uterize yes! but what for ?
uter-tool or Computer-science ?
d or progressive computerization of society ?
there existing means to achieve these objectives ?

are several questions which demand undivided attention and lection.

stly, with regards to the training programmes, it must be embered that the concepts of an "ultimate cultural experience" t be abandonned ; Working life must follow its course in allel with "continious" training periods, which implies the ting up of adapted educational structures for adults.

being specified, it must be considered that since 1981, data essing has developed two different orientations :

first concerns data processing for computer experts, data essing which necessitates many years of studying, which cerns the handling of major computer systems, the conception laborate programmes, fundamental or applied research.

second, is more recent, little known to executives and to the eral public, (it is a problem of information and of awareness seldom or not taught at all in the traditionnal syllabuses (it problem of training) .

aspects of difficulties in the handling of data processing becoming relatively transparent : one can speak of data essing for users, of a computer-tool, of an economically ential data processing.

understand this second aspect, it must be understood that ce 1981, the concept of micro data processing has passed from ng that of "home enthusiasts" to that of professional usage. 1, was the year where the first PC IBM appeared on the market.

success of this micro data processing is due to the umulation of discoveries and of new concepts and of their tematic use on a very large scale in micro data processing : ro-processors, operating systems, wide spread professional tware,...

A MICRO-PROCESSOR is an electronic component of several millimetres squared, including today more than 250000 elementary and automatically interconnected components, destined to reproduce the functions of the central processor of a computer (the essential part of a computer) which, in 1945, weighed 3 tons, and used as much electricity as a factory, and for an extra peculiarity , spent more time broken down than in working order, in spite of a stupendously high cost.

The micro-processors are produced in millions of models at a unitary cost in the order of ten dollars.

Next, the OPERATING SYSTEM of a computer whose essential charateristic is to take charge of the communications between MAN AND MACHINE, abolishing at the same time a great number of technical constraints, imposed in the past to the user, the disappearance of which renders the machine more convivial and easier to handle.

Finally and above all, WIDE SPREAD PROFESSIONAL SOFTWARE programmes of great distribution, of a relatively small cost (when comparing it to the cost of original software), of a relatively rapid apprenticeship which doesn't necessitate an extensive knowledge of the concepts of computer science. 5000 software programmes have been drawn up in FRANCE, 100000 in the world.

The different types:

The HORIZONTAL SOFTWARE PROGRAMMES such as the software programmes for word processing, the management of files, the lists of numbers (the tables, which originate from the micro-data processing "explosion" of the 1980's) , communication (transforming a micro-computer into a terminal, into a data bank,........), graphics,.........

The HORIZONTAL SOFTWARE PROGRAMMES which develop today in a systematic manner and on a large scale, sector by sector, profession by profession. For example, the software programmes for medical surgeries, for artisans,.......

These software programmes associated with an operating system (The SOFTWARE) and with a micro-computer (The HARDWARE) form a unit, a professional tool : A DATA PROCESSING SYSTEM, whose essential part is not always the most visible (*).

(*) The quality, the efficiency and the price of a data processing system depends more and more on the SOFTWARE.

The growth of the software market (50 %) is approximately twice as fast as that of hardware : which gives an idea of the importance of the "Software" phenomenon.

Today the use of a micro data processing system no longer presents any great difficulties, it doesn't require any profound theoretical knowledge.

It implies an apprenticeship in the use of data processing machines including determined applications and an introduction to the principal concepts, becoming indispensable for economic survival.

It is on this basis, that since 1982, Summer Universities and certain training centres of data processing have been developed.

The NETWORK X2000 which was set up in 1984 is based on a similar idea. This network is directed by the FOUNDATION X2000 whose president is also the president of the AGENCE DE L'INFORMATIQUE, which clearly signifies that this network is placed under the trusteeship of the MINISTRY of INDUSTRY.

In 1986, consisting of just under 200 centres on a national plan. The objective of this network is, on the one hand, to participate in the diffusion of the "informatics' culture" (minimum vocabulary, principal concepts, basic principles which do not need any particular scientific or technical knowledge), and, on the other hand, to train in the professional usage of data processing machinary.

In other words, it is a question of participating in the progressive introduction of the applications of data processing technologies in all the economic sectors of society.

How can the network be defined ?

It is an assembly of computer centres interconnected by physical (Telematics) and intellectual (Human relations) connections. These connections assure the exchange, the sharing and the communal use of human and cultural resources.

These centres are selected according to their dynamism, their ability, the specificity of the services they provide, their pedagogic project. Their activity is essentially based on :

-Training programmes : companies, tradesmen, artisans, self employing professions, educational systems, county services,....;

-Experimental actions : training in prison environments, pedagogic and automation projects, telematics, training in agrarian environments, training in the educational system, help given to the handicapped, musical or graphical creation, first level maintenance in micro data processing, memory cards for students, the exporting of know-how to foreign countries,......;

This recital of activities, widely varied, shows the multiplicity of the public concerned : executives, farmers, the self employed, students, teachers, craftsmen, the handicapped, artists,......;

In certain cases, with the agreement of the Ministry of Education, computer activities are arranged during school time for the pupils of primary or secondary education : this only happens occasionally.

The origin of these centres is very variable ; likewise their importance, their status and their means of finance.
Their future is based on their innovative ability in the context of their proposed training programmes, in their promoting actions of data processing systems in response to specific needs.

The span of activities is represented by four categories :

-1- **Initiation and Training** : starting from the most elementary initiation to high level training. The most frequent is the apprenticeship of traditionnal software programmes (word processing, manipulating files, tables, vertical professional software programmes) .

-2- **Awareness and Animation** : carried out within the educational framework. Lectures are proposed in the plan of public manifestations.

-3- **Production and Creation** : essentially pedagogic software.

-4- **Advice and Services** : a future activity.

To give an idea of the activity of an X2000 centre, take for example the "CENTRE D'INFORMATIQUE SOCIALE" in Salon de Provence : In 1985, 1000 people followed different training programmes. Also ,3 missions abroad were accomplished in 1985 and 4 in 1986.

There are 3 permanent computer experts (or nearly), 2 young computer experts who are completing their military service as civilians, 2 part-time secretaries and numerous other experts who help with the teaching of the training programmes when their work allows them.

The centre has 70 micro computers including 2 "nano-réseaux".

nd finance ? The basic principal is that it is self-financing.

The centres have numerous backers (private sector, county organisations, ministries), the credits of operation essentially originate from the invoicing of the completed training programmes.

Also the centre receives subsidies provided by the local county organisations and direct help with data processing equipment from the FOUNDATION X2000, once the application to join the NETWORK X2000 of the centre concerned has been accepted. The centre exists therefore before it's request to join the network X2000.

This network, launched by a State agency, has a sufficiently flexible structure to allow each centre to remain autonomus, to adapt itself to local demand and to be innovative.

This network most often uses specialists, outside their professional activities, which benefits the acquired skills in an ever growing field.

This network allows everybody whether they work or not to have access to this "informatics culture", to satisfy their curiousity, to teach themselves, to initiate themselves to the use of data processing machinery in their daily working life.

This network replies to a need : it allows each citizen to inform and prepare themselves to this new civilisation of information and communication, the XXI century, as commonly refered to by the media.

This network forms an integral part of the policy of the computerization of society, its perpetuity depends on its ability to innovate and to continually adapt itself to the evolution of the technologies of information.

ONE YEAR EXPERIENCE IN TELETEACHING: RESULTS, SUCCESSES AND DISAPPOINTMENTS

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CONTENT

The courses offered by FIM:
- An introduction to programming using BASIC (seven lessons, six exercises, a special mailing modul for communication).
- TOP JOB: A three-level game for learning computer fundamentals (structure of the game; demonstration).

Some remarks on the history, equipment in use, organizational background.

Who has enrolled the courses? (Age, necessary grounding).

Some statistics on drop outs.

Comparison of different techniques for the design and developement of teachware (programming language; authoring system).

Composition of lessons using text components in combination with adequate graphics.

How to communicate with the students?
The right balance between electronic express mailing and detailed remarks and other teaching aids distributed conventionally.

