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NATIONAL REPORT

BULGARIA

I. CURRENT STATE OF TEACHING INFORMATICS AT SCHOOL

In 1981 the production of 8-bit Apple compatible personal computers was given a start. At the end of 1984 the Government took a priority decision to create conditions for training the youth in working with computer-based equipment. Following the State policy a new compulsory subject - Informatics - was introduced in the upper grades of the high school, vocational schools and high technical schools since the school year 1986/87.

Those three factors reflected the urgent social needs and speeded up the process of immersion of computers and information technologies in the Bulgarian Educational System. Although, these were necessary, they were not sufficient conditions for running the hardly-known and specific in kind Training in Informatics. Normal and effective realization of the educational processes leading to acquiring and using the computer and the information technologies in the social practice requires the presence of a system of mutually related didactic factors. Until 1986 no didactic system that could be widely used in the Bulgarian schools, existed for teaching of Informatics.

Despite the lack of experience (both Bulgarian and foreign), the Ministry of Education introduced Informatics as a compulsory school subject from the school year 1986/87 within the following restrictive conditions:
1. Informatics was introduced as a general compulsory subject. It started from the second term in the 10th grade (second year of the vocational and high technical schools) with two hours per week (for the total of 34 hours) and continued in the 11th grade (third year of the vocational and high technical schools) again with a two hours a week. The total number of hours allocated for Informatics in the curriculum was 98.
2. Schools were equipped with at least ten 8-bit Apple compatible personal computers, while not all of them with peripherals (disk drives).
3. The programming language was BASIC, and the Operational System was DOS 3.3

With the available technical, software and methodical facilities existing by that time in schools, the three developed and implemented variants of subject contents were restricted to studying the following topics:
1. Introduction in Informatics.
2. Principal structure of the computer and the computer system.

3. Algorithms and ways of expressing them.
4. Introduction in programming.
5. Drawing geometric figures and shapes and animation.
6. Data. Type of data.
7. Data Structures
8. Basic informational activities and algorithms for inputting, outputting, actualizing, processing, finding and sorting.
9. Stages of problem solving by means of computers.
10. Utilization* of the computer and the information technologies for problem solving through computers.

During the first stage (1986 - 1991), the introduction of the subject contents is related to the computers and the information technologies and was motivated, introduced and acquired mainly in the process of solving a suitably chosen (by the authors the actual text-books by that time) system of specific problems.

The existing conditions, the ideas of the authors and the chosen educational strategy led to a groundless domination of programming in teaching in Informatics during the first stage of its introduction in the Bulgarian school.
It is known that the study contents reflects the level and needs of the economical, social-political, cultural and scientific - technical level of society. The deep social and political changes and the economic crisis in Bulgaria in the beginning of the nineties, affected the educational system.

Though slowly, the attitude and the aspirations of society towards education were changed. A tendency is observed towards decline of society' interest in education, that are expressed in the following:

- reduction of the relative share of funds, allocated for education from the national budget
- lack of motivation and common attitude of the youth towards the general and vocational training.

In the conditions of an economic crisis the educational system is gradually being re-oriented and reset in accordance to the changes taking place in the society:
1. Symptoms of decentralization have appeared, expressed in the emergence of private schools.
2. Since 1992 a new curriculum has been adopted, according to which part of the study time (number of hours per week) is used in conformity with students' interests and the priorities of the specific school.

As far as organization is concerned, the variable part of training is accomplished in classes through:

- compulsory elective preparation;
- profile training;
- free-elective training.

In the comprehensive schools in the 9th and the 10th grades the subject "Technologies" is studied. The subject contents is specified locally in accordance to the profiled technological trends, chosen by the relevant school.

3. The Ministry of Education, Science and Technology promotes a tendency for decreasing the relative share and level of the theoretical component of subject contents in the comprehensive schools and increasing of potential possibilities of the study contents for acquiring skills, abilities and methods of learning.

The new curriculum dramatically changed the approach of allocation and use of teaching hours in Bulgarian schools.

The following is regulated for each grade in the curriculum:

1. Compulsory subjects and their weekly horarium. The number of these subjects and study hours defines the General Compulsory Training (GCT) for the students from the specific grade.
2. The number of hours per week, used obligatory for expanded study of one or a couple of disciplines. These are the hours for “compulsory elective training” (CET). The number of hours per week for the GCT plus the number of hours for CET specify the compulsory study time per week.
3. The number of hours per week, that can be used for additional training range. These are the hours for “free-elective training” (FET). In order to carry out a FET, groups of students (occasionally from different classes) with similar interests should be formed. The FET is not compulsory by nature and is carried out when supplementary funding is available.
4. The number of study weeks.
5. Scheme of allocation and usage of the study hours in GCT, CET and FET.

The CET appears in the curriculum with 2 hours per week in the 9th grade. In the upper grades the hours for CET are gradually increased.

Implementation of the training in Informatics

The new curriculum and the tendencies for development of the secondary education, launched by the Ministry of Education, Science and Technologies offer possibilities for a differentiated introducing of subject contents, related to computers, Informatics, and its implementation in the various forms of education, existing in the schools:

1. Non-profiled education in general secondary and high schools.

1.1. Informatics is part of the GCT. It is studied in the 11th and 12th grades with 2 hours per week. Practically though, training in the subject in the 12th grade is not common, as most general secondary schools do not offer 12th grade. Compulsory secondary education is completed in grade 11.

1.2. Part of the hours for CET can be used for training in Informatics. The number of hours and subject contents are specified locally for the school and the different groups in accordance to:

- equipment (hardware and software) in the computer classroom;
- teachers qualification;
- students’ interests and potentials;

- orientation of the school.

1.3. In the frames of the GCT in the 9th and 10th grades the school subject “Technologies” is studied with the total horarium of 140 hours and under the following specific conditions:

- availability of at least seven 16-byte (or more powerful) personal computers;
- suitable software;
- qualified teachers;
- willingness of the students and the school authorities.

The study time defined for the subject could be used for acquiring some concrete information technologies knowledge in word processing, data base, spreadsheets, etc. at the relevant textual or graphical interface. Training is done on a modular principle, in study programmes approved by the Ministry of Education.

2. Profiled training in general comprehensive secondary and high schools.

In the form of profiled training students choose (in 9th grade) and study (since 9th to 11th or 12th grade) extensively three school subjects, called the first, the second and the third profiling subjects. The name of the profile and its course are specified by the first profiling subject. In 9 - 11th (12th) grade hours for the CET are distributed according to a certain scheme between the three profiling subjects. Thus the number of hours for the GCT in the profiling subjects is increased and conditions for their extended and intensified study are provided.

When graduating high school, school-leaving examinations (matriculation) in two profiling subjects are taken.

2.1. Studying Informatics as a profiling subject

In this case training in Informatics and its implementation is carried out in:

- GCT in Technologies (Information Technologies) in 9th and 10th grades, in a total horarium of approximately 140 hours;
- the hours for profiled training in Informatics, that are formed from the GCT Informatics plus a part of the hours for CET in 11th and 12th grades.

2.2. Studying Informatics in a profiled training, when no profiled subject is chosen.

In this case Informatics is studied only in the frames of the GCT, with two hours per week in the 11th and 12th grades. Practically, training in the subject in 12th grade is not common, as most general secondary schools do not offer 12th grade. Compulsory secondary education is completed in grade 11.

3. Training in Informatics in vocational and high technical schools

3.1. The compulsory general-educational training in vocational and high technical schools does not include training in Informatics.

3.2. The vocational training in some types of high-technical schools includes training in Computer Science and/or Informatics and its implementation. For example:

- all students in high technical schools in economics and high technical schools in trading study the subject "Informatics and computers" for the total of 140 study hours. Some specialties in these schools - "Machine processing of information" and "Business and administration" study Informatics and computers extensively or in other school subjects;

- vocational training in high technical schools in electronics includes the following subjects - "Programming" (approximately 140 hours), "Microprocessor-based equipment" (approximately 120 hours) and "Software applications packages" (approximately 70 hours).

3.3. Part of the study hours (classes) for CET (compulsory elective training) in the vocational and the high-technical schools can be used for studying and acquiring computer hardware, Informatics and Information Technologies. Training takes place where there is hardware, software, a teacher and most important - willingness in the students.

Equipment

1. In the period 1986 - 1989 computer classrooms were set up in almost all secondary and high schools in Bulgaria. They were equipped with 8-byte Apple compatible personal computers, but not all of them had floppy-disk drives.

2. In the period 1988 - 1992 some schools changed their equipment entirely (through self-funding or centralized purchasing) with home-made personal computers "Pravetz 16" (IBM XT compatible).

3. In the recent years the Ministry of Education has allocated almost nothing for the modernization and upgrading of the computer equipment. Schools are supplied with computers through self-funding, following an initiative of their own. The restricted sums given at their disposal force the schools to buy mainly particular, usually second-hand units. That is why a significant part of the computer classrooms were equipped with hardware and software that is different in kind and type, which makes specification of study contents and the actual training with up-to-date tools and means quite difficult and rather frustrating.

4. During the last 2 - 3 years some Bulgarian schools were supplied with high-quality up-to-date software at preferential conditions or as donations from world-known software companies, the "Open Society" Foundation, or through International Educational Programmes.

4.1. Twenty-five computer classrooms and one Centre for Teachers' Qualification are equipped with 7 - 8 Macintosh computers (mainly LC II and LC III models). They are using the Bulgarian version of System 7. Basic education is carried out with the integral package Claris Works.

4.2. In May 1994 started the fulfillment of the contract "Educational Initiative of IBM for Bulgaria", signed between the Ministry of Education, IBM and "Open Society" Foundation. Under the patronage of that very contract IBM practically granted 240 personal computers to Bulgarian schools as follows:

- 28 pieces IBM/APTIVA/486/DX/66
- 196 work-stations IBM/APTIVA/486/SX/25

This equipment supplied 27 modern computer classrooms in schools and one Centre for Teachers' Qualification. "Open Society" Foundation completed the equipment in the classrooms by multimedia accessories, laser jets, modems and last versions of software. The Foundation, the schools and the Ministry of Education allocated funds for the special training of teachers, working on the initiative.

In conclusion, it can be pointed out that by the end of 1995 almost all secondary and high schools in Bulgaria had their computer classrooms. Unfortunately most of the hardware and the software is old-fashioned and worn out now. This can be seen from the approximate data given below:

- 70% of computers in the classrooms are 8-byte, Apple compatible, with, or without disk drives;
- 21% are IBM XT compatible;
- 4% are IBM AT 286 or compatible;
- 3% are IBM 386 and IBM 486 or compatible;
- 2% are Macintosh computers, mainly LC II and LC III models.

Subject Content

The subject content in Informatics is determined in each concrete school, class or group, according to the curriculum, the interests of the students (identified through the choice of compulsory electives or free electives), the equipment and software available and the expertise of the teachers in the school. The wide range of factors influencing teacher and student activities in the classroom call for variety in choosing the subject content. The concrete topics, their scope and depth, and the structuring of the subject content is done by the teacher on a modular basis. Teaching the different modules follows syllabuses designed and approved by the Ministry of Education, which act as broad frameworks.

1. Subject content within the core curriculum.

1.1. When the school has provided only 8 byte PCs (with or without floppy discs), the subject content in Informatics is being introduced in the process of solving appropriate sets of tasks (or problems) and generally covers the following themes:

- introduction in Informatics;
- algorithms, basic algorithm structures and ways of describing them;
- introduction in programming (Basic or versions of Logo in Bulgarian are explored);
- Database. Type of data. Symbols, logic and numeric types of data. Compound types of data - one-size bulk (Basic) or linear lists (Logo);
- Basic algorithms for input, output, accumulation, search and sorting information;
- Drawing out geometry figures. Moving simple geometry objects;
- Applications - DOS, electronic sheets or word processors.

The following software is in use in schools:

- File study system - a didactic tool for introducing and learning topics related to creating, editing and data processing saved on files;
- Programmme study environment in informatics - it is an adapted programming environment which imitates the basic opportunities available with MS DOS, study text editor and symbol .... editor.

1.2. When the school provides 7   16-bit PCs at least (or more powerful than this type), learning Informatics is organized in two stages:

- theory - within a school term;
- applications - word processing, electronic sheets, database, graphic design, etc.