The advantage of asynchronity (i.e. time independence) versus the implicit motivation given by a strict schedule and organization.

Some consequences: Teleteaching must be organized similar to an open university.

Can Teaching by Computers Replace Teaching by Professors? — Results of an Experimental Study at the University of Karlsruhe

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1. Introduction

Computer–assisted instruction (CAI) projects started already in the late 1950's. Initial hopes of saving labor, manpower and capital by *automating* education at the university level by means of computers were not fulfilled. Currently, however, one can observe a fresh impetus on CAI. There are serious indications which allow to predict an ultimate breakthrough of the computer as the only two–way mass communication system used in the educational process (cf. [3]). Among the main reasons for this phenomenon we mention the following ones:

- cheaper and better *hardware* (colour and graphic displays, instant response time)
- *networks* (local area networks, interactive videotex and packet switching networks)
- a better understanding of the *specific advantages* of the computer as a medium used for educational purposes (good for algorithmically tractable topics, less appropriate for "philosophical" fields of knowledge)
- easy to learn *author languages*
- a growing library of *courseware.*

In cooperation with the IIG of the Technical University of Graz, we started in Karlsruhe a major CAI project in summer 1985. The aims of the project are

- to develop courseware for a one–year course on *algorithms and data structures* which is a mandatory subject for our students,
- to establish a CAI lab in the university where the students can execute CAI lessons,
- to replace a considerable fraction of a course on algorithms and data structures by courseware,
- to evaluate both the used courseware and the acceptance of this way of teaching and learning by our students.

The project is based on the CAI system AUTOOL developed at the Technical University of Graz, Austria, by Prof. Dr. H. Maurer and his group, cf. [2]. This system is a further development of the PLATO system, developed at the University of Illinois already in the 1970's, later marketed by Control Data Corporation. In Graz the system was adapted to the videotex system and the international CEPT standard. AUTOOL allows to write courseware by *editing* (using a graphic–editor), not *programming* a linked set of frames.

Frames may contain graphic and/or text, different colours, animation (motion and blinking). It is further possible to include control questions of both the multiple choice and the free-text-answer type. The CAI user, i.e. the student working through an AUTOOL lesson conducts a tutorial dialog with the computer which is mainly user driven. AUTOOL lessons can be read into a microcomputer from a file-server which may be a simple diskdrive, a dedicated Unix-based system, or even the central computer of the interactive videotex system. After loading the interpreter, as telesoftware perhaps, and loading a lesson into local store no further connection to the server is required. One of the most interesting aspects of the current project is that it is even possible to work through an AUTOOL lesson at a home TV-set, — once the lesson (and the AUTOOL executer) are stored in the videotex-database and the TV-set is provided with an intelligent terminal.

The still ongoing project in Karlsruhe can be devided into the following 4 stages: Courseware writing, establishing a CAI lab, teaching students, and the evaluation phase. This sequence of stages only partially describes the progress of the project in time. For example, the results of the evaluation phase are used to rewrite parts of the courseware. In the next 4 sections 2,3,4,5 we will describe the 4 stages in turn in some detail. In Section 6 we will summarize our experiences obtained so far and make some final comments.

2. Courseware writing

Courses on algorithms and data structures belong to the core of every computer science curriculum in the world. Many different courses both at the undergraduate and at the graduate level are mandatory for all students with computer science either as a major or minor subject. The field is not only a standard topic for teaching but also a very active research area. Thus, it is not surprising that the body of knowledge has grown considerably during the last years. Beyond classical topics like linked lists, trees, sorting and searching new ones have become important because of new hardware and new applications. Geometrical algorithms and data structures and parallel and distributed algorithms belong to these new topics. The whole field of algorithms and data structures is ideally suited for CAI, because it is algorithmically tractable *by definition*. Using specific advantages of the computer (color, graphic, animation, the ability of conducting a dialogue) the dynamic manipulation of data structures and the intrinsic properties of algorithms can much better be explained than by using one of the *classical* media book, blackboard, overhead projector. However, one has to know, *how* to use the computer in the right way.

In Karlsruhe we began in May 1985 with a group of about 25 students who had computer science as a minor subject in their third or fourth year at the university in order to write courseware using the AUTOOL system. We selected both standard topics and topics arising from the research persued at our institute in order to prepare courseware both for our own and for widespread use. Altogether about 30 lessons have been written so far using the AUTOOL/PLATO editor basically by students but under permanent control of the professor and an assistant. The following topics are treated in these CAI lessons:

Hashing:

- open adressing with linear and quadratic probing, double hashing, Brent's method,
- hashing with direct and separate chaining, coalesced hashing,
- extendible hashing,

ual hashing (inclusive linear hashing).

h-tree structures:

- ural (random) trees,
- erent classes of balanced binary trees like brother trees, AVL trees, weight balanced es,
- trees as a structure for external storage of data,
- dim. trees.

etric algorithms and data structures:

- e scanline paradigm,
- ometric divide and conquer,
- uction of the rectangle–intersection problem,
- gment– and interval–trees,
- iority search trees,
- ronoi diagrams for points and line segments with various metrics inclusive algo- thms for nearest–neighbor search, minimum–spanning–tree construction, point loca- on problems.

cted topics:

- ta structures for the union–find problem and for priority queue implementation,
- aph algorithms (for computing mst's),
- rallel sorting algorithms,
- cktracking as an algorithmic paradigm.

y of these lessons consist of more than one package; one package roughly corresponds 1-hour lecture. The list of topics shows that we tried to cover both powerful algo- mic techniques like e.g. backtracking and difficult algorithms like e.g. virtual hashing ourseware. Analytical results on algorithms and data structures are generally only tioned but not derived in the respective CAI lessons. In parallel with writing course- e on the above topics we started to write a textbook covering the same material; thus ould provide both the students writing a lesson and the students working through ished lesson with detailed written material. We were quite surprised how much the pective to produce a CAI lesson for widespread use by the AUTOOL/PLATO system motivate a student, though — on the average — it takes about 100 hours to prepare hour lesson, if one has to get to learn both the system and the material to be covered he lesson.

t constitutes a *good* lesson? The results of the evalution phase show that the right cture, precise and lucid text, appropriate, moderate, and not excessive use of color, hics and animation and a sufficient number of good questions are characteristic erties of good lessons. As in all computer dialogs Nievergelt's *Sites, Modes, and ls* paradigm [5] should be observed. For more details cf. Section 5. Of course, it is surprising that not all students were able to make optimal use of the abilities offered he AUTOOL system though we always discussed a detailed plan of each lesson quite fully before the student started the editing process. Our experience shows that one ins the best results if one chooses a fairly small portion of material to be presented ne lesson, discusses the CAI lesson with the student at an early stage (after he ha ed the first five or ten frames), assures a transfer of knowledge from system exto novice users, and sharpens the student's eyes for precise formulations which cannot be misunderstood. On the average we (instructor and student) went through each CAI lesson between 5 and 8 times.

Based on our experience during the last year we are convinced that a new type of seminar at universities will emerge: Topics of current interest will be worked out jointly by students and professors; however, the student does not deliver a speech or a written elaboration but a CAI lesson. Of course, this is much more effort than a traditional seminar both for the students and the professor. In many cases, however, the additional effort will pay off because the "results" of such a seminar can be used to teach other students and to speed up the transfer of knowledge.

3. Establishing a CAI lab

AUTOOL was designed to write CAI lessons which can be accessed in the interactive videotex system using a home TV-set. However, at least in Germany it is currently still illusive to base a CAI project on the assumption that each student has access to the national videotex (the Btx-) system or has his privately owned computer. Therefore we established a CAI lab as a computer classroom with (currently) 13 graphics terminals. More than 250 students participated in the course where CAI lessons were offered. The students had access to the terminal daily from 9.00 a.m. to 7.00 p.m.. We reserved individually for each student one terminal for two hours per week; after some time the students used the system however fairly free. As one result of the evaluation phase we learned that two hours per student per week is a bit too short, if one course is accompanied or partially replaced by CAI lessons. About 80% of our students asked for time between 2 and 3 hours per week preferably offered as two separate sessions.

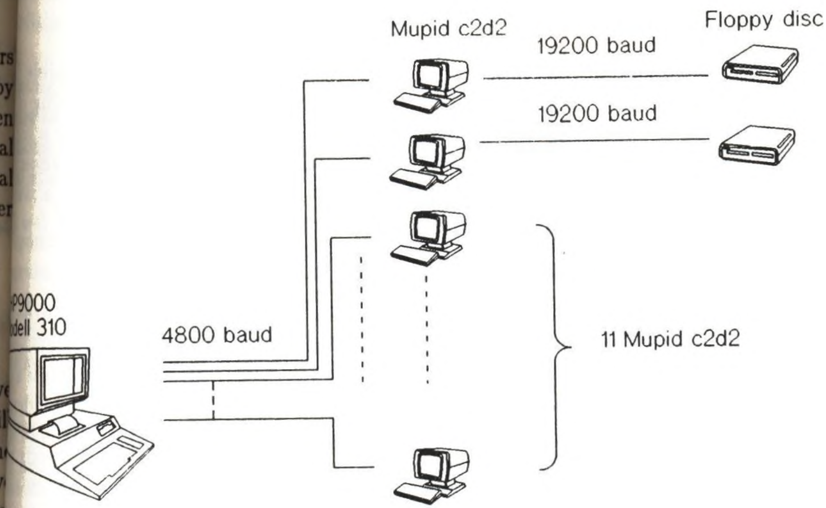
Our CAI lab is equipped with microcomputers MUPID–C2D2 with Z80–CPU, 128 KByte RAM, 64 of which are used for the bitmap display; in the remaining 64 KByte the CAI lesson and the software to execute a lesson are stored. Each computer is equipped with a colour display with a resolution of 320×240 points.

The 13 microcomputers are connected with a file–server which simulates the videotex (Btx) central computer. As file–server we used a HP9000, series 300, model 310, with 68010–CPU, 1 MByte RAM, 44 MByte disk and 13 serial interfaces; the communication rate is 4800 baud. The file–server runs under HP–UX, a UNIX V–like operating system. We used the CONNEX software, cf. [1], also developed in Graz which allows a communication with the 13 MUPID computers and the HP–computer in both directions. Thus not only the lessons and the software for executing the lessons can be distributed to the 13 CAI stations; data generated at these stations can also be transmitted to and stored at the file server. We used this possibility in order to evaluate CAI lessons by presenting students an electronic questionnaire and collecting the answers at the file server. Though we obtained already a number of interesting results in this way the method of "on-line evaluation" of CAI courses can certainly be improved considerably.

Two of the 13 MUPID computers are also connected with a disk drive by a fast 19200 baud serial interface. These are necessary in order to load CAI lessons into the system. The whole configuration is shown by the Picture 1.

During the summer term 1986 not only CAI lessons developed in the first stage at our university were available in our CAI lab. We included a series of lessons on *sorting* which

Configuration: CAI -Laboratory



Picture 1

written in Graz. These lessons were mandatory for the course on algorithms and structures in summer 1986 as well. Beyond that CAI lessons on other topics could ccessed by our students which were not mandatory.

nsiderable number of students made use of this possibilty:

% of the students worked through other CAI lessons on algorithms and data strucres covering noncompulsory topics,
% accessed lessons which introduce the AUTOOL system (for potential authors of urseware),
% accessed lessons on expert systems and natural language analysis,
% played games (chess).

ugh these topics were not mandatory, alltogether 52% of our students worked through or more of these lessons. This indicates, that beyond those lessons which are part of ecific course one could (and should always) offer further topics to allow *browsing* by ents.

eaching a course on algorithms and data structures

ergelt [4] points out that CAI will fail to achieve its goals if the system is not grated into the whole organisation and administration of learning established at the ersity. We integrated CAI lessons as follows into a standard course on algorithms and structures in summer 1986: Before we started using CAI lessons the course consisted lectures per week, 10 weeks per term. We decided to cover exactly the same material efore but to replace 5 of the 10 3-hours lectures by CAI lessons. Analytic material presented only by using blackboard and oral presentation; the material covered by I lessons was *not* presented again by the professor in class. However, detailed written erial was delivered to the students closely related to the CAI lessons. The whole course was accompanied by exercises where students were supposed to solve problems. Their solutions were then discussed by the professor and his assistants jointly with the students in small groups. In these exercises, of course, also the material presented only by CAI lessons was presupposed.

Not all CAI lessons covering compulsory material of the course were accessible from the very beginning of the term. Instead we tried to make the progress of learning of our students more continous by keeping the respective relevant CAI lessons only for a limited time (between four and six weeks) in the system. Comments by the students show that this form of organisation indeed had the desired effect: It was more difficult for a student to be passive until the end of the term and to start actively learning until a few days before the written examination than in a traditional course.

At the beginning of the experiment the system was still quite unstable: Hard- and software errors were quite frequent and the user interface had several serious deficiencies (17% of the students complained about technical problems when working through a CAI lesson.) Fortunately the system and its implementation could be improved considerably during the summer. However, it may very well be that the initial difficulties had some negative effect on the evaluation of this experiment by our students. Therefore the overall very positive impression is even more surprising.

The following topics were covered by CAI lessons only:

- 5 lessons on *sorting* which were written in Graz: Shellsort, Quicksort, Radixsort, Heapsort (2 packages),
- Hashing with open adressing,
- Hashing with direct and separate chaining (2 packages),
- natural (random) trees (4 packages),
- brother trees (2 packages),
- backtracking (2 packages).

CAI lessons covering the latter 5 topics were developed in Karlsruhe. We knew already that the lessons were of different quality, among them even lessons of non-acceptable quality which should be replaced by better ones. (This holds true for the lesson on hashing with direct and separate chaining. On the other hand we had the intuitive feeling that the first lesson on hashing with open adressing and the two packages on backtracking were really good lessons!) In order to derive criteria to distinguish between *good* and *bad* CAI lessons we intentionally left a few lessons in the experiment which we considered as *bad* ones and asked the *students* to evaluate all lessons.

5. Evaluation

As already mentioned, the experiment of teaching a course on algorithms and data structures to a large audience by replacing $\frac{1}{2}$ of the usual material by CAI lessons has been evaluated by the students themselves.

In order to obtain a reasonable questionnaire a pretest with a sample of 48 students was carried out after the series of CAI–lessons on sorting. Some of the results of this pretest are reported in [6]. As a result of this pretest an electronic questionnaire with 40 questions to evaluate single lessons was made accessible to the students in the system. Instead of asking questions we presented statements to which the student could express his opinion

choosing between 5 alternatives ranging from full agreement to full rejection. The statements referred to the quality of the respective CAI lessons also in comparison with traditional ways of learning in lectures and by books.

Among the 294 participants of the experiment 191 answered to the electronic questionnaire at least once; and 29% of the 191 even answered to it 5 times and thus evaluated all lessons relevant for the experiment. Each of the 5 lessons has been evaluated by roughly 100 students. Therefore we believe that the obtained results are indeed significant.

Beyond this evaluation of 5 single lessons by an electronic questionnaire 107 students answered an additional (written) questionnaire at the end of the term by which we wanted to obtain an overall impression of our students about this way of teaching a course. Here students were also encouraged to make verbal comments of any kind. We will sketch the main results of the evaluation phase and refer to [7] for the many interesting details.