Bulgarian versions of widespread and used software are used - Word, Lotus 1, 2, 3, DBase, etc.

2. When Informatics is among the subjects in the group for extended study, about 60% of the time (over 180 teaching hours) is set for compulsory study of the following topics:
1. Structure and basic elements of the computer. Classifying. Historical ,information.
2. Arithmetical and logical basis of computers. Countable systems. Representation of information in computer memory.
3. Algorithms. Properties. Ways of describing. Programming languages.
4. Operational systems. mS DOS;
5. Algorithms and programmes (PASCAL).
5.1. Outlines of PASCAl.
5.2. Simple data types.
5.3. Basic algorithmic structures.
5.4. Compound data types.
5.4.1.Array. Basic algorithms.
5.4.2. Records. Basic algorithms.
5.5. Procedures and functions.
5.6. Recursion.
5.7. Problem solving with the aid of computers.
5.8. Files. File types. Basic operations. Algorithms for working with files.
About 40% of the teaching hours is devoted to introducing and learning the subject content, determined in the schools. The topics to choose from vary within:
1. Application of Informatics in mathematics - using the Plane Geometry System GEOMLAND.
2. Programme packages - word processing, electronic sheets, database, computer graphics, etc. under DOS and /or Windows.
3. Numeric methods. Close equation problem solving. Close functions.
4. Combinatory algorithms.
5. Dynamic data structures - lists, stacks, tails, dual trees. Basic algorithms. Applications.

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II.Computer Science in the Secondary Schools - Today!

1. INTRODUCTION

Whenever we treat and discuss the future of teaching Informatics in the secondary school, no doubt we have first to pose the problems and to report the results obtained in this field today. That is why our report is concentrated on those problems, approaches and methods used at present which will be applied to teaching Informatics in the secondary school in future as well.

The implementation of computer technologies in modern society is unthinkable without well educated people in this field and no doubt this sort of education should start in the secondary school. Some of the basic notions of computer science and computer applications are studied in Bulgarian secondary schools in the Informatics classes.

Those who study Informatics as a subject according to the curricula offered by the Ministry of Education, namely ({1,2}, {3,4}, {5,6}, {11,12}, {13,14}) are supposed at graduating from the secondary school to have acquired knowledge on:

- computer hardware, principles of computer operation and some computer applications;
- some types of software and the ways of using a certain operating system in order to write and execute simple programs and programming systems;
- the main methods of coding and representing data, some data types and data structures, the principal management structures. In addition, pupils are expected to be skilful in creating algorithms and programs for solving some unsophisticated problems.

2. USING MODULES AS A METHOD OF TEACHING INFORMATICS IN THE SECONDARY SCHOOL AND AN INTRODUCTION TO THEIR IMPLEMENTATION

The process of introducing Informatics as a school subject in secondary school in 1986/87 was accompanied by some problems which we could summarise as follows {15}:

- As a "new" subject, Informatics had to "be inserted" in the high school curriculum among the other, well established subjects, which naturally resulted in decreasing the number of classes in some of them. Some of the experts in the Ministry of Science and Education adopted a negative attitude towards the new subject which led to a multiple shifting of the place of the classes in Informatics in the curriculum from one grade to another and to a crucial decrease in their total number. That inevitably resulted in destabilising the attitude of most teachers, primarily mathematicians. The latter insisted on classical teaching of Mathematics pleading the new Textbooks and School Aids to be introduced in other school grades within another syllabus.

Also we cannot assume that "blurring " Informatics knowledge into Mathematics classes is a successful attempt. As an argument we can point out that not all Mathematics teachers have the qualification needed to teach Informatics as well and for this reason we could hardly expect any achievements in teaching Informatics in this way.

- The available computer technique (both in quantity and quality) does not prerequisite a general and unified Informatics teaching, even when the education is integrated. This impression could hardly be influenced substantially by the recent changes in equipping some schools with new computer classes. One of the possible ways to solve the problems caused by the great diversity in teachers' qualification, in the computer technique available as well as the very lack of computers in some schools, is to teach Informatics at two levels, namely:

- *first level* - all pupils graduating from the secondary school should acquire an obligatory minimum of Informatics knowledge;

- *second level* at which the knowledge acquired by the first one is upgraded by including additional knowledge which may vary in topics and in volume depending on the desired professional qualification of pupils and on the hardware and software available. The teaching materials supporting such an education could also be created according to the module principle. The idea of module approach is a prerequisite for differentiating Informatics teaching with the obligatory minimum as its lowest boundary and with a free upper boundary which may vary according to the desires of pupils and the hardware and software available.

The changes of the syllabus for specialised and non-specialised education in the secondary school introduced recently have shown in practice how Informatics might be taught in different ways.

The textbook "Informatics II" {6} is an attempt to illustrate the real implementation of this idea; it comprises some modules {7}, {8}, {9}, etc. oriented to practice. Next follow the basic parameters of three of them. The modules given are TEXTPROCESSING, SPREADSHEETS and DATABASES and they comprise three modern, popular and simple (as far as the hardware required is concerned), programming systems, namely WORD, LOTUS 1-2-3 and dBase III+ in their Bulgarian versions. The modules are unified in structure and reveal both the basic and the specific facilities of the systems under consideration. Also some practical examples have been given so as to illustrate how these systems can be implemented for solving real problems. Each topic ends with a Topic Summary. Next follow the main topics of the modules:

TEXTPROCESSING

I. Introduction to Textprocessing Systems
1. Computer Texts
2. Starting with MText
3. MText Commands
4. First Computer Text and Text Writing and Correcting
5. First Steps to Formatting Texts
6. Text Printing

II. Specific Facilities of Textprocessing Systems
7. Screens, Windows and Operations with Them
8. Table Creating and Editing
9. Calculating Expressions; Text Sorting and Searching
10. Formatting through Masks

III. Implementation of Textprocessing Systems
11. Staff File of a Company
12. Mail Automation of a Company

SPREADSHEETS

I. 1. Introduction to Spreadsheets Management Systems
2. Starting with MPlan
3. Creating Spreadsheets
4. Editing Spreadsheets
5. Fields and Operations with them. Addressing
6. Additional Information about Calculations in MPlan

II. Some Specific Facilities of Spreadsheets
7. Displaying Spreadsheets Data
8. Business Graphics in MPlan
9. Databases and Spreadsheets
10. MPlan mosaic ... or Something else about MPlan main Commands

III. Implementation of Spreadsheets
11. One Hundred Levs Today is More Than One Hundred Levs Tomorrow
12. Each Loan is Paid Back with Interest

DATABASES

I. Introduction to Database Management Systems

1. Databases
2. Relational Systems
3. Starting with dBASE
4. Creating a Main File
5. Up-dating a Database
6. Using Restrictions at Processing a Database

II. Some Specific Facilities of DBMS (Database Management Systems)

7. Sorting and Indexing Files
8. Operations with Two Main Files
9. Introduction to Programming in dBASE
10. Management Structures in dBASE

III. Implementation of DBMS

11. A Card-Index of Addresses and Telephone Numbers
12. Stock Control of a Store for Building Materials

3. INFORMATICS AS A SCHOOL-LEAVING EXAMINATION SUBJECT

The problems mentioned above have already been solved and standardised for the cases when Informatics is studied as a chosen obligatory or specialised subject. The Ministry of Science and Education approved a syllabus for that type of education in 1993 and in May 1994 a Textbook was approved by anonymous competition {10}.

Principal ideas observed when writing the textbook

The classes of Informatics envisaged are 216, distributed as follows:

- classes for new lessons	about 70
- exercises in class	about 40
- drills and practice in a computer classroom	about 90
- tests	about 5
- revision	about 10

a) Structure of the textbook

The textbook consists of Introduction, where some historical notes are given, four Sections and a concluding part. Each Section covers several topics comprising one or more lessons. Wherever possible lessons begin with some examples or problems. Thus an introduction to the root of each topic is made. The basic headings of each topic are:

- autotests;
- questions and answers;
- topic summary

The autotests comprise one or more problems enabling students to test what they have learnt by themselves. Thus some additional problems whose solutions are given at the end of each topic are added to the lessons.

b) Why PASCAL is chosen as a programming language in the textbook?

PASCAL is a universal programming language. The first idea of its author, Professor N. Wirt, has been to use this language as an educational one. The passed twenty years have shown that he was right. During that period PASCAL has proved not only to be the most taught programming language but also the one most often used in different programming systems. Probably this is due to the fact that it is:

- a programming language with a wide scope of problems which can be solved through it;
- a structural programming language;
- a module programming language;
- a standardised programming language ;
- a language supplied with relevant media for programming on almost all models of large computers, mini- and microcomputers.

c) Didactic features of the textbook

The main guiding principles at creating the different methodological units of the textbook have been systematisation, consecutiveness, scientific rigour, simplicity, visuality. New notions are introduced relying on pupils' intuition and wherever necessary they are formally defined as well. Topics are ordered so as to enable the implementation of the following three parallel types of activities:

- teaching new lessons;
- class exercises;
- practice in a computer classroom

d) Brief content of the textbook

The History of a Dream which Became Reality - instead of an Introduction

1. Mathematical Foundations of Computers;
   Numerical Systems;
   Predicate Algebra
   Algorithms
2. Computer Systems
   Structure of Computers
   Operating Systems
   Programming Media and Applied Systems
3. Introduction to Programming
   Structure of a PASCAL Program
   Numerical Data Types
   Use of Standard Subroutines
   Conditional Operator. Boolean Data Type
   Loops
   Character Data Type. Multiple Choice
   Simple Types: Completion and Generalisation
4. Subroutines and ...Data Types:
   Functions
   Procedures
   Arrays and Character Strings
   Computer Graphics and PASCAL Programs
   Recursive Definitions and Programs
   Records
   Files
   How Fast Can Computer Programs be Run? - Instead of Conclusion

SCHOOL-LEAVING EXAMINATION IN INFORMATICS

Pupils will sit for a school-leaving examination in Informatics this year. Naturally they feel excited and embarrassed. What will a school-leaving examination topic in Informatics look like? Though there exist a number of opinions in this field, the problem is not clarified yet. Let us even add another one.

The school-leaving exam in Informatics will consist of two parts called conventionally theoretical and practical.

The theoretical part will be a written exam consisting of a test and a problem. The problem will be formulated so that its solution should be written as a PASCAL program. The topic for the written exam will be one and the same for all graduates and it will be given by the Ministry of Education, Science and Technologies.

The practical part of the exam will be absolutely independent of the theoretical one. It will aim at testing the actual skills of pupils to implement a certain applied system, for example, a textprocessing system, spreadsheets, a DBMS, a computer graphics system, etc. The use of different hardware and software in high schools will hamper the formulation of a unique practical topic at first. Teachers might be given the opportunity to prepare these practical topics in the form of exam tickets. If the number of computers in a school is not sufficient, the practical part of the school-leaving examination might be carried out in several consecutive days but it should precede the written examination and only pupils who have passed it would be admitted to the theoretical one.

Next follow some problems which might be items of a test included in a topic for a secondary school-leaving examination. More detailed information about tests in PASCAL can be found in the journal "*Mathematics and Informatics*, 1994 {see 16}. In 1995 on the pages of the same journal under a new heading called Info Secondary School Leaving Exam will be published some exemplary topics for such an exam.

THREE HOT POINTS

1. No more than 10% of the high schools in the country possess 16-bit PCs. Then, can we talk about Computer Free Informatics in the secondary school in Bulgaria at all? Does not this percentage mean that studying Informatics without computers in the secondary school is still a hot problem?

Note: The authors of this paper make a distinction between the notions of "Computer Free Informatics" and "Studying Informatics without Computers"

2. Are the 11th and the 12th grades the most appropriate ones for studying Informatics? How could we introduce new technologies in schools if future teachers do not face the problems of Theoretical and Applied Informatics while being school or university students?

3. The obligatory minimum of Informatics to be covered by pupils in the non-specialised schools is not formally determined yet. This is an essential obstacle for teachers and especially for pupils who would like to sit for a secondary school-graduating examination in Informatics. There are such pupils.

WHAT ABOUT TOMORROW?