Many of the 40 statements of the electronic questionnaire obtained quite different votes for the 5 different CAI lessons. These may indicate what constitutes a *good* lesson. The statements which were almost uniformly evaluated can lead to general recommendations for course authors. We start with a report of the evaluations of single lessons.

a) Dialog structure: Independent of the quality of a CAI lesson the student generally follows the recommended path. However he wants to have more and other possibilities to branch than the authors implemented in the 5 lessons. In order to help the student always to know where he is in a lesson it is good to place a key–word on each frame always at the same position. This is one way of implementing Nievergelt's *Sites, Modes, and Trails*–principle, because the AUTOOL system already tells the user *what* he can do, *where* he can go and *how* he can go there.

b) Presentation of the content: Bad lessons contain, that is the impression of the student, too much material and make him tired. This is not correlated with the real amount of material and the real time which the student spent at the terminal to work through the lesson. (We also asked for the time.) Students want to have more examples and less general statements; this is independent of the quality of the lesson. However, the quality of a lesson is very much dependent on its structure.

c) Text and formulations: This is one of the most important criteria to distinguish between *good* and *bad* lessons: Clear statements which cannot be misunderstood are an absolute necessity in CAI lessons. If a lesson is *bad* the student has the impression that too many new concepts have been introduced and not sufficiently explained. This subjective impression may be wrong, however: There may be only a very few new notions that have been introduced, — but, unfortunately, not by clear, easy to understand and consistent definitions.

d) Graphics and Colour: Independently of the quality of the lesson students complaint about a too frequent *change* of colours. Furthermore, less different colours both in text and graphics were wanted. On the other hand a majority agreed that the use of colour and graphics has facilitated the understanding of the content of a lesson. However, slowly displaying "nice" graphics *just for fun* which do not contribute very much to the content of a lesson is generally felt to be boring. The right design of graphics, a reasonable layout of the screen, utilizing spatial analogies and analogies in colours on the screen can make good lessons better but cannot make bad lessons good.

(e) Questions and answers: Students want to have *many* questions. They hardly feel that a question is too difficult to answer. Though they have always the possibility to skip a question they rarely do it. Many, not too simple, and clearly stated questions should be included into a CAI lesson in order to obtain a *good* lesson; whether the questions are of the multiple choice or free-text–answer type does not matter.

The students generally agreed that they have understood those lesson which they (and we) considered to be good ones; it is surprising that they believed to have learned at least something even by those lessons which were considered to be bad ones.

Even after they have seen between 7 and 10 CAI lessons a large majority of the students had still *fun* when working with a good lesson. Comparing the computer with other media (book or lecture) it turns out that a CAI lesson is preferred to a lecture a bit more than preferred to a book. A *good* CAI lesson is preferred both to a book and to a lecture. The same does not hold for a bad one.

What concerns the overall impression of our students about this way of teaching a course we asked them about their opinion *before* and *after* the experiment: From the sample of 107 students 22 had no idea, 18 were positive, 53 ambiguous and 14 negative about CAI before the experiment; after the experiment 78 were positive, 22 ambiguous and 7 negative. We consider this as an overwhelming vote in favor of CAI.

6. Conclusion

Can teaching by computers replace teaching by professors? Based on the experiences of the CAI project in Karlsruhe obtained so far the answer must be at least partially affirmative. Certainly, students can understand a new topic easier and faster by a good book or a good lecture delivered by a competent professor than by a bad CAI lesson. However, our experiment shows that a good CAI lesson beats both a book and a lecture. (However, the right topic has to be chosen!) Writing good CAI lessons requires a considerable amount of pedagogical talent. However, our experiment also proved that even students are able to become authors of good lessons when using the AUTOOL system and guided by a professor.

Students appreciate a mixture between different ways of teaching. CAI lessons constitute a welcome variation. At least in the area of algorithms and data structures there are a number of topics ideally suited for CAI which can be explained by a CAI lesson much better than by any of the traditional media (lecture using blackboard or slides or book). Thus CAI can at least *improve* the teaching of a professor if he knows how to use this new medium in the right way.

In Karlsruhe we have run an "in–house" experiment by setting up a computer classroom where students could work with CAI lessons. The AUTOOL system on which we based our project has of course other very attractive and promising aspects: Sometimes the student may use a CAI lesson at home like a book when studying a certain topic. If he has access to interactive videotex he needs not even leave his study room. Whether or not this ever will happen depends not only on the selection of courseware but also on the development of the interactive videotex system or any other data network for private use. The latter point is, of course, a political issue.

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TELEMATICS SERVICES, EDUCATION AND CULTURE: ASPASIE and its Role in France.

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Open learning with the aid of audio-visual methods often makes use of CAI, or Computer Assisted Instruction. In France, however, forms of open learning are increasingly being developed which take advantage of on-line electronic information services (Telematics) operating to TELETEL standards. The advantage of these standards lies in their ability to make both text and graphics widely available.

Yet open learning was not a prime objective of the French telematics system. Such educational applications are newcomers to this phenomenon of universal communication, which is in itself so unparalleled that it seems necessary to describe it in outline before giving some of the results of the use of French telematics services for educational purposes. Although increasingly numerous, such educational uses still seem relatively hesitant about adopting telematics services, not only for wide distribution of information but also for creative teaching and technical training. This view is borne out by the achievements which Aspasie has had at its X2000 Centre in Marne-La-Vallee, as will be seen in the second part of this article.

Telematics and Education in France

An Outline of French Telematics Services

Historical Overview

1975 the French Government decided to back a distributed video- service called ANTIOPE with four main objectives:

To modernise the telecommunications network;

To develop the telephone industry both nationally and for poses of export promotion;

To set up national data banks and export technical expertise;

To promote wider use of the telephone.

This early sense of direction was confirmed in 1978 with the appearance of a report by Nora and Minc entitled "The Computerization of Society". This report brought a new term into current use by describing a system combining the use of computers and telecommunications as "telematics". From then on the emphasis was on Teletel, a French interactive videotex service which incorporates the user/machine dialogue, unlike the ANTIOPE system which allows videotex information to be received only. The term "telematics" currently refers to Teletel standards, no matter whether the information is conveyed on the national packet-switched data network (Transpac) or on the traditional commuted telephone network (RTC).

Following publication of this report the Minister for the PTT (Postal and Telecommunications Administration) proposed a plan of action for the development of telematics services, based on the following points:

a) Developing technical standards and networks;

b) Collaborating with manufacturers in the development of input terminals and system servers;

c) Seeking out potential suppliers of information contents;

d) Testing the market for future users of the medium in the light of experiments such as the one for the electronic telephone directory which was carried out in the Departement of Ile et Vilaine in Brittany beginning in 1980, and in the new town of Velizy to the West of Paris in July 1981.

2. Originality

The originality of French public access telematics services stems from four main characteristics, which are:

a) The Electronic Phone Book Option

Begun in 1978, this involves gradually replacing the traditional paper telephone directory with a home-based look-up facility using a videotex terminal called a Minitel, which is very simple to use. This is an ambitious project, and entails distributing the terminal to telephone subscribers one area at a time entirely free of charge (except for the 160,000 or so hired by some subscribers ahead of the free distribution). So it was that by March 1986 it was possible to account for 1.7 million Minitel terminals throughout the country as a whole. There should be 2.5 million by the end of 1986, and 6 to 8 million are predicted by 1990.

b) Automatic Invoicing for Teletel 3

Most of the telematics traffic in France is generated over the national Transpac network. This network gives the user a choice of three ways of charging, all based on time and regardless of distance.

- Teletel 1, call number 3613

The connection charge to the user is Fr 0.77 per 20 minutes. This version is used almost exclusively by businesses. The charge for nsulting the service is left to the discretion of the formation provider.

Teletel 2, call number 3614

e call charge is Fr 23.10 per hour at peak rates. As with 3613, e amount charged for consulting the service is decided by the formation provider.

Teletel 3, call number 3615

r the moment this is reserved for the press, and is called a iosk" function. Users who consult the information services are tomatically invoiced according to the duration of the call at e rate of Fr 61.60 per hour. The French telecommunications ministration keeps part of the fee to cover the call charge (Fr .10 per hour) and hands over the remainder (Fr 38.50 per hour) the system server and the information provider. In 1986 the rvice providers should achieve a turnover of 722 million Francs, mpared with 278.4 millions in 1985. This system has the enor-us advantage of being simple and efficient because of the auto-tic, centralised recovery of small sums from a large number of ers. Teletel 3 accounts for about 70% by duration of all calls de on Teletel.

The Unexpected Discovery of an Informal Electronic Bulletin ard Service in Strasbourg

number of users with some experience of telematics services ovided by a local organisation known as ARES, along with a gional newspaper "Dernieres Nouvelles d'Alsace" (The Alsace ws), got together with the local telecommunications managers to apt the service maintenance software so that messages could be changed in real-time. This type of messaging facility has now come very popular and widespread, and is simple to use. Once nnected to the service the user gives a name, as often as not a eudonym, which is then listed among the names of all the people nnected at that moment wishing to converse in real-time. It is en possible to start a conversation without any constraints, nce there is no initial identification, and this can also be ne from any part of the country. Along with games, this type of terchange represents about 65% of the inquiries being carried by letel 3, or (excluding the electronic phone book) some 45% of l the traffic in telematics services.

The Number of Services on Offer to Inquirers

counting up the abbreviated names by which users consult the rious services when connected to Teletel, the following growth ttern can be observed:

* 145 on 1st January 1984;
* 844 on 1st January 1985;
* 1899 on 1st January 1986;
* 2278 on 1st March 1986;
* 2986 on 1st June 1986.

e current rate of progress is of the order of 3 new services per y. Given the variety of applications which are available (see low) and the fact that the terminal is free, together with exible invoicing on Teletel 3 (notwithstanding the high cost of

Fr 61.60 per hour) and in view of the "conviviality" of the messaging services, it is scarcely surprising that demand has grown so strongly. In March 1986 demand stood at 2.1 million hours of service inquiries for the entire Teletel network, and of these 1.6 million hours were on Teletel 3.

In April 1986, the average duration of Minitel traffic was 86 minutes compared with 43 minutes in January 1985. Also the average number of calls by Minitel in April 1986 was 13.

These figures refer only to information transferred over the national Transpac network, which is the carrier medium for Teletel 1, 2 and 3. They do not take into account another account of the facts about telematics, namely that the switched telephone network in its traditional form puts low-cost, local telematics services within the bounds of possibility for a basic telephone area.

3. Applications

There is such a tangled skein of services available that it would not be possible to unravel them all, and so the following is no more than an outline indication of the types of application on offer:

a) Information

The first service ever produced was the Electronic Phone Book, which is free for the first three minutes. It is greatly appreciated by users, since it makes the following items possible:

- Rapid look-up of the whole subscriber body, some 23 million people and firms;

- The service is much more up-to-date than before : four weeks for the electronic phone book, as against a year for the paper directory. Some 40% of all calls are to this service. It was interrogated 13 million times during December 1985.

Thanks to the Minitel terminal the following are also possible:

- Consulting the information services put out by the newspapers, more and more of whom have a telematics edition as well as a printed one. The information provided may be of a general nature, such as that published by for example Le Monde, Le Parisien Libere, Liberation, and so on, or may specialise in, say, flowers, motor cars, lonely hearts, cuisine, data processing, holidays, finance, economics and the like. At the end of Spring 1986 about 200 press titles were represented on Teletel.

- Getting in touch with the Bank and making various transactions on one's account from home, ordering a new cheque book, making a transfer of funds, and so on. For example, 29% of the customers with Credit Commercial de France, some 100,000 people, connect into the telematics service operated by the Bank on Teletel 2.

- Obtaining a variety of information on such things as the weather forecast, train services, airlines, shows, holidays (there are 3,000 hotels to choose from) and so on. In addition to looking things up, the user sometimes has the option of making bookings by remote control. This explains why the SNCF (French Rail) accounts for 5% of all traffic on Teletel 3.

Buying a variety of items on mail order, such as clothing, cameras or groceries, all with home delivery. One such service, ditel, claims to have 1,000 subscribers in the Paris Region.

Finding out about national and local government matters by looking up information provided on a national basis, such as the guide to rights and procedures prepared by the SID (the Prime Minister's Office of Information) running to 12,000 pages, or consulting local information put out by the many local authorities which publish a telematics service for the benefit of their citizens.

Looking up information material which clubs and societies prepare for the benefit of members and others interested in their activities. Some typical examples are the Secours Populaire Francais, which offers help and advice to members of the public, and the Union Federale des Consommateurs, a body representing the interests of consumers.

Inquiring into a variety of information services on such topics as astrology, agriculture (Teleagri 47 on Teletel 3) or sport (Asport on Teletel 3).

Calling up services which have a religious theme. On Teletel 3 the Destel service makes the whole of the Bible available for reading. It makes it especially easy to look up the actual verses containing some particular quotation such as "the salt of the earth".

) Communication

When using the whole body of information under the various headings available on Teletel 1, 2, and 3, the consumer is happy merely to draw upon details provided by others. When using the messaging services which are summarised below, the user has entered the dimension of communication, in which individuals and even groups of people exchange symbols and messages among themselves in real-time or off-line.

Deferred Exchanges. Electronic mailboxes make it possible to exchange correspondence off-line with anyone else who has opened a mailbox on the same service, by using a password. Such exchanges normally take place between individuals, but they are also possible as a group activity, as for example the activities of the 50 or so X2000 Centres.

Real-Time Exchanges. These are informal messaging services which are either of the above-mentioned dialogue type, putting two people in touch with one another, or of the forum type, which put several people in touch on the same screen.

Free Expression or Graffiti. Users fill up blank spaces which are made available to them for writing what they like on any topic of their own choosing or on some pre-set theme.

Small Ads. Just like the small ads. in the printed press, these are classified into headings such as property, meetings, clothes, jobs and so on.

c) Entertainment

This is second only to messaging services on the Minitel users' hit parade. In the Spring of 1986 there were over 250 items available under the heading of games. Among them are social games such as chess as well as games of chance, situation games, and philosophical games, along with games of strategy, simulation games, and so forth. Some games offer prizes, and players can win a variety of things such as holidays or micro-computers.

The largest of the games services, Funitel, counted a total of 3,200 hours per day in January 1986.

It seems quite likely that had the informal messaging services not been discovered, and without the automatic invoicing, neither of which had been foreseen, simply giving away Minitels and providing information services would not have been enough to give French telematics services their leading position among public access telematics networks.

Nevertheless the various matters outlined above bear witness to the inescapable facts, and these are recognised internationally if one is to believe a report from the Office of Technology Assessment of the US Congress which is to be published in September 1986, stating; "The success of the Minitel should be studied closely, so as to learn from it" (Videotex; No 98; 30th Jubly 1986; p. 6).

Even though it is still too dear (Fr 61.60 per hour for Teletel 3 is an exorbitant amount for most potential users) and under-used (certain estimates say that one Minitel in two is never connected) the list of uses to which French telematics can be put has not been exhausted under the headings mentioned so far. Other areas of application are being entered little by little. One such is the field of education, and the first few applications in that area will now be discussed.

B. Educational Applications for Telematics Services

1. Elimination of Illiteracy

DIDAO is one of the earliest providers of telematics services, and specialises in education. In conjunction with the Immigration Office it provides "refresher courses" in arithmetic and French. As an experiment, thirty Moroccan motor industry graduates successfully made use of this educational facility.

2. Courses

More and more courses are being produced in mathematics, computing, and foreign languages. They are being provided by such institutions as the La Villette Science and Industry Campus in Paris or the University of Provence, which offer working students conventionally printed courses as well as courses via telematics leading to such national diplomas as a mathematics degree. There are also private companies, such as CPLE for languages (via their Linguatel service) or Atlantel Sud-Ouest (via their Etud service).

Sometimes there is an educational aspect to a service which is not presented as such, for example an English-language messaging serice for English-speaking users via the "Leon" service on eletel 3.

. Knowledge Testing

here are many such services on offer, either independently or as n adjunct to course modules followed via telematics, as for xample the Telesup service provided by the University of rovence. They generally take the form of Multiple Choice uestions with a scoring system which makes it possible to test he level of knowledge in some particular subject area.

. Educational Games

here are many of these to be found, either under the heading of ames services, or among the items provided by those producers of nformation who specialise more particularly in education.

. Tutoring Systems

) Services provided for pupils out of school hours by certain eachers such as J.Y.Garnery of the Ecole des Buttes in Creteil. lass books are available for remote inquiry. In addition, school hildren kept at home because of illness, for example, can carry n working by using the information which their instructor has ntered into the system server.

b) Advisory systems provided by service companies such as CRAC, with their SOS Homework service. Telematics services make it possible to bring together schoolchildren who are having difficulty doing their homework and educators who are paid for helping them out. Teletel 3 allows questions to be put to specialists either directly, with a reply being given at once, or via their electronic mailbox with an off-line reply being given generally within about 24 hours.