Informatics as a school subject is entirely dependent of computer (hardware and software) technique available in high schools. That is why no essential changes are expected in the near future. But since the necessity of implementing information technologies is undoubtedly growing, then the position of Informatics in the secondary school will be strengthened. And if we have to answer the question "*What shall we do tomorrow*", the reply inevitably will be: *Tomorrow we are going to implement what we experiment today in secondary school and in training future teachers in Informatics*.

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III. Integrating Information Technologies In The High School Curriculum

I. DEFINITION OF THE NOTION OF INFORMATION TECHNOLOGIES

The term *information technologies* is comparatively new. It became popular in the 80s and in the early 90s in connection with the rapid development of microelectronics and the implementation of personal computers in administration, economics, technology, etc.

In general, the term *information technologies* is used to denote the set of technical devices, tools, methods, knowledge and skills required for data processing.

Thus defined, the scope of the notion of information technologies is very wide. Since we are interested in the specific purposes and problems of education in the high school, further on information technologies would mean computer-based information technologies in the high school defined as follows:

Technologies related to developing and/or using software products and systems for computer-based automation of the main information processes (compiling, processing, displaying and distributing data).

This definition is used to narrow the scope of information technologies to those used in the secondary high school and it enables us to determine some educational criteria.

Next follow some corollaries of these definitions:

1. Technologies directly connected with hardware and its elements are excluded from the high school syllabuses (they are not supposed to be studied in high school).

2. Primarily ready-made software products are to be studied, in the secondary high school since we suppose that most pupils should be well qualified users of computers and some often used software packages such as textprocessing systems, spreadsheets, DBMS, etc. In this case information technologies appear to be an object of studying in high
school and they are not treated as a tool through which this process is optimized (as a tool for optimizing this process)

3. Except as an object of studying, some information technologies can be treated as a tool for optimizing the learning process in some school subjects.

4. The scope of studying information technologies in high school is reduced to those which presuppose an extensive use of computers (the computer-based ones). Thus the basic idea of studying information technologies in the high school is concentrated on training pupils to be skillful in working on computers, i.e. to become well-qualified computer users, who on the one

hand, can operate with the most often used representatives of software packages and on the other hand, are capable to learn by themselves how to use some new software products.

Is such an education necessary for pupils in high school?

In my opinion - yes, because nowadays, the use of computers in the above-mentioned manner becomes an element of mass culture typical for the end of the 20th century (due to the implementation of PCs) and it is no more (it is far from being any more) an occupation of special groups of experts.

That is why from now on the problem will be not **whether** to study computer-based information technologies but **what** and **how** should be studied - topics, their volume, methods, organization of the learning process, etc.

II. SOME POSSIBLE SOLUTIONS FOR ORGANIZING THE EDUCATION IN INFORMATION TECHNOLOGIES

The possible ways of organizing the study of information technologies in high school are two - either through integrating them into the school subject of Informatics or by separating them in another subject.

In the second case the study of Informatics should include some fundamental knowledge in information technologies as well, but at a more principal, conceptional level, while education in the other subject should focus on implementations and applications.

What is the present situation in the high school?

Informatics is studied as a school subject in the 11th grade of the high school twice a week. The syllabus envisages pupils to acquire knowledge on some fundamental notions of Informatics and some information activities and processes; on algorithms and their representation; on some essential constructions of a given high level programming language and to use them to write some elementary programs. Also, in addition, pupils are supposed to get some idea about the essence and the functions of the operating systems and the description of the functions and structures of the main types of software products such as textprocessing systems, spreadsheets, data bases, data base management systems (DBMS), etc.

Evidently, pupils could hardly acquire any stable practical skills for operating with software products with such a curriculum and for such a period of time and probably that should not be the main purpose of studying Informatics in the high school.

Starting from 1993/1994 the curriculum envisages studying information technologies as a school subject twice a week in the 9th and 10th grade of high school.

A special guide for studying information technologies in high school was worked out in 1994/1995.

In conformity with this guide and with the general guide for the organization of work in high school in 1994/1995, each school could choose the concrete trends and technologies to be covered by the school subject of information technologies. Thus information technologies could be one of the probable choices and some syllabuses for them had been worked out.

Does such an approach to the organization of education give any advantages?

In my opinion, yes, because it is up to each school to judge and choose to study information technologies. But they should meet some requirements concerning the number and model of computers available, the qualification of staff, etc. At present asking all the schools to study information technologies as an obligation might fail because of their inadequate conditions in school computer studies.

III. GOALS, ORGANIZATION AND SYLLABUS OF THE EDUCATION IN INFORMATION TECHNOLOGIES

The main goals of education in information technologies are as follows:

1. To enable pupils to acquire knowledge and skills needed for using computer systems and ready-made software products in different fields of economical and social life.

2. To help pupils in the high schools for natural sciences and Mathematics to extend and deepen their knowledge by applying some special information technologies to studying other school and special subjects.

3. To stimulate pupils in the specialized classes in Mathematics in combination with those in Informatics to get knowledge in programming and to use modern programming media in creating applied software products.

A main organizational approach to fulfilling the above-mentioned aims is the creation and development of separate modular syllabuses in information technologies to be approved by the Ministry of Education and each school might combine them in one or two-year course in information technologies, according to its profile, or through including them in the extracurricular or optional subjects.

Education in information technologies should be based on the names of concrete information technologies and types of syllabuses, approved by the Ministry of Education. Education in other syllabuses or other information technologies may be accomplished only in extracurricular or optional classes but only if the school meets the relevant computer and staff requirements.

The principle of the obligatory minimum of required computers and teachers is observed when permitting education in a certain information technology and these requirements are described in the relevant syllabus so as to avoid education where no adequate base is available.

Education on each module terminates with pupils' course reports which aim at testing their knowledge and skills acquired on the respective software product.

Types of syllabuses had been worked out for the following modules in 1994/1995

NAMES OF THE INFORMATION TECHNOLOGIES FOR WHICH THERE ARE SYLLABUSES

1. Operating Systems with Text Interface	36 classes
2. Textprocessing	36 - " -
3. Spreadsheets	36 - " -
4. Databases	36 - " -
5. Computer Graphics	36 - " -
6. Information Technologies	

for Research in Mathematics
(for mathematical investigations)   at least 36   - " -
minimum

A module of 72 classes or a combination of two modules of 36 classes, chosen by the teacher form the syllabus for a school year.

It is planned to work out syllabuses on: programming techniques; numerical methods; operating systems with graph interface; network and multi-user operating systems; pre-printing systems; graph processing; multimedia; information technologies in education, etc.

The planned variety of concrete information technologies aims at enabling schools which have the equipment and teachers needed to make their choice according to the profile of the school and pupils' desires.

IV. SURVEY ON SOME OTHER EDUCATIONAL PROJECTS AND MODELS

I would like to review the work of the two centres for training teachers founded in conformity with two different agreements.

These centres are located in the Department of Information Technologies at the Faculty of Mathematics and Informatics at the University of Sofia.

In 1993 a Centre for Training Teachers to work on Macintosh was founded according to an agreement among the Ministry of Education, the Department of Mathematics and Informatics at the University of Sofia and the company "Bulgarian Business Systems" in connection with equipping some with   Apple-Macintosh computers.

In the summer of 1995 an IBM Centre for Training Teachers was founded in cooperation with IBM Bulgaria and the Foundation "Open Society" under the terms of the contract "Educational initiative of IBM in Bulgaria"

The goals, the work and the perspectives of the IBM Centre are treated in details in the report of Mrs. Iliana Nikolova. I would like to add that the Ministry of Education considers that the activity of these two centres and especially the work on "Educational Initiative of IBM in Bulgaria" might be a good chance of experimenting with some models of organization and interaction in the field of School Informatics and the application of information technologies to studying other school subjects in some schools, namely: developing and experimenting some syllabuses and educational projects, creating a system for permanent training of teachers, on their working places as well -   through modern systems of communications, connecting the schools they work in and the educational centres.

If, in this two-year period of work with the agreement with IBM, some useful school projects and models of organization occur, they could be submitted to the Ministry of Education for approval and further implementation in high school.

At present a project for implementing the well known system "GEOMLAND" in the High Schools for Mathematics and Informatics and in some other specialized classes has been worked out. In the beginning ten High Schools for Mathematics and Informatics and some specialized classes in different schools in the country would participate in the experiment.

In conclusion, I would like to point out that further study and use ofinformation technologies in the learning process would inevitably develop with the growth of their applications to different fields of economic and social life. This perspective and the equipment of schools with modern computers and tools would result in some more efficient changes of the organizing the process of education in the high school related to widening the scope of studying and using information technologies in the high school.

Pencho Mihnev,
Ministry of Science and Education
Sofia

IV. Studying Informatics in the Mathematical Schools in Bulgaria

In 1970 several schools specializing in Mathematics-the so-called Mathematical schools-could be found in Bulgaria. Informatics was started, being taught together with an increased number of lessons in Mathematics. At that time courses of Numerical Methods and Programming were presented. At the end of the 1970s computer laboratories using computers type IBM-360 were present in some of these schools. In 1983 the pupils in the Mathematical schools were given the opportunity to specialise in Computer science as “Operator-programmers for computers”.

It is known that teaching Informatics depends to a large part on the computer equipment. In this connection the present study focuses on teaching Informatics in the Mathematical school in Plovdiv which has traditions in this sphere. This school is known to be outstanding with:

- its own computer laboratory, the first of its type in Bulgaria established in 1975;
- its computer laboratory on the basic of APPLE-computers first found in the country in 1982;
- its teachers - authors of textbooks and curriculum in Informatics for the secondary schools, etc.

At the present time the Mathematical school in Plovdiv has 4 computer laboratories with 68 IBM PC computers, 1 laboratory with MACINTOSH computers, 1 laboratory with BBC computers and a lab in Robotics. Informatics is studied every year in this school - from the first-preparatory class to the end. In the first four years of education the pupils have two Informatics lessons a week.

The program includes:

- Introduction on Using a Computer;
- Introduction to Operating Systems;
- Introduction to Text Processing;
- Introduction to Working with a Spreadsheet;
- Introduction to Robotics;
- Introduction to Programming in BASIC and PASCAL.

In the final year of education the emphasis is on the professional training of the pupils as Operator-Programmers for computers. This training includes 470 teaching hours. The working plan for school terms and subjects is as follows:

Professional Training	I Term	II Term	Lessons
School Weeks	17	15	

1.Theoretical Training:			
1.1. Programming and Algorithmic Languages	5	3	130
1.2. Operating Systems	2	1	49
1.3. System and Applied Software	-	5	75
2. Practical Exercises:			
2.1. Programming and Algorithmic Languages.	2	2	64
2.2. Operating Systems.	2	1	49
2.3. System and Applied Software	-	3	45
3. School practice			60
Total:			472

Thematic Plan: "Programming and Algorithmic Languages":

Name of the Theme	Lessons Total Number	
	New knowledge	Exercises
I Introduction to Programming		
1. Historical data. Algorithms and programmes. Programming languages. Classification. Metalanguages. Solving problems with the help of a computer.	3	-
2. Basic objects in the programming languages-identificators, variables, expressions, arrays, functions.	3	1
3. Operators in the Programming Languages. Sub-programmes. Structure of the programmes.	4	1
II. Algorithmic Language Pascal.		
1. Introduction to the Pascal language-historical data, alphabet, key words, integer and real numbers, strings. Structure of the programmes in Pascal, classification of the operators. "Turbo Pascal 7.0" system.	8	2
2. Data types in Pascal.	3	2
3. Constants, types and variables.	4	2
4. Standard functions.	5	3
5. Expressions.	5	5
6. Input and Output in Pascal.	5	5
7. Driving Operators-IF .. THEN .. ELSE, CASE, FOR, DO..WHILE etc.	15	8
8. Procedures and functions.	15	8
9. Records, Files, Sets.	15	10
10. Additional functions of the "Turbo-Pascal" System 7.0.	15	10
III. Programming Technology.		
1. Programming style.	4	1
2. Program design.	10	2
3. Program verification.	8	2

4. Program documentation.	8	2

The basic textbook used is: *Informatics with Pascal*, Pavel Azalov, Fanny Zlatarova, Sofia, 1994.

Thematical plan "Operating System"(OS).