6. STI (The Initial Telematics System)

As part of the "Computing for All plan" agreed by Government in January 1985, which aims to equip each school with at least one micro-computer, a telematics phase was added in Autumn 1985. Some 317 schools have been provided with micro-servers, which are usually IBM-PC compatible. Each computer has been supplied with an Initial Telematics Service comprising items of administrative information, games, graphics, specialised sections and newspaper facilities, so as to encourage the equipped sites to develop and set up the initial service sections. From the viewpoint of both the design and the technical development of the telematics service, this STI was created by Aspasie by order of the Prime Minister and the Minister for State Education.

II. Aspasie, from Education to Culture

A. The Background

The Aspasie company has the task of designing and producing a system of communication based on telematics at Marne-La-Vallee. The company was established on the 14th January 1983 at Torcy, 25 kilometres east of Paris. Sector 2 of Marne-La-Vallee is known as Le Val Maubuee. It is here that Aspasie is developing its plans, and the area comprises six towns: Champs-sur-Marne, Croissy-Beaubourg, Emerainville, Lognes, Torcy and Noisiel, involving a total population of 70,000 people. Le Val Maubuee is a new and recently populated town which displays a markedly pyramid-like structure among its age groups, insofar as the number of young people under the age of 20 is twice the national average. In addition, the predominant social classifications are lower-salaried and clerical staff grades.

Aspasie is distinguished from other telematics systems by the fact that its partners in the scheme (some 65 at present, not counting individual participants) have total freedom to decide the form and contents of the 15,000 pages of information which they themselves produce. There are five categories of participant involved in setting up the data bank on the Aspasie system server. These are:

1. Individuals.
2. Associations.
3. Local authorities.
4. Companies
5. The Education System

At this point it is appropriate to consider the use of telematics at local level for educational purposes, as used by education officials of Le Val Maubuee long before 14th January 1986, the day on which the Prime Minister inaugurated the first of the 317 telematics servers for the Ministry of State Education.

B. Educational Information

People from Le Val Maubuee can call the Aspasie system server over the switched telephone network by dialling (1) 60 17 20 00. By selecting the Education section on their Minitel they can first of all find out about the school environment in which their children are educated. In accordance with the Aspasie philosophy, each item of information is produced by the participants resident in the data bank. The following types of information can be found:

1. General Information

a) Of National Importance. Aspasie has installed the SID data bank on rights and procedures, and this service includes a substantial section on education and training from which it is possible to obtain details about free education, moving up from primary to secondary education, university registration procedures, university for mature students, or open learning university courses.

Of Local Importance. Here are two examples:

The Departement of Seine et Marne has installed a service giving rogress reports on the Computing for All scheme. As a nsequence, the Aspasie server is used by all the staff concerned ithin a much larger geographical area than the six townships of Val Maubuee.

In October 1985 the SAN (New Town Corporation) res-ponsible for he administration of Le Val Maubuee new town began providing the irst service giving details of school transport facilities. Each hild with access to one of the 2,500 Minitels distributed free of harge in Le Val Maubuee can now find out at any time full details the school bus timetable for the journey from home to school or ollege. Similarly, each town hall puts out a certain amount of ta such as registration details, a list of schools, the menu for e school meals service, rest centres, and so on.

. Life in School

n addition to the institutions, each school can use the server to eep its local area informed of the school's activities. Although ach group or educational establishment is completely free to pre-ent the information in any way it pleases, the details are gene-ally organised as follows:

) The school's identification record, such as the Dragonfly rimary School at Lognes.

) General information specific to the school, such as procedures or returning to school after the summer holidays, or the ducation methods followed by the school, such as non-streaming nd the organisation of activities into mixed ability groups at he Children's Centre in Torcy.

) Educational activities at the school, such as the types of roup training carried out with the children. This might include uch things as micro-computing, DIY, silk dyeing, and so on, at he Ecole Georges Brassens in Torcy.

. Parent Associations

hether representing opinions at the national level, such as the CPE (Federation of Parent Associations) or created to meet a ocal need, such as the Torcy AAPEM (Le Mail Independent ssociation of Parents) all Parent Associations for schools in the e Val Maubuee conurbation use the system server for displaying heir objectives and their means of achieving them.

. Information on Education and Full-Time Training

In Marne-La-Vallee such details are mainly supplied by the MEP (Mission for Full-Time Education). In addition to supplying the public with information on training courses, conditions for pas-sing them, and the opportunities available in the Ile-de-France Region, this body provides a legal advisory service on training matters, lists of job vacancies, an information bulletin, a spe-cialised messaging service, and a list of specialised organisa-tions. This service totals just over 500 screens of information.

5. Field Mailbox

In April 1985 a primary school class from the Lions School at Croissy Beaubourg went away on a field visit to study bird behaviour. Aspasie provided the class with an electronic mailbox for the group to use. And so for a week parents, children, teachers and school administrators kept in touch by sending around a hundred messages between the site of the study tour at Pougy, and Croissy-Beaubourg. Since at that time the Minitels had not yet been distributed free of charge throughout Le Val Maubuee, each message from Pougy was printed out at Croissy school so that parents could read letters from their children on the spot and even send replies using the school's Minitel.

C. Creative Teaching

To speak of creative teaching in connection with telematics services would certainly have brought a charge of heresy only three years ago. Since it was well known that telematics provided information services, it was difficult to think of it as an instrument of creative teaching. The term creative does not refer here to remote supervision of open learning for consumption by the user, but a use of telematics which makes it possible to produce and communicate teaching material within a strictly localised area. Two examples produced in this way by Aspasie through its "Full-Time Education and Training Commission" have made it possible to measure the attraction of this new form of creativity in teaching, fully involved as it is in aspects of communications, since the children are increasingly aware that their work can be referred to by their friends, parents and acquaintances, or simply by anyone with a Minitel.

1. Creative Writing: Telematic Novels

a) "The Story of a Very Funny School"

Even before Minitels had been given out free of charge throughout Le Val Maubuee during the second half of 1985, some schools had been given a telephone line and a Minitel for exchanging educational ideas. In addition to using group electronic mailboxes as in the situation at Pougy, the Ecole Georges Brassens at Torcy used the mailbox concept to start a school telematic novel which was to be the first of the genre. The theory was as follows:

From the technical point of view Aspasie suggested a single mailbox entitled "Novel" and a password to be shared by the schools wishing to take part in the experiment. There were two:

- the Georges Brassens Primary School at Torcy;

- and the Lions Primary School at Croissy-Beaubourg.

From the educational point of view, the pupils aided by their teachers called up the Aspasie server and then used one or more screens for drafting contributions on a jointly chosen theme "The Story of a Very Funny School". Every pupil involved was allowed complete editorial freedom, and wrote when he or she wanted to and in no fixed order.

"Pere Noel"

The early lessons learned from this educational innovation, the schools telematic novel, led executives of Aspasie's "Full-Time Education and Training Commission" to ask the technical support team for a number of software changes.

The Sequence of Messages

In the system as previously conceived, messages appeared on screen in chronological order. This meant having to scan through every message already sent in order to get to the last bit of text entered. In terms of a conventional work of fiction, that would be like having to start again at page one every time the book was reopened. It was impossible to go directly to screen 20, which meant starting at the very beginning again, and this rapidly became tiresome.

Ease of Access

By definition access to an electronic mailbox is protected. It meant a password was needed not merely to write, but also in order to read what the children had produced. There were therefore limits to the size of audience which could access the screens. Aspasie's technical team offered the Full-Time Education and Training Commission another system of messaging which would correct these defects. After further discussion the new technical system, provided in direct response to a cultural and educational demand, made the following things possible:

- Direct access to required information by date;
- Coordination of text input by a teacher acting as editor-in-chief.

This teacher assigns colleagues the password they need for writing the schools telematic novel or novels;

- An unrestricted look-up facility for the 2,500 Minitel holders in Le Val Maubuee at very low cost (Fr 2.25 per hour).