Name of the Theme	Lessons Total Number	
	New knowledge	Exercises
I. Introduction to the OS.		
1. Operating systems-role, importance, types.	2	-
2. Stages of development of the OS.	1	1
3. Basic functions of the OS.	4	2
II. Functions of the operating system MS DOS.		
1. Starting MS DOS.	1	2
2. File system.	2	4
3. Command classification.	1	1
4. Command description:		
4.1. Commands for working with directories.	3	3
4.2. Commands for working with files.	3	5
4.3. Commands for working with disks.	3	4
4.4. Other commands.	3	3
5. BAT Files.	3	3
6. Service Programmes.	3	2
III. Other Operating Systems		
1. Operating System VMS.		
1.1. General information.	1	-
1.2. File system.	3	1
1.3. Terminals. Command characters.	-	2
1.4. Starting VMS.	1	2
1.5. A general format of the commands.	1	-
1.6. Basic commands.	5	2
1.7. Exit of the system.	-	1
1.8. File editing.	1	1
1.9. Basic work schemes.	1	1
2. Operating system Apple DOS		
2.1. Basic commands.	2	2
2.2. Sequential files.	2	2
2.3. Direct files.	3	3
2.4. Other functions.	2	2

The basic textbook used is *Operating Systems for 11th Class*, Agop Hatchikian, Asen Rachnev, Kosta Garov, Sofia, 1990.

Thematic plan:"System and Applied Software"

Name of the Theme	Lessons Total Number	
	New	Exercises

	New knowledge	Exercises
1. Mathematical and Logical bases of the computers-number systems, logical operations and functions, realisation and application of the logical functions, logical schemes.	8	4
2. Representation of the information in the computer memory and operations with it.	15	4
3. ASSEMBLER for IBM PC.	15	10
4. Applied Software.		
4.1. Working with Database. Working with "WORKS" package.	15	10
4.2. Text processing. Text processor WORD.	12	10
4.3. Spreadsheets. Working with the spreadsheet LOTUS.	10	7

At the end of the school year the pupils work out and defend their projects in Informatics.

The extracurricular work in Informatics is very-spread n the Mathematical Schools. Talented pupils are organised in study groups. A system for working with talented pupils in the Mathematical School in Plovdiv has been functioning for 20 years. Here is a thematic plan for working with talented pupils in Informatics.

Thematic plan for working with talented pupils in Informatics:

Name of the Theme	Lessons Total Number	
	New knowledge	Exercises
1. Numeric problems-arithmetic of the real numbers, computing of formulas. Fibonacci, Bernoulli and Stirling numbers.	8	8
2. Arrays, matrix algebra, sorting and searching, polynomials.	10	10
3. Geometry and Programming.	10	10
4. Data structures-stacks, decks, tables, hashing methods.	15	15
5. Elements from the theory of the Graphs.	20	20
6. Combinatorial algorithms.	15	15
7. Methods for constructing algorithms.	25	25
8. Algorithms and games.	15	15
9. Numerical methods.	25	25
10. The Theory of Coding. Fano, Shenon, Huffman codes.	15	15

Besides the participation in the Olympiads in Informatics every talented pupil works upon a particular problem in Informatics and prepares a report. Here we offer a list of such reports which gained prizes at national conferences and competitions.

"*MDL-System for Processing Mathematical Objects*"- a system for input, support and processing of the mathematical objects. The programmes are written in Turbo C and Scheme Lisp.

"*OOEP-Object-Oriented Extension of Pascal*"-that is a language extension of Pascal by means which show the main characteristic features of object-oriented languages. The programmes are written in Turbo C.
"*A Program System for Modelling 3-Dimensional Objects*." - a graphic system for modelling 3-dimensional objects.
"*An Information System for Computer Service of Bridge-Tournaments*"-this system was used at the European youth championship in 1989 in Plovdiv.
"*Interpretator Lisp-8 for Computers APPLE-8*".
"Program Model of the Post Machine and its Application in the Lessons in Informatics."
"A Package of Programmes for Computer Teaching in Mathematics, Biology, Chemistry."
"Program System for Working with Polynomials"

The analysis of the results of our pupils shows that the Mathematical Schools train young people who can successfully use the modern Information Technologies.

Kosta Garov
Mathematical School "Acad. Kiril Popov",
Plovdiv,
Bulgaria

V. The State-of-the-Art in Informatics Education in the Bulgarian Schools as Provided by the IEA Comped Survey

Introduction

Teaching informatics at school has a long history and tradition in Bulgaria. The first steps were made in the late sixties when some optional informatics courses were taught for secondary school students in mathematics and in vocational schools. In 1979 the Research Group on Education (RGE) under the Bulgarian Academy of Sciences and the Ministry of Education started an experimental teaching of informatics in twenty seven schools both at elementary and secondary school level. Informatics has been taught as a compulsory school subject for all secondary schools in Bulgaria since 1986. The procedure for introducing computers into the secondary schools, the relevant stages, objectives and tasks, were part of a Program for the implementation of computer technology, was worked out and approved by the Higher Council for Education at the Ministry of Education in Bulgaria in 1985. Since then a large number of computers have been delivered to schools, a compulsory course on informatics has been introduced in all secondary schools, several informatics textbooks have been published, a great number of teachers have passed computer education courses, many scientists and university teachers have done valuable research in the field of computers in education. However no significant research on present situation in using computers in education has been undertaken in Bulgaria so far. The International Association for the Evaluation of Educational Achievements (IEA) Computer in Education (Comped) Study, Stage 2, gave us an opportunity to draw up a realistic picture about application of information technologies in Bulgarian schools and to compare it with the situation in the other participating countries.

1. Some General Findings of Comped Study

The study showed that the integration of computers in classroom practice is being impeded by obstacles of which the most important are [1]:

- lack of good educational software;
- restricted access to computers at schools;
- teachers do not receive enough support and do not have the necessary training for computers to play a meaningful role in the classroom.

The IEA has drawn a number of conclusions from the study:

a) Having a computer at school does not mean in itself that it will be used regularly in the classroom. The effective integration of computers into lessons demands more time and targeted activities, such as the provision of information on the added value of integrated use of computers, software development and training. It can already be concluded that progress will be slower than originally anticipated when computers were first introduced into schools.

b) It is essential that teachers receive full training and support and that more hardware and software is available.

c) For students who do not have a computer at home, the school is an important provider of equal opportunities to learn about information technology.

National educational systems will have to work hard to keep pace with the social changes caused by further digitalisation of information flows. There has been a striking increase in the availability of computers at school in recent years but the computer is still marginally used as a tool for teaching and learning.

Schools, parents, and policy makers should be aware of the differences in knowledge and attitudes between boys and girls towards using computers. Lack of familiarity and experience with computers could be socially disadvantageous for girls.

Any participating country could benefit a lot by analysing the data available according to its concrete needs so that to answer many questions related to computer education. Some findings based on the analysis of Comped data made by the International Co-ordinating Centre [3] and by the Bulgarian Comped research team follow.

2. Access to Hardware and Software

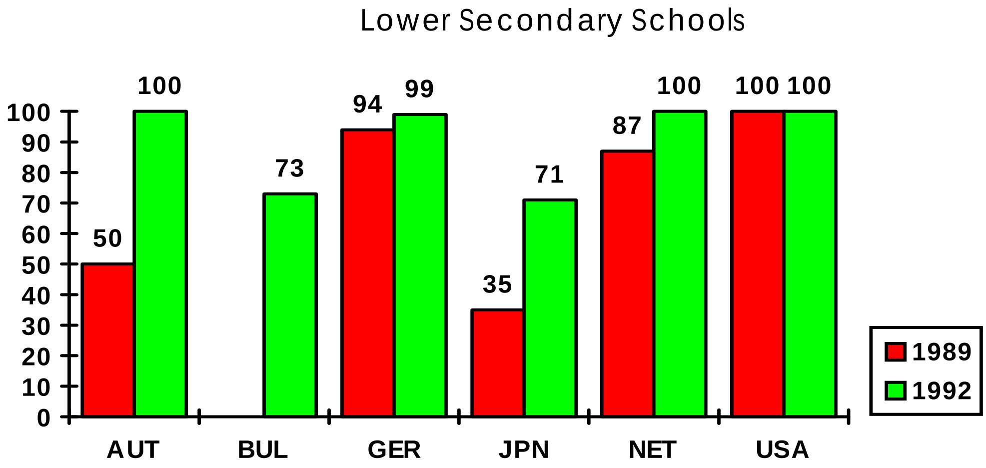


Figure. 1

Upper Secondary Schools

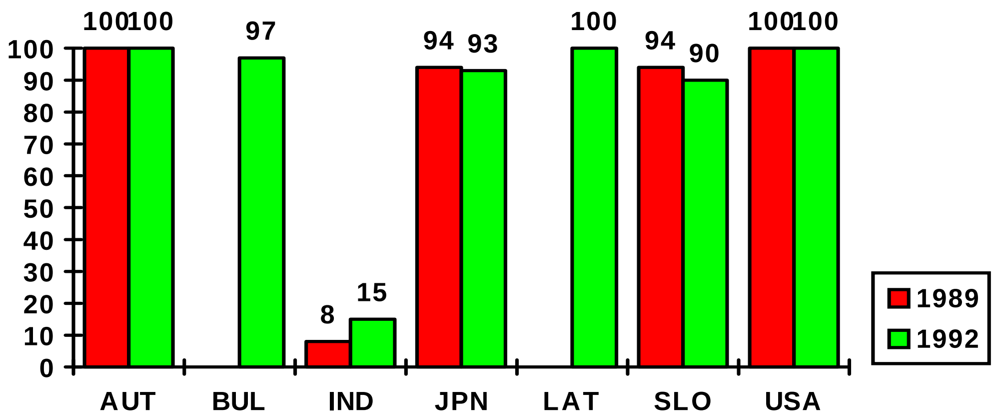


Figure 1 (cont.)

Lower Secondary Schools

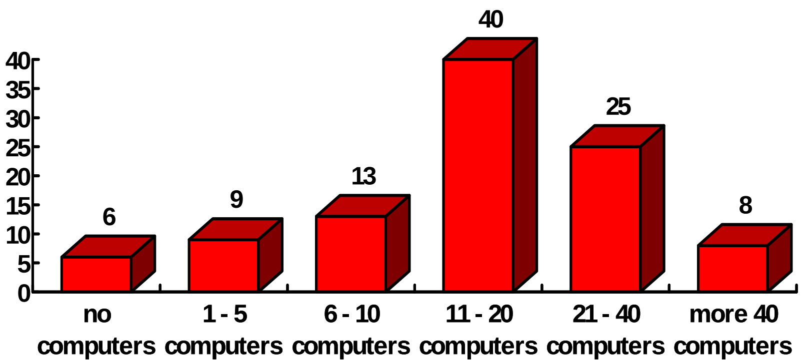


Figure 2.

Upper Secondary Schools

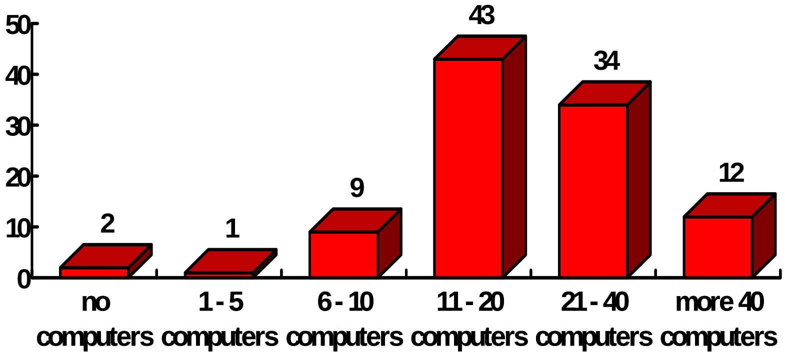


Figure 3.

As it could be seen from Fig. 1 the percentages of Bulgarian schools having computers in use for instructional purposes by the end of 1992 are: 73 % at LSS and 97% at USS. Only in Austria, the USA, and the Netherlands (at LSS) and in Austria, the USA and Latvia (at USS) all schools are supplied with computers. Fig.2 and Fig.3 show that most of the schools both in LSS and USS have more than 10 computers available and can rely on a well equiped computer laboratory. The median number of computers at computer using schools in Bulgaria is 17 in LSS and 18 in USS.

Table 1

Country	School + Outside	Only School	Only Outside	Not	At Home	Hours
Lower Secondary Schools						
AUT	62	28	6	4	43	5.2
BUL	15	24	14	47	5	4.9
GER	59	18	16	7	58	7.0
GRE*	55	41	1	4	31	5.5
JPN	13	19	24	44	21	1.9
NET	60	17	16	6	57	4.0
USA	74	21	2	3	51	2.1
Upper Secondary Schools						
AUT	62	26	7	7	53	4.7
BUL	18	61	2	20	6	5.6
IND	2	6	3	89	1	4.4
JPN	23	26	16	35	27	2.3

LAT	27	53	3	17	11	6.6
SLO	40	29	12	19	28	4.2
USA	77	19	1	3	51	2.2

Notes:*Students in computer using schools only.

All data mentioned above give the impression that the Bulgarian schools are very well supplied with computers. However in order to find out the real access of students to computers we could analyse Table 1 which shows that many of the Bulgarian students (e.g. 61% at USS and) rely only on using computers at school while a great number of the students do not have access to computers at all, e.g. 47% in LSS and 20% in USS. Another indication of the real access of students to computers is the availability of computers at home. Only 5% of the students in LSS and 6% in USS in Bulgaria report that they use computers at home. According to this indicator Bulgaria is far behind the well developed countries. It is behind the other Central and Eastern European countries participating COMPED - about 28% of the students in Slovenia and 11% of students in Latvia in USS report of using computers in school. The reported high number of computers in LSS are mainly due the fact that a lot of the Bulgarian schools are so called Unified Secondary Schools and they comprise students from 1st to 12th grade, i.e. these schools cover both LSS and USS level and the students there share the same equipment. Great problem for our schools is the quality of the school computers. As it can be seen from Fig. 4 and Fig. 5 about 30% of LSS and 39% of USS report that they have more than 6 computers out of order. The percentages of computers with 16 bit processors offers a good indication for the extent to which the schools keep the quality of their equipment close to the recent technological developments. According to this indicator (see Fig.6) Bulgaria is at the last place among all participating countries - the mean percent of 16 bit computers is only 3% for LSS and 4% for USS. The quality and variety of computer peripherals are also quite low in the Bulgarian schools. Very few schools have local area networks and the access to Internet or Bitnet is still (almost) impossible. The majority of the computer teachers report that they face problems like: "insufficient peripherals available" (58% in LSS and 62% in USS), "difficulty with maintenance" (66% in LSS and 74% in USS), "limitations of computers" (64% in LSS and 70% in USS), etc.

Lower Secondary Schools

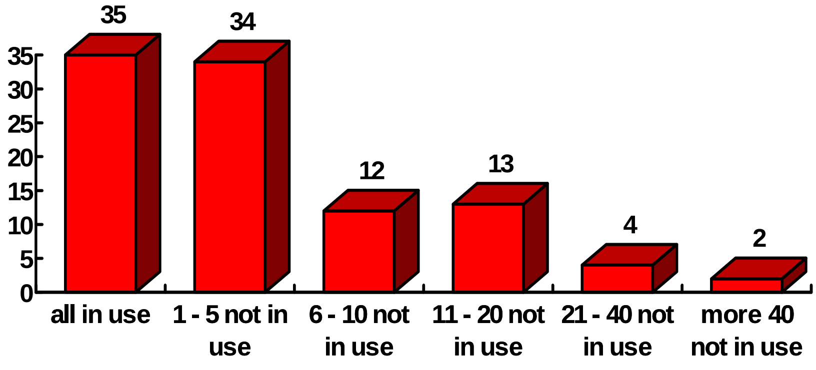


Figure 4.

Upper Secondary Schools

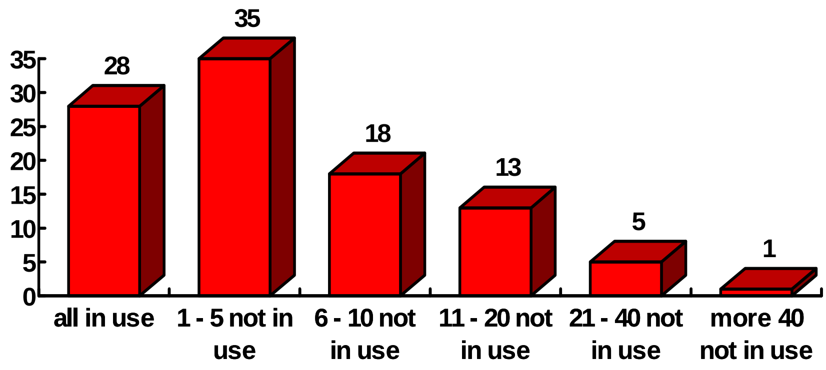
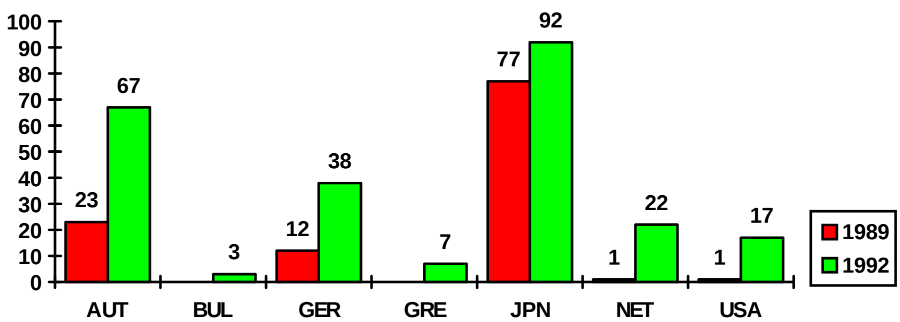


Figure 5.

Lower Secondary Schools



Upper Secondary Schools

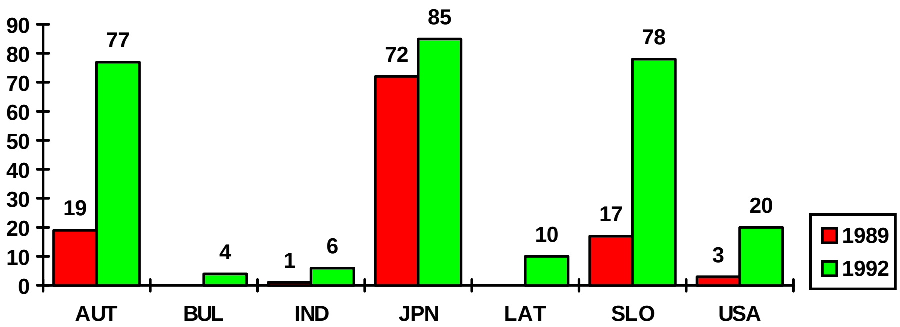


Figure 6.

Although the availability of educational software is reported to be relatively high in Bulgaria compared to other participating countries, 64% of the computer co-ordinators in LSS and 67% - in USS find that "insufficient instructional software" is among the major problems. According to our personal impression and the interviews with school teachers the amount of legal software used at schools is not much and after the Low for Copyright and Author's Rights has been approved by the Parliament the situation is expected to be dramatically changed to worse. The quality of the educational software available or which is possible to be run on the school computers is also very poor and this software is usually written by teachers or by students.

Some conclusions for introducing computers in education in Bulgaria can be drawn:

- there are not enough funds for computer education;
- there are not enough peripheral devices;
- there are many difficulties in hardware support;
- computers are not powerful enough (mainly 8-bit)
- the teachers do not have enough time for computer lesson preparation;
- the teachers face great difficulties in integrating information technologies into other school subjects;
- there is not enough educational software.

A new national computer in education programme should be launched in order to help schools keep the quality of their equipment, software and education close to the recent developments in that field..

3. How Are Computers Used at School

The information concerning application of computers at school should be interpreted in the context of why schools started to use computers [3]. The reason most frequently mentioned by school principals was: *To give students experience with computers that they will need in the future*. Another reason: *To keep curriculum and methods up-to-date.* was ranked at the second place. Many school principals in Bulgaria (78% in LSS and 84% in USS) consider computers as tools for improving quality and effectiveness of education. This purpose implies a very deep integration of computers in all school subjects and activities. However Table 2 (p.33) shows that computers are used mostly for computer education (*learning about computers*) and a real integration in the other school subjects (*learning with computers*) is still expected in the future. We can also infer that the level of integration of computers little depends on the number and quality of hardware and software available - the students in both well developed and developing countries report that they rarely use computers in mathematics, science, mother tongue, and social studies.

Table 2.

	Lower Secondary Schools							Upper Secondary Schools						
	AU	BUL	GE	GR	JPN	NET	USA	AU	BUL	IND	JPN	LAT	SLO	USA
A.	90	52	78	96	49	78	95	87	81	40	52	80	73	96
B.	71	52	81	71	10	86	67	84	84	51	73	86	90	83
C.	7	13	15	9	2	7	7	2	5	20	2	4	3	6
D.	2	5	Ì	8	2	Ì	2	1	4	13	5	2	3	4
E.	5	6	9	8	1	7	9	0	4	8	1	2	0	9
F.	1	Ì	Ì	7	1	12	3	0	3	8	1	0	0	2

Notes: M = number of valid cases too small (< 250)
or too many missing cases (> 20 %)

The original wording of the computer use/subjects is:

À. Computer used; D.Science;
Â. Computer Education; E. Mother tongue;

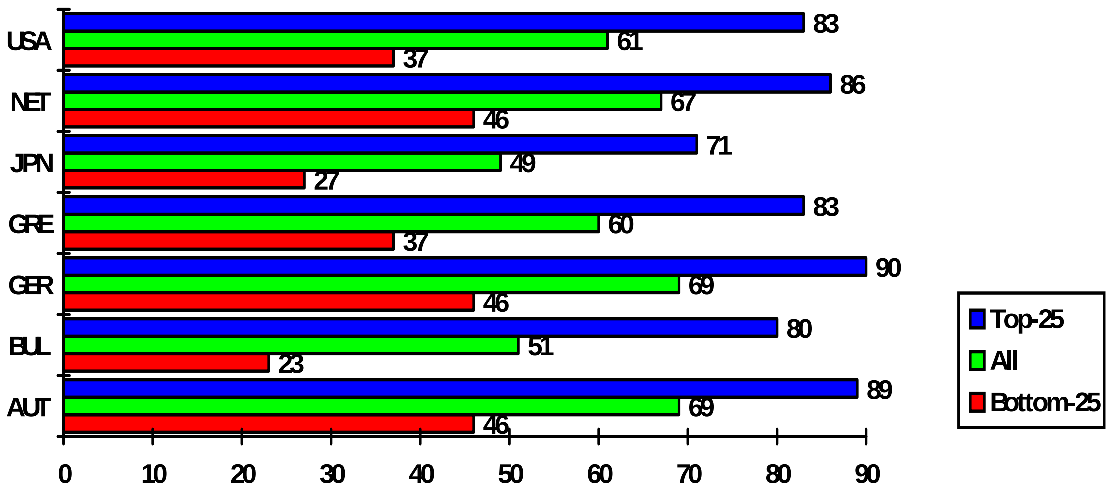
C. Mathematics; F. Social studies.

In order to clarify the extent of application of different types of educational software the computer teachers were asked to indicate how often they use any of them. It can be seen from Table vvv and Table Www that the *favourite* type of software is tutorial or drill and practice. Application software packages like word-processors, data bases, spreadsheets, simulation, etc. are used rarely by the Bulgarian teachers. For instance about 90% of teachers at both LSS and USS never used spreadsheets, about 90% at USS and 80% at USS never used simulation software, more than 70% at LSS and 50% at USS never used word-processors, about 90% at LSS and 75% at USS never used data bases. Educational software packages for statistics, authoring, item banks, communication, multimedia, etc. are almost unknown at schools. Most of the computer teachers use BASIC as a programming language and about 40% of the teachers at USS report that they use it every period.

The statistics provided above shows a non optimistic picture for computer application in the Bulgarian schools. There is an urgent need of a new national programme for integrating new information technologies in school.