Beginning on 9th January 1986, three schools put this new messaging system to the test on the common theme of Pere Noel. The experiment went on until 4th February during which time the children input 19 screens of text.

2) Taking Stock

Jean-Louis Bray, who is Director of the Georges Brassens School Group in Torcy, and the prime-mover behind these first two schools telematic novels, states that the average age of the children who worked on them was ten. This type of production has a number of advantages:

- It makes it possible to have a different approach to reading, almost like looking at a newspaper. Pupils learn to skip from page to page. There is no more painstaking, line-by-line reading as with school text books.

- Children learn to express themselves in writing more easily. The text of the novel is first of all prepared on a sheet of paper or on the board, and then transcribed on minitel.

For "Pere Noel" the children had no constraints at all. They were allowed total freedom of expression. This independence in their writing, combined with the novelty value of the device and the ability to communicate their own work to other people, led to some unexpected results. Quite apart from the general air of excitement and interest which it generated, thanks to the "P re Noel" novel two children who had been two years behind in their writing skills, and thus making no progress, actually contributed compositions of their own.

- It becomes an exercise in original and logical thinking. Jean-Louis Bray takes advantage of the way in which the screens for the telematic novel and the Aspasie data bank in general are organised, to encourage his pupils to carry out their own research into tree-like information structures.

- It throws the school wide open. Telematic novels make it possible to exchange ideas between school groups which differ even though they are relatively close in the geographical sense. This makes it easy to set up face-to-face meetings to discuss the work which has been done. In addition to the school-to-school contact, communication now also exists between school and the home, even though there are still too few homes equipped with a Minitel. (The figure for Le Val Maubuee is about 10%).

For the future, Jean-Louis Bray suggests two further innovations:

- From the technical standpoint, to use Praxitele, a videotex graphics software package installed on schools nano-networks (see below). This would then allow novels to be illustrated, since it is very easy for children to produce graphic designs by composing directly onto the television screen with a light-pencil. The software also makes text editing more flexible than is possible on the Minitel, as the cursor can be moved to any part of the page for correcting errors. Screens of text produced in this way can be amended at will. They are loaded onto the server and can be recalled, reworked, and then returned to the data bank.

- From the educational standpoint, perhaps a rather more tutor-led approach to future novels (at least in certain cases), with a more precise choice of theme while keeping the exercise to an appropriate time-scale. For instance it is much less fun to be writing about "Pere Noel" in February than in December.

2. Creating videotex graphisms

Aspasie obtained a graphic design terminal in September 1983 with the assistance of the Ministry for Post and Telecommunications. Straight away some children began composing graphic designs. But training had to be done with care, and trainees had to go to company head office.

As part of the Computing for All programme, a number of schools were equipped with nano-networks, which are systems comprising a personal micro-computer of a type compatible with the IBM-PC, driving six or more home computers which were usually Thomson TO7/70 or MO5 devices. 14 schools or colleges in Le Val Maubuee have been so equipped.

From the standpoint of the telematics services, nothing officially existed until Autumn 1985. But then, at the Georges Brassens

School in Torcy, various interested industrial parties transferred the Praxitele software onto the nano-network and produced the necessary utilities for graphic designs to be held on the "B" type (IBM-PC compatible) servers belonging to the State Education service, and if need be on any other server. As a result, ever since the second quarter of 1986 it has been theoretically possible for all schoolchildren in Le Val Maubuee to use either the nano-network at their own school or at a neighbouring school if their own does not have one, to take part in the fully decentralised production of videotex graphic designs, without having to travel to some special place such as the company offices. There are two types of application which have been produced in this way:

a) Illustrations of poems.

Schoolchildren often produce and sometimes illustrate poetry collections which are shown to thier parents at the end of the scholastic year. In June 1985, at the George Brassens school, two poems were illustrated on a videotex composing screen, "Lune" (moon) and "Definitions". The first screen is divided into two parts: one graphic showing a crescent moon plus a few words "the moon is a harp of roses".
On the second screen, the graphic does not change, just the text continuing the poem. The principle is similar to that of "Definitions". Here we have a dictionary giving the pupil's Christian names. Each name corresponds to a definition given by the pupil in question as his or her fancy dictates. For example, "Laure is a sunflower tied up to a panda eating a white strawberry in a flowerpot !"
The installation of the Praxitele software programme in the nano-networks, end 1985, meant this king of animation could be continued much easier, as the children could henceforth both compose in their schools, and as longer on the Aspasie Composition terminals, and do so in an easier way thanks to the flexibilities of the software and to the use of the optical pencil. In this way the children produced another pen called "The Witches" with a similar functionary to the other two, unchanging graphics in the form of a logo, text differing screen by screen.
This king of exercise is now open to all the children in Val Maubuee. Over and above the pedagogical impact already stressed by the telematic novels where are blended the various aspects of communications, written expression, reading, logic and the use of a new tool, the videotex graphic is enriching as:

+ it brings an extra dimension, that of graphics, of design. It thus aids imagination to flourish, adding to traditional graphic expression but without supplanting it in any way.

+ it adds a further dimension to traditional graphics. It is not simply recopying, often rather crudely, drawings on paper. The use of telematics holds the dynamism that attracts all children.

+ it allows for synergetic work. It adds to the traditional poetry writing, which already involves the children, the teachers and sometimes professionals, the Aspasie graphists who teach how to use the telematic tool for videotex illustrations. Subtly, in between the make-up of a drawing and that of the text, slip in the first outlines of a telematic culture.

b) The Graphics competition.

Up until April 1986, only four or five schools and their pupils had taken part in the use of telematics in its pedagogic creation-communication form, experimented in Val Maubuee.In order to make known these new avenues of remote education, Aspasie organised a videotex graphics competition with the following bases: each schoolchild in Val Maubuee could offer a drawing made on the nano-network. Aspasie encouraged teachers to learn how to use Praxitele on nano-network so as to pass on their knowledge to the children. Whenever someone was missing, the Aspasie team travelled around the schools to give the necessary demonstrations. The children gave free rein to their imagination as no paper work was involved. Once installed in front of the screen, most of them were leading for the first how to compose whilst producing their drawing. The succes of this competition was shattering. From the infant schools up to secondary level, 430 children from 25 different schools produced a drawing which was then stocked on the Aspasie system server.
Now virtually all the schools in Val Maubuee are alive to this new possibility of pedagogic creation thank to telematics. The drawings can be called up via the Aspasie system server and are available either via the child's name or that of his school.
Many parents thus discover telematics through looking for the graphics designed by their child.

c) In the future, it is likely that animators and teachers will fix more precise themes for a longer haul. In the north of France, for example, at Fontaine-Notre-Dame, M. Desobry, the school director, has chosen to prepare with his pupils a data bank on the theme of "eat better to live better". Called "Nutritional" this data bank includes 75 pages of information about a well balanced diet.
In Val Maubuee the themes may concern both scholastic activities and the local environment.
One such case is a project whose feasibility goes well beyond the capacity of the school both in terms of production and of the audience concerned. It is a telematic history of the Val Maubuee in which would take part, in both the conception and the production, teachers, pupils, graphists, historians, institution, associations and other interested individuals.
The gamble is major, as we are living in a recently inhabited geographical area. The residents know rather little about the past of their town. We are often made aware of this when demonstrating the Aspasie data bank. When we key in the code word "chocolate", we see the adress of the town hall of Noisiel, on of the six communes in the Val Maubuee. This is on the "Place Emile Menier", thus recalling that Noisiel is one of France's high spots for chocolate, Menier installed his factories there last century.
The Aspasie data bank is gradually tending to become a priviledged repository to build a cultural identity for the inhabitants of Val Maubuee, based both on storing a collective local memory and on the collection of elements of daily life of social groups and individuals who find a means of expression in Aspasie. But here, we change gear. We slide in specifically pedagogical questions, keyed to the acquisition of a telematic culture proposed by Aspasie, leading ever more people to the acquirement of this new means of communication, individually or as a collectivity.

. Telematics and paideia.

. The objectives of Aspasie.

The Greeks bequeathed us the notion of "paideia", taken up by the Romans in the closely linked idea of "Humanitas". Henri-Irenee Marrou defines it as being "the state of a fully developed spirit, having brought out all its potentialities". This action magnifies that of education, at least on two points: quality and scope. It is not limited to just scholastic institutions and its scope is unlimited. This scope furthermore has varied over the ages. The paideia of the V century B.C. dearly excluded any technical know-how. Today "a well-tempered mind" can hardly exist without a minimum of technical knowledge. Indeed we must avoid any further cleavage between current social segments between those who know and those who do not. Here we are referring to the notion of "computer illiteracy" which looms over, more and more people in every walk of life with the recent massive upsurge of micro-technology. Without any technical culture, and here telematics, alienation from our own background inevitably grows. Furthermore, acquiring a technical culture, even the simplest, can help towards a greater participation in our world. The control of these micro-technologies which is virtually accessible to everyone increases our ability to act in the world of education, in work, in socio-economic and political life, in culture and leisure activities. Naturally possessing this technical culture enabling us to master these new tools neither translates ipso facto by communication waves, nor does it spirit away other systems of logic - state or ideological superstructures, social, economic or political conflicts.
Participation in and control of the world today - and even more tomorrow - can hardly be envisaged (at least in those countries where the techniques of creation and communication have reached a certain level) without the individual and collective appropriation of these technologies, not merely to understand the uses proposed, but also to act on the tools to fit them to a dynamic social demand.

2. The means deployed by Aspasie.

Here we are going to give a very succinct summary of the means that Aspasie has used to concretly encourage a wide upsurge in image of telematic communication.

a) Approach. Ever since its creation, Aspasie setting its face against turnkey telematics, has assembled its five categories of partners (individuals, association, collectivities and local administrations, companies, teaching infrastruture) into different groups. These commissions, education and adult training, technical, sport, research, environment, artistic creation, administrative and social information, animation and culture, have all drawn a maximum of people to participate in the definition of a telematic system suited to the desires of a given group of people wishing to acquire it.

b) Editorial independance. Aspasie rejects the usual gulf between the users of telematics and the suppliers of information. Each individual or group in Val Maubuee is a potential source of data. Whilst being a media, source of proposals, central dispenser of computer and telematics culture, Aspasie has no editorial role. It produces no information other than that which concerns its own activities, and it gives full freedom to its partners concerning content and form. Some partners only compose a few screens: other, like the Maison des Jeunes et de la Culture Victor Jara of Champs-sur-Marne go to over 300.

c) Cost. Minimal, especially when compared to that of Teletel 3. For producers not belonging to the production sector, an annual subscription fee of 300 francs. For users, the information is free, and the communication represents 2.25 francs per hour, at peak time. The data is transmitted via the traditional commuted telephone network (RTC) which is very cheap for local calls. In a limited geographical area, it is thus perfectly possible to offer a moderately priced telematic service. This is indispensable to bring telematic culture fully through to a broad audience.

d) The right technical netword. The Aspasie telematic system is based on the use of micro-technology. It uses the telematic communication (Teletel standards) of microcomputers, both for graphic composition and for handling data. The use of specific tools (ease of use: omnipresence and multi-purpose: the possibility of creating its own programmes) has made it possible to create a telematic system wich, as its first goal, allows the decentralised, broken out, production of data given by the partners of Aspasie. Instead of a classical configuration with a serving system and consumers of data, we have a network designed as follows:

* one common serving system, handling all the data;
* scattered sites of production in the areas, places of activity, schools, institution, administration, companies, household. These are basically professionnal micro-computers equipped with composing software programmes and nano-networks with the Praxitele programme.
* terminals, minitel or micro-computers.

e) Training. Aspasie proposes training courses that gradually sets its partners in control of the telematic tool, as it takes into account two aspects:

* the apprenticeship of using software and equipment such as proposed by service companies and manufacturers. At this stage the results start to be positive as the 65 partners (not including individuals have already learnt how to use micro-computer to compose some 2.500 to 3.000 information screens.
* the intervention of the partners in the offer. This consists of sending out requests to modify (perhaps oneself) the tools to render them more suited to the cultural needs of Aspasie's members. We have already quoted the case of the corrections concerning the telematic novels with the change from "Story of a funny sort of school" to "Pere Noel".

In the same way, the creation of the right technical network illustrates the modification of the technical offer according to cultural demands, since it is partly due to Aspasie that the

Praxitele programme was put on nano-network and that the screens thus created could be retrieved on a server system.

With these means, Aspasie, in the Val Maubuee, is trying to meet its goals of encouraging a fuller expression of citizens and hence a finer participation in day to day environment. Here it reflects s symbol from ancient Greece, Aspasie, the concubine of ricles, whose influence it is said was often decisive in the nning of political life in Athens.

is swift overview of the french experience in telematics leads to think that this tool opens fresh horizons in the areas of ucation and culture. It seems proper to add to the publication information and teaching material, the potential of textual and aphic production which immediately take a dimension of communi- tion. It would perhaps be most useful to start on in depth flection on the intrinsic links between this production and its mmunication capacity. In certain cases, managing to handle the lematic tool may lead a wide public to express itself and to rticipate more fully in its daily environment.
wever, we have to measure our words. These phenomena are very cent and the in depth studies on their nature affects the oblems encountered (cost; relative unsuitability of programmes d equipment), the resistance met (the burden of habit and struc- res) are not that many. We can only hope that the elements set rth here will encourage us to delve further into those few acks.

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REMOTE TEACHING VIA VIDEOTEX:

A case study concerning computer science at the University of Hagen

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ABSTRACT

The "FernUniversität Hagen" is the only university in Germany which offers studies at home in several subjects (e.g. computer science). The teaching aids currently used are mainly paperbased, and have obvious disadvantages especially for areas with the need of training and practical work, like computer science. The lack of possibilities for testing, computing, doing laboratory work etc. has negative consequences: students at the University of Hagen have good theoretical knowledge but relatively little practical experience.

Another problem is the bad ratio between the number of students and the members of the teaching stuff, which does not allow students to be tutored individually to a sufficient amount. Since the aspect of continued education (adult's schooling) becomes more and more important, the number of students is steadily increasing, especially in computer science.

To approach these problems the University of Hagen has started a project to develop learning concepts based on electronic media. At this moment, the most attractive medium is videotex in connection with intelligent videotex decoders (personal computers), because videotex

- is cheap
- has excellent grafic presentation
- provides access to external computers
- supports both intelligent and non intelligent decoders

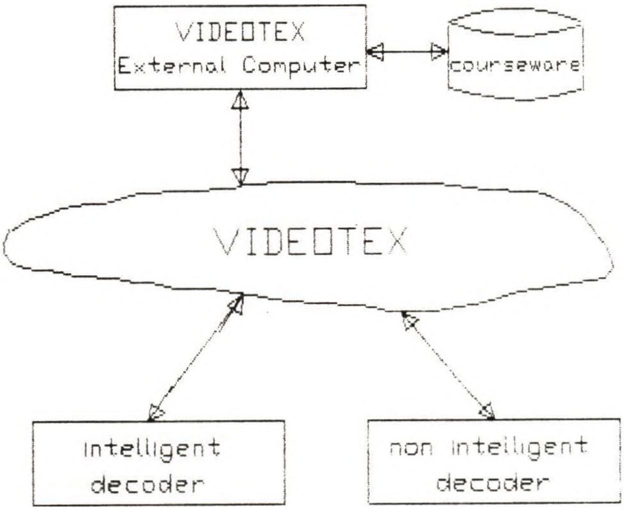

Figure 1: Model of remote teaching system

By using these concepts the following features can be offered to the student:

- guidance through electronic course-material by an 'intelligent' tutor-program
- integration of comprehensive experimenting ("learning by doing")
- elaborated exercises (automatic answer-analyzing)
- "intelligent lexicon access" to the course material
- comfortable electronic communication facilities ("student-student" or "student-professor" connections)

This paper describes first concepts of the project and presents the basic research aspects:

- decentralized CAI environments (e.g. CAI and videotex)
- CAI and experimenting (e.g. programming)
- intelligent exercises (automatic answer analyzing vs. manual correcting)

Furthermore, the integration of electronic courses and the course system of the University of Hagen is discussed.

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