4. Students' Knowledge about Computers

Lower Secondary Schools



Upper Secondary Schools

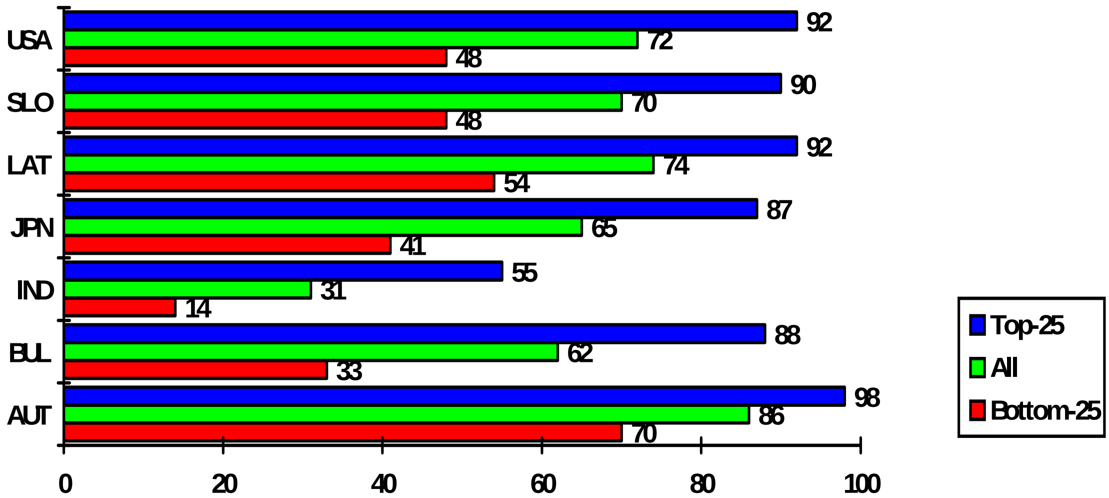


Figure 7.

The level of students knowledge and skills was measured by so called Functional Information Technology Test (FITT). The 30 item test was the same for LSS and USS. The average score of the total sample in the target grade level and for the 25% highest and lowest scoring students as well as the accuracy for estimating the score for the total target population in a country (95 % confidence) are displayed in Fig. 7. As it could be seen from the data the scores of the Bulgarian students both at LSS and USS are holding a lower than the average position. The Austrian students showed highest scores both for LSS and USS. However the test scores do not show only the effect of learning and using computers at school but rather the total experience and knowledge gained within and outside school. The relatively low achievements of the Bulgarian students are due the lack of enough additional sources of information about computers and the low percentages of the FITT topics having been studied in advance at school - 22% in LSS and 47% in USS. The highest correspondence between FITT topics and the content the students have learnt at school is in Austrian schools - 85% in LSS and 94% in USS. For Slovenia and Latvia this correspondence is respectively 87% and 82% (in USS).

The main implication from the FITT for Bulgaria is that the low scores do not mean a lack of learning abilities for Bulgarian students. For instance they are quite successful in the international programming Olympiads. Computer education in Bulgaria should be drawn towards the European standards. In addition better supply of computers, software and other teaching materials should be ensured for the Bulgarian schools as the students can not rely on access to computers outside school.

5. Staff Development

Table 3.

	Lower Secondary Schools							Upper Secondary Schools						
	AU	BUL	GE	GR	JPN	NET	USA	AU	BUL	IND	JPN	LAT	SLO	USA
A.	22	59	81	57	9	23	21	42	60	29	15	57	32	19
B.	57	39	31	29	54	16	43	63	36	29	49	24	90	52
C.	25	3	19	4	19	11	29	21	8	3	10	22	33	26
D.	0	1	1	0	0	0	3	0	2	0	3	0	0	5

E.	42	66	13	17	7	47	29	27	74	27	7	49	20	29
F.	6	19	9	19	31	15	11	11	22	7	37	46	20	12
G.	2	1	7	9	21	20	26	2	2	2	14	0	6	40
H.	95	13	23	7	62	80	43	93	21	32	68	M	22	40

Notes: M = information not available or too many missing cases (>20%).
The explanation of the agencies is:
À. Ministry of Education;
Â. Local Educational Authority;
Ñ. Teachers of other schools;
D. Parents;
Å. Universities/(teacher training) colleges;
F. Teachers associations/ other associations;
G. Business and industry;
H. Support institutions/resource centers.

Teacher training is a key problem for a successful application of computers in education. As it can be seen from Table 3 the highest support for teacher training in Bulgaria comes from universities and other teacher training institutions. For instance the teacher development programme at Sofia University has been providing courses covering the most important aspects of application of computers in education since 1984 [2].During the courses the teachers have access to powerful computers and software and gain self-confidence in experiencing new styles of teaching. Unfortunately their enthusiasm does not last very long. The informal interviews and meetings with some teachers showed that once they returned to their schools and face all the problems - technical, organisational, curriculum, human, etc. - they could not overcome the burden and only a few of them applied what they had learned. During the last few years (mainly due financial reasons) teacher training and retraining courses have been rarely organised. According to the COMPED data the Bulgarian teacher feel lack of enough knowledge about computers and their application - 58% in LSS and 66% in USS report about such problem. They also can not find adequate support and guidelines for instructional use of computers - 59% in LSS and 57% in USS. More than 40% of teachers both in LSS and USS report for lack of enough training opportunities and enough time for computer lesson preparation.

7. Conclusions

On the basis of the above said the following suggestions for improvement of computer education in Bulgaria could be maid:

- a careful analysis of Bulgarian COMPED data should be made in order to better determine the current problems and needs in the field of computer education;
- a new national strategy for integration of communication and information technologies in education should be developed by taking into the consideration the new economic and social circumstances;
- relevant educational standards in communication and information technologies both for students and teachers should be adopted;
- a new national teacher training programme should be launched for providing continuing teacher education. Some advanced training methods such as flexible and distance learning by means of new information technology should be applied as well.

- following the tendency of decentralisation a network of teacher training and resource centres where teachers can refresh their knowledge, share ideas and experience, keep in touch with new trends in the field, receive educational software and literature, rely on competent help, should be established.

- the co-operation of Bulgaria with other leading in this field countries should be extended and strengthened. For example - the International Programme “Children in the Information Age” should be re-established.

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VI. Teacher Development Support in Using Information Technologies in Schools

1. Teacher Development and Information Technology (IT)

It is recognised that the teacher's role is essential in the adoption of any change in education. Teachers are the key factor for the successful integration of IT in schools too. Therefore the qualification of teachers to use IT competently in their professional practice is considered here an important task. After an initial training to provide a background in IT and make them aware of the potential of IT in education, teachers need further development and continuing support in the integration of IT into teaching and the learning process.

1.1 Some Observations

According to recent studies related to teacher education and IT and proved by our own experience, the following are important factors influencing the process of teacher development:

Teacher's motivation: Convincing examples of applying IT in education have to be presented to the teachers. The teacher's efforts to enter a new field and adopt her/his teaching style to a new technological environment have to be encouraged and stimulated. Nationally approved standards for teacher development in IT have to exist [2].

C*ontent of training*: Building a basis in IT is necessary [4]. It will help teachers gain competence and feel confident. A balance between theory and practice in their further training - activity-based training taking into account classroom reality - is needed. Teachers have to be able to decide on the content of training and choose their own paths in a flexible training program [3].

Methodology and technology of teacher education: A demonstration of the usefulness of IT is necessary. The technology has to be extensively used in the training process by the trainers themselves. Discussions, reflections and support in generating ideas of what can be done with technology in the teaching and learning process should also be included in the training. Teachers need to develop transferable skills.

Organisation of the training: Flexibility is essential: full and part-time courses, school-based training, "cascade" training [1]. Distance delivery of those could also be a useful option.

Dedicated course managers and tutors: Constant efforts are needed in the process of training and co-ordination of on-going activities.

Continuing support: Teachers need to be supported in their work after the training course. Information resources and consultants have to be accessible. The availability of teacher-supporting materials is important.

1.2 Where are we now?

There are traditions in Bulgaria in teacher-training concerning IT. Mainly higher education institutions offer teacher training programs. Most of them require a mathematics background. The experience gained so far shows some of the problems which have to be taken into consideration:

Content: The training is more theoretically oriented and often not related to classroom reality. Training programs are fixed and do not allow flexibility. Teachers can not decide on the training content.

Technology: Equipment in the training labs usually differs substantially from that in schools.

Course materials: Specially developed course materials for teachers are usually not provided.

Further support: Teachers come and go - the training units are not responsible for further support of teachers after the training period.

One step towards a better match of teachers' needs could be the establishment of Resource and Training Centres, where teachers can periodically update their qualification in a more flexible way, find up-to-date information and get continuing support in the process of their work.

2. Support of Teacher Development in the Framework of the Project "Educational Initiative of IBM for Bulgaria"

2.1 Description of the Project.

The project "Educational Initiative of IBM for Bulgaria" was initiated in 1994 by IBM-Bulgaria, the Open Society Fund-Sofia and The Bulgarian Ministry of Education and was planned for a period of 2 years. The scope of the project is supporting the integration of computers and information technologies in Bulgarian schools. 28 secondary schools participate: 1 pilot school in Sofia and 27 country schools. These schools have been chosen on a competitive base. Each of them has been equipped within the project with a computer lab: Server (PS/1 486 DX2/66) + 7 Workstations (PS/1 486 SX/25). The software initially installed is: DOS 6.2, MS Windows 3.1, MS Works 3.0, NetWare LITE, LINKWAY.

A Teacher Training Centre with exactly the same equipment has been established at the Faculty of Mathematics and Informatics, University of Sofia, with the task to provide training and support for teachers from the participating schools.

The project activities are co-ordinated by an executive body in which each of the initiators is represented. IBM provides the initial hardware and software equipment. The Open Society Fund supports financially the starting-up activities: a 3-week initial training course for one teacher per participating school; upgrade of the existing hardware at the Teacher Training Centre with additional RAM, printers and screen projection system; the establishment of a library with relevant books, periodicals and software. The Ministry of Education is responsible for the overall organisation of the project activities relating to schools.

2.2 Teacher Development Scheme

The Teacher Training Centre is hosted by the Faculty of Mathematics and Informatics at the University of Sofia. The main purpose of the Centre is to provide courses, information services and continuing support for teachers. The courses are carried out by the Educational Computer Systems Laboratory (ECSL) which has experience in pre- and in-service training of mathematics and informatics teachers. A project co-ordinator (a member of ECSL staff) is responsible for the overall activities of the Centre.

The teacher training during the first year of the project is planned in two phases: initial and specialised.

2.2.1 Initial Phase. The initial phase consists of a 3-week full-time course, offering a basic acquaintance with the hardware and software installed in each school lab. Such a course will be offered to all school project co-ordinators (one teacher from each school participating in the project). Until now one initial course has been carried out. Here are some details about the course:

PARTICIPANTS' PROFILE:

12 teachers (school project co-ordinators) with a background in Mathematics or Engineering and with varying previous experience in teaching Informatics at Secondary School level.

DURATION

3 weeks;
Daily schedule: 6 hours (tutorials and guided practice) +
3 additional hours free practice (with a consultant available)

PROGRAMME

DOS 6.2 - an overview.

Working in WINDOWS 3.1 environment

Working in a Network: NOVEL LITE NetWare

MICROSOFT WORKS 3.0 in Education:
- Text processing
- Spreadsheets
- Database
- Integration
- Classroom Applications

Computers in Education: Approaches and Methods, Versions of the Curricula adopted by the Ministry of Education
Presentation of Link Way

Closing seminar and discussion

This content of the initial course was chosen by the executive body to ensure that school project co-ordinators would feel comfortable with the available hardware and software and can immediately start working with it as well as helping their colleagues to start. The integrated package "Microsoft Works" was presented in a project-oriented way and during the course every teacher developed a small project related to some school activity.

2.2.2 Specialised Phase. This phase will provide more individualised training for school co-ordinators according to their competence, interests and the particularities of their schools. Every teacher will be offered 3 one-week courses until the end of the school year 94/95. To match better teachers' needs and to define the appropriate paths for their further training, a special questionnaire, "SUPPORT AND FURTHER TRAINING NEED IDENTIFICATION

QUESTIONNAIRE", was developed and filled in by the teachers during the initial phase. Here follow some details:

The participants were invited to choose topics for further training among different groups of modules (open questions for suggesting additional modules were also included).

Suggested Topics for Further Training:

- Learning Environments ("Mathematics", "Geomland")
- Subject-oriented Software (Physics, Chemistry, Biology, Languages)
- Programming Languages (Logo for Windows, Turbo Pascal, Visual Basic, Prolog)
- Theoretical Aspects of Informatics (Program Verification, Program Synthesis)
- Applications (Textprocessing, Graphics, Databases, Spreadsheets, Statistics)
- Desktop Publishing
- Hypertext and Multimedia
- Communications (e-mail based school projects, BBS, global networking)
- Other

These "self-definitions" of further training needs are useful, but teachers will not be left to determine completely by themselves what they need. It is the training team who will make the final decision about the emphasis in the content of the training and about the style of using IT in education which will be promoted by the Centre. In this sense, creating a feeling and appreciation of using open learning environments will be stimulated. As far as application software is concerned, a project-oriented style will be followed. Teachers will be stimulated to search for cross-curricular projects.

2.2.3. Course materials. The training team has the ambition to provide the teachers with relevant materials in Bulgarian. A set of handout materials was developed by the trainers for each module of the initial course. Each set consists of a reference part (structured information about the module itself) and a methodical part (teaching notes and hints for possible classroom applications). These materials were given to the participants at the beginning of each module. Thus each participant had a handy copy of necessary and useful information to use during the course and take home at the end. This turned out to be essential also for overcoming the language barrier - all the accompanying documentation which schools get, together with the equipment, is in English.

2.2.4 Evaluation. At the end of the initial course the participants were invited to fill in (anonymously) a COURSE EVALUATION SHEET. They were invited to share their impressions, opinion and recommendations as relating to:

- Course structure and organisation;
- Each module in the programme, according to:
  - content,
  - teaching performance,
  - adequacy, sufficiency and quality of the handout materials prepared by the instructor,

- Other comments

This provided a useful feedback and will be taken into account for the next courses.

2.3 Further support

2.3.1 Studying the needs. During the initial course the level of competence and needs of the participants was studied on the basis of specially developed questionnaires. The information collected gave the Teacher Centre coordinator an impression of the individual teacher's needs and helped him form a better view of the appropriate future activities of the Centre. Here are some details about the questionnaires:

The PARTICIPANT'S PROFILE QUESTIONNAIRE is aimed at compiling a project on the participants' database and comprises the following items:

- full address for correspondence;
- current position;
- professional background and qualification;
- track of in-service training;
- experience in teaching and using IT at school;
- areas of competence;
- areas of interest;
- English language skills.

The teachers were also asked about the RESOURCES AND FURTHER SUPPORT by the Centre they would welcome:

- Literature (topics, acceptable languages).
- Software
- Specially developed materials for teachers (to be specified)
- Specially developed materials for students (short references, worksheets, etc.)
- Expectations and suggestions relating to the Teacher Centre's future activities.
- Suggestions on the form of contacts and co-operation with the Centre.
- Other

2.3.2 Providing Information and Communication Resources. A small library collection was gathered and made available to the teachers. It contains recent books on Computing and Education, textbooks in Informatics, Reference Guides and Handbooks, periodicals. The next step is to establish a software library.

A telephone “hot-line” is open for the teachers to contact the Centre when problems arise in their own school settings.

Providing Internet connection for the Centre and establishing e-mail links among the participating schools is also a priority task for the near future. A Bulletin Board System could also be a solution for providing information and communication.

3. **A Concept for Future Teacher Development Support**

On the basis of the experience gained so far and the analysis of the filled in questionnaires, conclusions were made and a concept for further teacher development support was developed. It was recognised that Resource and Training Centres (RTC) for teachers using IT is a necessity and it should act as a focal point offering up-to-date information, courses, seminars, discussions, software demonstrations and continuing support for teachers. These should include:

3.1 Information services

- The RTC team has to permanently search for up-to-date information about research and developments in the field of IT in Education. Having an Internet connection and access to relevant publications, international conferences and expert groups meetings is essential. Special arrangements with hardware, software and publishing companies for a regular supply of relevant materials would be helpful.

- Inexpensive and reliable communication links between the teachers and the RTC are required: telephone “hot-line”, fax, e-mail connection, an RTC newsletter, bulletin board system.

- RTC should provide library facilities for teachers. These should not only have books and periodicals, but also copies of diploma theses on relevant topics. A software library must also be maintained.

3.2 Training

- A research approach - integrating research and practice - has to be adopted in RTC [6]. A team of specialists and trainers has to be formed at RTC to discuss and decide on the content of training. A modular training scheme has to be developed [3]. Careful planning for a continuing training is necessary, taking into account the existing pre-service training programs and aimed at establishing a smooth relation between pre- and in-service training. Links and collaboration between MA students in Mathematics and Informatics and in-service teachers can be beneficial.
- A *teacher-centred model* [5] has to be adopted - the training scheme must be individualised as much as possible and the support offered must take into account the concrete situation - tasks and school environment - in which the teacher works. Flexible forms of delivery of the courses have to be found - full and part-time courses, optional short modules, school-based training, distance delivery.

3.3 Continuing support

- Keeping teachers informed about new developments in the field has to be an important task of the RTC. This should include discussions between experts and practitioners to find out the most appropriate way of IT application in education as a whole and in a particular setting.
- "Listening to the teachers" - the RTC must provide a forum for teachers to express their needs and findings; to exchange ideas, experience and examples of good practice between themselves. This could be done personally (seminars, discussions) or in an electronic form (e-mail, BBS), or through a newsletter.

- Building a national human network of specialists and practitioners ready to devote some of their time to help solving teachers' problems would be helpful and useful. Communication in this network should be supported electronically as well.
- RTC has to help teachers in the establishment of international contacts for a collaborative work in international educational projects.
- Creating a stimulus for teachers and contributing to a higher social esteem (formal and informal) of teachers working with technology should also be a RTC task. Encouraging and supporting future teachers to participate in the development of teacher and/or student-oriented materials and in the development of courseware and educational software could be motivating.
- If RTC proves to be successful, local branches in different geographical regions can be established. These could be build around active and future teachers.

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VII. The Contribution of PROSVETA Publishing House to the Teaching of Informatics in the Secondary Schools in Bulgaria

There is a long-standing tradition in every Bulgarian family to respect the scholar. Most parents strive to provide as good education for their children as possible. This ambition of the Bulgarian to study was one of the reasons - even 170 years ago when the nation was still under the Ottoman yoke - for publishing a *Primer with different instructions.*

For 50 years every Bulgarian has begun to learn the alphabet from the primers published by *Prosveta* Publishing House. *Prosveta* has published and is still publishing textbooks, supplementary school and methodological books. The publishers strive to publish books with the latest scientific information.

The development of informatics has not missed the attention either of Bulgarian scientists nor of *Prosveta*. The books published on informatics confirm this statement.

We shall trace the publishing of textbooks and books separately in this paper beginning with *Cybernetics and thought* by Konstantin Kostov, which was published in 1969 (1). It is a matter for debate whether to include this book in informatics literature but we have decided to do so since in it, for the first time, thought is discussed as an object of management. Seven years after the subject Programming was included in the curricula for the mathematical classes in some schools and mathematical schools in 1974 *Algorithms and Their Preparation for Machine Realisation* (2) by Miroslav Ivanchev was published. The book was addressed mainly to teachers of informatics, because until that time a textbook had not been published. The book included short preface on the theory of algorithms and an elementary idea of machine languages and description of FORTRAN IV was presented. The examples of algorithms were related to the already studied material in algebra, geometry and numerical methods.

In 1978 four books were published on informatics. These were among the first books addressed specifically to students in Bulgaria. The first of them was *Elementary Knowledge of Cybernetics* (3) by T. Boyanov. It was addressed to a wider circle of readers - these eager to learn could become acquainted with terms like information, its measurement, information structures, algorithms and management.

The second book was *Algorithms* (4), written by P. Barnev and P. Azalov. General information about algorithms and their presentation through block diagrams was given in the book, and a number of concrete algorithms connected with funny questions and serious problems.

The principal construction of computers was presented in the third book published in 1978 called *Mathematical Bases of Computers* (5) by Hristo Hitov. This book was addressed to students and treated historical information, elements from the Boolean algebra, and the presentation of data in computers.

The last book, published in 1978 *Information and Management* (6) written by P. Barnev, was addressed to teachers. The meaningful terms information and management are explained in it.

The coming of information systems as helpers in all spheres of life was the reason in 1981 why A. Radensky's *Information Systems* (7) was published. It explained the essence of information systems using examples, and then discusses database management systems through which they are realised.

The book *Algorithms and Algorithmic Computing* (8) by D. Skordev as one of the series for students *Alef* was published in 1981. Some basic ideas from a relatively new field of mathematics - the theory of algorithms are discussed in the book. It tries to express in a simple way these ideas to students.

For teachers, who know the classic parts of elementary mathematics and wish to know the fundamentals of programming in 1983, a second book by A. Radensky *Mathematics and Programming* (9) was published. It shows the connection between some traditional methods for solving classical mathematical problems and methods for solving problems using computers.

For students with a great interest in maths and informatics a new series of books introduced was *Mathematics and Informatics - Extracurricular Work*. Within a period of six years, six books on informatics were published in this series. The first book, published in 1985, was *FORTRAN in Examples and Problems* (10) by P. Azalov. By giving a number of examples the language

FORTRAN is explained. Problems given at students' competitions were also included in the book. In 1985 the next book from the same series was published, namely *Coding of Information* (11) by St. Dodunekov and I. Denev. Its aim was to provide opportunities for the serious students to get acquainted with elements from the theory of coding. In 1986 the first *Pravets* computers (Apple-2 compatible) were produced in Bulgaria but there was no available book for these wanting to work with them. So the book *Computer for Beginners* (12) by Morgan was translated into Bulgarian. It offers a system for learning on *Apple*, and its introduction, written by T. Boyanov, differentiates between *Pravets* and *Apple*.

From 1986/1987 informatics began to be studied in all schools. Students have already studied programming at school. At that time the book *Datastructures* (14) by P. Azalov and F. Zlatarova was published. With the knowledge from that book, students and specialists could make a qualitatively new step towards improving programming and also improve their style of making programs. With the expansion of the production of computers *Pravets* children also had more free access to computers and, as usually happens, children were the first to overcome the barrier of working with them. However, there was no book available for children. Thus we published the book *I Can Program at the Age of 9* (17) by P. Stanchev, which discussed an elementary course in programming on Basic for small children.

There were schools in which children started using computers at an early age on the Logo language. The authors R. Nikolov and E. Sendova have had great experience in their work with children and they offered the book *Informatics for Beginners* in 2 parts (23), (24). The ideology of the Logo language was explained in them and ready computer programs were used in the working up of the themes.

In 1990 *Basic in Examples and Problems* (28) by Rahnev, Garov, Gavrilov was published. The very title of the book reflects precisely its contents. Using it the reader learns some methods of programming. It includes also problems given at students' competitions.

So far we have presented in succession published by Prosveta dealing with questions from informatics books which filled the vacuum existing because of the lack of textbooks. But they also served as the basis for the writing of textbooks.

Now we shall consider the textbooks publishing for the 2 stages of the secondary comprehensive schools.

In 1967 the subject "programming" was included with a resolution from the Ministry of Education in the curriculum of some mathematical classes and mathematical schools, as we already mentioned. Until that date no textbooks had been published for these students. That was not an omission on the part of the publishers as textbooks are published only if ordered by the Ministry of Education.

The curriculum for 1986/1987 provided for the second school term informatics to be studied as a separate subject. So the Ministry of Education assigned *Prosveta Publishing House* to publish two textbooks on informatics for the students in 10th and 11th grades (15), (16) and (18), (19). These two textbooks written by different teams of authors - Barnev, Azalov, Dobrev, Bisterov and Angelov, Gavrilov, Garov - with different syllabuses aimed at teachers in informatics to enable them to choose the appropriate textbook for their students. The textbook by Barnev, etc. explain basic questions from informatics illustrated by the language of Basic while in the other textbook by Angelov, etc. programming on Basic prevail. Students who studied using that syllabus could choose the second stage of education which had a different duration. For the students studying in educative industrial schools where informatics was taught, three textbooks were published by Prosveta:

In 1986 *Informatics for 11th Grade (II stage)* (13) by M. Barneva and S. Stoykov; *Operating Systems* (27) by A. Hachikyan, A. Rahnev and K. Garov; *Programming and Algorithmic Languages* (29) by P. Azalov (1990).

Education in 8th Grade began with new syllabuses in 1988. These textbooks treated elements solely from informatics. For this batch of graduates textbooks were published in mathematics written by two teams of authors. The first one, led by Sendov, wrote *Mathematics and Informatics* in 4 parts (20), the second wrote separate textbooks in algebra, geometry and optional maths. The two teams used different approaches to the writing of their textbooks. The textbooks written by Sendov, etc., republished in 1992, contained "information corners" which presented programs with the language Logo and that approach continued in the textbooks for 9th, 10th and 11th grades. The textbooks for 8th grade in algebra by other team of authors has elements from the language of Basic.

In 1989 textbooks by two teams were published for 9th grade students. One by Barnev, Azalov, Dobrev and Bisterov, *Informatics for 9th Grade* (21), treated programming by INFO (hypothetical language), and for each example in the lab, practice was given with a version in Basic.

The textbook was republished in 1992 with the title of *Informatics I* (30). The basic examples for programming also contained the programs in Basic and Pascal.

The other team, led by Sendov, wrote a textbook in informatics under the title of *Mathematics and Informatics*, part I. The language of Logo was used. The second edition of this textbook is *Informatics I - a Reference Book* (31).

Two textbooks in informatics for 10th grade students were published in 1990. They were also written for different syllabuses. *Informatics for 10th grade - a Reference Book* (25) by Barnev and Azalov does not use any concrete language for programming while the other textbook written by Sendov, etc. again uses the language of Logo (26).

The second unrevised edition was published under the title *Informatics II - a Reference Book* (32).

The authors Barnev and Azalov of *Informatics II* had new ideas for this textbook and the Ministry of Education ordered it to be rewritten as the main textbook with five appendixes separately. Thus the new textbook *Informatics II* (33) by Barnev and Azalov was published in 1993. The five appendixes *Word-processing* (34) by Azalov and Zlatarova, *Database* (35) by Azalov and Kouneva, *Spreadsheets* (37) by Azalov and Hikov, *Bureautics* (38) by Barnev, *Computer Graphics* (37) by Barnev, Banchev were published in 1994.

The last textbook written by Azalov and Zlatarova is *Informatics with Pascal - a Reference Book* (39). The Ministry of Education announced a competition for its publications. From the three applicants *Prosveta* Publishing House won the competition and the textbook was published. We have given a complete survey of the published by Prosveta books and textbooks in informatics until today. We firmly believe in our contribution to the teaching of informatics.

Appendix A

List of books and textbooks in informatics published by Prosveta

No.	TITLE	AUTHOR/S/	YEAR OF PUBL.
1.	*Cybernetics and Thought*	Konstantin Kostov	1969
2.	*Algorithms and their Preparation for Machine Realisation*	Miroslav Ivanchev	1974
3.	*Elementary Knowledge of Cybernetics*	Todor Boyanov	1978
4.	*Algorithms*	Peter Barnev, Pavel Azalov	1978
5.	*Mathematical Bases of Computers*	Hristo Hitov	1978
6.	*Information and Management*	Peter Barnev	1978
7.	*Information System*	Atanas Radensky	1981
8.	*Algorithms and Algorithmic Computing*	Dimitar Skordev	1981
9.	*Mathematics and Programming*	Atanas Radensky	1983
10.	*FORTRAN in Examples and Problems*	Pavel Azalov	1985
11.	*Coding of Information*	Stephan Dodunekov, Yordan Denev	1985
12.	*Computer for Beginners*	Morgan	1986
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VIII. University Teleteaching Centres: A Central and Eastern Europe Perspective

1. General Issues and Training Needs

Like all other Central and Eastern European (CEE) countries Bulgaria is experiencing a dramatic change in all areas of its society and it is seeking to create democratic institutions and market economy. As the political and economic reforms are not at a satisfactory state, the Bulgarian economy is still in a deep crisis. There is a lack of modern economic and management practice in the Bulgarian companies and the lack of enough public support and understanding of the political and economic changes. In the long run, economics and management understanding is critical to a successful transition and economic growth. In addition, the urgent need to turn around the existing companies and at the same time to create favorable conditions for emerging private enterprises require better knowledge in economics, business, and company management. This makes economics, business and management education at university level of utmost importance to the development of the country. This fact is politically recognized by the Bulgarian government, which would support any valuable initiative. However a mass education could hardly be achieved without applying the methods of the new educational technologies based on Communication and Information Technologies(CIT). As the Bulgarian society and economy is getting more open, a mass foreign language education is also needed, along with training in application of CIT.

The education used to be the main instrument for ideological influence before 1989 and the advanced educational technology methods had not been widely applied. Only few educationalists are well prepared in this field now both at a secondary school and university level. Most of the teachers and lecturers have to be trained in applying modern curriculum and instructional design methods, instructional technology, educational instrumentation, etc.

Some new ways for opening the Bulgarian education towards the modern education are needed. The traditional forms of achieving it - by student and staff mobility, has its disadvantages, especially for the long term visits. The main problems are economical, political, geographical, social, etc. When a student goes for a study abroad the knowledge he/she acquires can not be easily disseminated in Bulgaria because the students usually leave and study in an isolated environment and in some cases - the students do not come back to the country. The teleteaching option, combined (when possible) with a short term student/staff mobility scheme, gives quite more opportunities and solves some of the problems which appeared. From the other side the teleteaching provides opportunities for developing a school and university presence on the Internet and thus making this institutions transparent for the outside world. In such a way the exchange of ideas, materials, multimedia educational software, curricula, and people would be extended, and the Bulgarian education would be drawn closer to the European standards.

There exists a belief that the traditional departmental structure of universities is reaching great obstacles in fulfilling its usefulness and that new organisational structures are needed if universities are to provide education for the masses with the diminishing resources which are available to them. At the same time, universities are facing increasing pressures from the outside. Tuition fees are rising far beyond the ability of middle class family in the CEE countries to pay, and government grants for research and education are drying up as governments face budgetary pressures. The telematics based Distance Education (DE) is considered as an answer of the new challenges in the field of education. It opens new dimensions for the educational systems of Bulgaria and the other CEE countries.

2. Background

2.1 An EU Copernicus Project on Distance Education through Telematics Networks

In January, 1995, the EU Copernicus Project COP1445: *Flexible and Distance Learning through Telematics Networks: A Case of Teaching English and Communication and Information Technologies* began[1]. The partners were: Sofia University, Faculty of Mathematics and Informatics and Faculty of Economics and Business Administration, Sofia, BG; University of Twente, Faculty of Educational Sciences and Technologies, Enschede, NL; University of Exeter, Exeter, UK; The Technological University of Kaunas, Kaunas, Lithuania; and Glushkov Institute of Cybernetics, Kiev, Ukraina. The project aimed at:

- establishing Internet communication between the project participants;
- developing Project Data Base suitable for establishing a Telematic Research Network;
- developing pedagogical framework for teleteaching in individual and group mode and a conceptual model for flexible and distance learning system using Telematics networks.
- developing and delivering two sets of distance education courses: English (English for CIT and Business English) and CIT (CIT for Teacher Training and Business CIT);
- developing software tools supporting course development and delivery;

The Copernicus Project outcomes offer a good basis for developing the Sofia University Teleteaching Centre.

2.2. An EU Phare Project on Distance Education

The first steps in building a distance education network in the CEE (Phare) countries were undertaken in June, 1995, when the Technical Assistance Programme (TAP) for the implementation of the Trans-Regional Component of the Phare Pilot Project for Multi-Country Cooperation in Distance Education started[2]. The TAP includes 70 experts from the European Association of Distance teaching Universities (EADTU) and the European Distance Education Network (EDEN) who will deliver technical assistance to the distance education network now developing in the CEE countries.

The pilot project is based on the following main activities[2]:

* creation of a background and expertise for future adaptation of distance education learning materials in the Phare countries;
* creation of a common understanding in the Phare countries on the main European open and distance learning concepts;
* creation of a nucleus of DE trainers/experts serving as a basis in the future for the development of DE in the Phare countries;
* development of regional cooperation in human resource and DE issues in CEE countries;
* testing the feasibility of joint course development and implementation actions in the region leading to core course modules which can be adapted to national requirements and contexts;
* development of the necessary conditions for the cooperation with the distance teaching institutions of the EU;
* creating a common basis for the formulation of adequate policies and priorities in the Phare countries, at national and regional level, towards the development of relevant and efficient distance education methods and structures;
* raising awareness and creating cohesion about the national measures and actions in the field of quality assurance, customer care, accreditation and credit transfer, concerning distance education programmes and institutions;
* introduction of European dimensions in the CEE distance education.

A network of National Contact Points for DE has been established and in addition Forty Regional DE Centres are envisaged to be developed during the second phase of the project.

The paper analyses the opportunities of developing a network of teleteaching centres in the CEE countries on the basis of the Phare DE infrastructure and the on-going teleteaching projects.

3. Objectives

The main objectives of the Network of Teleteaching Centres (NTC) are:

- to provide information on the Internet for the on-line distance education courses offered by the NTC;

- to provide information about on-line courses offered by other universities and accessible via Internet, along with facilities for tree browsing, and keyword searches.
- to setup and support mailing lists and list servers;
- to setup and support: a central web server where instructors may put course materials and texts. The web servers will be configured as to allow people to send messages via e-mail as well as allowing establishment of web-based discussion groups.
- to provide access to the personnel database and statistics database;
- to support of distance collaborative training workshops and projects;
- to maintain databases containing students records;
- to provide software tools helping students and teachers locate information on the Internet;
- maintain a list of hypertext links to sources of distance education and mailing lists for discussion of teaching issues.

4. Main Tasks

The main objective might be achieved by developing:

- a common delivery and communication system with an user-friendly environment allowing access to the on-line multimedia learning resources;
- an appropriate pedagogical framework for teleteaching facilitating new learning services and course delivery and stimulating both peer to peer and pear to tutor communication;
- a software based technology for course transformation from a traditional mode of delivery to a distance education through telematics networks mode of delivery;
- an adequate credit transfer system adopted for the needs of the NTC and with respect to the European standards;
- a joint set of modules determined as a common core curricula in the participating universities and a common accreditation scheme;
- a common standard for course and other teaching material and software preparation as to facilitate for an easier transition from a traditional type of education to a teleteaching type of education;
- a strict procedure for resource materials filtering and their organisation in an appropriate data base.
- a procedure for on-going DE monitoring and evaluation based on case studies and ‘good DE practice’;
- quality standards for teleteaching products and services, and their production and delivery;

On the basis of the on-going projects and new developments the first (experimental) teleteaching school year at Sofia University Teleteaching Centre might be offered in 1999. The teleteaching will not replace the traditional type of education but rather make it more flexible, efficient, and cost effective.

5. Advantages

The main advantages of the NTC are[3,4,5]:

* it provides education and training along with new types of university services, e.g. performance support, partnership, cooperative work, information access, consultancy, etc. on a national and worldwide scale using telematics facilities;
* it defines new roles for universities in their relations to large and small companies who are evolving toward learning organisations. They might jointly develop and deliver appropriate university services to such organisations, using telematics facilities.

The NTC will offer services to broader audience:

* staff and students in higher education;
* professionals in organisations who need on-going support in order to keep up-to-date with new developments in their fields;
* training departments of organisations;
* enterprises which incorporate the advantages of telematics services;.

The NTC might provide a diversity of courses and services and become a facilitator of educational clearing houses, providing learning materials, educational multimedia software and other educational resources both to the networked institutions and other regional organisations and enterprises. The NTC might also help such enterprises in development of their business presence on the Internet.

The NTC offers an opportunity for the universities to participate in a world-wide education and training which can be more profitable by involving new target groups of learners.

6. Conclusions

A multi-country network of university based teleteaching centres might be established as to cover some of the Phare regional centres but in some cases, depending on the telecommunication facilities which are available, such centres can be established at separate sites, e.g. institutions, big organisations and enterprises, specialised teleteaching units, etc.

For the first five-ten years (until the majority of families in the CEE countries have computers and modems at home) the NTC could also provide access to telematics facilities for some students.

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